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1914

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NINETEEN THIRTEEN—NINETEEN FOURTEEN.

This is a time of recapitulation and prophecy. To sum up the advances which have been made during the year just closed is not so much of a difficulty, because we are fortunate in having those to call upon who are willing to contribute from their store of information so that the world may have a better and greater knowledge of things electrical. To make a prophecy, however, is a more difficult matter.

There can be no doubt of two facts. First—the first three-quarters of the year 1913 was a very satisfactory period in the development of the electrical industry; second—the last quarter was not so satisfactory. For the entire year the volume of business increased materially. Careful estimates indicate that there was a horizontal increase of about 26 per cent in the gross returns for the business accomplished. This was accompanied, however, with a still greater increase in the volume of business done, indicating that in 1913, like a good many years before, manufacturers, jobbers and contractors fell short of the consummation of good salesmanship and in too many cases accepted any old price to get the business.

Telegraphic reports from various sections of the country from leading manufacturers and from leading electrical supply jobbers indicate a mixed sentiment. The predominating note is one of satisfaction over the material gains made in 1913, and a general feeling of optimism with respect to the possibilities of 1914.

It seems very evident that within the past two weeks there has been a decided change in sentiment with respect to the outlook for 1914. There appears to be no great apprehension with respect to the participation of foreign manufacturers of electrical material in the American market, and with the passage of the Currency Bill has come an acceptance of a new order of things and a disposition to be satisfied and make the best of it. Incidentally, the belief is manifest that the present administration at Washington will seek to conserve business while the attempt is made to bring the larger corporations into a stricter conformity with present-day interpretation of the meaning and extent of the Sherman Anti-Trust Act.

It cannot be denied that business is and has been halting. The reports from the steel trade are depressing, the reports of idle freight cars are depressing, and the reports from labor bureaus in a great many sections of the country are also noticeably depressing. On the other hand, the report of the Department of Agriculture with respect to the nation's crops for 1913 is of the most encouraging nature. Ten billion dollars' worth of products, a bumper year in spite of many setbacks, and considerable loss in some products, is a record of something like 6,000,000 American farms. This most successful year of husbandry in the United States has brought forth $6,100,000,000 worth of crops, of which $2,896,000,000 is represented by cereals alone, and $3,650,000,000 worth of animals sold and slaughtered and animal products. The 1913 crop is twice as great as that of 1899; more than a billion dollars over 1909, and substantially greater than 1912.

Upon other pages of this issue patriotic and far-sighted men, occupying leading positions in manufacture, science, banking and finance, present their opinions with respect to the conditions of the industry today, and the outlook for the future. There is nothing the matter with the electrical industry that cannot be readily adjusted by looking squarely at conditions and striving mightily to so harmonize the activities of the various elements entering into the conduct of the business that, although immediate gain may be somewhat sacrificed, the future may be made sure and a staple industry developed. A disposition to recognize the requirements of the public on one hand and the limitations upon the part of the public utilities in meeting these demands, will establish a basis of reasonableness which will conserve the rights of all. A disposition to ignore the limitations of the public utility or a disposition to ignore the demands of the public will result in continued deferment of activity and result in economic waste and general dissatisfaction.

In a notable address delivered before the Economic Club of Springfield, Mass., recently, Mr. Samuel Untermyer, counsel for the Pujo Investigating Committee, said that the time had come to call a halt. We would like to print all of Mr. Untermyer's address, but it is too disheartening. If all that he has to say is true of corporation management it would leave too bad an odor to perpetuate it in the public mind. Retaliatory measures, while they bring relief, often bring distress upon whole families, communities and indeed a nation. If mismanagement and misdirected energy in the past has made it necessary to affect drastic changes in the management of some forms of big business, no good can be accomplished by laying siege to what is left and starving it to death. Therefore, it would be well for all of us to set our minds in the direction of devising ways for protecting all of our interests all of the time, and granting to our railroad corporations and other corporations suffering from inadequate returns the relief that must be had in the increase of rates. It is estimated by well informed men that an increase of five per cent in railroad freight rates would impose but a slight burden, well distributed, upon the shippers of the country. It would, however, put the railroads upon a paying basis, which would allow them to rehabilitate, and establish proper funds for the maintenance of property and put back into the market one of the biggest buying elements the country knows.

The year 1913 has developed some salutary lessons. It has indicated that in spite of great flux and change, in spite of widespread apprehension, the inherent stability of the country has made for a material increase over 1912, which was a fairly steady year. With everything to hope for and with the indicator pointing to a speedy readjustment of confidence; with the leading men of the country looking forward with calmness and courage; with the proceeds of a record crop available, we should mark time but a little longer; only long enough to carefully and intelligently map out an aggressive campaign for new business and greater developments. If the resources of this country are properly appreciated, and the opportunities now lying dormant met with decision and prudence, 1914 will be one of the best years the country has ever known.

DEVELOPMENT OF SUBSTATIONS.

In considering the progress made during the past year, attention may well be directed to the rapid evolution going on with respect to substations of a less permanent type than those which are installed in large centers in substantial buildings. Two distinct types of such substations may be mentioned; one is the outdoor form, usually installed where power requirements are small and costs must be kept down; the other is the portable substation which may be mounted upon a car or a floating barge and is made use of for temporary work.

Both of these types have proved their convenience and value as well as their possibilities for successful operation. The meeting in Chicago this week, reported upon other pages of this issue, serves to attract attention more especially to the outdoor type. Transformers for outdoor service have been available for several years. Within the past few years, and especially during the year just ended, auxiliary apparatus has been designed to accompany these. We now have satisfactory air-break switches which will operate in all kinds of weather, and high-tension fuses are also available for similar mountings wherever they may be considered necessary.

There are many communities through which high-tension transmission lines have been built, which offer small markets for electric power, but where the demand is not sufficient to pay interest upon any considerable investment. If, however, an outdoor substation can be installed at small cost to serve such communities they will constitute a load which is worth developing. Power companies generally appreciate this condition and the demand for equipment of this kind has been steady and will no doubt increase. Other developments in this line may be expectantly looked for in the near future.

POWER SUPPLY FOR PENNSYLVANIA RAILROAD.

It has been announced that the negotiations for supply of electric power to the Pennsylvania Railroad for operating its suburban trains between Philadelphia, Paoli and Chestnut Hill, which have been under consideration for some time, have finally resulted in the award of a contract to the Philadelphia Electric Company. This represents a departure from the previous policy of this railroad, which in connection with the electrification of its New York terminal and of its line between Camden and Atlantic City, N. J., constructed its own power houses. Whether the former policy was one of necessity or desire cannot be stated, but it is certain that since the presentation of the famous paper by Mr. Samuel Insull before the American Institute of Electrical Engineers in 1912, it has been more generally realized that such a load will be of considerable benefit to a central station by creating greater diversity in its total load. The minimum power specified in the Philadelphia contract is 3,750 kilowatts, with a load-factor of 25 per cent. The total mileage is about 35.

Electrification projects already in operation, such as the New York Central and the New Haven Railroads, have involved the erection of separate power houses for electric supply, but it seems to be generally recognized now that this is not the best policy for a railroad if it can secure the supply from a power company at a reasonable rate. We thus see not only in the new Pennsylvania developments, but also in the contemplated projects on the Chicago, Milwaukee & Puget Sound and the Denver & Rio Grande Railroads, an inclusion of provisions for purchasing power from local power-supply corporations.

The spread of the electrification of steam railroads, both in centers of dense traffic and in regions where difficulties in steam operation have been met, proceeds steadily. In some cases the difficulty with steam operation is the smoke, as where long tunnels are encountered; in others it is the prevalence of steep grades, as on the mountain divisions; in others the difficulty of securing good boiler water, as on the Denver & Rio Grande Railroad; and in others the limitation on the amount of tonnage handled, as on the Norfolk & Western Railway. The smoke nuisance is also a matter impelling consideration at the terminals in large cities, and we may expect to see further terminal electrification in the near future, as for example in Chicago. It may be confidently prophesied that when the change comes in the latter city we shall again see contracts made with the local electric power company for the supply of current, and this will doubtless form a prominent factor in the plans for the future development of the power stations of the Commonwealth Edison Company in that city.

REPORTING VEHICLE PROSPECTS.

In commenting in these columns on the co-operation of the central station with the manufacturer of electric vehicles it was pointed out recently that a progressive utility company was justified in spending about $45 for a commercial-vehicle customer and about $20 for a passenger-car customer. These are average amounts based upon the usual allowances made by most progressive companies for obtaining business.

The battery-charging load is particularly desirable, however, and when all the advantages of such business are taken into consideration it would seem that central-station companies are warranted in spending much more than is necessary in securing the usual run of customers. For instance, battery charging being essentially an off-peak load, the central-station load-factor is improved, and the cost of production reduced. Also, the advertising value of the electric vehicle should be considered, as every electrically operated machine, whether an automobile or a buzz-saw, is an advertisement instrumental in bringing new customers to the lines of the utility.

For some unexplainable reason many central stations, particularly in the smaller towns, have failed to appreciate the value of the battery-charging load, or, perhaps due to local conditions, expenditures of any amount for developing business could not be made. However, the greatest service the central-station can render the electric-vehicle industry is in making the vast army of central-station salesmen active booster for the battery vehicle. This procedure will not add to commercial-department costs and will certainly give great impetus to the development of electric automobiles.

Under present conditions only a very small part of the advance information received by vehicle manufacturers concerning prospective purchasers originates from central stations and obviously the exact reverse should be true. New-business men in particular, and all central-station representatives in general, should be instructed to report all prospects that come to their attention and there is no reason why just as much credit should not be given the salesman for the placing of an electric vehicle as for a contract for any other power of similar character. The salesman usually gets credit when a rectifier or charging equipment is contracted for, but it should be remembered that the central-station revenue is not proportional to the number or capacity of charging equipments on its lines, but rather to the number of machines charged.

The giving of the proper credit to salesmen by central stations for the sale of, or being instrumental in the sale of, electric vehicles will be equivalent to the addition of several thousand vehicle salesmen to the force now in the field; and these men spend practically all of their time among the very people that the manufacturers are trying to reach.

Missouri Contractors' Meeting.

The Electrical Contractors of the State of Missouri held their thirteenth semi-annual meeting, at the Coates House, in Kansas City, Mo., December 20, 1913.

At about 6:30 p. m., the members and guests collected in the hotel lobby, and at once began an experience meeting, which shortly adjourned to the banquet room where preparations had been made for fifty; as soon as seated the electric songsters opened the ceremonies with several selections that were very much enjoyed by those present.

There were many talks, which were interspersed with a cabaret, vaudeville and a colored quartette, which was very much enjoyed by all present. Talks on electrical business subjects were made by F. B. Uhrig, district manager of the Western Electric Company and others. He is the president of the local committee for the exploiting of the Society for Electrical Development and spoke at some length on the objects and aims of that association as relating to the several interests in the electrical business, especially in harmonizing conflicting policies.

E. S. Cowie, Jay R. Ross, Charles J. Sutter and W. L. Hutchinson spoke from the contractors' angle, and C. H. Talmage, P. B. Chaney and K. G. Kennie represented the jobbers' side of the talk.

Owing to the absence of President L. E. Reid and Vice-President William Koeseman, E. S. Cowie was elected as chairman *pro tem* of the meeting, which had but little business to perform. The following resolution, to protest against the letting of the electrical work on the state capitol building of Missouri, to a plumbing contractor who has included the electrical work in his bid for the plumbing and steam heating, was passed.

Resolved, by the Kansas City Electric Club, composed of members of the various electrical industries of Kansas City, that we believe in the awarding of the various building lines required in the construction of the new state capitol, at Jefferson City, and an injustice will be done the citizens of the state and the various electrical contracting companies of the state, if the electrical wiring and construction work required in the Capitol Building is awarded to anyone but a responsible and an established contractor in this line of the building industry, and

Resolved, further, the secretary forward a copy of these instructions to the Capitol Commission.

The resolution was adopted without a dissenting vote and it was further resolved that the electrical unions in Kansas City and also the Electric Club of Kansas City be asked to remonstrate. It will be considered a bad precedent to have the electrical work done by any others than electrical contractors.

The meeting adjourned to meet on the Monday preceding the holding of the national meeting in Detroit next July.

◆

American Institute Meetings.

The second annual midwinter convention of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York City, February 25, 26 and 27, 1914, under the auspices of the Electric Power Committee.

The general subject of the meeting will be "electric power" and each of the subcommittees of this general committee will present papers on the special branch of this subject under its jurisdiction. The subdivisions of the subject are: (1) power stations, (2) power generation, (3) protective apparatus, (4) transmission, (5) distribution, (6) economics, and (7) engineering data.

In addition to the technical sessions there will be some entertainment features, provided by the New York Reception Committee.

The 290th meeting will be held in New York, on January 9, at 8:15 p. m. This will be a joint meeting of the American Institute of Electrical Engineers, and the New York Sections of the Amercian Electrochemical Society and the American Society of Mechanical Engineers. The subject of the meeting will be "power problems in the electrolytic deposition of metals," and three papers will be presented as follows: "Limitations of the Problem of Electrolytic Deposition," by Lawrence Addicks, who will present a brief statement of the conditions imposed by practice in the electrolytic refining of copper as a typical process; "The Mechanical Side of the Problem," by H. E. Longwell, who will consider the application of gas and steam prime movers for driving generators of the required type; "Sources of Direct Current for Electrochemical Processes," by F. D. Newbury, who will discuss the design of the electrical equipment required in electrochemical work.

At the close of the technical session the meeting will adjourn to the Institute offices on the tenth floor, where a smoker will be held.

◆

Peoria Electric Show.

Announcement is made of the tentative plans of electrical interests of Peoria, Ill., to hold another electric show in the early spring. It is practically certain that the Peoria Auditorium can be obtained for the show on the dates arranged, namely, March 9-15. T. D. Buckwell, manager of the commercial department of the Central Illinois Lighting Company, Peoria, is director of the show.

Jovian League of Chicago.

A joint meeting of the Jovian League of Chicago and the Chicago Electric Club was held on December 29 under the auspices of the former organization. A representative attendance of both bodies was on hand and an interesting program carried out. Charles P. Scott and Alexander Shane of the Bureau of Safety, Middle West Utilities Company, were the speakers, the subject of "Safety" being the topic of discussion.

Mr. Scott outlined the function of the Bureau of Safety, which is a separate and distinct department of the Middle West Utilities Company, composed of a corps of "safety" experts who act in an advisory capacity. The work of this department is divided into three parts, dealing with (1) safety of employees; (2) safety of apparatus; and (3) safety of practice. Every employee of the company automatically becomes a member of a safety society which embodies the entire organization. Periodic meetings are held in the various districts and educational measures adopted. The bureau makes detailed analysis of all accidents and these are discussed at the meetings.

All apparatus used by the company is inspected by the bureau and all safety precautions possible are adopted. Line and station practice is also standardized as far as possible and every employee made familiar with the rules.

Mr. Shane discussed the subject from the psychological standpoint, pointing out that self-preservation is the first principle in accident prevention. Both speakers were accorded a rising vote of thanks on the motion of Frederic P. Vose.

E. E. Rines announced that an electric show would be held in Peoria in March and he asked for the support of Chicago electrical interests.

◆

Wireless in Alaska.

The announcement has been made in London that the Marconi Company will link Alaska to the United States by wireless stations to be erected at Ketchikan and Juneau, both to be capable of communicating with Seattle.

◆

Wireless to Russia.

It has been reported that the Russian Government is entering into negotiations with a Norwegian company regarding the establishment of a regular wireless communication between Russia and the United States, through the station being erected in Norway.

◆

Meeting of Illinois Contractors.

The annual meeting of the Electrical Contractors' Association of the State of Illinois will be held at Springfield, Ill., on January 16 and 17.

The Year in the Electrical Industry.

A Review of the Outstanding Developments in 1913, in the Several Great Divisions of Electrical Work. The Year's Advance Marks a Steady Growth in the Utilization of Things Electrical. Material Increases in Value of Many Manufactured Products Indicated.

With respect to technical developments there is little to chronicle of a nature out of the ordinary. It is true that in some directions, as will be indicated in the reviews of the various specific departments of the industry which follow, there has been considerable development. Notably in incandescent lighting and in electrification of railways some rather important movements have taken place. For the greater part, however, there has been steady advance in the adaptation of known principles and in the refinement of design of standard apparatus.

Reviewing the great divisions of electrical activity and reflecting the opinions of leaders in the industry who have very kindly contributed their suggestions as to what has constituted the most important development in each division, the following pages will present a review of what appears to be the outstanding developments of the year past. To those who have contributed to this review hearty and sincere thanks are hereby given, and a great appreciation of their assistance in preparing this information is gratefully acknowledged.

Telephony and Telegraphy.

Coming with startling suddenness out of an unsettled state of affairs with respect to the future of corporation management, the proposal upon the part of the American Telephone & Telegraph Company to divorce itself from its Western Union relations, open up its long-distance connections for independent extensions and refrain from acquiring or seeking to acquire domination or any form of control over competing lines, forms the largest factor of speculation in the commercial development of the telephone and telegraph today. Going apparently beyond the most sanguine expectations of the Departments of Justice in the generosity of its proposal, and in fact deciding against itself in view of the decision of the Supreme Court of California that the order of the State Railroad Commission compelling the Pacific Telephone & Telegraph Company to make connections with independent lines was confiscatory, there is much opportunity for adjustment and some apprehension as to the ultimate working out of a divided system.

During the year the telephone and telegraph companies have suffered a little more than usual from wind storms, floods and sleet storms, and the recuperative possibilities of these great lines of communication have been tested to the utmost. To the great credit of both the American Telephone & Telegraph Company and the numerous independent companies, it may be said that devastation has been met with high courage and a service rehabilitated and continued upon a basis which but for great organization strength and adequate resources would have been impossible.

In switchboard design and operation there has been little change. The idea is growing to compact the system so as to gain space, and a considerable development has taken place in installing city distribution systems in underground structures of great permanency.

The intercommunicating telephone has seen a greatly increased utilization, and in train dispatching the telephone has either relieved or greatly supplemented the work of the manual telegraph.

Mine rescue telephone sets have been developed, the transmitter fitting the throat of the helmet man, the sound waves being transmitted through the walls of the throat, as the mouth is needed for the breathing in of oxygen. A head receiver is also furnished, being held in place by a light leather harness. Repeating coils for phantom-circuit work have been developed to a high degree of efficiency. Transmission over a phantom circuit can be obtained about 15 per cent farther than over the original physical circuits. While the loss in the repeating coil amounts to less than one-fifth of a mile of No. 19 gauge cable per coil, the loss in the phantom circuits is only one-fifth of a mile.

In cable telegraphy the invention of John Gott, chief engineer of the Commercial Cable Company, by which sound Morse telegraphy is applied to long lines and which is quite revolutionary in its mode of operating long cables, is the most important development during the year.

The most important development in telephony during 1913 was in the completion by the American Telephone and Telegraph Company and its Associated Companies of the underground cable between Boston and Washington, by the installation of the section between Hartford, Conn., and Providence, R. I. This cable, the total length of which is approximately 450 miles, insures the telephone service against interruption by storm between Boston, Providence, Hartford, New Haven, New York, Philadelphia, Baltimore and Washington and other important places along its route. A high degree of protection is also afforded to communication between the cities mentioned above and other important points not touched directly by the cable and reached only by aerial lines because of the ability to secure alternate routes by the use of the cable in combination with the network of aerial wires connected to it at all important points.

This project cost in excess of $5,000,000. The cable contains about 45,000 miles of circuit. It would be practically impossible to furnish a satisfactory grade of service over the distances covered by the cable without the use of loading coils, and over 630 loading coil cases containing more than 25,000 coils have been installed at about 300 loading points. Even this number of coils does not completely load the cables and as the demands of traffic increase, coils will continue to be added. The total weight of the cable itself is approximately 8,700 tons, of which about 2,870 tons are pure copper and 5,400 tons lead. In splicing this cable, over one million individual wires had to be connected with perfect joints. To ship this cable from Chicago, where it was manufactured, to various points along the cable route, required about 350 freight cars or 10 complete trains of 35 cars each. It is interesting to note that approximately half of this cable is of the so-called duplex construction which permits of obtaining three telephone circuits from four wires. The extra circuits obtained in a cable of this type are known as phantom circuits. In addition to the loading of the ordinary or side circuits, the phantom circuits are also loaded.

Another important underground cable, containing high-grade loaded conductors and extending from the long-distance office in the city of Chicago to a point approximately 35 miles southeast, is now nearing completion.

Probably the most interesting development now under way is the project to connect New York City and San Francisco by direct telephone circuits. A great deal of actual construction work has been done to the point that the lines between Denver and Salt Lake City are now nearing completion and much of the preliminary work has been done between Salt Lake City and San Francisco. This in connection with the network of high-grade circuits now in service east of Denver is expected to give telephone service between the Atlantic and Pacific coasts by the time of the opening of the Panama-Pacific Exposition. The American Telephone & Telegraph circuits now extending from the Atlantic seacoast to Denver are the longest circuits in use for telephone purposes today. The projected work will make these circuits still more noteworthy, making them over 3,000 miles long.

The rapid extension of electric power and electric railroad systems on the one hand, and of telephone wires on the other, has rendered necessary much work in an attempt to devise ways and means for a harmonious occupancy of the same field. During the past year important work along these lines has been done in studying inductive interference with telephone working by high voltage three-phase power circuits, and by single-phase electric railroads, with the object of minimizing the induction from such systems. In this work the engineers of the telephone companies have been co-operating very closely with the engineers of the electric power and railroad companies and the large manufacturers of electric power and railroad apparatus. Not only have the existing systems of railway electrification been under investigation, but as well certain of the recently proposed systems of electric railway operation not yet in commercial use.

During the year considerable work has been done towards the extension of telephone train-dispatching systems of the country. The indications seem clear that the system of train-dispatching by telephone is gradually displacing the use of the telegraph for this purpose.

Wireless Telegraphy.

The most important advances in radiotelegraphic work have been along the line of the building of high-power stations, especially those which operate with high-frequency alternators. The Marconi Company is rapidly establishing systems of high-power stations, notably at Belmar, N. J., and the Telefunken Company has increased its station at Sayville, Long Island, for the reception of signals from its station at Nauen, near Berlin. At this station there has been installed a high-frequency alternator of the Arco type, having a capacity of 150 to 200 kilowatts. The antenna current is approximately 150 amperes, and the system uses a wave-length of about 9,000 meters. The Goldschmidt Company has built two 800-foot towers near Hanover, Germany, and at Tuckerton, N. J. These are equipped with Goldschmidt 150-kilowatt high-frequency alternators, and the system uses a wave length of about 7,000 meters. The Marconi Company has acquired the patents of the Goldschmidt Company and will likely utilize many of these features in its new high-power stations.

The big radio station at Arlington, near Washington, D. C., which was built by the United States Naval engineers, was completed the beginning of the year. Communication has been established with ships in the day time up to 2,000 miles, and at night communication has been established for a distance of over 3,500 miles. The station is operating satisfactorily between Arlington and the new high-power station being erected on the Canal Zone.

In receiving apparatus the de Forest ampliphone, which consists of three of the well-known audions used in series, permits a signal of one-sixtieth audibility to be successfully read.

The appointment by the British Association of a committee to investigate simultaneously in all parts of the world the ether conditions and their effect upon the transmission of wireless messages, is important. This committee has submitted an elaborate form to operators and investigators all over the world with a view to recording their observations of particularly favorable or adverse conditions and determining upon the reasons for the large variation in the strengthening of signals and distance traveled. It is also hoped that by means of these observations definite information may be obtained as to the exact effect of daylight upon the transmission of signals.

With the development of the Bellini Tosi compass or direction-finder, a ship fitted with this apparatus is enabled to definitely locate a ship or station sending out distress signals or warnings. This avoids the loss of precious time which might result from a slight, or considerable, error of the exact location given by the vessel requiring assistance. It also permits a ship to receive a timely warning from the lighthouse or light vessel, and in the event of loss of sunlight through inclement weather, a ship is still enabled with a high degree of accuracy to find its position from signals sent by other ships.

Just as the year closes announcement is made of the successful application of wireless telegraphy to train service. The recent experiments of the Lackawanna Railroad established communication over a distance of 50 miles or more by means of the latest type of Marconi apparatus. Additional stations are proposed along the line of this road, and some of the limited trains are being fitted with all the necessary equipment and it appears to be but a question of a short time when commercial service will be maintained on the limited passenger trains of this road.

Electric Lighting and Illuminating Engineering.

With one notable exception the year's developments in the various branches of electric lighting and illuminating engineering were not of a startling character, but represent rather steady advance by the small but sure steps that make for progress. Practically every division of the electric lighting industry has forged ahead. At the same time there has been a steady improvement in the quality of illumination through a more general acceptance and application of the principles of illuminating engineering.

In electric illuminating sources the improvements of greatest importance are those relating to tungsten lamps. The striking announcement made last summer of the practical perfection of a tungsten lamp with an efficiency of about one-half watt per candlepower, or twice the best efficiency hitherto attained by lamps of this type, produced only a mild sensation, since it was coupled with the statement that these lamps could not be made in sizes smaller than about 1,000 candlepower. This greatly allayed the fear that the new lamps would presently supersede the tungsten units that have become standard. The great increase in efficiency of these lamps is due to the much higher temperature of the filament made possible by filling the lamp with an inert gas, nitrogen, which eliminates the presence of traces of oxygen that are commonly found in the vacuum lamp and that cause disintegration of the filament. During operation the nitrogen is at about atmospheric pressure. The great increase in temperature more than offsets the loss of energy in lamps of large size through gaseous heat conduction to the walls of the lamp by the nitrogen present. In the smaller lamps the proportion of the latter loss increases, so that the efficiency is not much better than that of standard tungsten lamps of the vacuum type; therefore nitrogen-filled lamps are not likely to be made below 500 candlepower.

Although the bulk of the research resulting in the development of the nitrogen-filled lamp was done in this country, the lamps have not yet been placed regularly on the market here; in Europe, however, they have been available for several months. They are made with a relatively thick helically coiled filament well concentrated in the middle of a large bulb. The lamps range in size from 500 to 5,000 candlepower, and the statement is made that lamps of even 10,000 candlepower can be manufactured. Similar lamps will probably be available on the American market within a few months, so that greater opportunity will be given to study of their life and other operating characteristics.

In all likelihood the field for the greatest adaptability of the nitrogen-filled lamps will be in series street lighting, where they are sure to offer still further opportunity for discarding obsolete types of arc lamps. The probability of their competing for supremacy in this field with the modern magnetite and carbon-flame arcs is not so great. Multiple 110-volt lamps of this type of 1,000 candlepower and over will doubtless be forthcoming for such interior lighting where high-candlepower lamps can be used, but the alarm felt in some quarters lest the new lamps replace all tungsten lamps is entirely unwarranted. Nevertheless, the new half-watt tungsten lamps, together with further improvements in the standard tungsten lamps now in such general use, bespeak a far reaching increase in the use of metal-filament incandescent lamps.

Of the improvements in standard tungsten lamps just referred to there are many. To begin with, the drawn-wire lamp has practically displaced the pressed-filament lamp on account of its greater ruggedness, uniformity and adaptability. The strength of the filament has been increased about 40 per cent within two years and this has also permitted an improvement in efficiency without decreasing the life. Chemical "vacuum-getters" in the bulb have practically prevented the blackening of lamps with relatively thick filaments. The size of the lamp bulb has been reduced for 40 and 60-watt lamps. Lamps are now much better standardized through improved wire-drawing, so that it is possible to get more uniform results with reflectors and shades and series lamps can be had of identical current capacity without the elaborate sorting formerly necessary. Very small 110-volt tungsten lamps are now made for sign, candelabra and miniature decorative purposes. These have a filament that is helically coiled over a mandrel of very small diameter and then the filament is mounted in the usual manner; this coiling permits a great increase in the length of filament that can be placed in a small bulb; it also increases the strength of the filament. Somewhat similar coiling is used in concentrating or focusing lamps which have made great headway in projection, automobile and similar services where a compact filament is needed at the focus of the auxiliary reflector. This type of lamp will likely replace many arc lamps in spotlights, projecting lamps, locomotive headlights, etc., and probably will also find use in light houses.

Greater emphasis is being placed by lamp manufacturers on the operation of tungsten lamps at their rated voltage, instead of several per cent below this point, which has been the practice on the part of many large users. Such a practice is no longer necessary on the score of attaining a good life for the lamps and in fact prevents achieving the full advantages of efficiency and color that the tungsten filaments have over the old carbon filaments.

With all these improvements in the quality and variety of tungsten lamps there has been a marked reduction in the price of these lamps. A number of central stations have even adopted the policy of free renewals of tungsten lamps in sizes of 100 candlepower and over. These decreased costs and improved performance and adaptability have made the tungsten lamp used so generally that the older types of carbon, metalized carbon and tantalum filaments are very rapidly being replaced. New installations nearly always use tungstens from the start. The field of the arc lamp, both in interior and exterior lighting, is being restricted by its sturdy competitor and the cause of electric lighting against lighting by combustible illuminants has been very greatly strengthened.

Developments in arc lamps have been confined almost entirely to the magnetite and flame arcs. Since the open and inclosed carbon arc lamps became obsolete a few years ago there have been no important improvements in their construction and performance to give them a renewed lease of life. Consequently they are fast being replaced by the more efficient metallic or carbon flame arcs of today or by large-sized tungsten lamps. Many details of the flame arcs have been improved; the construction of the condensing chamber has been made such that the deposit of ash or fumes on the globe is less troublesome; the clutch mechanism does not depend upon the thickness of the electrode for the reliability of its action; economical impregnated electrodes have been made for attaining any desired color; series alternating-current lamps have been perfected for reliable operation and many thousand of them are being successfully used for street lighting; flame lamps for operation on 25-cycle circuits have been developed. The efficiency of flame arcs has been improved so that the white-flame lamps now have as good an efficiency as the yellow-flame lamps of a year ago; the efficiency of the yellow-flame arc is now practically 0.20 watt per mean hemispherical candlepower. Long-burning flame arcs now give from 100 to 120 hours of burning per electrode trim. All these improvements have greatly extended the opportunities for the successful employment of the flame-arc lamp and their use is becoming more common for outdoor lighting and for the lighting of large interior areas where a powerful light source is needed. Where smoke, dust or fog abound the penetration of light from flame arcs has been found to be quite superior.

Magnetite or metallic-flame arcs have also been improved in many ways and are continuing to give good service, especially for street lighting. The inverted type of this lamp is making considerable headway in ornamental street lighting, for which it has been adopted in preference to ornamental clusters of tungsten lamps in many installations. By increasing the voltage on magnetite arcs, and also on carbon-flame arcs, it has been found that the efficiency is considerably increased and a whiter light produced.

In the way of vapor-tube lamps there have been improvements in both the standard and quartz-tube mercury-vapor arcs. An improved method of sealing the leading-in conductors has been found; a mercury seal is now successfully used. The number of installations of mercury arcs has increased considerably. The performance of quartz lamps as regards efficiency is about on a par with that of the carbon-flame arcs and both these are the most efficient electric light sources of the present time.

The neon-tube lamps have been improved by increasing the area of the electrodes so that their life is now placed at over 2,000 hours for tubes having a length of about 65 feet. Provision has been made for maintaining the purity of the neon gas. The intensity of these lamps is about 60 candlepower per foot of tubular length. For a tube of 20-foot length the terminal voltage is 800. Although the light of the pure neon tube is excessively red, the correcting mercury tube used with it gives a satisfactory color combination.

After this hasty review of developments in electric illuminants, it is desirable to summarize the progress in the art of illumination or applied illuminating engineering; space will not permit more than a brief reference to the scientific aspects. To this country is due the credit for originating what has now become an international movement for the betterment of illumination. This began with the organization of the Illuminating Engineering Society in 1906; a few years later a similar society was organized in Great Britain; this year a similar society held its first meeting in Germany; efforts are now being made to start a society in France. This increasing worldwide interest in the subject is evidenced by the reorganization of the International Photometrical Commission, which represented only gas interests, into the International Commission on Illumination, a representative body of all interests concerned in the development of the science and art of illuminating engineering. At a number of international congresses held this year the subject of improved illumination received consideration, notably at the Fourth International Congress on School Hygiene held at Buffalo in August. Much of importance was brought out at this gathering. The subject of schoolroom lighting has also been particularly studied by a special committee of the British Illuminating Engineering Society.

A gratifying increase of interest in matters of illumination has been shown this year in this country by many vitally concerned in improved lighting, but hitherto lukewarm in furthering the movement. Among these are many prominent architects, opthalmologists, school authorities, artists, trunk-line, interurban and urban railway companies, etc.

No radical changes have been made in street lighting, but hundreds of miles of streets have had their lighting remodeled to modern efficient equipment. Tungsten, magnetite and flame arc lamps have all shared in the lighting of the rehabilitated streets. Ornamental tungsten-cluster lighting has been extended in some places; a greater variety of cluster standards is now on the market; some illuminating engineers seem to think, however that this system has reached the climax of its popularity; single tungsten lamps or ornamental posts are preferred in many quarters. A unique installation of series tungsten lamps in diffusing and reflecting lanterns has been made in one of the smaller cities by an illuminating engineer; it shows new possibilities of original and economical designs. Ornamental magnetite arcs have been installed in quite a few cities with pleasing results, both by day and night. It is not likely that the movement for esthetic results in street lighting will die out; on the contrary, it will doubtless increase and be taken up by the municipalities themselves, instead of being left to the initiative of merchants. A greater variety of ornamental street-lighting systems may be looked for in the future. Although the flame arc has not lent itself to ornamental street lighting so well, its use for the utilitarian lighting of very busy streets is increasing. One large city is using thousands of these lamps for its standard equipment and is even lighting many miles of its residence streets with them, apparently with success. They are also being successfully used for the lighting of important crossings of boulevards and driveways in parks.

By the further increase in the variety of shades, reflectors and lighting fixtures of good design now on the market there has been made available for interior lighting a still greater wealth of material to select from and thus there is being produced that highly desirable diversity of lighting equipment which a few years ago there seemed little hope for. Although mercantile establishments are most in need of original design in their lighting equipment and are coming to appreciate this fact, many other installations could be improved by attention to this feature.

The improvement in lighting of commercial and industrial establishments has been extended to include not only a very considerable part of large, up-to-date buildings and plants, but a gradually increasing number of small stores and shops are being rehabilitated to modern standards of illumination. Wherever improved lighting has been installed on proper lines, it has been found to more than pay for itself in greater safety and comfort and increased production and commercial efficiency; in many cases even actual reduction in lighting cost has resulted from such improvements.

An increasing tendency which it is pleasant to record is the more general attention to screening of brilliant light sources. Inclosed diffusing globes are in greater use, reflectors of the deep-bowl type are more in evidence, semi-indirect lighting with artistic translucent glass bowls has come into increased vogue, and pure indirect lighting has made great headway, being now used even in some railway dining cars. All these advances are evidence of the increasing extent to which the campaign for elimination of glare has met with popular approval. In other words, the public is coming to understand that better light does not mean more bare lamps and that it can be attained economically without eye strain and with more or less of beauty.

A notable sign of progress during the past year is the marked interest in illumination being manifested by the art fraternity. This was stimulated, no doubt by a number of lectures dealing with the relation of light to art that were given in several of the large cities and which evoked an appreciation of the effects of direction, quantity and color of light on works of art. These had received comparatively little study heretofore. Since attention has been directed to them there has been marked improvement in the illumination of several art galleries. It is now possible to arrange the lighting so as to bring out exactly the effect that the artist had in mind and in some cases even to enhance it; formerly the lighting in many cases vitiated the impression that the artist wished to convey.

The foregoing brief comments have merely skimmed over the recent achievements of the steadily broadening field of electric lighting and illuminating engineering. The two have worked together. Electrical men have given the more marked impetus to illuminating engineering and the latter has stimulated great advances in electric lighting. As a result of this mutual service of one to the other the art of illumination has made prodigious forward strides and the slogan "More and Better Light" has come to be practically synonymous with "Use Electric Light."

Electric Railways.

In spite of the political unrest which has characterized the year just past there has been a steady development in the field of electric traction although, financially the business of 1913 has been somewhat below expectations. This condition has been particularly noticeable during the latter months and may perhaps be attributed to the apprehension of business interests as to the attitude of the government regarding tariff and currency legislation. These two momentous questions have been decided, however, to the apparent satisfaction of all concerned and renewed activities in all lines of business are confidently expected.

In the field of steam railroad electrification several important steps have been taken during the past year although the influences mentioned have militated somewhat against the actual work of construction on some of the new projects.

One of the first and also most important electrification decisions made was that of the Chicago, Milwaukee & St. Paul Railway to substitute electric power for steam on the main line in the mountainous districts of Montana. The company first expects to electrify a division of the railroad 113 miles long, extending over the Rocky Mountains between the Three Forks and Deer Lodge, Mont. Ultimately the electrification will be extended to that portion of the main line between Harlowton, Mont., and Avery, Idaho, a distance of 450 miles. It is practically certain that a 2,400-volt direct-current system will be used. Electrical energy has been contracted for from the Montana Power Company and the Thompson Falls Power Company.

Of equal importance to the Chicago, Milwaukee & St. Paul electrification is that authorized early in 1913 by the Norfolk & Western Railway from Bluefield, W. Va., across the summit of the Alleghanies to the town of Vivian, W. Va., a distance of 30 miles. An unusual feature of this project is that only coal trains will be operated by electric locomotives, passenger trains being handled through the electric zone by steam engines. Electric power will be generated in a steam power house being erected by the company at Bluestone. The system will be 11,000 volts, 25 cycles, single phase and 25 electric locomotives of unusual design are being constructed. The motors of these locomotives are being built without commutators and follow the principles of the standard polyphase induction motor, retaining all the advantages of ruggedness and absence of complication which are characteristic of the latter type. The service on this road will be of the heaviest class yet considered in connection with electrification, as 3,250-ton trains are contemplated and these, on two-per-cent grades, will require a total drawbar pull per train of approximately 150,000 pounds. It is expected that all work will be completed for service in the summer of this year.

In the East one of the most important happenings in the field of heavy electric traction was the authorization by directors of the Pennsylvania Railroad on March 12, of the electrification of the company's main line for suburban traffic out of Philadelphia as far as Paoli, a distance of 20 miles. This is a further step in the general electrification projects of the Pennsylvania which has for its object the electrification of all trains entering Philadelphia and which will ultimately mean the electrification of the entire main line from New York to Washington, D. C. It is stated definitely that power for the initial project will be purchased from the Philadelphia Electric Company.

The Washington & Old Dominion Railway, a typical suburban steam road extending from Washington, D. C., to Bluemont, Va., a distance of about 60 miles, was another convert to electric power, during 1913. This company originally owned the Great Falls & Old Dominion Railway, a double-track trolley line from Washington, D. C., to Great Falls, and when electrification of the main steam line from Washington to Bluemont was considered, it was decided to use the 600-volt direct-current system because considerable of the equipment of the former road, which was 600 volts, could be used.

Mention must also be made of the electrification plans of the Great Northern Railway for a section of the main line from New Rockford, N. D., to Lewistown, Mont., a distance of 530 miles. No definite announcements have been made by the directors of this road and it may be years before the project is completed. The roadbed, tunnel and other construction contracts have, however, already been awarded.

It is also a matter of record that the Butte, Anaconda & Pacific electrification was completed in 1913 and is operating with great success. This is a 2,400-volt direct-current system using the geared type of locomotive.

In Chicago the agitation for terminal electrification continued throughout the year, although very little was accomplished. The committee of the Association of Commerce, which is making an exhaustive study of conditions from a financial and engineering standpoint, will be ready to present a report early in 1914. An ordinance introduced in the City Council, requiring the abatement of smoke on or before July 1, 1915, by all railroads entering the city, was held pending the report of the former committee.

No event has happened more significant of the near approach of general steam railway electrification than the establishment, in 1913, of the Pennsylvania Railroad's correspondence school of electricity. This school is designed particularly to instruct those employees who will have to do with the construction and operation of the company's electrification from New York to Washington, D. C.

In the field of interurban and suburban traffic several important events have transpired. Work was completed on the high-speed line of the Kansas City, Clay County & St. Joseph Railway, between Kansas City, St. Joseph and Excelsior Springs, Mo. The total mileage of the system is 80 miles. The 1,200-volt direct-current system is used. About 500,000 people are served by the line which is considered the most important development in the Middle West.

The Nashville-Gallatin Interurban Railway, a new 1,200-volt direct-current system between Nashville and Gallatin, Tenn., is another of the important developments of the year. The line is 27 miles long and since beginning operation the earnings have far surpassed those anticipated by the promoters.

In Iowa, the Waterloo-Urban extension of the Waterloo, Cedar Falls & Northern Railway was completed during 1913. This is a 40-mile addition to an already successful 600-volt direct-current system serving a prosperous farming district. No expense was spared in making the new line a model of approved construction.

The Oregon Electric Railway, which was completed in 1913, is interesting, as it is one of the longest electric railways recently put in operation. It extends between Portland and Eugene, a total distance of 122 miles. This line operates trains with observation and sleeping cars, making direct connections with the Spokane, Portland & Seattle Railroad, a steam railroad of which it is a part. The 1,200-volt direct-current system is employed.

Interurban electric systems are fast supplanting the steam railway in the vicinity of San Francisco and many important projects are being planned. One recently completed is the Oakland, Antioch & Eastern Railway, a 1,200-volt direct-current line ultimately to extend between Oakland and Sacramento, Cal., a distance of 85 miles. At present service is maintained between Oakland and Bay Point, 31 miles. An interesting feature of this line is a tunnel, 3,458 feet long, through the Coast Range.

Progress must be reported on work for the new 2,400-volt Kalamazoo-Grand Rapids (Mich.) line of the Michigan United Traction Company, which will connect these two cities. This is a 92-mile line and it will be ready for operation early in 1914.

Mention must also be made of the inauguration of high-speed service by the Public Service Railway, between Newark and Trenton, N. J. This was accomplished by the construction of long sections on right-of-way in place of former highway routes.

Subway and elevated transit has received great impetus during the year just closed. Construction work on the additions to subway facilities are rapidly progressing in New York City and in Chicago another subway program has been outlined by the municipal authorities. In the elevated field the most important happening was the merger of all elevated railroads in Chicago and the establishment of universal transfers and partial through routing. This consolidation was effected under a general merger ordinance, which also provides for the unification of street railways and the financing of a subway for the city.

In considering important happenings of the year just closed in the field of street railways, there is little that can be termed startling. Rehabilitation and improvements have been made in many cities, notable examples being San Francisco, Cal., Cleveland, Ohio, Detroit, Mich., Boston, Mass., and Providence, R. I. The new center-entrance cars and double-deck cars are proving effective in relieving crowding, in localities where employed, and indications point to an increasing use of this equipment.

The annual convention of the American Electric Railway Association, on October 13 to 17, at Alantic City, N. J., was one of the important events of the year, and to the work of the various committees of this organization belongs the credit for the keener interest in standardization.

Within the last year there has been apparent a decided tendency for electric railways to purchase power from local power companies instead of generating it themselves. Growing examples of this practice will be found in New York, Chicago, St. Louis, Philadelphia, Cleveland, and a large number of smaller cities. During the year the Commonwealth Edison Company entered into a new contract with the Chicago transportation companies for more power than ever before and at considerably reduced rates. The railway load now totals 70 per cent of the Edison company's entire business. The Cleveland (Ohio) Railway Company during the year also abandoned its generating stations and entered into a contract with the local central station for practically all of the power it requires.

No review of the year would be complete without reference to the unusual weather conditions of 1913 and the losses experienced by companies in many localities. In Omaha, Neb.; Indianapolis, Ind., Dayton, Ohio, and other sections of Michigan, Illinois, Ohio and Indiana, tornadoes, and floods caused damage amounting to many thousands of dollars, and in the latter part of the year, a blizzard in Cleveland caused serious delays and damage. It is gratifying to record that the afflicted districts received the combined assistance of their more fortunate neighbors, in every case, and rehabilitation was accomplished in record-breaking time.

Electrochemistry and Batteries.

The work on the silver voltameter which has been on at the Bureau of Standards for a number of years was completed early this year and the many perplexing points connected with its operation have been elucidated. As a unit of electric current, the ampere, is defined in terms of the deposit made in this voltameter, the work is of fundamental importance. It was found that the presence of acid in the electrolyte makes a difference in the deposit and that many of the divergent values previously found were due to uncertainty as to the neutrality of the solution. A difference has been found in the values of the deposits obtained with the porous-pot form of voltameter and the new form used at the Bureau. This difference amounts to about seven parts in a million.

The seasoning of timber by electrochemical methods has been announced in France. The process consists in passing current through the timber while immersed in a bath, the result being the elimination of sap and substitution of material from the bath.

The use of electrolytic lightning arresters increases and these are now provided in a form which includes a charging resistance for voltages up to 14,500; for higher voltages a separate resistance is used.

The electric generation of ozone continues to be commercially successful, the apparatus being put out in a form which can be attached to any lamp socket. These apparatus are especially popular in motion-picture theaters and similar places occupied by large numbers of people. There has been a discussion during the year as to the benefits and disadvantages of the presence of ozone in the air, and while perhaps too much has been claimed for it in some quarters, it is harmless when in diluted form, and its oxidizing effects are beneficial in certain ways, such as destroying organic matter.

Electrolysis in concrete has been receiving very thorough study at the Bureau of Standards and the conclusions from this work have been announced in a recent publication. It has been established that the cracking of reinforced concrete due to electric current is caused by the oxidation of the iron anode. Cracking was not found to be so general as has been reported and a high voltage (60 volts per foot) is usually necessary for such a result. Non-corrodible anodes and metals which do not form insoluble products never cause cracking. The use of copper-clad steel or aluminum as reinforcing material is impracticable. Rapid destruction of the anode occurs only when the heating effect of the current is sufficient to raise the temperature above 45 degrees centigrade, as corrosion is very slight at temperatures lower than this. Concrete is found to soften near the cathode, which destroys the bond of the reinforcing materal. This effect develops at all voltages but takes place only close to the cathode.

The progress of electric steel refining continues. There are now about 20 electric furnaces for steel refining in this country and others have been ordered. A Stassano furnace has been installed at Redondo Beach, Cal., and a Girod furnace at Seattle, Wash. In addition to the induction furnace installed at Lansdowne, Pa., in the latter part of 1912, additional furnaces of this type have made their appearance here. It is reported that the American Iron & Steel Manufacturing Company, of Lebanon, Pa., has ordered the largest electric furnace for refining steel in the world. This also will be of the induction type.

The electric smelting of iron ore has continued successfully in Sweden and in California. The shaft type and the long narrow type of furnace has each been demonstrated to be suitable in the field best adapted to it. Where power is cheap, coke scarce, and the ore suitable for high grades of iron, it has been fully demonstrated that the electric smelting furnace can be made commercially successful and it enables ores to be worked that otherwise could not be utilized. The plant which was started at Hardanger in Norway has shut down. It was patterned after the Swedish plant which used charcoal. It, however, made use of coke, which did not work well in this design of furnace. For other electrochemical and electrometallurgical purposes Norway is using about one-half of its total electric power, which results in a high general load-factor upon its generating stations. In France and other European countries the use of the electric furnace is also increasing.

It has been shown that copper, nickel and tin ores can be successfully smelted in the electric furnace, but zinc ores have not been handled with commercial success. The electrolytic zinc process is now commercially feasible under certain conditions. It has been shown that lead can be successfully plated in solid, dense, coherent deposits.

A new dry cell has been brought out during the year by the Western Electric Company. This is known as the Red-label Blue-bell battery and is intended for general-utility work. It has high initial amperage and low resistance and is adapted for use with call bells, railway signals, slow-speed ignition, and other work where there is not a constant drain for extended intervals.

A storage battery having a semi-dry

electrolyte has been announced by the Cook Railway Signal Company. The advantages claimed are freedom from spilling and evaporation. The use of an electrolyte, consisting of halogen salts of various metals, has been suggested in England, the advantage being in the light weight. The anode is porous carbon and the cathode of some metal such as iron.

The Ironclad-Exide cells have been altered during the year by a slight reduction in thickness and consequently in weight of the negative plate. This gives a larger clearance for acid and results in more nearly equal life of the positive and negative plates. The boosting of these cells during discharge is now recognized as having no injurious effect, but being actually advantageous in prolonging the life of the battery.

The Gould Storage Battery Company has brought out during the year a new type of battery for use in automobiles. The active material in the positive plates is only partly formed with the result that later action during the life of the cell brings more material into action and the capacity of the cell is consequently maintained.

A new size of Edison cell designated as A-5 and having a capacity of 187.5 ampere-hours has been placed upon the market for use in pleasure cars.

The use of storage batteries for transportation purposes continues to increase and they are being used more than formerly for indoor work in factories, railroad terminals, etc. A storage-battery mine locomotive has been installed by the Philadelphia & Reading Coal & Iron Company. The battery consists of 70 A-8 Edison cells with a capacity of 300 ton-miles per charge. Storage-battery vehicles have demonstrated their applicability to long-distance runs through the tours made by Col. E. M. Bailey.

Many improvements have been made in apparatus for battery charging and the equipment of charging stations. These have been mainly in the direction of simplifying the charge, providing against injury to the batteries or operator, and securing greater economy. Self-contained rheostats are now provided with battery panels. These can be assembled in frames in a manner similar to sectional bookcases.

Electrical Machinery.

In the design and manufacture of electrical machinery the past year was devoid of revolutionary innovations; nevertheless, much progress was attained in the further development of several types of machinery and the refinement of many details of design. Both in rotating and stationary apparatus there was further advance in capacities. Early in the year there was an extended discussion of many features affecting proposed revision of the standardization rules governing electrical apparatus, as a result of which revisions in rating of some lines of electrical machinery may be looked for.

The steady increase in the size of alternating-current generators was continued. While this was in a measure anticipated, it was not believed that such a large number of machines exceeding 20,000 kilowatts would be constructed within a year. The largest generating unit now under way is being constructed for the Philadelphia Electric Company; this mogul will have a capacity of 35,000 kilowatts or about 50,000 horsepower. It is a Curtis horizontal turbogenerator that will operate at a speed of 1,200 revolutions per minute; its total length will be 65 feet and the weight of the combined steam and electrical unit will be about 1,200,000 pounds. Other similar large machines now under contract are three 30,000-kilowatt units for Chicago, New York and Philadelphia; five 20,000-kilowatt units, of which four are to be horizontal and one vertical; and four vertical 15,000-kilowatt units.

Of novel design are three 30,000-kilowatt turbogenerators now being built in the Westinghouse shops for the Interborough Rapid Transit system. Their design resembles the "cross-compound" type so familiar in steam-engine practice, except that the high-pressure element will be distinct from the low-pressure side, each driving a 15,000-kilowatt generator at the most efficient speed for that turbine element; thus the high-pressure side will operate non-condensing at a speed of 1,500 revolutions per minute, while the low-pressure side will run condensing at 750 revolutions per minute. The two generators will be electrically connected as a single unit. It is believed that this combination unit will give exceptionally economical operating results. The Westinghouse company also installed during the year several horizontal turbogenerators of 20,000 and 15,000-kilowatt rating and for 25-cycle and 60-cycle service.

The largest generating unit as yet completed is now being installed for the Commonwealth Edison Company at the historic Fisk Street station. It was made by the English firm of C. A. Parsons & Company and has a rating of 25,000 kilowatts. The high-pressure and low-pressure turbine units are placed tandem to drive a single generator. Exceptional steam economy has been guaranteed for this unit, which will operate at 750 revolutions per minute. All of the auxiliaries for this unit will be motor driven; 50 motors will be required for this purpose, these ranging from 250 to 5 horsepower.

In direct-current generators the largest as yet designed are for a rating of 5,200 kilowatts. Eleven of these are being built for the Southern Aluminum Company; they will be of the horizontal type driven by waterwheels; they are to develop 10,000 amperes at 520 volts.

Alternating-current waterwheel generators ranging in capacity up to 17,500 kilowatt-amperes have been installed and are giving good results. Vertical type waterwheel generators operating at very low speed have been built in sizes exceeding 12,000 kilowatts.

Motor developments of greatest moment have been the perfection of several types, which, though already known for several years, have not been constructed in commercial form. Among these are the polyphase series motor and the polyphase adjustable-speed motor, which have emerged into the realm of successful designs. Although but few of these have been built in this country, in Europe they are being built to a considerable extent in sizes up to several hundred horsepower and the series motors seem to be well suited for crane and hoist work. A self-starting direct-current motor in sizes up to 20 horsepower has been brought out especially for mining work.

The construction of many types of motors has been improved. Steel frames have come to be used for both squirrel-cage and slip-ring induction motors with resultant reduction in weight and greater strength. Mill motors have been made more rugged. A reversing motor equipment for a large blooming mill is being built, which will be the first of its kind in this country, it is said. A considerable number of electric mine hoisting equipments have been installed and a contract has been let for the largest plant of this kind in this country, which is to be installed in Montana.

Synchronous motors are being used more extensively, not only as pure rotary condensers, but for power work, where the value of their power-factor correcting quality is being better appreciated. They have also come to be used very successfully as voltage regulators on important transmission lines, maintaining the receiving end at substantially constant potential. The self-starting types of these motors are coming more into favor.

The year has seen a great widening of the fields of application of small motors, which are being used for driving a rapidly increasing number of kinds of machines in offices, stores and residences. Their compactness, ease of control, economy and quiet running make them exceptionally well adapted for supplying power where convenience, speed and labor-saving are important considerations.

For driving machine tools, pumps and other larger machinery electric motors are rapidly replacing all other forms of mechanical power. Great attention has been given to the development of automatic control equipment for alternating-current motors, which have adopted this type of motor for certain power purposes that it had not seemed suitable for hitherto. Several lines of self-starters have now been developed for alternating-current motors which are arranged to safe-guard the motor completely. Remote-control equipments of several new types have been brought out, all of which extend the field of usefulness of the electric motor. A unique development was the design of a complete and wonderfully ingenious control equipment for governing the powerful electric motors that will operate every part of the great Panama Canal locks.

Rotary converters have not been changed in design, but are being built in larger sizes than ever. Contracts have been closed up for the construction of 11 machines of 4,000 kilowatts rating to develop 600-volt direct current from three-phase 25-cycle supply. Ten 60-cycle machines of 1,500-kilowatt rating have been installed and are giving excellent service. Sixty-cycle rotaries have also been built for operation two in a series to give 1,500 volts direct current. Portable substations with rotary converter and transformer equipment have come into much wider use by electric railway, central station and mining companies. Polyphase and single-phase converters in small sizes (one to twenty kilowatts) have also been developed and are finding considerable application for vehicle-battery charging, moving-picture work, experimental purposes, etc. Single-phase induction motors are being tried out as phase converters with some promise of success.

Static transformers for power lines are now built for voltages up to 150,000; a considerable number of this voltage have been installed in California. Several units of 3,000 kilovolt-amperes rating and intended for 140,000 volts have been put in service in Michigan. A number of transformers for 120,000 volts and rated at 7,500 kilovolt-amperes were installed in Utah. Transformers for 110,000 volts are now quite common. Outdoor type transformers are increasing rapidly in use, several for as high as 100,000 volts having been built. The outdoor transformer, together with weatherproof switching and protective gear, has made the outdoor substation practical and has greatly extended the zone to which electric power can be very successfully supplied from a central station to a rural or sparsely settled district.

These developments in electrical machinery and allied apparatus that have been hastily reviewed are all tending to make the distribution and utilization of electricity well nigh universal. Through them each day sees the electrical field broadening in extent and becoming more intensively cultivated.

ESTIMATED VALUES OF MATERIALS FOR USE IN ELECTRICAL INDUSTRY.

ARTICLES.	For the Year				
	1909	1910	1911	1912	1913
Arc lamps and appurtenances	$ 2,500,000	$ 2,750,000	$ 3,000,000	$ 3,000,000	$ 2,000,000
Auxiliaries, steam, for electrical installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc	3,000,000	3,350,000	3,000,000	3,500,000	3,250,000
Bells, buzzers, push-buttons, call-boxes, annunciators	1,500,000	2,000,000	2,000,000	2,000,000	2,500,000
Boilers for electrical plants (water-tube)	5,000,000	5,500,000	4,800,000	5,000,000	4,500,000
Boilers for electrical plants (other than water-tube)	1,750,000	2,500,000	3,000,000	3,500,000	3,000,000
Cables, underground, aerial and submarine	11,000,000	12,500,000	13,000,000	16,000,000	15,000,000
Carbons for lamps, batteries, brushes or other electrical purposes	4,000,000	4,500,000	5,000,000	5,500,000	8,000,000
Circuit-breakers	1,200,000	1,350,000	2,000,000	2,500,000	3,000,000
Conduits (underground) and similar material	700,000	850,000	750,000	1,500,000	1,000,000
Dynamos and motors, including parts of machines, boosters, balancers, rotary converters, motor-generators, etc., and all motor applications, such as in automobiles, not specifically enumerated in this list	70,000,000	75,000,000	80,000,000	100,000,000	110,000,000
Electroplating and other electrolytic apparatus not elsewhere specified	1,100,000	1,000,000	1,000,000	1,200,000	1,400,000
Electrostatic machines, induction coils, medical sets, etc	600,000	750,000	700,000	800,000	500,000
Elevators, electric (mechanism only)	2,000,000	2,600,000	2,500,000	3,500,000	4,000,000
Engines, gas or gasoline or oil, used to drive electrical machinery	9,000,000	9,000,000	12,000,000	14,000,000	8,000,000
Engines, steam (reciprocating), used to drive electrical machinery	12,000,000	12,000,000	10,000,000	11,000,000	6,000,000
Fans, electrically operated and direct-connected	1,500,000	2,000,000	2,250,000	2,000,000	1,700,000
Fire-alarm apparatus, also burglar alarms, crossing indicators, etc	1,000,000	800,000	900,000	1,000,000	1,250,000
Fixtures for electric lighting	10,000,000	11,000,000	12,500,000	20,000,000	15,000,000
Fuses	1,000,000	1,150,000	1,500,000	1,000,000	1,500,000
Glassware, electrical	2,500,000	3,000,000	3,500,000	6,000,000	6,000,000
Heating and cooking apparatus, electrical	1,500,000	2,000,000	2,500,000	4,000,000	6,000,000
Incandescent lamps (carbon or metal filaments)	14,000,000	17,500,000	19,000,000	22,000,000	23,000,000
Instruments for measurement and meters of all kinds; also ground detectors, scientific and laboratory apparatus, photometers, Leyden jars, X-ray outfits, etc	2,250,000	2,400,000	2,400,000	7,000,000	6,500,000
Insulating material, fiber, tape, etc	2,500,000	2,700,000	3,000,000	5,000,000	6,000,000
Insulators (glass and porcelain)	2,300,000	2,560,000	2,500,000	3,500,000	3,500,000
Interior wiring supplies, as tubing, interior conduit, molding, junction boxes, rosettes, outlet boxes, etc	3,000,000	2,500,000	4,000,000	5,500,000	5,000,000
Lightning arresters	400,000	500,000	500,000	600,000	650,000
Mercury-vapor lamps	500,000	700,000	800,000	900,000	900,000
Poles and wire towers, cross-arms, brackets and pins	4,000,000	5,000,000	5,500,000	5,500,000	6,500,000
Primary batteries	2,000,000	2,500,000	2,700,000	3,000,000	3,250,000
Railway supplies, electric, such as trolleys and other contact devices, strain insulators, cross-overs, rail-bonds, etc	3,000,000	3,250,000	5,000,000	7,200,000	7,000,000
Rheostats, car controllers, motor starters, etc	4,700,000	5,000,000	5,000,000	6,000,000	6,000,000
Shafting, pulleys, clutches, etc., used in electrical generating plants	500,000	500,000	750,000	1,200,000	1,000,000
Signs, electric	1,250,000	1,500,000	2,000,000	4,000,000	3,200,000
Sockets, switches, cut-outs	5,000,000	6,000,000	6,000,000	7,500,000	7,000,000
Steam turbines used to drive electrical machinery	12,000,000	14,000,000	10,000,000	14,000,000	14,000,000
Storage batteries, including those used in automobiles	6,600,000	6,750,000	10,000,000	12,000,000	15,000,000
Telegraph instruments and apparatus	600,000	500,000	600,000	650,000	600,000
Telephones, telephone switchboards and distinctively telephonic apparatus	15,000,000	20,000,000	20,000,000	16,000,000	18,500,000
Transformers, stationary	4,000,000	4,500,000	5,000,000	10,000,000	10,000,000
Water-wheels, used to drive electrical machinery	4,000,000	3,500,000	3,000,000	5,000,000	4,000,000
Welding apparatus, electric	150,000	200,000	200,000	400,000	500,000
Wire, bare	22,000,000	24,000,000	25,000,000	33,000,000	30,000,000
Wire, rubber-covered	12,000,000	15,000,000	15,000,000	18,000,000	21,000,000
Wire, weatherproof	10,000,000	12,000,000	13,000,000	15,000,000	15,000,000
Wire, all other electrical	5,000,000	5,000,000	5,000,000	7,000,000	10,750,000
Wireless apparatus	500,000	350,000	400,000	500,000	500,000

General Survey.

Sentiment appears to be very much mixed as regards the volume of business done during the year. Telegraphic dispatches received from prominent manufacturers and leading electrical supply jobbers just before the close of the year indicate that in some lines of manufacture and in some territories there has been a very material increase, while in other directions the year has maintained only a normal volume of business, or has fallen behind 1912.

From reliable indications it appears that the various elements of the industry are tending toward a better understanding of their mutual relations and the opportunity seems better now than it has for some time for an amelioration of this vexed situation and a harmonizing of the efforts of the manufacturer, central station, electrical supply jobber, contractor and dealer. During the year progress has been made in the inauguration of the work of the Society for Electrical Development. In September last there was an important conference of electrical interests, at Association Island, under the auspices of the Association Island Corporation, which resulted in the program of the Society for Electrical Development receiving a considerable impetus. Great activity has also been manifest upon the part of manufacturers and other interests adhering to the Society and through the membership of the Jovian Order, and it is believed that early in the year the Society will begin to actively carry out its plans for the education of all those who may use electrical energy and current-consuming devices.

The year 1913, like too many of its precedessors, has witnessed a continued unsettled condition with respect to the price of electrical material. In several lines the rate of production has rather exceeded the logical demand owing to restrictions in building operations and a shortened market for railway supplies. Consequent upon this there has been a tendency to make a price that would get the business. The net result has been the handling of a large volume of material at a totally inadequate profit.

The demand for varnished-cloth insulated cables upon the part of electric lighting companies has increased. In order to economize in duct space there has been more demand for three-conductor cables with conductors of sector form. More and more junction boxes and insulator terminals are being used for systems of large distribution. Some of these are of large proportions and designed so as to increase the flexibility of electrical systems of distribution.

The passage of the tariff bill caused some apprehension upon the part of some of the electrical manufacturers, but the indications to date are not such as would lead one to believe that the foreign manufacturer will make much of an onslaught upon American business.

The compiling of concrete statistics with respect to the value of electrical product is under the best conditions a rather difficult proceeding. In the table published on page 12, the figures have been made up from sources which are held to be reliable. They are the result of many estimates from manufacturers and others who should know a great deal with respect to the various materials listed. Only where there has been a considerable consensus of opinion has a total been established in this table. The comparative figures for 1913 and the year before will therefore show some considerable changes. Where an increase is not definitely indicated, except in a few cases, it will not necessarily mean that there has been as much apparent retrogression in the business. Our more enlightened knowledge would rather indicate that some of the figures given in our estimates of last year were high.

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New Hampshire Electric Power Stations.

Preliminary figures of the forthcoming quincennial report on the central electric light and power stations of the state of New Hampshire have been given out by Director W. J. Harris of the Bureau of the Census.

The statistics relate to the years ending December 31, for 1912 and 1907, and June 30 for 1902, and cover both commercial and municipal electric plants. They do not include electric plants operated by factories, hotels, etc., which consume the current generated, those operated by the Federal Government and state institutions, or plants that were idle or in course of construction.

The figures in the table for New Hampshire show that during the decade 1902-1912 there were substantial gains in the industry. In the case of the aggregate income of the 59 establishments reported in 1912 there was a gain of $1,394,676 over 1902, or 180 per cent. There were also large gains in total horsepower reported; the kilowatt capacity of dynamos; the output of stations in kilowatt-hours; and in the number of stationary motors served and their horsepower capacity.

	1912	1907	1902	Per cent of increase, 1902-1912
Number of establishments	59	56	51	15.7
Commercial	56	52	50	12.0
Municipal	3	4	1	200.0
Income[2]	$ 2,326,998	$ 1,422,345	$ 832,322	179.6
Light, heat, and power	2,199,468	1,321,296	826,176	166.2
All other sources	127,530	101,049	6,146	.....
Total expenses, including salaries and wages	1,596,152	912,214	554,967	187.6
Persons employed	578	422	294	96.6
Salaried employees	170	109	77	120.8
Wage earners (average number)	408	313	217	88.0
Total horsepower	84,228	46,784	28,096	199.8
Steam and gas engines (including turbines):				
Number	67	52	44	52.3
Horsepower	27,291	20,375	12,690	115.1
Waterwheels:				
Number	115	101	78	47.4
Horsepower	56,937	25,404	15,406	269.6
Auxiliary engines:				
Number	....	13	....	.....
Horsepower	....	1,005	....	.....
Kilowatt capacity of dynamos	57,768	31,917	17,777	225.0
Output of stations, kilowatt-hours	126,593,970	55,258,921	27,377,793	362.4
Estimated number of lamps wired for service:				
Arc	1,900	[3] 3,510	2,879	—34.0[1]
All other varieties	397,491	[3] 301,734	170,541	133.1
Stationary motors served:				
Number	1,958	1,061	415	371.8
Horsepower capacity	18,488	10,231	4,583	303.4

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[1] A minus sign (—) denotes decrease.

[2] Exclusive of $21,293 in 1907 and $10,625 in 1902 reported by street and electric railway companies as income from sale of electric current for light or power or from sale of current to other public-service corporations.

[3] Exclusive of 94 arc and 2,870 lamps of other varieties reported by the electric companies as used to light their own properties. Lamps used for such service were included in the number reported for 1912.

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Philadelphia Company Secures Big Railroad Contract.

The Pennsylvania Railroad Company has notified the Philadelphia Electric Company that it will purchase power from the latter for operating the electrified lines between the Philadelphia terminal, Chestnut Hill and Paoli.

The contract is for a period of five years and calls for a minimum of 3,750 kilowatts, with a load-factor of 0.25.

Part of the construction work upon the main line is already under way and a stretch of one mile between Wayne and St. Davids is nearing completion.

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Politics in Utility Jobs?

The Chicago City Council overwhelmingly rejected a proposition to end the practice of members securing positions for their henchmen with public service monopolies. The extent to which this practice is carried on is indicated both by the proposal and by its rejection by a three-to-one vote. In the light of such facts, how puerile appears the objection most frequently urged against public ownership that politics would govern selection of employees.—*The Public.*

British Electrical Developments in 1913.

By Albert H. Bridge

Advances Shown in Central Station Building—The Future of London Power Supply—Electric Railways Suffer—The Telephone Service to Be Greatly Extended.

Review of Great Britain.

The past year may be described as one of quiet, but substantial progress in most departments of the British electrical field. In lighting, domestic applications, as they are termed, industrial power, railway conversion and indeed all directions the activities of the year have been very satisfactory. Manufacturers of electrical equipments for power station and other heavy installation work have had their factories better employed at improved prices and managers and engineers of electric supply systems have not been able to get plants quickly enough to suit their plans for coping with the rapid growth in the electricity demand. Our works have been and still are doing big business for colonial and foreign electrical markets, the export returns for the year 1913, so far as it has gone at the time of writing, having considerably overtopped the figures of 1912. The reports received from abroad and from some parts of the United Kingdom indicate that there may be a falling away of general trade consequent upon the world development being somewhat hampered owing to monetary stringency and other temporary disturbing factors, but there is so much absolutely essential electrical work in hand and in prospect that it is unlikely that electrical men will feel anything like a slump in 1914. One cannot mention this industrial aspect of electrical affairs without remembering that the past year has witnessed financial reorganization of some of the oldest and best-known electrical manufacturing companies in British electrical industry. While this is a good thing got out of the way and may lead to dividend distributions sooner or later on reduced capital, the fact remains that the operation cannot be delayed in some other outstanding cases as well.

Preparing for Future Possibilities.

The rapidly growing demand upon the electrical supply systems in large cities and industrial centers has compelled engineers to go very closely into the question of future possibilities, preparing plans for being equal to the demand some years hence. Birmingham, which already has three generating stations with 33,900 kilowatts aggregate capacity is proceeding with an entirely new station at Nechells, beginning with 15,000 kilowatts (three 5,000-kilowatt sets), and ultimately reaching 100,000 kilowatts. This new station will supply at 5,000 volts, 25 cycles to the whole of the area of the greater city, via the existing stations, and will also supply direct to high-tension consumers. Manchester is planning a separate 100,000-kilowatt plant; Bradford is faced with similar pressing needs which induced it to send its engineer to the continent to report upon practice there. Glasgow sent its officials to America and Canada to learn anything they could that would serve them in recommending the lines along which to proceed with the Dalmarnock Road big plant. This station is expected to have ten 13,000-horsepower sets. And while these visits abroad were taking place Parsons were putting the finishing touches upon the big 25,000-kilowatt turbo-alternator set for dispatch to the Fisk Street station of the Commonwealth Edison Company at Chicago.

Power Station Developments.

In regard to power-station work actually done during 1913, here there are some features of interest. Of course, as is known, the high price of fuel oil has been in some degree an obstacle to Diesel engine progress. Interest, however, centers around the installation of horizontal four-cycle and two-cycle, four-cylinder engines of this type driving flywheel-type alternators at Kingston on Thames. The first Ljungston radial-flow steam turbine set in England (a 1,000-kilowatt machine) has got to work at the Willesden power station of the North Metropolitan Power Company. The Accrington municipality has installed Mond gas producers and by-product recovery plant—the first owned by a municipality—and two 1,000-brake-horsepower gas engines driving 938-kilowatt alternators. West Hartlepool also is the first place to municipally adopt a system of generating electricity from waste steam obtained from outside sources. It has opened a new power station on these lines and has six 1,500-kilowatt turbogenerators supplied with exhaust steam from six blowing engines served by 16 boilers. The municipality gives the Seaton Carew Iron Company a free supply of electricity in return for the use of the exhaust steam. The Yorkshire Electric Power Company has got to work with its waste heat power station at Barugh; the first installment is 2,000-kilowatts, but a 5,000-kilowatt plant has already had to be ordered. A reminder of the troubles caused by the coal miners' strike of a year or two ago is found in several stations, and especially does it come from Hammersmith (London) where with a view of future possibilities the Council has just placed contracts for a system of hydraulic coal storage and conveying. These are a few of the interesting departures of the year's practice.

The Future of Power Supply in London.

Big as the problem of future supply may be to provincial cities, such as are selected for mention in the foregoing, it is insignificant compared with the problem facing the London authorities. The future of London electric supply has been discussed in a way on many occasions, but the whole matter is now to all appearances coming to a very definite stage where something will be done. The last annual statistics available are those prepared by Frank Bailey, engineer of the city of London Electric Lighting Company. He shows that in an area having a population of 4,500,000 there are 38 generating stations; 14 municipal authorities (maximum load last winter 59,130 kilowatts) and 13 companies (maximum load last winter 103,980 kilowatts). The capital expenditure of the companies has been nearly $75,000,000, and that of the municipalities about $32,500,000. The companies are subject to purchase in the year 1931, and the London County Council is to be the purchasing authority for all undertakings. A committee of municipal and company representatives has been sitting periodically for a year or two now with a view to devising a policy or scheme for conducting or controlling matters in the future. During the latter half of 1913 the committee was authorized by the London County Council to spend $10,000 upon obtaining advice from experts concerning the technical issues involved. At the time of writing the subject is giving rise to discussion owing to a proposal having been filed by one of the companies asking Parliament to defer the purchase date. It is expected that this will be one of the great questions for consideration, and maybe for settlement during the year 1914.

Increasing the Use of Current-Consuming Devices.

There has been an excellent move forward in electric heating and cooking. The efforts of managers and engineers of electric supply systems to popularize this side of the business by reducing charges and the availability of cheaper apparatus, have in many places been followed by success. In a number of towns hire-purchase systems have been introduced and have been amply justified by the results; today some of our leading authorities hold that without such assistance, reducing the consumers' capital outlay, it will not be possible to compete satisfactorily with gas cooking. By the opening of public restaurants where electrically cooked meals are served, such as the B. & K. and 'Tricity establishments in London, and by the emphasis laid on the cooking side at various local exhibitions, valuable educational work is being done. Some excellent examples of electric kitchens have also been completed during the year at hotels and in public buildings. The returns issued by the Marylebone electric supply department, which has long shown energy and enterprise in this branch of its service, were exceptionally gratifying, revealing an advance of from 3,922 kilowatts to 6,321 kilowatts in one year in "heating, cooking and other uses." There were on circuit 2,401 radiators of 2,820 kilowatts, 620 cooking equipments of 2,047 kilowatts, 605 irons of 205 kilowatts, 524 medical equipments of 369 kilowatts, and 973 sundry apparatus of 877 kilowatts. The Point Fives Club has been considering the questions of standardization of cooking apparatus, and of adopting a rateable value basis of charging plus one cent per unit for "domestic" supplies. As a result of its discussions conclusions were arrived at as to a number of general preliminary principle, which use and observation of various types of cooking apparatus showed to be of importance. The spirit which has prompted the "Point Fives" has influenced electrical departments to announce specially favorable systems of charging. Harrogate, West Ham. Bradford and Manchester especially occur to one as places where this movement has been observed. Manchester announced the fixed percentage rateable basis mentioned above plus one cent per unit metered for all supplies, contingent upon the consumer agreeing to install for domestic purposes a certain minimum number of kilowatts, in addition to the existing lighting requirements. Bradford introduced special tariff for shopkeepers, and other places have made special rate concessions to electrical contractors taking electricity for advertisement purposes. In this and other ways more consideration has been meted out to the private contractor by municipal authorities. The Contractors' Association has also been engaged with propositions respecting guaranteeing the installation work carried out by its members, chiefly with the idea of raising the standard of such. There have been strikes of electrical wiremen for better wages in several centers and at the time of writing the agitation is occupying attention in London where a new Electrical Masters' Association has just been formed to handle the difficulty.

The leading purely electrical exhibition of the year was that organized by the Glasgow electricity department, but the larger part that electricity is playing in all sections of industry was very plainly evident in specialized trade exhibitions connected with the cinematograph, building, automobile, clothing, laundry and other branches.

Electric Railways.

The electric railway department has had reason of satisfaction, for more contracts of this description have been in hand than ever before. The conversion of several hundreds of miles of line by the London & North Western and the London & South Western, also the extensions of the London & Brighton Company's single-phase lines, have been the chief works proceeded with so far as English systems are concerned, while the Australian (Melbourne) railway contracts are also going through the factories. The Lancashire & Yorkshire Railway has opened its new electric train services to Ormskirk, thus completing a through electrified system from Liverpool to that place, and the completion of the electrification of the East London Railway has cleared away a controversy of many years' standing. In the direction of new electric tramway equipment there has been little of special import. Railless electric trolley vehicle schemes have been authorized in a number of additional districts, but progress is by no means sensational. Parliament has, when authorizing new systems, made stipulations that promoters shall pay a certain proportion of the costs of adapting the roads to the traffic and a specified figure per car mile for the maintenance of the roads. Petrol-electric omnibuses are now running at Birmingham and some other towns not previously using them, and in London the London County Council connected a number of its horse cars for petrol-electric working. Motor omnibus competition has been one of the great problems of tramway authorities. The London County Council has been hit exceptionally hard by this and other troubles. The annual statement last issued showed that 20,000,000 fewer passengers were carried, chiefly owing to such competition. The gross earnings fell by getting on for $1,000,000 in the year, with the result that the net surplus which in the previous year was $1,114,000 dropped to only $2,500! Many propositions have been discussed for improving the tramway facilities so as to make them more profitable and attractive, but fortune was against the undertaking when a number of breakdowns occurred at the Greenwich power station and hung up very large sections of the system for some time. The public wanted to know the cause of this inconvenience and loss and the fact emerged that the system was operating with too small a margin at the generating station. Tenders were invited for new turbine plant costing $1,000,000 and this is being installed, equipment that was put in only a few years ago being scrapped.

Wireless Telegraphy.

Probably no other department of electrical work has been so constantly to the fore as has wireless telegraphy, the chief reason being that wireless was for many months one of the great public questions. To refer to the controversy centering around the Imperial Wireless scheme is superfluous; all that need be said is that a revised contract with the Marconi Company was approved by Parliament, three of the great stations being ordered. Since then tenders have been invited for the remaining three, the Marconi Company has consolidated its position by purchasing the Goldschmidt patents and has increased its capital by half a million shares. On the technical side of wireless telegraphy only good is likely to ensue as a result of the discussion of the year, the importance of research work having been recognized in high quarters and appropriate steps taken by the government to enlist the services of well-known advisory experts in this connection. International wireless research has also been undertaken during recent months, of which particulars appeared in these pages, and its work and resulting data will be of immediate value. Disasters at sea have again emphasized the value of wireless in marine service and have given rise to a demand from workers on cargo vessels for equipments to be carried on all such ships. The stipulations of Parliament made when the lessons of the Titanic catastrophe had been learned did not embrace cargo vessels, but the men consider that it should be as much an obligation upon owners to protect their lives as those of passengers and they announce their determination not to board any cargo vessel devoid of wireless equipment on May 1, 1914. I mention this merely as a straw indicative of the way the wind is blowing. Wireless is a subject that is in everybody's mouth. Discussion in the press has made it popular. How far does this carry suggestions for us in our efforts to popularize other applications of electricity?

The Telephone Service.

The arbitration proceedings relating to the taking over of the telephone system of the state have been cleared out of the way during the year and the postoffice authorities secured Parliament's sanction to expenditure of $50,000,000 upon developments, included in which is the equipment of many exchanges for automatic working. The experiments at Epsom and in London were successful and orders have been placed for equipments for a number of towns in the provinces, the intention being that larger cities shall follow in due course. According to statistics recently prepared the telephone service of London now comprises 130,000 lines with 222,000 stations and in estimating for the future it is calculated that by the year 1921 there will be 267,000 lines and 432,000 stations. So loud and widespread have been the complaints of the telephone service since the transfer from company ownership that the postmaster-general has had to make many speeches in defence of the postoffice, explaining the big things that are proceeding which in due time will remedy present defects. In one of these speeches a few months ago he said that since the transfer 162,000 miles of additional wire had been laid down and 20,000 new subscribers connected in London. In the whole country $5,000,000 had been spent on the improvement of the exchange system apart from the trunk system, and this year larger sums were being expended. This year 220 exchanges had been opened. Revision of telephone rates has not yet been introduced, but an interesting development is the appointment of local advisory committees, in important centers, to confer with the postoffice authorities with a view to improving the service. A scheme has been taken in hand by the postoffice by laying six miles of tube electric railway connecting the chief London postal centers for purely postoffice purposes at a cost of close upon $5,000,000. This work is to be put up for tender directly. There will be a two-track system, each track being two feet gauge, one for east-bound and one for west-bound traffic, in one single tunnel of nine feet internal diameter.

The Prentice automatic wireless train control system has been demonstrated on the Hampton Court line of the London & South Western Railway.

Electric Vehicles.

An outstanding event of the year has been the determined effort that has been made, partly by the municipal electric supply men, to boost the electric-vehicle business. The regular reader will recall the appointment of a special Electric Vehicle Committee by the Municipal Electrical Association and the long list of duties that it has set itself to do in coöperation with vehicle builders, battery makers, equipment firms, etc., in order to, if possible, bring this so far neglected section of the industry into a very similar relation to the whole industry to that which it has come to occupy in the United States.

Electrical Machinery Standardization.

The British Electrical Manufacturers' Association provisionally adopted a code of rules for electrical machinery standardization, relating to standard pressures and frequencies, high-pressure tests and insulation resistance, types of machines, rating, overloads and heating. These are still the subjects of discussion, as also I believe are model conditions of contract which formed the subject of much controversy during the year in the meetings of the Municipal Electrical Association. The Board of Trade issued new regulations concerning overhead wires making concessions as to their use and facilitating the obtaining of consent to run them, and introducing important changes in the high-pressure code. The Institution of Electrical Engineers has settled down to quieter life since the discussions relating to articles. The last returns show a total membership of 7,034, a net increase for the year of 547 as compared with an average increase of only 137 for the preceding five years. The institution went to Paris in May for a period of very successful fraternization with members of the Societe International des Electricians. An electrical research committee has been appointed, particulars of the duties and objects having been stated in these papers at the time.

The completion of the petrol-electric ship "Tynemount," the larger business done in electric clock installations in public buildings, the new emphasis that has been laid on the necessity for all trains to be lighted by electricity owing to the fire dangers attendant on the use of gas, and the adoption of electric lighting in smaller towns and villages where a year or two ago with the then available equipments and lamps such installations were not regarded as commercially justifiable—these are all among the features of a truly progressive and interesting year in British electrical engineering and development.

Electrical Progress on the Continent in 1913.

By Francis P. Mann.

Important Hydroelectric Schemes—Big Generators Installed—Railway Electrification—Important Wireless Developments—Electric Furnaces and Electrochemical Industries Advance.

Central-Station Development.

Referring in the first place to this year's progress in the construction of central stations, we note among the principal hydraulic plants the large one which is now running at Biaschina, in southern Switzerland, and it uses an 870-foot head of water from the Tessin River. It is mainly intended as a center of electric power for electrochemical works which are to be grouped near it in course of time, and several of these, for nitrogenous products and others are already installed. The station contains four 10,000-horsepower Brown-Boveri turbine-alternator units, with Escher-Wyss turbines, and works at 8,000 volts. An extensive project is on foot in Germany to use the water of the Weser stream and its tributaries for several large hydraulic plants, distributing current over a district of 2,500 square miles area and costing over $10,000,000. South Italy is to be well furnished with power from water storage basins in the Sila mountain region, erecting a 50,000-horsepower station in the first place. In Norway there has been finished a hydraulic plant at Stemdal, which is one of the largest in northern Europe. We should also mention the Russian enterprise for using the Terek river and Lake Goktcha. The highest fall yet to be employed in Europe will be used for the Lake Fully plant in Switzerland, this being 5,000 feet. Drawn steel tubes of unusual strength will be required to stand the enormous water pressure in the penstock. In France the waters of the Durance and the Gironde will be called upon for 50,000 horsepower, and 30 turbine groups will be erected in the powerhouse. The largest sized Pelton wheel in use, or 15,000 horsepower, is seen in the Löntsch station, this plant being one of the principal ones in Switzerland and furnishing 55,000 horsepower in all.

An extensive enterprise in the way of steam plants is the erection of two central stations for the city of Paris, these being located in the immediate suburbs of town. The first plant, at St. Ouen, has an output of no less than 75,000 horsepower while the second station, at Issy-Moulineaux, has 35,000 horsepower, making a combined output of 110,000 horsepower. The first of these plants will have eight groups of steam turbine alternators of 15,000 kilowatt size, of the Brown-Boveri, Zoelly and Rateau types. The boiler room has 40 boilers, while an extensive pump room lies alongside. Fifty tons of coal per hour is taken in from Seine flats by a modern conveyor system. The second plant will have about the same makup, using three steam turbines of Schneider and Zoelly types. Both stations work on two-phase, 12,500-volts, and connect by underground cable to substations within town.

Sizes of steam turbines are on the increase, for instance we may mention the 40,000-horsepower turbine which the Brown-Boveri works is building for a plant in Westphalia. It drives a three-phase 10,000-volt alternator at 1,000 revolutions per minute. At the Reisholz electric plant there is installed a 30,000-horsepower turbine of the same make, and a second one is now building for a Cologne station. Genoa and its surburbs now use current from two large stations, whose combined output is 50,000 horsepower. The principal station is equipped with Allgemeine steam turbine sets in several sizes from 10,000 horsepower down, the total output being 30,000 horsepower.

Generators of Large Size and Output.

Progress in building large sized generators will be noticed from the one which the Société Alsacienne recently built. While we are familiar with alternators of large output, direct-current machines have been behind hand as to size, and America held the record with 3,750-kilowatt machines. However, the French works comes out with a 4,400-kilowatt multipolar, 480-volt generator, which is claimed to be the largest in the world, and a second one is now building. For Diesel engine groups, the Oerlikon works designed an alternator which is of a novel type, for in order to secure the increased flywheel effect which such engines need to work well, and without increasing the diameter of the machine, the multipolar field is here used as the flywheel and is mounted next the engine. This field overhangs a fixed slotted armature mounted against an outer bracket or foundation plate, thus answering to the best conditions for the Diesel engine and also keeping the machine within a small size.

Electric Traction.

As usual, the electric traction field is one of the most active, and among the most important enterprises we may mention the new metropolitan electric line across Berlin, for which the Allgemeine firm has received the contract. This is to be a six-mile double-track road, having the greater part in tunnel and a short section of about a mile, in overhead structure. The line connects with existing city lines and with the leading railroad stations, and it is proposed to have it running by 1917. Measures are also being taken to adopt electric traction for operating the Berlin city belt and suburban lines, for this is considered the proper solution of the problem which now arises from heavy traffic, especially on the city road, and using electric trains, there can be run 40 trains an hour instead of 24, as at present, and the passenger traffic will be increased 100 per cent.

The question of equipping the suburban lines of Paris is now reaching a conclusion, and the magnitude of the undertaking will be seen when we consider that the three depots of St. Lazare, Montparnasse and Invalides use rolling stock to the extent of 200 locomotives and 1,500 cars. It is probable that direct-current, 650-volt motor cars and trailers will be used, and substations along the lines will be fed by three-phase current from central stations. Contracts for two large stations have already been awarded, these to be located in the suburbs and furnishing over 100,000 horsepower. The metropolitan subway for Naples is also one of the extensive projects, and it will run for about five miles through the city, connecting at one end with the Vesuvius electric road. Some of the underground stations which lie at a great depth will be reached by electric elevators. A connecting surface traction system for the suburbs forms part of the scheme.

The new Rjuhan electric railroad in Norway is the first standard-gauge line in that country to run on single-phase. Locomotives for this line run on 10,000 volts on overhead trolley and carry four 125-horsepower motors. The present road is used mainly for the saltpeter traffic. On the Milan-Varese electric road, in Italy, which has 60 miles length, there are now in use several locomotives of new design, of the Brown-Boveri type, these having three driving wheels worked by two 1,000-horsepower motors, and they take freight and passenger trains at 60 miles an hour. Electric traction will soon be used on the German Magdeburg-Leipzig section of about 100 miles length, and another line in the same country is the 80-mile Lauban-Konigszelt section, together with 100 miles of branch roads. Successful tests of high-voltage, three-phase locomotives have been made by the government on the Magdeburg-Halle section, and it is thought that these will be extensively adopted for future plans.

Wireless Telegraphy on the Continent.

One of the principal events in the wireless field this year was the international conference, which met at Paris in order to decide the question of time signals. These signals were to be sent out each day from one of the largest stations on the continent. The Eiffel Tower post was chosen for the purpose, as it is considered to be the best equipped in the world. It is true that the new station now building in Germany at Norddeich may perhaps be more powerful, but on the other hand, it is the intention to add to the output of the Tower plant as time goes on. Fifteen governments all over the world have now adhered to the union, and others will no doubt follow. The Tower plant will send out the time signals twice a day and this will be received in the large stations at various points on the globe, each of these acting in turn as a center for sending the signals within its own range to smaller land posts and to ships at sea, allowing these latter to take their bearings within 30 feet or so. Previously to this, however, the Tower was already engaged in working a time-signal system in connection with the Observatory clocks and now sends signals, mainly for France, twice a day, this being much appreciated. Since the first of September another move has been to send special weather signals from the Tower each day, and this will be especially useful to mariners and aeronauts.

We should mention the Magunna musical spark method employed in France, consisting in the use of tuning forks which break the 220-volt current at a constant rate of 750 vibrations a second, the forks vibrated in an original way by using a motor-driven stretched belt after the fashion of a bow against which the end of the fork is placed. This is found better than the usual magnet vibrator for the fork. He now makes up portable wireless sets on this principle for military field use, aeroplanes and airships.

Regarding long-distance work, the Nauen station sent messages to Long Island over a distance of 3,900 miles. Pennant Hills, Australia, worked with a steamer at sea at 4,020 miles, equipped with Telefunken apparatus. A still longer range, 4,680 miles, was covered by Marconi instruments, between Honolulu and Yokahama.

Wireless Telephony.

In the field of wireless telephony, Professor Vanni obtained some remarkable results by the use of his new liquid microphone transmitter. Working from the army wireless headquarters near Rome with his microphone, together with other apparatus of the Moretti type, he was able to communicate with a post across the Mediterranean at Tripoli, and persons at this latter post could hear conversation quite well. He also used a phonograph to transmit into the microphone, and the result was even better. Some 730 miles were covered here, and Professor Vanni hopes soon to be able to work between Rome and Paris.

Incandescent Lighting.

As regards lighting, we note the new high-candle-power lamp quite recently put on the market by the Berlin Allgemeine firm. It uses a drawn-tungsten filament in a glass bulb filled with nitrogen, and this bulb is considered smaller than what prevails for the usual high-candle-power lamps. The new lamp is now made from 600 candlepower up as high as 3,000 candlepower and works on 50 to 240-volt circuits. It is claimed to take only one-half watt per candlepower, and as the incandescent body is very compact, this is favorable for the emission of the light. This latter is of a good white color and comes very near sunlight. Concerning the usual metallic filament lamp, manufacturers have been improving it quite a little within a recent period so that its efficiency is higher. For instance, the 600-candlepower, 250-volt lamp made by the above works shows a consumption of 0.8 watt per candle, according to recent tests, and the light fell off only 20 per cent after 2,750 hours' run, taking at that time 0.91 watt per candle. One of these lamps burned for 3,500 hours and lost but 25 per cent of the light at that time. Reports about the osram lamp state that the former difficulties in drawing the tungsten are now overcome in the recent processes used by European works. Concerning the 16-candlepower, 217-volt lamps of the best makes, these are found to burn for 2,000 hours with a loss of only 10 per cent light. High-candlepower lamps of 200 to 1,000 candlepower show 0.8 watt per candle. For instance, the 110-volt, 300-candlepower osram lamp of 300 candlepower gives as much as 9,000 hours' life with but very little drop in candlepower. Among the newest lamps is the "Verico," made at the Siemens-Schuckert factories, and it now apears in 75 candlepower size, running on 100 or 200 volts. It is claimed to be extremely white and the nearest approach to daylight that has come out as yet, so that it will be excellent for store lighting and also for helping out poorly-lighted rooms, in which case, there is little difference seen between the lamplight and daylight in different parts of the room. The "Flammeco" is a new arc lamp of the Allgemeine works' manufacture, and it uses mineralized carbons enclosed in a globe so that the carbons last four or five times as long as usual. The lamp is especially useful for shop lighting where the works run night and day and in which case it would be a drawback to take the electric cranes away from service in order to use them for replacing the carbons. Much less attention for trimming is now required by the use of the new lamp.

Electric Furnaces.

There is a very good progress to be reported as to electric metal working processes. The production of electric steel is on the increase, and the last figures show upwards of 83 steel works in operation all over the globe. In these works the steel is produced outright, and should we add the plants used simply for refining of steel, the number would be much increased. The total number of furnaces in all these plants is about 140. In France one of the largest plants is the Girod works at Ugine, and it employs a type of rotary furnace to produce a homogeneous steel of high grade, taking some 800 watt-hours per ton. Sweden is a country where numerous plants are to be found, and one of the most recent is the Hallstahammer, where there is installed a Rennerfelt furnace. Two others are now building, the largest of these having 2,000 pounds output. It is said that there are upwards of 16 different systems of furnace in use for steel production at the present time, the principal ones besides the above being the Herault, Keller, Röchling, Kjellin and Stassano. The latest figures obtained for annual production (1911) show 128,510 tons.

Electrochemical Industries.

The Siemens-Schuckert company is engaged in extracting copper from the ore by an electrolytic process, in Chile, this being located on the coast at Cobijo, where there is erected a station with 4,000 horsepower in steam turbines. At the mines, 110 miles off, is a substation which supplies 250 to 190 volts for the electrolytic tanks. The new method is said to be quite a success. As to aluminum, the industry is especially flourishing in France, Germany, Switzerland and Austria. Latest accounts for the world's production show 44,200 tons annually and the entire number of furnaces foot up 320,000 horsepower.

Nitrogenous fertilizer also occupies a leading place among the electrochemical industries on the continent, and among others we mention the large plant which has been lately installed at Johannesburg, Sweden, for nitrates and also carbide of calcium. Nitrate of calcium is made on the new Carlson process. At present there are working six furnaces for nitrate. The electric station has machines to the extent of 20,000 horsepower, using the power of the river Ljungan. The Trolhattan plant is among the foremost engaged in nitrate production, and Engineer Lindblad has now brought out a new fertilizer which he calls "electrokali," obtaining this by treating feldspar, carbon and iron in the electric furnace. We also note the new nitrate plant at Bonvillard in the Savoy region, which is to use a 40,000-horsepower hydraulic station.

The Outlook from the Banking and Financial Point of View.

By George M. Reynolds.

The President of the Continental and Commercial National Bank of Chicago Sees no Condition to Lead to Panic—Stop Starving the Railroads—Readjustment and Improvement Under Way.

Lack of liquid capital is the dominating feature the world over at present. This condition is attributable primarily to the conversion of liquid capital into fixed investments, and to private, corporate and governmental extravagances, the worst form of the later being due to wars and preparation for wars. Being a country yet in the making, we have at least one advantage in overcoming the difficulty; namely, superior natural resources, the development of which serves to stimulate production; but in other respects, we labor under greater disadvantages than do other countries. Our currency system is deficient; railroads are hampered by inability to raise funds; trust agitation and investigations impede progress; and the new tariff is in an experimental stage.

No Causes to Lead to Panic.

The foregoing are the facts, but they should not produce undue alarm for there has been such orderly liquidation and gradual cessation of speculation in land, commodities, stock exchange securities, and worthless promotions, as to eradicate the causes that lead to panics. The indicator does, however, point to a period of readjustment. We must admit that or deceive ourselves, and denying the existence of a thing begets inability to discover and apply remedies.

A Time to Exhibit Calmness and Determination.

After fifteen years of unprecedented and almost uninterrupted prosperity, it is logical to expect some recession in trade, but we are apt to overdo pessimism as the pendulum swings backward, and therefore this is the time to exhibit calmness and determination, lest we become bewildered and falter in solving the problems that confront us. Production and economy will in time cure the world-wide disorder; the difficulties local to this country are in process of treatment. The currency bill, amended and improved, has been passed, and it removes one of the principal causes of uncertainty. It provides elasticity by making the commercial assets of the nation available as a basis for currency, and a more scientific method of issuing currency has never been devised. On account of the shifting of reserves which it requires from banks now in existence to the regional reserve banks, the immediate effect of the law will probably be a very slight disturbance of credits, but here is where patience is needed, for our currency should expand to meet the requirements of business after the first flush of inaugurating the new system has passed. From that time on, it should not be necessary to restrict credits, except to prevent inflation, and the plan itself guards against over-expansion.

Relief for the Railroads.

We all remember the vehemence with which shippers fought advances in rates asked by the railroads several years ago. The best information obtainable indicates that there has been a change of sentiment on this question. Shippers, especially the larger ones, say they now favor slightly increased compensation because the carriers' expenditures for labor and equipment have been raised to a point where net revenues are no longer sufficient to maintain the properties and pay bond interest and dividends. Stringent regulations, awards of higher wages and a public demand for better service are the reasons assigned for the narrowing margin between income and outgo. Under these conditions transportation companies absolutely cannot finance themselves. Thus by far the largest buyers of materials and employers of labor in the country have been compelled to retrench to a degree that is detrimental to all. Next to a new banking and currency system this is the most important question affecting the commercial and industrial life of the nation, and it is greatly to be desired that serious complications shall be avoided by granting a reasonable measure of relief. A continuation of the policy of starvation and legislative harassment will end in a calamity. In view of the disappearance of widespread opposition the railroads ought to be able to justify their application for somewhat higher rates. When these companies are again in position to enter the markets for materials and labor with aggressiveness, there will be noticeable improvement in all lines.

The Government Policy Toward Corporations.

According to recent utterances the President has no intention of asking Congress to add to our perplexities by a legislative onslaught upon corporations. He favors amendatory acts that will clarify the Sherman law, and no harm can come from better defining the powers and limitations of corporations, so that their directors and officers may know with greater certainty what acts are within, and what constitute violations of the law.

Dispatches from Washington a few days ago contained the reassuring information that President Wilson and his advisers have taken a comprehensive view of the subject of the investigation and prosecution of corporations, and decided to settle cases involving infractions, or supposed infractions, of the antitrust law in an amicable way where possible. The announcement of a determination to apply the principles of negotiation to differences between the legal department of the government and the corporations has been anxiously awaited for a long time, and the promised respite from what seemed to be a ceaseless airing of disputes in the courts will certainly afford opportunity for the business men of the nation to meet the changed conditions arising from tariff and currency legislation. This action displays a quality of statesmanship that deserves the commendation of every patriotic citizen. The American Telephone & Telegraph Company settlement under this plan was received with favor.

The Tariff Law has not been in operation long enough to really determine by actual test whether its influence will be for an upward or downward movement in general business. There seems to be a lingering feeling of uncertainty on this point, but owing to the great additions to the wealth of the country, the absence of speculation and the soundness of underlying conditions, our ability to successfully change the tariff is immeasurably greater now than it was 20 years ago when the last attempt at a substantial reduction was made.

With readjustment under way, the situation is simply one that calls for fairness, patience, conservatism and courage. The practice of these virtues by government officials and private citizens will do far more to promote the future supremacy and stability of our country than is generally realized.

A Period of Conservative Optimism.

By Theodore N. Vail.

The President of the American Telephone & Telegraph Company Looks for Early Restoration of Confidence—Underlying Conditions Sound.

[When Mr. Vail was asked for an opinion as to business conditions and the outlook he referred to several recent utterances which indicate his sentiment and conviction. These are herewith republished, trusting that they may contain some useful suggestions.—EDITOR.]

Public Utilities and Public Policies.

Public prosperity is largely dependent upon good service of all kinds, not only within but without. The interconnecting interests of individuals within a community, and of communities with one another, is like an endless chain, each link or unit depending on the strength and reliability of the whole, and the effective worth of the whole depending on each link. Good or bad movements in economic matters do not produce immediate effects, but because the effects are not immediate they are none the less certain to come. If the causes which have produced prosperity are ignored, if economic laws are disregarded, and experiments in new ideas are enforced without trial, the resulting trouble will again, as it has in the past, cause unfortunate results, which will in time bring about reform, but the damage and destruction done will never be restored.

Unless the public is reasonable in the use of its new-found power, and exercises it justly and equitably, but rigidly and consistently, all remaining confidence will be destroyed, and prosperity will cease; for, unless utilities can be invested in with certainty and security, investment will cease and growth and development must surely be checked. These utilities, and those dependent upon them, are by far the largest purchasers and consumers of the products of the earth and the factory; and a very large proportion of this consumption is due to normal or above-normal activity in the improvement, extension, and development of these utilities, and to the greater activity in every line of industry or production which accompanies these activities. Activity of extension and development means full consumption of all products and commodities, good wages, and full employment for all. Sub-normal, normal, or above-normal activity means the difference between shops half filled with work, full of work, or worked over-time.—*The Atlantic Monthly*, March, 1913.

Underlying Conditions Sound.

It seems to me that the fundamentals are sound. Most of our troubles are superficial and are therefore susceptible of rapid and decisive improvement. From the security-market standpoint it is entirely possible that the tendency toward depression may persist for some months more, but with underlying conditions as favorable as they are today, the recovery to a more normal and happier frame of mind is merely a matter of time and patience. People tell me that the money markets are moving under close sail and that the money pilots have cautioned against stormy times ahead. This is the very best guarantee in the world that we shall not have them. These same conservatives forget the fact that we are today laboring under the strain of having to assist in the great work of financing Europe through its war troubles and that business expansion has been held in check in this country as by an iron leash.

Every bit of development work, every new enterprise which it has been physically possible to hold back has been stopped or not initiated. Business is simply normal—what is barely necessary to keep the country in operation as a going concern and no more. We have slowed down so far that when activity starts in again, say in another year or two years, in a big way, we shall probably be so cramped for railroad and industrial facilities, that the problem of handling the volume of business pressing for transaction will choke our arteries of commerce and flood our mills and factories to a point making economy of operation exceedingly difficult. That is one of the most serious troubles today and not the Balkan war, the tariff, or tight money. We have slowed down too far and too fast and we shall have to pay an excessive price for expansion when revival starts.

Business in the United States adjusts itself to change with wonderful facility. That is the history of the past. It will be the history of the future. I am not worrying over the tariff nor prostration in industrial New England. What we want is more courage, and a disposition to make the best of things, remembering that in this very human world expediency and a sense of compromise are the part of wisdom and discretion.

The same business men who are trembling lest their factories will be closed because of textile tariff or other tariff alterations have opposed a rational increase in railroad freight rates. And yet an increase in freight rates is the very biggest thing which could happen in this country today. The railroads need it, must have it. When they get it, and I feel morally certain they will get it, then their financing credit will be restored, their ability to grow and expand will be assured and this will work down along the line to every industrial town and city in the land. It is no idle estimate to claim that a rational solution of the railroad rate problem would mean a 25 per cent to 50 per cent expansion in general business. And on that basis the shippers would be paying a very cheap price to consent, say, to a 5 per cent increase in freight rates.

In fact were the railroads and industrials to undertake only necessary improvements and necessary extensions together with such expansion as wisdom and experience teach is necessary to provide for the future the tremendous impetus which would be given to general business would settle the problem of the safety of railroad dividends and would largely dissipate the tendency among industrials to do a constantly larger gross at a smaller margin of profit. In other words, restoration of railroad financing credit would produce railroad buying of such proportions that factories and mills would have a much larger volume of gross sales over which to distribute their fixed overhead charges, so that the new gross would be relatively very profitable.

I believe in the enduring ability of the people of this great country to triumph over all obstacles and all hindrances to business prosperity. Let us look away a bit from the ticker tape and the pessimism of the financial centers. The broad viewpoint gets its horizon back in the western wheat fields where nature is happily promising to pour out another wonderful harvest in the fall.—*Boston News Bureau,* May 20, 1913.

Electrical Contracting, 1913-1914.

By Ernest Freeman.

The President of the National Electrical Contractors' Association Describes Some of the Contractor's Troubles and Suggests a Remedy.

Of the different branches of the electrical industry, there can be but little doubt that contracting is in many ways the most pleasing and interesting.

There are many reasons for this, the most important being:

First.—Almost every device, contrivance or improvement must at some stage pass through the hands of the contractor, who becomes acquainted with every new thing, has the opportunity of studying the workings of whatever it may be, and in the end, has much to do with its success or failure.

Second.—Electrical contracting IS a good business, because the men who are in it think it is.

The above statements, however, are not intended to convey an impression that contracting is without its perplexities. We, like others, have our own troubles.

One of the most discouraging conditions we have to overcome is after spending our energy, time and money estimating on a job, to be turned down by the owner with: "We are going to buy the material, hire men and do it ourselves." We have given them the benefit of our knowledge, we have shown them how, and then—well, they wish us a prosperous business in 1914.

And then there is the fellow who carefully puts the matches out of the way of the children and when they have gone to bed he strings a piece of cord around the picture molding and connects for himself a table lamp; tells his friend about it on the way down-town the next day; this friend spreads the good news and shortly there is a whole block of high-class electricians and, incidentally, but only incidentally, a whole block of fire traps. Still, each has saved a little money in doing the job himself. Of course, if the building burns, the insurance company pays. If a human life or so is lost—well, one is born every minute.

Oh yes! everybody takes a hand at the contracting game.

Probably, however, the worst enemy the contractor has is the lighting company or central station. The contractor says the lighting company is a hog, and the lighting company says the contractor is a cheap skate—sometimes they are both right.

One dark night years ago, some central-station manager conceived the idea and immediately started to advertise "old houses wired at cost"—since which night others have trailed and offered the same inducement.

So it is, contractors not only must convince a prospective customer that he should "wire," but he must also show that one cannot get "something for nothing."

Central stations and contractors should be friends working together hand in hand instead of enemies calling one another names.

And this could be so easily remedied and the result would benefit all.

If all municipalities and governments would enact laws prescribing safe and sane rules for the installation of things electrical and require of each individual or firm engaged in the business to pass a rigid examination for fitness and then prosecute the "do it ourselves" and "lamp cord" electricians, a real progress for the good of contracting and the public would result.

A job done at cost is a job done at a loss. When the public understands this, they will realize at the same time that this loss must be made up somewhere and the somewhere is in the cost per kilowatt consumed by each and every customer on the lighting company's lines.

If a central station is doing two things —selling current and doing wiring—and the wiring is done at cost, which is at a loss—the losses must be made up in a higher kilowatt-hour charge.

If the central station would spend the same amount of money and exercise the same energy trying to create in the minds of the public a desire for things electrical, that they do in trying to get an owner to let them do some wiring at cost, and then get on friendly terms with the contractor and all electrical interests in their respective cities, so all could "boost," their business would experience a freshness and health which would surpass all records.

Sail the True Course to the Buyer's Door.

By Franklin Overbagh.

The General Secretary of the National Electrical Supply Jobbers' Association Sees Continued Prosperity for the Electrical Industry.

The electrical business, like other industries, naturally adjust itself to the general economic laws of trade. There are times when consumption is not equal to production; on these occasions there is an easing up in buying activity. There are times when consumption is in excess of production; at these periods we have "boom" times. There is another market condition, and that is when consumption equals production.

The first mentioned condition comes along at certain regular intervals. It points to the necessity for watchfulness and care in steering the business ship through the storms of uncertainty. The depression generally is for short duration and cannot be considered as of no practical use for the reason that it teaches one of the many lessons that makes success possible.

The second condition from a superficial standpoint would seem one to be thankful for, and so it would be were it not for the fact that the benefits received come from an abnormal state of affairs. The values are temporary only; they cannot be lasting, and consequently are real disturbing factors in the business world.

The last condition is the real, true, ideal way that means a steady demand and a market that does not fluctuate from day to day.

The first condition is the one that confronts us today. There is a slowing down. It doesn't apply to the electrical business alone but affects concerns that are in other lines of trade. The consumer is unable or unwilling to buy, or perhaps it would be better to say that he is resting on his oars awaiting developments.

It is not difficult to speculate and say the changes in tariff, the proposed change in the banking laws, or the activity of the politicians in their various schemes are the causes, but it is quite a different thing to give a sound, reasonable, convincing argument to back up such statements, and so we are compelled to fall back on those fundamental laws of business; namely, supply and demand.

According to reports, sixty-five million people in the United States are strangers to the use of electrical devices in one form or the other. A great majority of them are waiting for some one to tell the story. It will be listened to for the reason that it appeals to the human factor which naturally takes to things that are progressive when they are properly presented. Electricity means light, and light means comfort and comfort is a necessity.

The electrical industry is well founded on a solid basis. It produces necessities more than it produces luxuries. The demand will come and the product will be marketed by those who are prepared to grasp the opportunity. Nineteen hundred and fourteen should have no terrors for the man who sails the true course to the buyers' door.

Examination for Inspector of Electrical Engineering.

The United States Civil Service Commission has announced an open competitive examination for inspector of mechanical and electrical engineering to be held on January 21, 22 and 23 at the usual places. A vacancy is to be filled in the office of the Supervising Architect of the Treasury, at a salary of $2,000 a year.

The duties of the position consist of inspecting and testing equipment entering into the modern government or office building.

Making Public Utility Securities Valuable.

By Frank A. Vanderlip.

The President of the National City Bank of New York Discusses the Position of Electrical Securities in the Investment Market.

It will be remembered that Frank A. Vanderlip delivered one of the most noteworthy addresses of recent times at the conference of electrical interests at Camp Co-operation, Association Island, on September 5, 1913. The following excerpt from this address, "Financing Electricity" are especially interesting and worthy of repetition at this time:

"Four out of five investors at the present time have their minds closed against any investment in securities of electrical corporations, and that is true largely because they fear the effect of present political conditions and tendencies. An investor who has such a fear may not be marching in step to the so-called new freedom; perhaps he does not recognize fully the force of the principles advocated in our new progressive politics. But, remember he still controls his own capital; remember that it is his individual decision that determines in what field that capital will be invested. The problem that the banker has to face is to convince investors holding such conservative views about political tendencies that capital issues of this type are attractive; and when you ask bankers to convince enough investors of this so that they will absorb $8,000,000 a week of new capital issues, you are outlining a large task.

"Nevertheless the time has now come, in my opinion, when no man with capital to invest in corporate securities, if he has a desire for return that is any larger than government obligations will pay, can longer hold back from the study of public utility investments. The experimental inventive stage is past. The business has a background that has now become broad enough so that one can make valuable comparisons and sound deductions. It has ceased to be a business of only small units, and the tendency is markedly in the direction of great capital issues which shall have at all times a broad market. The dangers from a prejudiced, unwise, or unfair vote by a municipality or a board of aldermen are being greatly lessened by the newly organized public service commissions and these same bodies, recognizing the monopoly character of the business, are guarding it from useless and venal competition, as they are also guarding the investor from too free capital issues by the optimistic developer, or the enthusiastic promoter.

"We are a long ways from having either uniform or satisfactory administration of public service commissions, it is true. This word commission has a sound of wisdom, experience and justice about it, but after all commissions are composed of but men, and sometimes of very poorly equipped even if honestly intentioned men. All this takes us into the question of government itself, but I think no one will deny that the securities of public service corporations are sounder and their future more secure, on the whole, because of the tendency to place the affairs of these corporations under the control of public service commissions.

"The public is by no means all-wise when it is not well informed, nor is it always just. You can cite many instances, in your own field, of injustice and of unwise forms and methods of control, but I believe you will find back of every injustice which you have received at the hands of the public, some measure of injustice, or unfairness, or lack of sincerity and frankness on your own part in dealing with the public.

"This business you are in requires qualities of statesmanship as well as inventive faculties, technical skill, and business acumen. It requires clean-cut recognition on your part that you are creating a condition of affairs wherein the business in which you are engaged becomes of vital necessity in the life of the community, and you cannot and ought not to expect the community to fail to safeguard itself.

"The measure in which you recognize the justice of the public's rights, the activity and skill with which you educate the public so that it can make wise decisions, the extent to which you refrain from unfairness or rapacity, which would give ground for greater unfairness and rapacity in the public's dealings with you, will, to a large extent, be the measure by which capital will come to recognize the security which this form of investment offers. Those of you who keep in mind most clearly that any deviation from the highest standards on your part in dealing with the public is apt to lead to unfair retaliation and unjust regulation by the public of the business in which you are engaged, will find that you are creating about your properties an atmosphere which will encourage the investment of fresh capital. Nor will it be enough for you to be fair and just. You must be both patient and energetic in educating the public, in giving them information which will permit them to form wise conclusions, to make sound laws. Above all you must educate the public to recognize the tremendous importance of both high character and broad intelligence in the men who are appointed to positions on public service commissions.

"The field of public supervision is new. The unavoidable mistakes even at the hands of wise commissioners will be many. In the end those mistakes will react on the development of the community itself, and if the voters can be brought intelligently to recognize this, there will be a strong force of public opinion to compel the appointment of properly qualified men to these positions of far-reaching influence.

"Not only must you throw all the force you can in the direction of securing properly qualified men on the commissions, but you must more broadly inform the public, so that the commissions may have back of them wise laws, framed by men who intelligently comprehend the new and intricate problems which your development of the industry have raised.

"Today one of the difficulties that the financial world encounters with public service commissions is on the ground of delay. Sometimes commissions fail to recognize the necessity for prompt action. Frequently they are so burdened and overladen with matters requiring their judgment that it takes months, or even runs into years, before decisions are rendered. Those charged with the duty of financing public service corporations have perhaps more ground for just complaint over commission delays than against the character of decisions after they are made. The commissioners themselves may not be to blame for these delays. Not infrequently they are given an impossible task to perform. I believe if the public understood this, it would not be difficult to obtain laws which would permit the appointment of extra commissioners, or assistant commissioners, or in some manner to organize the work so that pressing public business might be promptly cared for.

For large financing, large single capital issues are desirable. Nothing in connection with the business is more obvious than that the tendency is toward large units, large corporations, and large issues of a single type of security. That all tends directly toward an absolute essential if we are to have a market for public utility securities as broad as the present market for railroad securities. There must be large issues, large enough to warrant the most careful investigation by issuing houses, large enough to make a market that investors can buy and sell in readily, and large enough so that there will be many minds centered on the operating facts back of that security, making the market price of that security represent the combined judgment of many investors, rather than merely the price placed on the security by an issuing house.

The investor wants large issues, but not at the price of over-capitalization. There has been much progress in the last few years in the direction of large issues, which has been brought about through the formation of holding companies that control a number of individual plants. In the creation of these holding companies there has frequently been a tendency toward over-capitalization, toward the building of one corporation on the junior securities of another, and even on the consolidation of holding companies, and the creation of another type of security still further away from a primary lien. That tendency should be halted. There is quite enough imagination inherent in the business itself, without letting the imagination of the promoter come into play in creating issues with remote liens.

The holding company theory, I believe, is admirable. It scatters the risk; it affords intelligent supervision and engineering; it makes possible the cheaper purchasing of supplies; it gives a broader market, and, therefore, a lower cost of capital,—but the relation of total capital to total income involves principles that a holding company can no more transgress with impunity than can the original corporation.

If the investor turns from these large considerations, involving the relation of the properties to public opinion and civic control, and the relation of capitalization to reproductive property values and to earnings, and looks at the technical side of the business in the present state of the development of the science, observe the outlook for broader uses, for more economical production, and the growing necessity of society for the product which you furnish, then indeed there will be seen ground for the most optimistic view.

An independent municipal lighting plant is either an indictment of the intelligence of the community where it is located, or a criticism against the management of the private companies. The government might as well undertake the organization of transportation lines solely for mail service as for a municipality to undertake economically to produce current solely for street lighting. Wherever that is being done, or is in contemplation, there is either a misunderstanding of the fundamental principles of the business by the voters, or gross mismanagement and shortsightedness on the part of the private companies that should be demonstrating their ability to furnish the current economically.

The Science of Illumination.

By Edward P. Hyde.

The Growth and Increasing Importance of the Work of the Illuminating Engineering Society—An Important Development in Gas Lighting.

Of the numerous important developments which are now annually measuring the rapid progress of the science of illumination and of those correlative sciences which are intimately associated with it, it is a difficult task to isolate those developments which, either because of their intrinsic merit or because of the important progress which they presage, should claim special mention in a résumé of a year's accomplishments. And yet, I think, there are two or three accomplishments of the past year which justify special attention as marking a distinct advance in the development of the science of illumination.

Eight years ago, when the Illuminating Engineering Society was organized, there were comparatively few who foresaw its rapid growth in membership and activities, but there is now no serious doubt of the good it has accomplished and of the tremendous impulse it has given to the science of lighting and illumination in many diverse directions. During the past year, the movement initiated in this country in the organization of the Illuminating Engineering Society, has been internationalized in the formation of the new International Illumination Commission. The reorganization of the old International Photometric Commission into the new Commission means more than a mere change of name or a mere change of representation. With delegates from 10 different nations representative of every lighting interest in each country, the new Commission was organized "To study all questions concerning the industry of illumination, and the sciences relating thereto and to establish by all appropriate means international unity on questions of illumination."

The organization of the Commission contemplates the formation of national committees in each country. The United States national committee has been organized with representatives from five different societies and institutions, and national committees in other countries have already been formed or are in process of formation. These national committees and the special international committees of the Commission are the avenues through which active work of the Commission will be done. The organization of this International Illumination Commission should mark an epoch in the development of the science of illumination.

A second accomplishment of the past year, and one wholly different from the preceding one, is the development of the new half-watt nitrogen Mazda lamp. One of the primary requirements in the incandescent electric lamp of the past has been the elimination of air from the bulb, because of its action on the filament, and because of the energy losses by gaseous conduction and convection. The use of an inert gas such as nitrogen instead of air vitiates any objection on the first ground, and the increased temperature of the filament made possible by the surrounding atmosphere of inert gas more than compensates for the losses through gaseous conduction. The filament temperature is approximately 550 degrees higher than that of the ordinary lamp with tungsten filament, corresponding, therefore, to a tremendously increased efficiency. Moreover, the losses by gaseous conduction are relatively not so large in the case of filaments of large diameter as for very small filaments, and the losses in any case become relatively smaller as the temperature of the filament is increased.

This new lamp is at present designed for large currents and high candlepowers and is admirably adapted to street lighting where it will probably become a strong competitor of the arc lamps at present used.

In addition to these two accomplishments of the past year which stand out uniquely there are many other developments which should be mentioned in a thorough review of the year's progress. Probably the most important development in gas lighting is the introduction of a high-power single-mantle inverted lamp of about 200 mean spherical candlepower, filling a gap between the old small unit and the multiple-mantle lamp. In photometry the interest has centered chiefly about the problem of heterochrome, and the problem of objective photometry through the substitution of a photo-electric cell, or a selenium cell in place of the eye. These problems are still not settled, and it would seem desirable that at least some empirical method of photometry of lights of different colors should be adopted as through the use of standardized transmission screens kept at the Bureau of Standards. Improved methods of standardizing these screens could be adopted when these improved methods of heterochrome photometry are developed.

In what might be termed "illumination proper" a very important development has been the application of the science of light in art, which has been done in such a way as to win the recognition of artists themselves. This accomplishment presages a new era in the lighting of art galleries, and furnishes another illustration of the results that can be accomplished in a discriminating study of the requirements in some specialized field of illuminating engineering.

Photometry in 1913.

By Herbert E. Ives.

Steady Progress Made in Clearing up Debated Points—New Suggestion for a Primary Standard—Advances in Colored Light Photometry.

On the whole, little of striking novelty has been added to photometric science during the past year. Steady progress has been made, however, in clearing up debated points and in putting into practical shape the results of previous pioneer researches. The work of the year may be conveniently reviewed under the headings of "Standards," "Colored Light Photometry," "Special Photometers," "Physical Photometers" and "General Photometric Researches."

The only new suggestion for a primary standard is in reality the revival of a rather old one, namely, the use of the carbon arc crater. An investigation reported during the year indicated that by using three carbons, inclined toward each other, a limited area of the crater of one is of very uniform intensity, even when the current is widely varied. Impurities in the carbon, however, appear to affect the intensity. Such standards as this, aiming to attain merely the characteristic of reproducability, cannot claim the attention that falls to one based on the fundamental centimeter-gram-second units and on the laws of radiation. Discussion of and work toward such an ultimate standard meanwhile continues. The report of the Illuminating Engineering Society Committee on Nomenclature and Standards is noteworthy, among other things, in that it has taken the first step in the consideration of units and names for the quantities which must enter into the specification of an absolute standard. In connection with standards the painstaking work being carried on upon existing ones—pentane, etc.—by the Bureau of Standards, must not be overlooked.

In the matter of colored light photometry, emphasis is laid upon the desirability of reaching a generally acceptable solution by some published measurements of neon tubes. It appears that with the color difference between the deep orange neon discharge and the light yellow of the present standards, differences of as much as 100 per cent may occur between the judgments of different observers. As the number and diversity of artificial illuminants increases, this situation cries out more and more for help. The most promising photometric method is, of course, the use of the flicker photometer under standardized conditions. Therefore, anything throwing light on the mode of action of this photometer is important. During the year 1913 additional evidence has been brought forward showing that at low illumination this photometer gives a reversed Purkinje effect. At the higher illuminations, which should be adopted as standard, and with this effect absent, its superior sensibility over other photometers is such as to recommend it highly. A theoretical point of much interest in regard to this photometer has lately been settled. The suggestion was made that the sensation of flicker is due to the effects of the iris to following the rapidly fluctuating illumination. That this is not the case has been shown by experiments on an eye in which the iris was paralyzed with atropin, without affecting the appearance of the flicker.

Probably the most important recent contribution to the problem of colored light photometry is that made by Professor Fabry. He has found experimentally two absorbing solutions—copper ammonium sulphate and iodine in potassium iodide—which, in various thicknesses and concentrations, will transform the light from our ordinary standards into light of the color of all our practical light sources. He proposes that these solutions be calibrated by the most approved methods and employed universally in order to reduce all practical photometry to that of lights of the same color.

Coming now to special photometers, perhaps the greatest activity has been in the production of instruments for measuring the watts per candle of incandescent lamps. No less than three of these have appeared during the year, working on three different principles, yet each intended to simplify the problem of putting out lamps at a uniform efficiency. Incidentally, it is worthy of note that this same problem is being met from the manufacturing side by the claim that the new drawn-wire filaments are so uniform in thickness that no photometering of the finished lamp is now necessary.

Physical photometers continue to attract attention, and doubtless will continue to do so until the real "moving pointer" desired by Rumford is attained. Selenium and photo-electric cells of the alkali metals appear, from the standpoint of sensibility to be the most promising substitutes for the eye. But selenium appears to respond in an almost prohibitively complicated manner to light stimulus. The photo-electric effect has been actually used to some extent in astronomical photometry, but here again much must be learned with regard to manner of response, permanence, reproducability, etc., before the eye may be discarded in favor of a physical substitute.

General photometric researches on questions of photometric accuracy, methods of plotting illumination data, etc., have occupied some attention. A tendency to be encouraged is that toward measuring the surface brightness of illuminated objects rather than merely their illumination.

Instruments calibrated in terms of brightness form a valuable addition to present laboratory equipments for photometric work.

How 1913 Compares with 1912, and the Outlook for 1914.

Telegraphic Paragraphs Received from Leading Manufacturers and Jobbers on the Last Day of the Year in Response to the Inquiry: "How Does 1913 Compare with 1912, and What Is the Outlook for 1914?

E. M. Herr, President Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—"Business nineteen thirteen about twenty-five per cent larger than 1912. Present outlook for 1914 poor. Fundamental conditions good if financial uncertainties are removed, and purchasing power of railroads restored."

Joseph W. Marsh, President Standard Underground Cable Company, Pittsburgh, Pa.—"Business this year in both shipments and orders slightly above last year. First half showed marked increases, while last half showed material decreases. Consider prospects encouraging for 1914 as whole, but expect first half to compare unfavorably and last half favorably with this year."

Otto H. Falk, President Allis-Chalmers Manufacturing Company, Milwaukee, Wis.—"The business of 1913, owing to falling off in latter part of year, was not equal in volume to that of 1912, but results were better. I consider prospects for 1914 very uncertain, but believe a fair increase in rates for railroads would go far to insure improvement over 1913."

A. W. Berresford, Vice-President and General Manager, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.—"Business 1913 about on par with 1912, some departments showing substantial increases. See many signs of revival of confidence and look for normal business next year under improved conditions."

B. H. Salisbury, President Pass & Seymour, Incorporated, Solvay, N. Y.—"1913 business heavy increase over last year. Will be well satisfied if we hold our own next year, in view of general business depression."

A. Edw. Newton, President Cutter Company, Philadelphia, Pa.—"The year just closing gave us the best business we have ever had. There is a slight temporary depression, but we do not look for it to long continue. Within six months the country should be on the upgrade for three years at least."

C. E. Corrigan, Vice-President National Metal Molding Company, Pittsburgh, Pa.—"Our business for 1913 shows increase of 30 per cent over 1912. Our business prospects for 1914 extremely good, and promises best for many years."

Jacob Bunn, President Sangamo Electric Company, Springfield, Ill.—"Our sales for 1913 were more than 45 per cent larger than any previous year in the history of our company. We are anticipating a fair increase for the coming year."

W. J. Grady, Faries Manufacturing Company, Decatur, Ill.—"Our business for 1913 about six per cent ahead of 1912. We have quite a number of orders on hand to begin the new year with, and the prospect for a good year is very encouraging."

D. Hayes Murphy, President American Conduit Manufacturing Company, Pittsburgh, Pa.—"Total volume conduit sold in the United States this year less than 1912. Business very quiet, and no immediate prospects of improvement. It is encouraging to note, however, that stocks are low, buyers having recently pursued a cautious policy."

W. I. Patterson, President Steel City Electric Company, Pittsburgh, Pa.—"Our business shows increase in sales over last year of 16 per cent. We believe outlook for 1914 is good; however, there will not be any immediate rush for material. As soon as confidence in money market is fully restored, business will be at least normal."

W. H. Jacobs, General Sales Manager Triumph Electric Company, Cincinnati, O.—"Our business for 1913 exceeds our business for 1912 25 per cent. Prospects for the coming year, judging from inquiry and branch office reports, are very encouraging. Have more orders booked for delivery the coming year than have had at this season of the year for several years."

R. V. Bingay, President Pittsburgh Transformer Company, Pittsburgh, Pa.—"Our business 1913 double 1912. Have just finished most prosperous year of our lives. Prospect 1914 looks good. Inquiries increasing, and business has every indication of improving."

H. B. Thayer, President Western Electric Company, New York, N. Y.—"Business for 1913 will show normal growth over business of 1912. Judging, however, from business of the later months of 1913, we should not expect the business of 1914 to be as large as 1913."

Oscar C. Turner, President Turner Electrical Supply Company, Birmingham, Ala.—"Our 1913 business most satisfactory. We have all suffered through lack of confidence and political changes, yet 1914 looks exceedingly bright. The tariff and currency bill both passed, will add wonderfully to the stability of business conditions. The farmer down here has plenty of unused money."

W. R. Herstein, Treasurer Electric Supply Company, Memphis, Tenn.—"1913 shows gratifying increase over year's business, though principally accruing during first six months. Collections good and outlook for next year encouraging, provided normal conditions obtain."

C. J. Litscher, President C. J. Litscher Company, Grand Rapids, Mich.—"Business for 1913 increased 21 per cent over 1912. The outlook here is encouraging for 1914. Lots of building going on now, and no doubt will continue during the new year."

A. W. Lindgren, Manager Northern Electrical Company, Duluth, Minn.—"Business 1913 compares very well with that for 1912. Volume considerably larger. General conditions surrounding the business have been very satisfactory. Prospects for 1914 encouraging and in this territory we look for considerable expansion. Most business men are optimistic."

Frank H. Stewart, President Frank H. Stewart Company, Philadelphia. Pa.—"1913 best year we ever had. 1914 looks fairly good for supply business in comparison with 1913. Expect it to be a great deal better than 1912."

W. H. Nolker, Vice-President Commercial Electrical Supply Company, St. Louis, Mo.—"Business for year shows substantial increase in volume over that of 1912 and other years in the history of our business. Prospects for 1914 are fair. While we do not expect to show same relative increase we prophesy a record-breaking period."

James Clark, Jr., President James Clark, Jr., Electric Company, Louisville, Ky.—"1913 not as gratifying as 1912. Business with us feverish. Look for the crisis soon, when we hope the patient will rally and recuperate quickly. We are optimistic and expectant for 1914. Making preparations for a large and satisfactory increase in business, which we are confidently looking forward to."

F. M. Bernardin, President B. R. Telephone & Electric Manufacturing Company, Kansas City, Mo.—"Volume of business for 1913 is practically the same as 1912. Compared with previous years, business net results unsatisfactory, this due to increase in cost of doing business, and to decrease in gross profit. With this fact before us cannot be other than pessimistic as to prospects for 1914."

W. W. Low, President Electric Appliance Company, Chicago, Ill.—"Year just closed one of the most successful in our career. Volume has shown a large increase over last year. At present business for the coming six months does not look very encouraging. Do not believe that there will be a great deal of development and construction among the larger interests, but I do believe that there is an opportunity to-day, if the manufacturers, dealers and contractors will subscribe to and support the Society for Electrical Development, so that they can actively start their campaign to open up new fields for current-consuming devices. While the units of sale will average less than the business of the past, they will be more numerous and this new business will help to offset the shrinkage which we are liable to have as a result of the inactivity of the larger buyers."

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Review of Hydroelectric Projects in India.

In the December 29 issue of *Daily Consular and Trade Reports* is a good review of the progress on a number of important hydroelectric projects in India. This was prepared by United States Consul Henry D. Baker, now on special commercial service in India, who points out opportunities for the use of American machinery and manufactures.

INTANGIBLE VALUES AND THEIR RELATION TO THE VALUATION OF PUBLIC UTILITIES.[1]

By George C. Shaad.

Values, established by careful appraisals, are being placed upon public utilities for a variety of purposes, some of which are: for the sale or transfer of property, for purposes of reorganization, for taxation purposes, for the issuing of bonds, and for the purposes of rate-making. What I have to say upon the subject of intangible values as a part of the total valuation of a public utility will be entirely from the standpoint of valuation for the purpose of fixing suitable rates for the sale of the product of the utility. Appraisals of property for rate-making purposes, then, may consist simply of attempts to arrive at the approximate value of the property by a more or less superficial examination, or they may be the results of a complete detailed study of the property and the accounts of the utility for the purpose of gathering evidence which shall be suitable for presentation before the public utilities commissions or the courts. Sufficient to say that it is only after a very complete study that the facts can be arrived at with any great degree of accuracy.

At present nearly every state in the union, through public service commissions or similar bodies, has power to partially or completely control its public utilities. Wisconsin and New York have as complete control over their utilities as any of the states and their laws have largely been the models for the laws of other states. It is of interest at this point, I think, to note that the regulation of the public utilities by the states has been the most satisfactory to both the people and the corporations where the power for control has been made complete. Personally, I have no sympathy with the laws which allow for the control of privately owned plants, but which give the commission absolutely nothing to say regarding municipal plants.

The controlling bodies in about every instance have to do with the fixing of rates for the public utilities, either on their own initiative or on appeal, and the power given to them is that to establish or approve "reasonable" rates. Now, reasonable rates are almost universally accepted as rates which will allow the utilities to make a fair interest return upon their property and which will not discriminate between consumers. In other words, as far as practical, the rates should, in addition to allowing the owner a fair profit, make the charge for service in proportion to the cost of service for each of the different classes of consumers. The matter of fixing a suitable scale of rates is, of course, beyond the scope of this paper.

Granted that fair rates should allow a reasonable return upon the property, all matters of inherent risks, etc., being considered in fixing the allowable rate of return, it is the invariable custom to judge whether or not a proposed rate is fair and reasonable by determining the rate of interest return it will allow upon the value of the property, and it is the value of the property in this sense which should be determined by the appraisal of the property for rate-making purposes.

Now, if we concede that the rates should allow a fair return upon the investment in the property which has not been returned to the owners, good business judgment and management assumed, what relation should the investment bear to the valuation when this valuation is made for the purposes of fixing rates?

In every utility there is a large amount of physical property which may be appraised from several different points of view. First, the actual first cost of the physical property, including the cost of engineering, interest on investment during construction, the cost of material and labor, inspection, tests prior to acceptance, etc., may be found, such cost to be determined directly from the accounts where they are properly kept. Next, the cost to reproduce the property new at the time of the appraisal may be determined, due consideration to be given to piecemeal construction and other items which would make the cost greater than it might possibly be if reconstructed under the most favorable circumstances. Finally, the depreciation from the time of the actual construction to the date of appraisal can be calculated and deducted from the cost to reproduce new, the result being the present physical value of the property. The cost of a hypothetical modern plant to replace the present equipment has sometimes been introduced as evidence, but I know of no case where this value has been given any very serious consideration in the final fixing of rates.

Let us assume that, for the valuation of the physical property, the cost to reproduce new less the depreciation to the date of the appraisal is the true physical value. Is it fair to fix what is considered a reasonable rate of interest return upon investment, after considering special inherent risks of the business, etc., and then apply this rate to the present physical value as a check upon the total net returns to be allowed? In exceptional cases, yes, but in the majority of cases this would not be a reasonable rate but would be less than should be allowed.

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[1] A paper presented before the sixteenth annual convention of the Kansas Gas, Water, Electric Light and Street Railway Association, Hutchinson, Kans., October 9-11, 1913.

If, then, rates are to be fixed upon a basis of an allowable interest return to utilities of the class involved, then there must, in the majority of cases, be some value in addition to the present physical value of the property and this value is the intangible value. Some believe that the charges for engineering, interest on investment during the construction period, tests, inspections, etc., should be made one of the intangible values, but the costs of such work do not vary greatly above or below a general average value and they should become a part of the cost to reproduce the property new, that is, a part of the physical value of the plant. This leaves for the intangible values: promotion expenses, franchise value, working capital, good-will value, and going-concern value.

Commissions, in their decisions, are apt, after hearing the testimony in any given case, to include a fixed sum under the heading of intangible value without any very clear outline of the reasoning used in arriving at this value; in other instances they include a going-concern or going value and do not allow for any of the other possible intangible values. Let us consider some of these possible values a little more in detail.

Promotion Expenses.—Promotion expenses, unlike the overhead charges of engineering, inspection, etc., vary considerably in their amounts and it is not so easy to arrive at a proper value by the use of an average percentage of the physical value. They are legitimate expenses in the establishment of the business and some consideration of them should be taken when the value of the property is being determined for rate-making purposes. Like certain other expenses, they should be charged off at the earliest possible date, but the fact remains that they have not been so charged off in a great many cases with which we have to deal.

Franchise Value.—Before the days when public utilities commissions were so common, cases involving the valuation of public utilities properties were determined largely by the courts and a considerable item for the franchise value was often allowed. In such cases the value allowed for the franchise often really included allowances for other of the items of intangible value already noted. At the present time the tendency of the commissions is to prevent competition between public utilities, and franchises which might allow of competition are not granted. Where this practice prevails it is difficult to see any value of the franchise except the actual legitimate expenses involved in securing it. If the accounts show the actual expenditure for this purpose, such a value becomes more on the order of a tangible value. While the franchise undoubtedly has value for certain purposes and the length the franchise has to run has played an important part in some very recent decisions where rates were one item to be determined, still it is difficult to see why the franchise should be capitalized at anything beyond the expense of obtaining it when suitable rates are to be determined. As soon as practicable the franchise cost should be charged off from any earnings in excess of those considered reasonable, but this introduces the question of amortization of accounts and I will not follow it further.

Good-Will Value.—Where competition is eliminated it is difficult to see where good will should be capitalized and where competition is eliminated no allowance for good will is made in rate cases.

Working Capital.—The value to be allowed for working capital is a matter of an approximation to the amount actually tied up in the ordinary transactions of the business and the amount, for the same class of utility, will differ in different localities, depending upon the frequency with which bills are paid, etc. It is seldom very difficult to arrive at a value for this which will be acceptable both to the commission and to the owners of the utility.

This leaves the item of going-concern value, the value about which opinions differ rather widely, for our consideration. Some prefer not to use the term "going-concern value," but prefer to substitute the term "going cost." The reason for this will be made plain later.

By going-concern value is generally meant a value which a property possesses, above its physical value and other intangible values, because of its business organization, its trained operating force, the fact that it is in full running order with profitable customers established, etc. The courts have been quite free in admitting such a value but the amount actually allowed differs widely, running all of the way from 50 per cent of the physical value of the property to no allowance whatever. When all we have to go upon in fixing the going-concern value of a utility is the definition as given above, it is rather difficult to fix a going-concern value in dollars and cents except arbitrarily, and the values allowed are often fixed in just this way. Testimony is taken regarding what the owners think should be allowed for this item and the commissions decide the value actually allowed, usually, strange to say, a value somewhat lower than the owners think they are entitled to. The fixing of any values arbitrarily detracts from the efficiency of the rate-making of any commission, and attempts are now made to arrive at every value, tangible or intangible, by logical methods, and the amount to be allowed for going-concern value is subject to some more or less accurate checks.

The rates should allow the owners a fair rate of interest return upon the money fairly invested in the business, good management and business judgment assumed, and the sum total of the value to be allowed should not be greatly different from the amount so invested. The going-concern value, then, should, when added to all of the other values, make the sum total equal to what should be the total capital account. Where accounts are charged off through excess earnings they should of course not be re-entered upon this capital account.

When a new utility is started, there is a period of time during which it is not practical to make the rates such that the returns will pay a fair rate of return upon the value of the property. This period varies in length from a few months for some properties to several years for others, but where there is a deficit between what is considered a fair rate of return above the operating expenses, including the item of depreciation, this deficit really amounts to an added investment in the property; in other words, this difference is a cost of developing the business and it should be allowed in the valuation of the property as a going-concern value, or better, as a going cost. Carefully kept accounts for a long period of the operation of the utility must be available for this method of arriving at the going cost but, with such accounts available, the fixing of the going cost is a task in accounting. The deficits for each year are determined and the amounts added to the capital account, and in years where there is a surplus the capital account should be reduced by this amount. If, then, at the time of fixing the rates there is a net deficit in the returns the property has paid, the property has a going value equal to this deficit, properly capitalized. The accounting system should, of course, charge off a proper depreciation each year so that the present physical value of the property plus the going value, plus the development and franchise expense, if any should be allowed, will make up the total valuation of the property.

There certainly appears to be no injustice to either the people or the utility if the rates are such as to allow a reasonable return upon the capital honestly invested and if any returns in excess of what are considered reasonable are used to reduce the capital charges upon which returns are to be allowed in the future. In a few cases all intangible values, together with the depreciation of the property, have been so charged and in these cases the value, for rate-making purposes, is the present physical value of the property only. Just what intangible values should be allowed is a matter which can only be determined after a very careful study of the property and the accounts of the particular utility involved.

In the report of Mr. B. J. Arnold upon the valuation of the property of the Metropolitan Street Railway Company of Kansas City, the present physical value of the property was found to be $21,535,000 but a total value of $35,000,000 was recommended. The intangible value of some thirteen and one-half million dollars was checked by four different methods:

(1) The actual cash invested in the property was determined from the accounts to be $34,298,000, and upon this there had been earned an amount equal to 5.36 per cent, not an amount to be considered excessive, therefore the total value of the property ought not to be anything less than this amount.

(2) The intangible value was determined by estimating the future earnings of the company during the period for which the franchise was already granted. The present value of these net profits was obtained by discounting them at 5 per cent per annum. Such additional interest charges as would be occasioned by investments in extensions were properly deducted and the net sum of $13,491,000 was considered as a check upon the intangible value.

(3) The earnings for each year were determined and the net returns, on a basis of 6 per cent and 7 per cent were calculated. Whenever there was a deficit this deficit was charged to capital account and had there been excesses they would have been deducted from this account. On the basis of 6 per cent as a fair return, the present value of the property was found to be $36,040,000. Had 7 per cent been considered the proper return, the value would have been over $44,000,000.

(4) The market price, that is, the amount which a willing purchaser would be willing to pay a willing seller, was judged not to be less than $35,000,000.

I know of but two rate cases which have come before the Kansas Public Utilities Commission which involved the fixing of the value of the properties. These were the Garden City and the Parsons cases. In the Garden City case practically no allowance was made over the estimated present physical value of the property devoted to the supply of electric light and power. In the Parsons case the commissioners allowed a going-concern value of $13,000,000, about 11 per cent of the total value allowed.

Enough has been said, I think, to emphasize the fact that the proper intangible values to be allowed are different for different properties and that the determination of the proper amounts to be allowed for each item is not difficult if the accounts are properly kept and are complete for a sufficient period of the operation of the plant.

Electrical Developments in Australia.

Probably in no British Colony or dependency is there so much important electrical development work in progress as that now engaging attention in Australia and New Zealand. In Melbourne (Victoria) the electric light and power undertaking of the municipality is making rapid strides, while the electrification of the railway system, involving an expenditure of many millions of dollars, is in hand, the contracts being in the care of American, English and German manufacturers. Out in the west, at Perth, the Government power-station contracts to the tune of a million dollars have just been placed and railway electrification schemes are under deliberation. The power station for the new capitol at Canberra, is also in a similar stage, while wireless-telegraph work and the equipment of automatic telephone exchanges are actively in progress in other parts of the continent. Factory owners and mining companies are adopting electric plants, and in the cities and towns the importance of the domestic load is becoming more widely appreciated by engineers, and more freely assisted by a public readiness to use electric cooking and heating apparatus. The electric iron sells well, according to reports, and local engineers are inventing and forming companies to work new heating appliances for which in some cases remarkable claims have been made.

In New Zealand the Lake Coleridge hydroelectric scheme, from which much is expected by way of assistance to industries, is in progress.

An illustration of the rate at which electric supply development is proceeding when energetically pushed, is found in the case of Adelaide, where the Electric Supply Company—a London concern—has just paid a dividend of ten per cent plus a bonus of two per cent on its ordinary stock for the past year. The number of consumers advanced during the year by 44 per cent, that is by 3,486 consumers to 11,354. Power supply increased by 22 per cent, making the present connections 6,270 horsepower. The total connections, including lamps, motors, heating and other apparatus, increased by 29 per cent, total units sold by 20 per cent, and the gross revenue by 23 per cent. Still further development is anticipated to follow upon important modifications which have been made in the scale of charges for electric power. Last year the new capital created was between $500,000 and $1,000,000, and a further $500,000 is now to be created to provide for expansion that is in sight.

Boston Motor Club Meeting.

The Electric Motor Car Club of Boston held its regular meeting at Hotel Thorndike on December 22, with a large attendance. The program consisted mainly of holiday festivities, with a line of stockings which contained gifts for prominent members, accompanied by limericks written by E. S. Mansfield. These verses were clever hits on the peculiar attributes of the several recipients, and elicited hearty applause. Prior to the merrymaking, W. H. Atkins, of the Boston Edison Company, offered the suggestion that the Club procure a tent which shall be moved from one New England city to another and which shall contain apparatus for the demonstration of electric vehicles. The tent with its exhibit shall remain two or three days in each city, during which time the people shall be shown the mode of charging and caring for the electric cars.

Messrs. Hunnewell, of the Lowell central station, and Smith, of the Salem Electric Light Company, promised their co-operation in the plan.

Coal Production in 1913.

A production between 565,000,000 and 575,0000,000 short tons of coal in the United States during 1913 is the official estimate of the United States Geological Survey, an increase over the record-breaking production of 1912 of 30,000,000, to 40,000,000 tons.

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An American consular agent reports that there is an increasing use of automatic electric elevators in Denmark. Norway and Sweden. Push-button self control is preferred. Both direct-current and alternating-current motors of either 110 or 250 volts are used.

Christmas Celebration by St. Paul Jovians.

At the Jovian luncheon in St. Paul, Minn., on November 7 a communication was received from The Goodfellows of that city asking the support of the Jovians in a Christmas celebration. It was planned to secure two large Christmas trees as a part of the entertainment for the children of St. Paul. The Jovians were invited to cooperate by taking care of the electric lighting.

The Jovians at once agreed to assist and a committee consisting of Lloyd W. Resler, A. A. Peterson and Russell H. Eddy was appointed to look into the matter. Mr. Eddy was later appointed chairman of the Tree Trimming Committee. This committee collected the following donations: Sixteen festoons, comprising about 800 sockets from the Eectric Construction Company; 800 eight-candlepower lamps from the Northwestern Electric Equipment Company; coloring matter for dipping the lamps from the Western Electric Company; four "Merry Christmas" tubular sign lamps from the Federal Sign System (Electric); tape and supplies from the St. Paul Electric Company; cabinets, cut-outs, feed wires and extension ladders from the Electric Construction Company.

About 40 Jovians met at the Auditorium, where the celebration was to be held, on the evening of December 22. By invitation there were present also some electrical contractors who were not Jovians, including John Gorman, Otto Hanson, Charles W. Kunze, August Hanson and C. E. Strong. They proceeded to dip the lamps; one-third being colored red; one-sixth, blue; one-sixth, green; while one-third were left clear. The trees, which were 40 feet in height and 16 feet across, had already been erected by the Tri-State Telephone Company. They reached within five feet of the ceiling and a rope had been left tied to the top of each tree reaching up through a hole in the ceiling to facilitate erecting and lowering them. It was decided to lower another rope through the ceiling and tie eight festoons to it, spacing them about 18 inches apart. The lamps were mounted in the festoons in the order white, red, blue or green, and repeat.

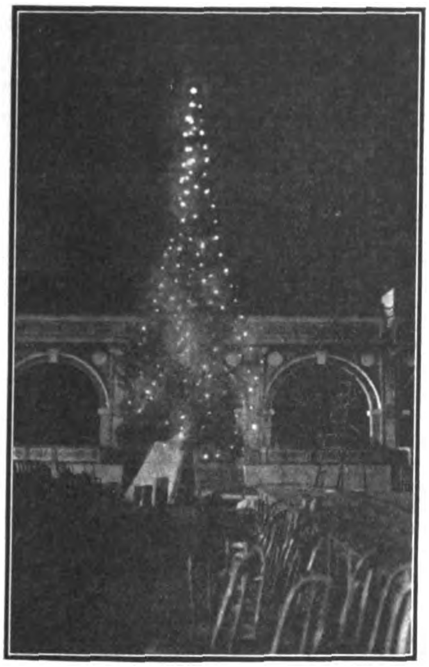
After hoisting the festoons upon the first tree, adjournment was taken for supper, after which the men returned to finish the work.

After arranging the festoons, the effect did not seem appropriate, so men were sent to climb the trees and drape festoons around the trunk, which greatly improved the appearance. Connections were made from floor outlets into a cabinet fastened to the base of each tree. Each of these contained eight circuits. The work was completed about 10:30 p. m.

On Tuesday morning, December 23, the St. Paul Window Drapers' Association appeared upon the scene and used a barrel of asbestos fiber on each tree. This was tossed upon the branches in loose, fluffy handfuls from ladders and gave the effect of snow. The base of each tree was banked with white cloth and kalsomined. Pulverized mica was then thrown around and more asbestos fluffed over it. This gave the effect of trees standing in snow banks, some of the snow having fallen from the branches after the snowdrifts had formed. When the lamps were turned on, the effect was especially pleasing.

On December 24, Mr. Eddy hung Federal signs bearing the inscription "Merry Christmas" about eight feet from the floor among the branches, two on each tree.

The celebration was held on the afternoon of Wednesday, December 24. There were present about 8,000 persons, of whom half were children, and admission could be had by adults only when accompanied by children. A ripple of delight and astonishment went through the audience when the electric lights were turned on, and well repaid the men for their work.



St. Paul Christmas Tree.

The celebration was opened by music from a volunteer band. This was followed by an address by Mayor H. P. Keller, who was followed by Governor Eberhart. The entertainment included numbers from the programs of various theaters, including dancing, instrumental and vocal music, a cow-boy act, tumbling and clowns, and some educated seals. At the end Santa Claus was impersonated by Wright Huntington.

A view of the tree is shown in the accompanying illustration through the courtesy of the *Dispatch-Pioneer Press.*

After the entertainment was over the two trees were taken into Rice Park, which adjoins the Auditorium, and set in place there by the Tri-State Telephone Company. The St. Paul Gas & Electric Company then connected the trees with its mains and they were illuminated throughout Christmas week.

The celebration was a great success in every way and it is announced that it will be an annual event in St. Paul. The Jovians found in it a good reason for their existence and an elegant opportunity to practice "co-operation."

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Outdoor Substations.

A joint meeting of the Electrical Section, Western Society of Engineers, and the Chicago Section, American Institute of Electrical Engineers, was held on the evening of December 29 in the rooms of the former society, Monadnock Block, Chicago. R. F. Schuchardt presided and called the meeting to order at 8:25 p. m. The following nominations for officers of the Electrical Section were made: Chairman, F. J. Postel; vice-chairman, W. H. Wheeler; member of Executive Committee, E. W. Allen.

A paper was presented by H. W. Young entitled "Moderate-Capacity Outdoor High-Tension Substations," an abstract of which follows. The paper was illustrated with lantern slides.

Outdoor High-Tension Substations.

Mr. Young's paper opens with a discussion of the problem of furnishing electrical energy to isolated communities and rural consumers. This was regarded as impractical until within the last few years. Small isolated plants with poor load-factor always operate at very low economy. A central station, on the other hand, supplying current to a large district where the energy demands are quite diversified operates at high economy and excellent load-factor. The construction of high-tension distribution systems does not involve extraordinary difficulty and the question of supplying energy from a central plant over a large district resolves itself to the equipment of high tension substations and protective gear at low cost. Such equipment for outdoor substations is now available and makes entirely practical the installation of high-tension distributing networks, supplying not only rural communities but also farms, irrigation projects, factories, coal mines, etc., along the lines. The development of such rural business is not as difficult as would seem to be the case. As soon as a high-tension network has been installed, manufacturers seeking factory sites where rental, taxes and labor costs are low will readily contract for supply of power from these feeders.

Since outdoor transformers, pole-top switches and reliable protective gear have been developed it has been possible to install outdoor substations along the lines on which the investment, maintenance and operating costs are very low. Mr. Young describes, with the aid of numerous illustrations, several types of outdoor substations, all of which are mounted on a cluster of wooden poles with a small platform for the transformers. The first type supplied single-phase street or commercial lighting, but as the demand for power increased a type of substation suitable for transforming from 22,000-volt feeders to a secondary distribution at 2,200 volts was developed. From the secondary network individual customers were supplied through standard lighting or power transformers located near their premises. Control switches of the simple disconnecting type were first used, but when it was found necessary to open the high-tension circuit under load a reliable pole-top switch was developed. The main transmission line or feeder is protected with lightning arresters near the point where the power is to be taken off; the substation itself then needs merely an equipment of weatherproof high-tension fuses mounted directly over the transformers. The disconnecting switches are usually placed on the next pole. Another type of outdoor substation provides for placing all of the transformers, switching and protective equipment on the same structure. In this case the switch handle for the air-break is placed below the platform so that the lineman opens the switch before mounting the platform. The protective gear includes high-tension fuses, choke coils and discharging horns. A small housing is provided for the secondary switches, meters, spare parts, etc. In another type of substation of somewhat larger capacity the substation tower is installed adjacent to an old generating station and the control equipment is so arranged that the power can be supplied from the old station to the high-tension lines or the reverse, or both can operate together in parallel. A fourth type of outdoor substation includes a three-phase air-break switch mounted on a separate pole adjacent to the pole supporting the transformer, lightning arrester and fuse equipment. This type of substation has been operated with complete success under severe sleet and storm conditions. In a number of cases the structure for operating the substation equipment is a steel tower. In this case the switch is always placed on a separate pole.

The continuity of service provided by such outdoor substation equipment is of a fair order. Although as absolute reliability cannot be provided as with an inclosed substation, nevertheless the interruptions in service are not excessively numerous and when they occur do not cause so much disturbance as in a community with a densely congested load. One of the most frequent causes of interruption on high-tension systems is from failure of insulators; a better grade of line insulators is therefore desirable. This, together with the installation of electrolytic lighting arresters at the generating stations and important distributing points, and the frequent installation of sectionalizing switches, materially aids in decreasing interruptions at main lines. Outdoor substation equipment branching from these lines takes care of itself; any trouble originating there is localized by the fuses and thus prevented from spreading to the main feeders.

Although automatic oil switches have been designed for outdoor service it is doubtful whether they are warranted in connection with small substations. The outdoor types of non-automatic pole-top switches with fuses meet all of the requirements of such rural service and are much safer to install, inspect and operate. A very successful type of chemical fuse for high-tension service has been developed; it consists of a short fuse wire kept under spring tension in a hermetically sealed glass tube filled with carbon tetrachloride. This fuse embodies quick action, minimum disturbance to the system, positive indication of open and closed conditions and is readily replaced. It has been repeatedly tested under short-circuit conditions on systems of high capacity. The reliability of operation of outdoor switches in places subject to severe sleet and ice conditions has been demonstrated in a number of cases. In conclusion, Mr. Young predicted that within the next two years there would be even a greater development in the design and use of outdoor substations than has taken place within the last two years.

The discussion was opened by Q. Wingard, who raised a question regarding the insertion of resistance upon the ground side of the horn gap. In reply Mr. Young stated that he knew of a case where water resistance had been inserted in that manner in a single-phase line. Although discharges have taken place on this line there has been no interruption to service. Where such a resistance is used, oil should be placed on top of the water to prevent evaporation and in such latitudes as this it is necessary to take the resistance out during the winter season and set the horn gap further apart. In Toronto he had seen a Siemens resistance used for this purpose, consisting of a wire resistance immersed in oil. These resistances are successful in use but are expensive.

E. W. Allen inquired as to the setting usually used on the horn gap and Mr. Young replied that the gap was usually set for a voltage somewhat less than twice the rating of the transformers; for example about 55,000 volts on a 33,000-volt system.

Leslie L. Perry spoke of the importance of having substations which would not be interrupted by fire any more than by freezing conditions. From this standpoint he advocated a steel structure rather than wooden poles, as the cost is not very much greater. Moreover, a steel structure is more readily removed and rebuilt. He referred also to the difficulty of transportation of a substation far removed from a railroad, when the roads are in poor condition. This makes it desirable to keep the weights of the units light, and for this reason he preferred single-phase transformers to three-phase units.

William B. Jackson referred to the rapid evolution which has taken place in this class of construction. About ten years ago he had seen a temporary outdoor substation in California, but the weather conditions are not so severe there as in this part of the country. He thought there were many stations now under cover which might as well be in the open, and would then have the additional advantage of smaller fire risk.

H. B. Gear referred to the great development of the industry made possible by outdoor installations. There are many towns inaccessible to high-tension transmission lines where the demand does not exceed 50 kilowatts at the start and where service could not have been offered under the conditions obtaining 10 years ago. These are now commercial possibilities. He referred to the regulation of voltage and the desirability of automatic voltage regulators which can be used outdoors. There are many cases where this is desirable although in others it is feasible to construct a housing for the secondary apparatus.

J. R. Cravath referred to a substation which had been first built with the apparatus indoors. Later the transformers had been placed outside, which made a saving in both cost and fire risk. He considered that the outdoor station was coming for large capacities as well as for moderate capacities.

L. N. Boisen referred to an Illinois town of 300 inhabitants where there were 50 customers and a revenue from street lighting of about $900 per annum. This service was made possible only by an outdoor substation. He referred also to the importance of fuses and favored placing the fuse between the line and transformer only, rather than in the position advocated by Mr. Young, where it would interrupt an excess current to ground. He had experienced 10 blowouts under this condition, and while it produced a momentary high load upon the generator there was no interruption to service. It left the arc unprotected, but this objection could be removed by placing resistances in the ground connection in order to limit the current. Concrete blocks had been tried for this purpose.

Frank C. Van Etten said that this type of construction was at present determined mainly by the question of minimum cost. For this reason steel towers were not used so much as wooden poles and a single-pole mounting was quite popular. In some cases there is actually a financial loss when operation is started, but this might appropriately be charged to advertising. The use of regulating apparatus is bound to come in the future. He told of one case where there was a limitation in the space available for an outdoor station. An installation had to be made for 33,000 volts upon a small plot of ground only 15 feet long.

After questions by M. G. Lloyd and D. W. Roper, Mr. Young closed the discussion. He stated that the switches operated without difficulty under sleet and ice conditions on account of the shearing action of the wiping contact. He also read a letter from an operating man who is aiming to completely cover the rural territory in his neighborhood and considered that farm service would when fully developed make better returns per unit of investment than other customers.

The meeting then adjourned.

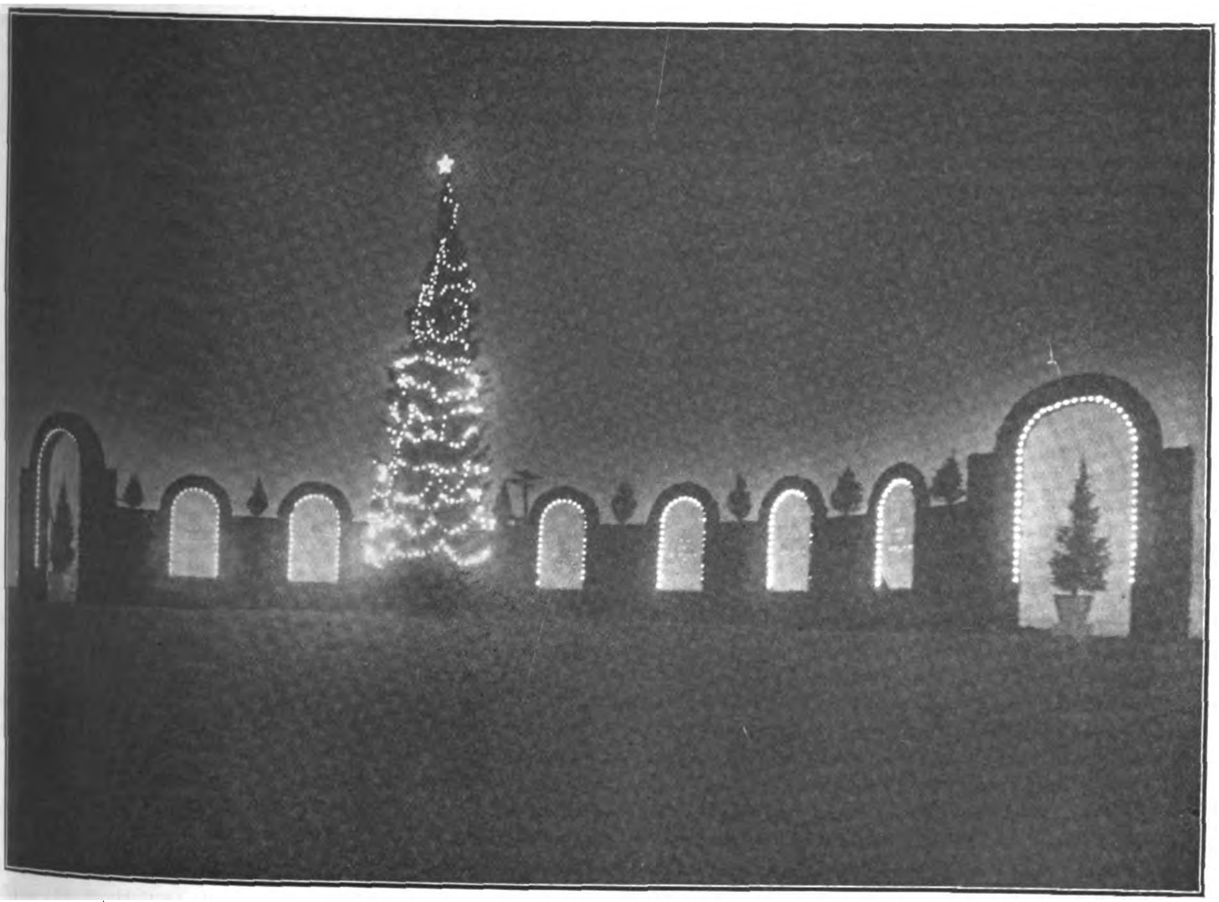
Commercial Practice Management, Rates, New Business

Municipal Christmas Tree in Chicago.

In practically every important city in the United States the custom of providing a municipal Christmas eve celebration was inaugurated last year and in most every instance a brilliantly lighted Christmas tree features the celebration. It is of interest to note that with but few exceptions the central-station companies were the chief contributors to these festivities, contributing wiring, lamps, energy and in some cases, poles and tree.

The accompanying illustration shows the giant tree and other decorations incident to the Chicago celebration. The tree, 55 feet high, was decorated with approximately 400 vari-colored lamps of 50-watt size and several 10-watt lamps. The eight small trees surrounding the large one, the balcony of the Art Institute and the band stand were all illuminated by 10 and 50-watt lamps, the total number used aggregating 1,300. Service connections were made with the Commonwealth Edison Company's pole line along Michigan Avenue and all wiring was done by the company.

Current was switched on by Mayor Harrison at 6 o'clock on Christmas eve and a notable program of speaking and singing carried out. The tree was lighted every evening thereafter until January 1.



Illumination of Municipal Christmas Tree in Chicago.

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Responsibility for Interior Wiring.

One of the member companies of the National Electric Light Association made inquiry recently as to the responsibility of a central-station company for wiring to which its service was connected. E. W. Burdett, the general counsel of the Association, furnished a reply to the inquiry, and it is here reprinted as a matter of general interest and importance, from the *Bulletin* of the Association.

"I have had occasion to give considerable attention to the question, whether an electric lighting company can safely assume the responsibility of inspecting or approving the interior wiring of the premises of its customers and have come to the conclusion that there is great danger in doing so. In case of accident to persons or damage to property from defective wiring, it might under such circumstances well be claimed that the company had assumed an implied contract to see that the wiring was safe and proper, founded upon the consideration of the supply of electricity by it to the owner of the premises; or even that in the absence of any contractual relation arising out of the circumstances the company could be held to have assumed the performance of a duty, a breach of which, followed by damage, would subject it to liability. A decided case upon the latter point is that of Brunelle vs. Lowell Electric Light Corporation, which can be found in the 188th Massachusetts Reports, page 493. In that case there was the following special agreement:

"'It is agreed that all wires upon the premises of the customer to which the company's service will be connected shall be so installed that the company may carry out this contract and shall be kept in proper condition by the customer; that the customer will give or obtain all necessary permission to enable the agents of the company to carry out this contract and to enter the premises at all reasonable times so long as any of the company's property remains therein, for the purpose of keeping in repair or removing its property, or inspecting its own or the customer's wires or apparatus.'

"It was held that under this contract the company did not owe the plaintiff the duty of inspecting the wires, and that the clause giving the company the right to inspect the premises of the plaintiff was for the protection of the company and not for that of the plaintiff.

"In the case of the Boston Edison Company, for example, it is expressly provided in their contracts as follows:

"'It is further agreed that all wiring upon the premises of the customer to which the company's service is to be connected shall be so installed that the company may carry out this contract and shall be kept in proper condition by the customer.'

"You will observe that this provision is founded upon the Massachusetts case above cited, but does not go as far as the company did in that case, of reserving the right of entering the premises for the purpose of inspecting its own or the customer's wires or apparatus. Under that decision it is safe to insert that clause also.

"Whenever official inspection of wiring is required by law or ordinance, the safe course for the company is to insist that such inspection be made and a proper certificate thereof furnished to the company before it turns on its current. Where there is no official local inspection, the company should require the wiring contractor to procure and furnish to the company some kind of certificate in compliance with whatever underwriters' rules may be in force with respect thereto in that place. If, however, the company itself assumes the responsibility of installing or inspecting the wiring, it will, I think, have to take all the responsibilities which would otherwise attach to the independent contractor. Its only protection in that event would be to see that the wiring is done in a safe and proper manner and in compliance with whatever underwriters' requirements may apply."

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Rate Reduction For Kansas City.

The Kansas City Electric Light Company, a subsidiary of the Kansas City Railway & Light Company, has made a proposition to the City Council to put in effect a new domestic rate schedule by which rates will be reduced on the average about 15 per cent, saving about $75,000 a year to the electric consumers of the city. At the same time, the minimum rate is to be reduced from $1 to 50 cents a month.

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Show-Window Contest.

In order to stimulate the interest of district managers in their window displays the Public Service Company of Northern Illinois recently offered a silver cup as a prize to the district office having the best display. The first prize was won by the Joliet office, although the offices at Pontiac, Austin and Waukegan received honorable mention from the judges.

The window in Joliet which was given the prize represents a portion of the "Lincoln Highway," which is a proposed transcontinental wagon road.

The chief object in making a window display is to attract the attention of the passersby, and cause them to see something which advertises the business of the company making the display. By using a part of the "Lincoln Highway" as the central idea, the designers of this window were wonderfully fortunate, as they appealed to the local pride of Joliet, through which this highway is to pass, and that this idea was appreciated by the citizens of that town is attested by the number of people who came to view this window, and the newspaper comments.

An ornamental street-lighting system, an electric automobile, a moving trolley road, an electric billboard advertising the 24-payment contracts, besides irons, toasters and other appliances which the company sells, also appeared in the display, thereby giving it a practical commercial value for the sales department as well as advertising the company's service.

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Mirror Company Endorses Central-Station Service.

A concrete endorsement was given electric drive and central-station service by the Bills Mirror Plate Company, Louisville, Ky., manufacturers of bevel plate-glass mirrors for use in furniture manufacturing. The company recently had a fire which destroyed practically its entire plant, and consequently was in a position to change its power arrangements in any direction it chose. The company quickly decided to use motors and central-station service, which will be furnished, respectively, by Fairbanks, Morse & Company and the Louisville Gas & Electric Company. Ten motors, with a horsepower of 75, will be installed. An interesting point in this connection is that the company maintains its own boiler plant, as it needs steam and hot water for heating and manufacturing purposes.

Presentation of Slogan Sign in Durham, N. C.

Amid much ceremony and pomp the slogan sign for Durham, N. C., was presented to the city on December 15, by officials of the Durham Traction Company. The presentation was made the occasion of a monster celebration in which fully 10,000 residents took part. Speeches of acceptance were delivered on behalf of the city by the mayor and officials of the Chamber of Commerce, while the presentation address was delivered by R. L. Lindsey, local manager of the company, which is one of the properties controlled by Henry L. Doherty & Company, of New York.

The sign is 50 feet high and 40 feet wide and contains approximately 1,200 lamps. The sign reads, "Durham, Renowned the World Around."

The slogan-sign idea seems to be continually gaining a stronger foothold in this country and in the many instances in which such signs have been presented without cost to the city, by the local central station, the favorable sentiment created has been of material benefit to the company. The following extracts taken from an editorial appearing in one of the daily newspapers the morning following the celebration serves to illustrate the friendly relations established by the presentation of such slogan signs.

"Some nine months ago the Henry L. Doherty Company of New York, which owns public utilities all over the country, picked out Durham as one of the coming cities of the future, one of the class in which it makes selections for investments confident of such growth as will justify expenditures for future development. Since that time the new owners have rebuilt the ice plant, illuminated the city and made other improvements. If so much has been done in a few months, what can be expected in another year if this spirit of progress continues? It is to the Henry L. Doherty Company that the city is indebted not only for the big sign costing a couple of thousand dollars, but also for the operation of it, that will cost about fifty dollars each month. But it is not so much the liberality of the Henry L. Doherty Company as it is the confidence of a company of such high commercial standing in the future of this city that is to be most appreciated. That great concern is not lighting up 'dead ones,' although it has done very much to help those who will help themselves."

In the same issue there appears a full page announcement of the Chamber of Commerce, signed by 50 of the city's leading business institutions, giving thanks to the electric company for its liberal gift.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president,
59 Deerfield Street, Hartford, Conn.

H. S. WYNKOOP, vice-president,
13 Park Row, New York, N. Y.

WILLIAM LINCOLN SMITH, secretary and treasurer,
Concord, Mass.

JAMES E. COLE, Representative on Electrical Committee of
National Fire Protection Association, 11 Wareham Street, Boston, Mass.

J. E. LATTA, assistant secretary,
608 South Dearborn Street, Chicago, Ill.

Executive Committee

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel
R. P. Strong
Henry A. Knight
C. H. Fletcher

Washington Devereux
James B. McCarthy
James H. Fenton

R. J. Forsyth
C. W. Mitchell
A. W. Hopkins
G. W. Perry

George L. Collison
T. H. Fritts
A. H. Soper

T. W. Bowry
F. G. Hartwell
A. A. Moffitt
Thomas D. McColl

Secretary's Message.

The Secretary is very pleased to report that the Massachusetts Association of Municipal Electrical Inspectors which recently organized as a section has begun work very actively in its new capacity. Up to this time it has been a more or less loosely organized affair, but has now under consideration a new constitution which will follow closely the lines of a model which the national president and secretary have worked out, following closely the national constitution as a model so far as its requirements apply to a local organization. It has also under consideration a change of name to something like "Eastern Massachusetts Section, National Association of Electrical Inspectors," with a consequent broadening of its scope so as to include the local brethren in the insurance and public-service fields.

The regular monthly meeting of the Section was held on Thursday, December 18, at the office of the Commissioner of Wires of Boston, Mr. James E. Cole, with 18 members present. A considerable amount of work was accomplished but as it mostly related to local matters in connection with the reorganization there was little which would be of general interest.

One matter of interest, however, may be referred to, especially as it is not without bearing upon the subject matter of Questions 247 and 248 which appear below.

As appears in several of the answers and also from a reading of the clauses of the Code in question, it is now allowable to ground conduit on the gas piping of a building. In one of the municipalities of this jurisdiction it has been a local rule not to allow this to be done, but recently in order to conform to the Code it was decided to allow it.

This was done in one case and almost immediately it was reported that severe shocks were being received from the gas piping, and that they seemed to occur when an electric car was within a certain proximity. Careful investigation, however, was unable to detect more than a fraction of a volt difference of potential in the neighborhood due to this cause. Finally a slight defect in a taped joint was found in such a place that the jar of a heavy car or team passing would cause a ground on the conduit, and, therefore, the gas pipe was brought to the potential of the grounded wire. When this occurred a voltmeter showed a potential difference of 125 volts between the gas-pipe and water-pipe systems, the gas was brought from across the street and in the main were several cemented joints. At the same time the ground was of such resistance that an ammeter could barely detect the current flowing between the two piping systems.

It would be of interest if our members would bear this in mind and look to see if any similar effects appear in their territories.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

In addition to the officers of the Section as printed in a recent number of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, the Section has elected the following Executive Committee: William P. Briggs, of New Bedford; Timothy C. O'Hearn, of Cambridge; Charles H. Ashby, of Salem; B. Frank Moody, of Lynn; and H. W. Greenlaw, of Beverly.

Western New England Section.

(Jurisdiction, Connecticut, Western Massachusetts and Southern Vermont.)

December 8 a meeting was held at the Auditorium of the United Electric Light Company, Springfield, Mass., for the purpose of organizing the third section of the Association. There were 20 gentlemen present. The meeting was called to order at 11:15 a. m., by National President Day, and it was voted that he and the national secretary should act as chairman and secretary *pro tem.* President Day gave a brief exposition of the purposes and intent of the section movement, after which a resolution to proceed to organize having been unanimously adopted, a nominating committee was appointed by the chair in pursuance of a vote of the meeting, consisting of Messrs. Whiting, of Canaan, Conn., and Hughes, of Pittsfield, Mass., together with the secretary *pro tem.* Following their report, it was voted that the organization should be known as The Western New England Section, National Association of Electrical Inspectors, and the following officers were elected:

President, City Inspector G. W. Perry, of Hartford, Conn.*

Vice-president, City Inspector A. W. Hopkins, of Springfield, Mass.*

Secretary-treasurer, Public Service Inspector R. J. Forsyth, Greenfield, Mass.*

Delegates to the Executive Committee, N. A. E. I.: Messrs. Perry and Hopkins (who already were members of said committee by appointment).

Executive Committee: M. S. Nettleton, city inspector, New Haven, Conn.;* W. F. Francis, city inspector, Pittsfield, Mass.; L. N. Heubner, South Manchester, Conn.; E. L. Duff, public service inspector, Southington, Conn.;* F. S. Knott, Eastampton, Mass.

In addition to the above officers the membership list comprises the following gentlemen: Thomas H. Day, Hartford, Conn.;* Howard R. Eddy, New Britain, Conn.; I. D. Hughes, Pittsfield, Mass.; J. J. Harges, Springfield, Mass.; W. C. Johnson, Amherst, Mass.; M. H. Mahoney, Turners Falls, Mass.; T. J. McEnroe, Norfolk, Conn.; Paul O. Newman, Holyoke, Mass.; John J. Rockett, Northampton, Mass.; John F. Shea, Springfield, Mass.; A. H. Soper, Hartford, Conn.;* F. A. Whiting, Canaan, Conn..

In the above lists the gentlemen whose names are marked with * are already members of the National Association, so that the net gain in membership of the Association is 13.

After the organization was effected a skeleton form of constitution was adopted and referred to the Executive Committee for completion with directions to report at the next meeting. The meeting then adjourned 'till 2 p. m. Upon reassembling, the Section was taken in charge by the newly elected officers, and listened to a most interesting paper by Mr. Day upon "The Grounding of Secondary Wiring." At the conclusion of the paper the matter was opened for discussion, which was of the most lively and interesting character, lasting for a little over two and one-half hours.

Mr. Day prefaced his paper as follows: "From its inception the National Electrical Code has represented the progress made in the practical application of electricity up to the date of publication of its several editions. Thus at the present date, it represents the progress achieved in the electrical world, as it appeared in March, 1913, the date of the last convention, at which the present rules (or Code) were made. In a word, the Code of today is a direct product from the University of Experience rather than a compendium of expressions from textbooks with all their technical perplexities. It is plain language. This is indicated by the fact that what has been a recommendation in the rules for several years, is today a rule, a rule because of the experience gained in places where the former suggestion, that of grounding the secondary alternating-current systems, has been applied and has given satisfaction. Thus the rule of today represents the experience in a large number of fields, and is without theory, but is the product of the University of Experience, a valuable institution of learning.

"You will have noticed no doubt the language used in the closing sentence of paragraph *b* of Rule 15: 'In either case the following rules must be complied with.' The experience gained has been along the lines suggested in the rules which follow and the requirements of today suggests by the language used, 'Anything worth doing, is worth doing well.'"

It is a matter of regret that the whole paper is not available, but Mr. Day was speaking to the inspectors of the territory which he regularly covers as representing the New England Insurance Exchange, and his paper consequently partook so largely of the nature of an intimate heart-to-heart talk as to preclude its publication in full.

The Secretary has heard from Brother Fletcher that the last meeting of the British Columbia Section was most interesting, and that he would shortly hear from Secretary Cook about it.

The questions which appear below speak for themselves and hardly require comment, nevertheless the Secretary wishes to call attention particularly to the one referring to the use of lead sheath on a cable *as a link* in the ground connection, for it seems to him a very dubious proposition.

Theater Service.

Question 246. Do you consider the arrangement shown in the accompanying sketch of a service to a theater to be in violation of Rule 24 a?

Answer 1 (S). Yes.

Answer 2 (J). I understand the sketch to mean that the "south wall" is the outside or street wall through which the wires are to enter, running thence in conduit to a cabinet 53 feet distant where the service switches and presumably the service cutout will be located. This is most certainly a violation of rule 24 *a* and of rule 23 *a* as well. The fact that the wiring is in conduit makes no difference in the necessity of placing cutout and switch at the point of entrance.

Answer 3 (U). Yes, unless special permission were given.

Answer 4 (F). Yes.

Answer 5 (Q). Yes. Switch does not appear to be located in the nearest accessible place; also note the absence of fuse where wires enter.

Answer 6 (P). Yes; under the assumption that the service enters at the south wall and runs for some 40 feet to the switch and cut-out.

Answer 7 (B). In sketch referred to, service switches are shown to be so located as to necessitate 53 feet of conduit and mains from point of entrance to service switches. On the face of it this is absolutely wrong, although rule 24 *a* which calls for location at nearest readily accessible place to where the wires enter the building does permit of departure from said rule when authorized by special permission.

Answer 8 (I). Yes, there should be a cutout where the wires enter the building.

Answer 9 (N). Presumably, from the sketch, fuses are located in the same cabinet as are the service switches This is absolutely wrong and although there might be very legitimate reasons for which in this particular case (of which we cannot judge without a more complete knowledge) the inspector might exercise his power of special permission as to switches, nothing appears which would lead one to the same conclusion as regards the fuses called for in rule 23 *a*.

If our members will refer to Question 123 (page 316, *Electrocraft* for May, 1911), also to Question 147 (page 725, *Electrocraft* for October, 1911), they will find further discussion of the location of service switches and cutouts. Personally, unless the conduit was so far behind the surface of a concrete floor or wall as to be practically "outside" the building, I would not allow it.

Answer 10 (E). Under the arrangement of the service mains, the main cutout and switch would be 53 feet from the point of service entrance. This would be a decided violation of rule 24 *a*.

Answer 11 (Y). Service switch should be placed on the wall where the conduit enters building, within reach of the floor.

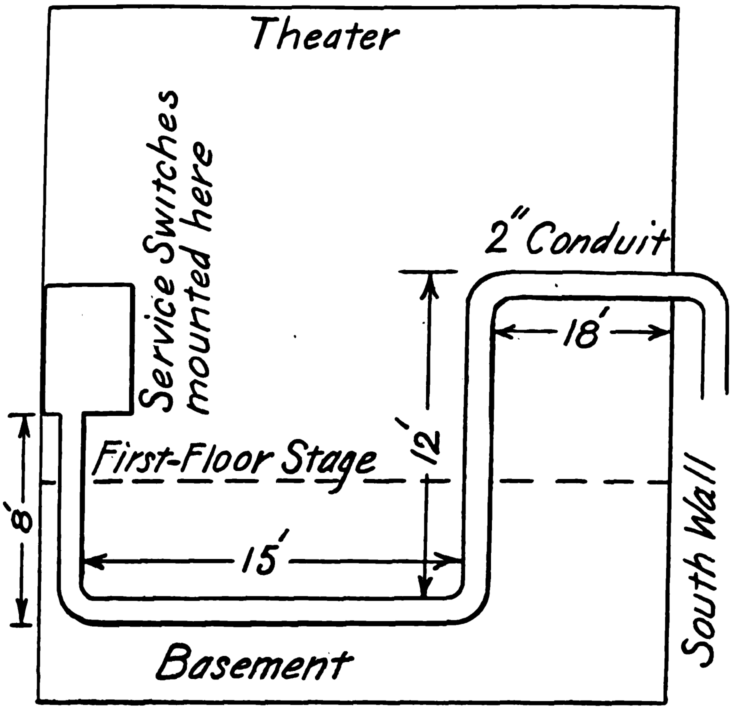
Answer 12 (M). This probably meets requirements of rule 24 *a*, but is in violation of rule 23 *a*, if the fuses are located where the switch is.

Answer 13 (R). This is certainly a violation of rule 24 *a*, and if it were impossible to put the switch at point where the wires enter the building a set of fuses should have been placed on the south wall to protect the wires running over to the service switch.

Answer 14 (V). I would consider this a violation of the rules mentioned unless this was the nearest accessible place.

Answer 15 (D). Yes; unless this is really the nearest accessible place.

Answer 16 (O). The service arrange-



Sketch of Theater Service Connections.

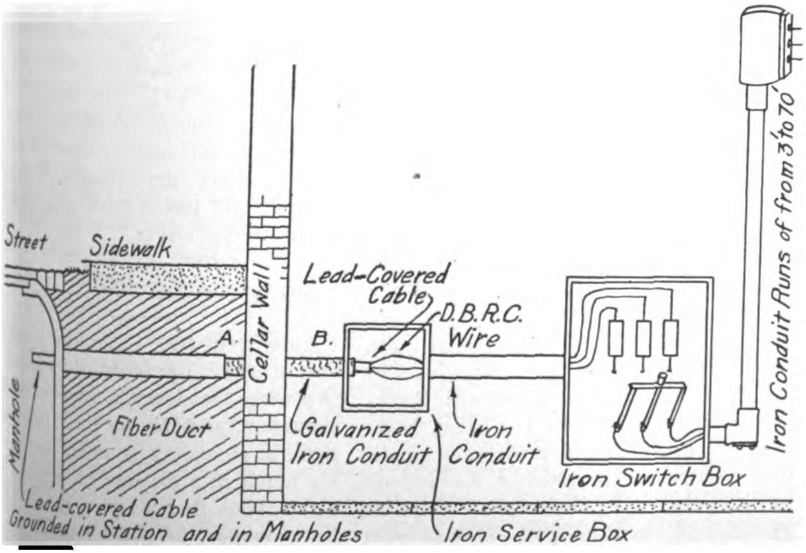
ment shown is not only in violation of rules 23 *a* and 24 *a*, but should be considered extremely hazardous, as the distance between the point of entrance and the service fuses appears to be more than 50 feet instead of "nothing" as required; even under the most favorable conditions, the insulation of the wires between the point of entrance and the service fuse will eventually break down, but in this case there appears to be a trap provided for holding condensed moisture in order to hasten the failure. When short-circuit finally occurs, it is probable that the service pipe will be destroyed and the building fired before the current will be interrupted by the blowing of fuses somewhere on the outside lines or at the central station.

Effective Ground.

Question 247. In the accompanying sketch of underground service entering a building, would the iron conduit to the service and inside be considered as permanently and effectually grounded to a suitable ground, simply by the lead-covered cable lying in the galvanized iron pipe A B? Suppose the lead sheath of the cable were bonded to the conduit or iron service box, would that properly ground the conduit?

Answer 1 (S). No, in both cases. "Rule 28 *f*. Waterpiping, gas piping or other suitable grounds must be provided." I should require the conduit grounded within the building if possible to do so.

Answer 2 (J). No. Our department has no jurisdiction over wiring outside buildings and we require the inside conduit system to be grounded independently of the manhole or station cable-sheath ground connections.



Underground Service Entering a Building.

Answer 3 (U). Rule 28 *f* calls for conduit to be grounded permanently to water piping, gas piping or suitable ground-plate by copper wire. As this inspection comes under the interior inspector, I do not see how he can rule that in either case the conduit is permanently grounded, as the ground connection is not where he can see it, although the cable may be properly grounded in a manhole.

Answer 4 (F). No. In both cases the interior conduit should be grounded as specified in rule 28 *f*.

Answer 5 (Q). No, to both questions. A permanent ground contact inside buildings should be installed.

Answer 6 (P). Certainly not, to both questions.

Answer 7 (B). First—we should not consider the iron conduit suitably grounded if dependence were placed simply on the fact that the lead-covered cable was lying in the galvanized iron pipe.

Second—if the lead sheath of the cable were bonded to the conduit or iron service box and said cable were part of an extensive underground system, we should consider that conduit was properly grounded, providing, of course, that bonding were done in a proper manner.

Answer 8 (I). In this jurisdiction the answer would be "no" to both questions. It is in a way a case where the inspector is left to his own judgment. We do not believe the grounding sufficient in either case. A standard method of grounding the conduit should be employed.

Answer 9 (N). First, most certainly not.

Second, again no, and this is regardless of where the lead-sheath cable goes to, and also whether it is grounded in the manhole or not.

My reason for this sweeping statement is the length of fiber duct which intervenes. Inside the duct the cable is lying in a puddle of stagnant air surrounded by a fiber jacket, the whole forming a pretty fair type of pipe covering of low heat-conducting power. Then the lead sheath has a specific heat of 0.0314 as compared with 0.0951 for copper. Specific heat being the ratio of the quantity of heat required to raise the temperature of a given substance one degree, to that required to raise the temperature of water one degree (from the temperature of maximum density), we see that it would take about one-third as much heat to raise the temperature of lead as it would that of copper. The conductivity of lead is 8.3 per cent of copper at freezing and 5.9 per cent at boiling temperature. From a catalog at hand I find for a three-conductor cable (No. 2 conductors) the thickness of lead is given at 0.078 inch and diameter over all 1.085 inches: this gives an area of lead of 0.247 square inch, while the area of one conductor is 0.521 square inch. Taking the average conductivity of lead as 7.0 per cent we see that this lead sheath is electrically the equivalent of 0.0173 square inch of copper, which is very closely a No. 7 wire, of carrying capacity of 60 amperes as against 90 for the copper conductor. But in view of the specific heats, and the location of the lead, we see that we must again increase the ratio and allow the lead at most 20 amperes. Again and finally, lead melts at 618 degrees, copper at 1,929 (according to Roberts-Austen with the Le Chatelier pyrometer). For these reasons it is obvious that a grounded conductor could send easily a current through the sheath which might destroy it, long before the fuse in the grounded conductor was in a condition to melt, and accordingly, I feel that no reliance at all should be placed on the lead sheath as a ground connection in the vast majority of cases.

Answer 10 (E). The lead sheath of a cable lying in a metal conduit does not make an effective ground.

If the lead sheath were properly bonded to the conduit or iron service box the system would still not be properly grounded because of the fiber duct between the metal conduit and the manhole.

Answer 11 (Y). To both questions, no. Rule 28 *f* requires conduit to be grounded to water piping, gas piping or other suitable ground. Connections to gas piping should be on the street side of meter.

Answer 12 (M). No.

Yes, if the conduit is electrically connected to the outside systems; if not it would depend on the nature of the soil.

Answer 13 (R). First, the lead-covered cable lying in iron conduit would not be a suitable ground.

Second, rule 28 *f* states that the conduit must be grounded to the water piping, gas piping or other suitable ground, and I do not consider lead sheathing and lead pipe are suitable grounds.

Answer 14 (V). All conduits should be grounded to the same system of underground piping, preferably water pipe.

Answer 15 (D). First, no.

Second, no, on account of the poor contact which bonding wire would make with the lead sheath.

Answer 16 (O). A connection to a lead cable could not be considered as a suitable ground as required by rule 28 *f*. Owing to the comparatively high resistance and low melting point of lead, such a connection could not be relied upon to carry large currents. The installation shown in sketch is in further violation of the Code because of the fact that the service fuses are not located at the point of entrance.

Grounding Secondary on Two-Wire System.

Qestion 248. When transformers feed service mains which have no neutral wire, that is, a two-wire system, should one side of the secondary wiring be grounded every 500 feet?

Answer 1 (S). Yes. Rule 15 *b*.

Answer 2 (J). Grounding of secondary every 500 feet is not required in the case of a two-wire system. See Code rule 15 *b*, third paragraph.

Answer 3 (U). There is no rule that would require it.

Answer 4 (F). This is not required by the Code. See rule 15 *b*, 3.

Answer 5 (Q). Yes, rule 15 *b*, 2, covers it.

Answer 6 (P). Yes, see rule 15 *b*, 2, which in the 1911 edition reads "may," but in the 1913 edition reads "must."

Answer 7 (B). While the rule does explicitly refer to the grounding of the neutral wire at least 500 feet in paragraph 3, section *b*, rule 15, which section refers to alternating-current secondary systems and does not explicitly refer to two-wire systems in said paragraph, there is no reason from a practical standpoint why a requirement applicable in one case should not be applicable in the other, and we should insist on the fulfillment of the 500-foot requirement with two-wire secondary systems the same as with three-wire systems. It does not seem, however, as if we would meet this condition very often in practice on account of the relative inefficiency of two-wire systems in covering any great amount of territory.

Answer 8 (I). No; see rule 15 *b*; grounding at one point would be sufficient provided this grounding be thoroughly done.

Answer 9 (N). Yes. Rule 15 *b* allows alternative grounding at transformer or on individual services, and requires frequent grounding on neutral wire of a three-wire system. Probably the same requirement was not put in for two-wire systems, because it hardly occurred to any one that any very extensive two-wire secondary systems would be installed. I think it implicit, however.

In this territory there are several very extensive market-garden farms, one for instance, with lights in the house, two barns, motors on silo and in pump house, lights in several greenhouses, and a garage with a mercury rectifier. The load is so diversified in time that a two-wire local distribution was used in place of a three-wire with troublesome attempts at balancing. A single transformer ground was not considered sufficient and the two-wire system was grounded every 250 feet, on account of the varying quality of ground connections at different times of year.

Answer 10 (E). Where there is no neutral wire one side of the two-wire secondary should be grounded at least every 500 feet.

Answer 11 (Y). While the Code is not very distinct on the subject, in this territory we should insist on grounding at least every 500 feet.

Answer 12 (M). According to rule 15 *b*, one side should be grounded in this way, if conditions as regards voltage, etc., are as given in the rule.

Answer 13 (R). If the individual services cannot be grounded, one side of the secondary should be grounded every 500 feet or less.

Answer 14 (V). One side of the two-wire secondary should be grounded every 500 feet at least with a No. 6 wire, the distance between grounds and size of wire being figured for a low resistance.

Answer 15 (D). Yes.

Answer 16 (O). The present wording of the Code does not require a two-wire secondary system to be so grounded, probably for the reason that such a secondary is rarely employed for much of a distance. There can be no question that if such a system is to be grounded, it should be at least every 500 feet.

Positions in the Bureau of Standards.

In the issue of December 20, 1913, mention was made of a civil-service examination for a position as laboratory assistant in the Bureau of Standards. A change in the list of optional subjects for the examination has since been made so that the subjects of electrical engineering and also mechanical and civil engineering will be included.

On the same dates, January 21 and 22, there will also be an examination for aid in the Bureau of Standards at salaries of $600 to $720 per year. This examination will cover elementary algebra, geometry, trigonometry, general physics, elementary mechanical drawing, education, training and experience. Graduation from a technical, scientific or mechanical training school or equivalent training in a laboratory is a prerequisite. Applicants must be between the ages of 19 and 24 years and should secure application form 1312.

Public Service Commissions

ILLINOIS.

At the time of going to press announcement had been made of four of the appointments by Governor Dunne to the Public Utilities Commission. The fifth member had not yet been named. The chairman is to be James E. Quan, a wholesale grocer. The other members are: Walter A. Shaw, civil engineer; Richard Yates, formerly governor of the State; Frank H. Funk, a candidate for governor at the last election.

An effort will be made by legal means by the city administration of Chicago and others to prevent the new law, which was to become effective on January 1, from going into operation.

MASSACHUSETTS.

The Massachusetts Gas and Electric Light Commission has approved the issue by the Shirley Light, Heat & Power Company of 80 shares of common and 74 shares of preferred stock of the par value of $50, the proceeds of 60 shares of common stock to be devoted to the purchase of the property and business conveyed by G. Merritt Ballon to Laurence E. Cushing, February 5, 1913, subject to two mortgages aggregating $11,000. The proceeds of 14 preferred shares are to be applied to a payment on one of the mortgage notes, and the proceeds of 60 preferred shares and 20 common shares to the payment of obligations incurred for additions to plant subsequent to the acquisition of the property by the company.

On the petition of the Postal Telegraph-Cable Company relative to alleged discrimination by the New England Telephone & Telegraph Company in favor of the Western Union Telegraph Company, in which it was claimed that telephone calls intended for the Postal Company were diverted to the Western Union, the Public Service Commission holds "that the evidence presented does not appear to be unlike the experience of the everyday user of telephone service, and there was no evidence to show any intent to discriminate.

"The evidence would seem to show that instructions as to the handling of telephone calls intended for either of the telegraph companies appear to be ample and explicit and care appears to be taken to make the operators familiar with these instructions. That there are errors made is entirely probable, but such errors are apparently as likely to affect one telegraph company as the other.

"The evidence would seem to show that the telephone company has in apparent good faith for more than a year past endeavored not to permit any discrimination as between the two telegraph companies. So long as the company continues to use all reasonable endeavors to maintain its present procedure and enforce its existing instructions, no action by the Commission seems to be required."

NEW JERSEY.

The Board has dismissed a complaint filed against the West Orange Water Company to require it to abrogate its contract with the borough under which water-meter rentals are exacted, at the same time expressing its disapproval of a system of requiring the payment of rental for such. In its decision the Board says: "The Board is of the opinion that the existing meter rental need not be displaced by an order to that effect; but at the same time is not ready to acquiesce in the legality of the alleged contract made by the Town of West Orange with the company, purporting to fix water rates to private consumers. And the Board expressly goes on record as indicating its opinion that when arrangements in future are made for rate schedules the company should plan to own the meters as part of its property and apparatus, and not include in the rate schedule any separate charge under the head of meter rental."

The Board has approved of an ordinance granting the Boonton Electric Company a franchise to construct electric light and power lines in the streets of Boonton Township, Morris County.

NEW YORK.

All street railroad companies operating surface cars within the City of New York have been ordered by the Public Service Commission for the First District to equip their cars with brake shoes having a lubricant insert or with some other equally efficient device for reducing noise, on or before March 1, 1915; and the companies must submit such devices for the Commission's approval by September 1, 1914. The order is intended to stop the squealing of street car wheels. The companies are now experimenting with brake shoes containing inserts of material which lubricate the flange of the wheel and thereby lessen the friction which causes squealing. The order was made effective March 1, 1915, in order to give the companies time to complete their tests of the new brake shoes.

OHIO.

The Public Utilities Commission has authorized the Ohio Service Company to issue capital stock to the amount of $30,000, to be used in payment for the property of the Twin City Traction Company in Dennison and Uhrichsville.

The Canton Electric Company has been authorized to issue refunding-mortgage five-per-cent sinking-fund bonds to the amount of $69,000. These bonds are to be sold at not less than 85 per cent of par value. The proceeds are to be used for the reimbursement of income account for money already expended.

Among the Supply Men

THE GOOD ABOUT THE ELECTRICAL BUSINESS.

By William G. Campbell.

There is so much good in and about the electrical business, that to enumerate it all is an almost impossible task. It is much easier to pick out the bad, but we know pretty well what the bad is.

Not long since the electrical fraternity had the privilege of hearing C. L. Eidlitz deliver one of his characteristically forceful addresses. Mr. Eidlitz in a most concise manner told us "what was the matter with the electrical business." In fact the speaker of the occasion said there was an awful lot the matter. Mr. Eidlitz proved all he said so we have to conclude he is correct.

It really seems reasonable to suppose there is much the matter with the electrical business. Why not? The industry is made up of human units and it is said "to err is human." It is so easy to find the black spot on a white cloth, and many persons would, on seeing a white cloth, say "See the black spot!" They would be quite blind to the beautiful field of white surrounding it.

The electrical business is not unlike a huge white cloth, and there are a few dark spots too (not black however) but are they a part of the business? Not at all! They are merely smudges caused mostly by the youth of those engaged in the commercial end of the business.

Shall a business be judged by the possibilities of it or by the men engaged in it? In either case it is impossible to find any business surpassing that under discussion.

We are merely commencing to properly utilize electric current. As long as the great majority of the cross-town streets of the country's metropolis are gas lighted we have a constant reminder that there is still something to do. Many distinct advantages are incidental to the doing of it too.

It is impossible to "butt" into the electrical business, as compared with the ease of entry into other fields. We often hear it said that anybody with a pair of pliers can "set up" as an electrical contractor. This is not exactly correct, because after the "set-up" has taken place it requires considerable mechanical skill or engineering knowledge to commence active operations. After a job has been finished there is the matter of inspection and approval—all tending to make for a "close" business. Commercially the retail grocery business is a good one—and it requires no technical knowledge at all. The question of capital is not a factor. A contractor gets the jobber to carry him and the grocer gets his jobber to carry him or supply him with goods on consignment. Truly, any one can sell canned tomatoes but it requires a mechanic to install the simplest electric work. In just the same manner does the electrical supply-house salesman differ from that of the wholesale grocer. Any one who can sell at all is fully capable of calling on the grocery trade, but to sell electrical supplies requires extensive technical knowledge. The electrical salesman must have considerable knowledge of a very extensive character before he is able to demonstrate any part of his line to his customer. Does this make for a bad business? Certainly not! An extensive analysis of the foregoing comparison will show conclusively many advantages possessed by the electrical supply business not to be found in any other field. The same general advantages extend into every branch, be it central station or manufacturer. It requires a specially trained man to sell current and current-consuming devices just as it requires a man with specialized knowledge to sell staple wiring devices for a manufacturer. Obviously there is much good in the business as a business.

Those engaged actively are young men possessing the ardor and enthusiasm of youth. Surely this is a most desirable condition. Dr. Frank Damrosch has observed that "men are ever young who still possess a desire to learn anything worth learning." This is good logic and by it we can include Thomas A. Edison as one of the youths of the industry.

Observe the spirit of co-operation rapidly becoming the prime factor in every branch of the electrical field. Can an equal to the Jovian Order be found in any other business? Is this great fraternal and commercial body something the matter with the electrical business? Most assuredly not. Suppose in the endeavor to improve from the producing standpoint the development of the merchandising end has been momentarily neglected, is this a disadvantage? Of course not! It is exactly the opposite. Why, there are more merchandising opportunities in the electrical business than in any other field, primarily because of its youth, and secondarily for the reason that there has not been time for study of the sales protection problem.

Wire does not have to be wire any more than H-O has to be rolled oats. This illustration can be applied to any staple commodity. There are much greater possibilities in giving new products in new fields, non-competitive identities or so-called distinctive names than in older lines. It is much easier to teach new ideas than to make people forget old ones. Then in presenting a new brand of wire a great opportunity is presented to some one in the selection of a name that will be an all-sufficient description. There are many kinds of electric flashlights but there is only one kind of a "Kodak."

Is not the opportunity here and but waiting to be seized? The business is a good business.

The advertising mediums are particularly effective, and in this, the age of publicity, the means of quick and sure dissemination of trade news is a most important factor.

Surely we can truly say, without any twinge of conscience, all together, all the time, for everything electrical.

◆◆◆

A. W. Lindgren, business manager of the Northern Electrical Company, Duluth, Minn., states that the company has been selling a lot of holiday goods. The year's business shows a substantial increase and the company is taking on several additional salesmen.

L. M. Wood, for the past seven years purchasing agent of the Wesco Supply Company, of St. Louis, Mo., has resigned his position, effective January 1. He will accept a position as sales manager of the Menominee Electric Manufacturing Company, Menominee, Mich., manufacturer of Menominee fans, vacuum cleaners and small motors.

Leo L. Hirsch, the genial and popular vice-president of the Electrical Supply Company, of New Orleans, has left the ranks of the bachelors and was married last week to Miss Sara Lazard. The wedding took place on Christmas Day. The employees of the company have presented the happy pair with a chest of silver, and they are the recipients of a great many other handsome tokens.

New Electrical and Mechanical Appliances

Exhaust Ventilation of Kitchens, Laundries, Etc.

The kitchen in a residence or apartment is very commonly the source of much strong smelling, smoky and steam-laden air that finds its way to the living rooms to the great discomfort of their occupants. While this condition is most prevalent in winter when windows are more apt to be closed, it also causes frequent annoyance in summer when rooms already uncomfortably warm are permeated by the still hotter air from the kitchen. In some residences the laundry is so located that the very moist "wash" air invades the living rooms. The toilet rooms in office buildings, stores, etc., sometimes pollute the air of corridors or adjoining rooms.

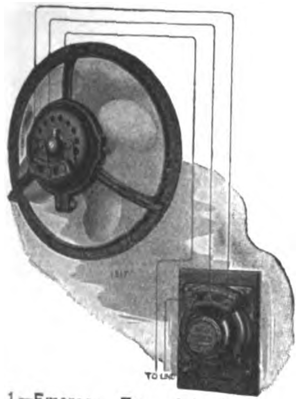


Fig. 1.—Emerson Fan Adapted for Exhaust Ventilation.

These and similar conditions call for the provision of some positive means for removing the foul and trouble-causing air so as to eliminate the possibility of its entering other rooms and at the same time to make the room where the odors originate fit to enter. If the odor-breeding room is large, such as the kitchen of a large restaurant, exhaust ventilating equipment has usually been installed, therefore it is the smaller kitchens and other smell-producing rooms that require most urgent attention. Contractors, central stations and others interested in electrical equipment should lose no opportunity to install such ventilating apparatus.

Naturally, in order to provide such installations of small size, equipment of simple character and low cost is necessary. Among manufacturers of electric fans and ventilating apparatus the Emerson Electric Manufacturing Company, 2024 Washington Avenue, St. Louis, Mo., has seen the need for such equipment and has made a special study of the requirements, with the result that a standard Emerson desk fan motor has been adapted for this service as shown in the accompanying illustrations.

Fig. 1 shows a 12-inch Emerson fan with four Parker blades. It is supported by a strong tripod connected with a flanged cast-iron ring that is bolted around the circular opening which is to serve as outlet for the foul air. The controller and switchbox are inclosed in a separate cast-iron casing mounted for convenient access. Larger fans of this type and also fans with six or more blades specially designed for exhaust ventilation are obtainable for cases where a more powerful equipment is needed, but the fan described answers well for small or moderate size kitchens, laundries, ticket offices, toilet rooms, etc.

A simple and low-cost method of installation devised by the Emerson company's engineers is shown in Figs. 2 to 4. A pine board one or one and one-quarter inches thick and six or eight inches wider than the circular supporting ring for the fan is cut to fit over the upper portion of the window frame, as shown in Fig. 2. The supporting ring is laid over the middle part of the board and the hole marked off on the latter; this hole should be about one half inch smaller in diameter than the inside diameter of the ring. The hole is then cut out with a keyhole saw and the board and fan screwed into place by means of wood screws.

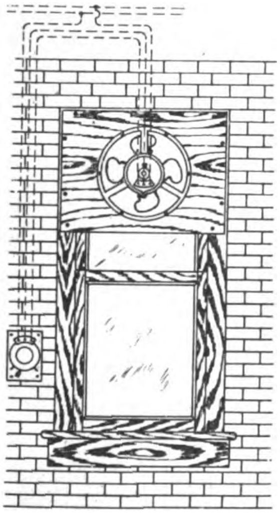
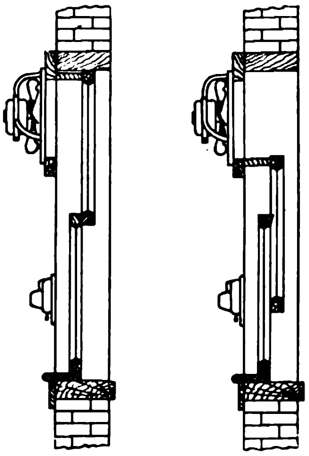


Fig. 2.—Mounting of Fan in Window.

To the inner top edge of the upper window sash is then screwed a piece of board across the window and of such width that it just fills the clear space between the upper sash and the fan-supporting board. Thus, when the upper sash is lowered to permit the exhaust air to be blown out, this board just closes the gap, as shown in section in Fig. 4, and prevents any foul air from being blown into the room. When the fan is stopped and the window is closed, the board rests against the top of the window frame, as shown in Fig. 3.

This mounting can be easily put up and does not even require a skilled carpenter. The motor wiring can be readily installed by an electrician.


Figs. 3 and 4.—Sections of Window Closed and Open.

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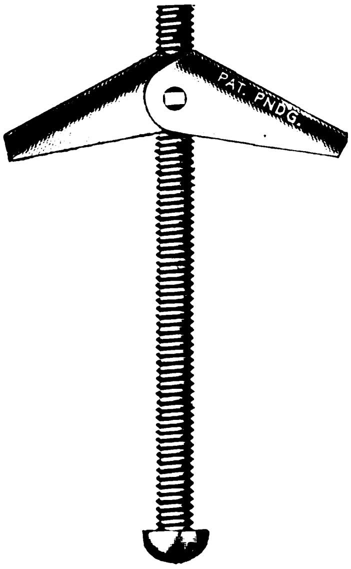
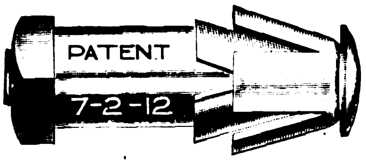
Paine Toggle and Expansion Bolts.

A toggle bolt of entirely new design and expansion shells embodying original features are among the new products meeting with much success in the electrical and allied fields. The Paine toggle bolt, shown in one of the following illustrations, can be used with a nut or as a screw, thus affording the user the advantage of having two styles in one. When used as a screw, the head of the toggle engages the threads of the bolt and acts as an auxiliary nut; when used as a bolt the head of the bolt engages the head of toggle, and also acts as an auxiliary to the nut, thus making a very desirable combination. The head of the toggle is made on the true-truss principle, deep in center and tapering gracefully to the ends. The back of truss resting solidly against the bolt gives it all the advantage of a stiff, rigid head.

The Paine toggle bolt will pass through a nine-sixteenths-inch hole when closed. Its principal advantages are that, when closed, it is only about one inch in length of head, and will work in hollow tile with a space of only one and one-eighth inch. The bolt is folded to insert in hole and when the head has passed the inside of hole the spring instantly throws the two halves of head out to a spread of about two inches, as shown. The two parts of the head swivel on the trunions of the nut; and also engage the thread or head of bolt, which gives additional holding power to the nut.

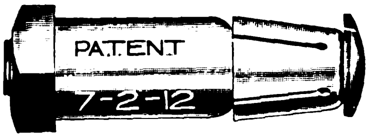


Paine Toggle Bolt.



Multiple-Cup Expansion Bolt.

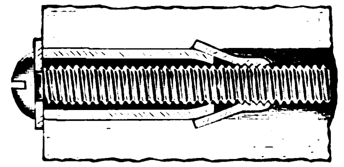
The Paine expansion shells or bolts are made in 35 different sizes suitable for use in hard or soft marble, slate, vitrolite, glass, etc., where it is necessary to fasten slabs to either wood or metal frame without injuring the face of the slab. They are also made for all general attaching purposes in connection with iron, brick, stone, concrete, or other hard material. They are made entirely of steel, cut from sheets with dies that leave the lips of the cups square and sharp.



Single-Cup Expansion Bolt.

The three illustrations of the shell show respectively the No. 1 multiple type bolt; No. 1 single-cup bolt; and the No. 2 bolt expanded. The latter demonstrates clearly the action of the shell. The tapered sleeve expands the cup into—rather than against—the walls of the hole, forming a perfect truss with a grip fully equal to the strength of the screw used.

To install as shell such as the type No. 1 or No. 2 it is simply necessary to drop the shell and bolt, head down, into the hole, attach work or article to be held in place and tighten up the nut.



Section Showing Bolt Expanded.

The principal claims of the manufacturer for these bolts are their sharp biting surface because of steel construction; ease and simplicity of installation; and the fact that because of their design they will not split the material in which used. Numerous tests under the most extreme conditions have been made with great credit to the devices.

The Paine toggle bolts and expansion shells are manufactured by the Paine Company, Winfield S. Williams, 1316 Corn Exchange Bank Building, Chicago, Ill., being the sole distributor.

New Line of Transformer Bells.

A new line of bells for operation on alternating current in connection with bell-ringing transformers has recently been brought out by the P R Manufacturing Company, 621 Bellevue Avenue, Detroit, Mich. These bells are made in sizes from 2.5 to 12 inches, inclusive.

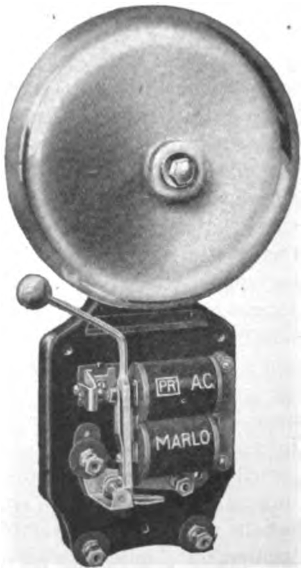
Marlo Three-Inch Transformer Bell.

The advantage claimed for the transformer bell is that it may be operated on the commercial lighting circuit, which offers a reliable and constant source of power without going to the expense of installing and connecting up a large system of batteries. This also eliminates the expense of battery maintenance.

PR
WEATHER
PROOF
MARLO
A. C.

Marlo Weatherproof Transformer Bell.

The P R transformer bells are of special design and construction for alternating-current use, and are made with laminated cores and carbon contacts. They are of the iron-box type with a wrought-metal base and an iron cover which protects all working parts from dust and injury. Two sets of binding posts are provided, one set to be used for ordinary exposed-wiring connections, and one set located underneath the iron box or cover to be used where the wiring and connections are concealed. Any number of bells of the same or assorted sizes may be connected in multiple on the same circuit and operated simultaneously. Any



Three-Inch Bell With Cover Removed.

desired finish for covers may be specified.

It is believed by the manufacturers that these bells will open up an entirely new field for contractors, dealers and jobbers and that these transformer bells will prove exceedingly popular for alarm and signal work for schools, factories, hotels, apartments, etc.

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New Gang Type of Pipe Taplets.

In conduit wiring cases frequent occur where the wires for several circuits run side by side for a considerable distance between some common point of control and the place where the different circuits branch out. To install separate conduit runs for each circuit throughout the length where they are parallel is generally unwarranted, since a number of circuits can be placed in one conduit at great saving in material and labor cost in the installation.

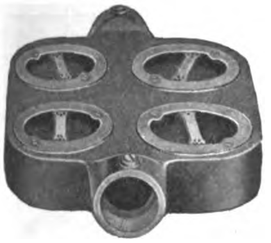

Fig. 1.—Four-Gang Pipe Taplet.

To aid this quicker and more economical construction, the H. T. Paiste Company, Thirty-Second and Arch Streets, Philadelphia, Pa., has added a new gang type to its already extensive and valuable lines of "pipe taplets." Two of these are illustrated herewith in Figs. 1 and 2. They are installed at the control point and take two, three or four switches, one for each separate circuit. Then instead of running two, three or four separate conduit lines for the different circuits, the wires for all the circuits are put into one conduit from the distribution box to the place where they separate, as shown in Fig. 3.

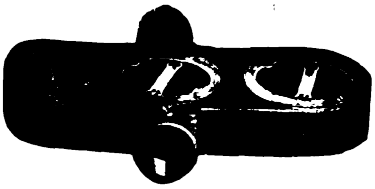

Fig. 2.—Three-Gang Pipe Taplet.

At the points where the side circuits branch off specially designed pipe taplets are used. The cross shown in Fig. 3 (fitting No. 4193), reduces a one-inch main to a three-fourths-inch main and has two half-inch branches. A similar larger fitting is also made to reduce from one and one-fourth-inch main to one-inch extension and to provide for two three-fourths-inch branches. The tee shown in Fig. 3, which is fitting No. 4170, reduces from the three-fourths-inch main to two half-inch branches.

By adopting this construction the cost of conduit and taplets on the line shown in Fig. 3 is reduced to about half the cost of four separate lines of smaller conduit, and at the same time the labor cost of cutting, threading and fitting the conduit is reduced to less than half.

Where the gang pipe taplets are used one or more of the openings may be used for lamp or plug receptacles.

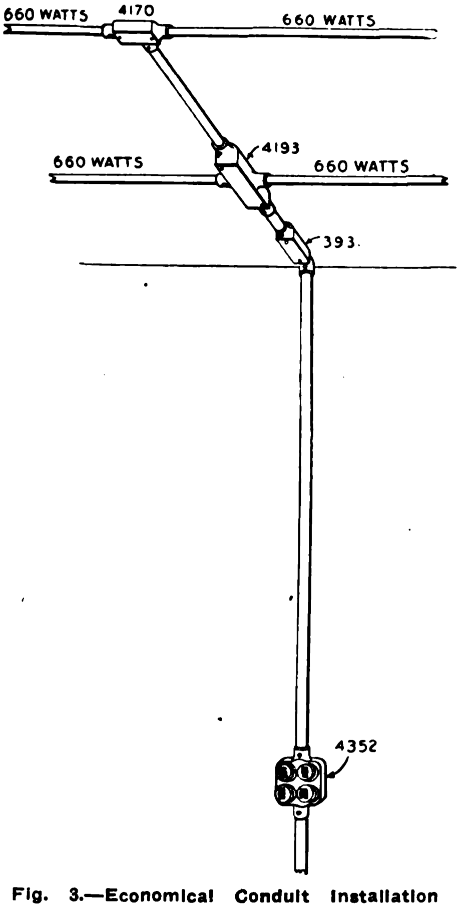

Fig. 3.—Economical Conduit Installation With Four-Gang Pipe Taplet.

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Foolproof Service Switch and Cutout Boxes.

It is more or less a general custom to seal service switches where entrance to a customer's premises is made in either lead cable or iron pipe because the seal furnishes an obstacle to those who might wish to tamper with the service connections or make connections to the service wires at a point at which the current used would not be metered.

Emergency conditions occasionally arise that necessitate the opening of the sealed service switch box for the purpose of either disconnecting the service, or replacing a service fuse, and, as this necessity furnishes an excuse for breaking the seal, it may become a pretense of excuse and the seal of the service box broken for the sole purpose of tampering with the service connection.

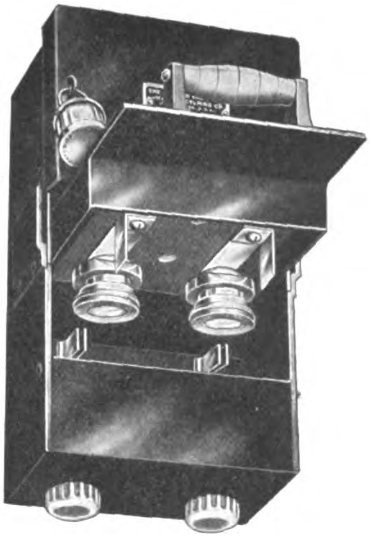

Fig. 1.—Palmer Service Switch and Cutout Box.

The service switches shown in the accompanying illustrations are designed for use under conditions that ordinarily call for the service switch to be sealed, and it is claimed that they offer all of the advantages found in a sealed service switch and cutout without access to the same being prevented by the use of a seal.

It is claimed that by the use of the box described ready access may be had to the switch and cutout for legitimate purposes, but that the construction of the box is such that the box may be opened and the fuse exposed without exposing any current-carrying parts or exposing any contacts to which illegitimate connections could be made and unmetered current used.

The illustrations show different forms of these boxes. In Figs. 1 and 2 the circuit is protected by the regular Edison fuse plug, while in Fig. 3 open link fuses are used. Referring to Fig. 1, in which the cover of the box is shown

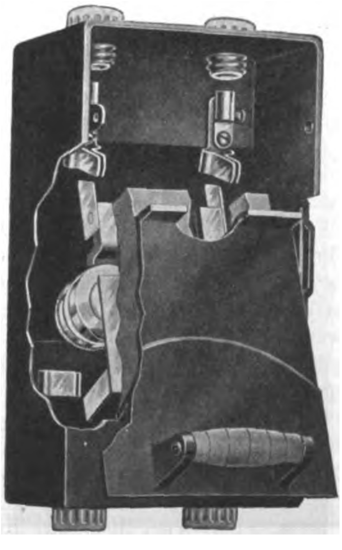

Fig. 2.—Service Chamber Open.

open, the switch is in an open position and the fuses are exposed for inspection or replacement. The upper part of the box in which the service wires enter is shown secured by a seal. Fig. 2 shows the same box with the cover of the service terminal chamber removed, and the side of the box cut away to show the relation of the fuses and the moving switch parts.

The switch and fuses are mounted on a pivoted cover arranged so that, in opening, the switch is disconnected from both the line and load terminals. A projecting flange upon the inner side of the cover closes that portion of the box in which the switch and fuses are located before the moving switch contacts engage with the fixed contacts, and the upper portion of the base on which the switch is mounted swings downwardly into the box when opening the switch, forming a barrier between the open end of the box and its sealed or service end.

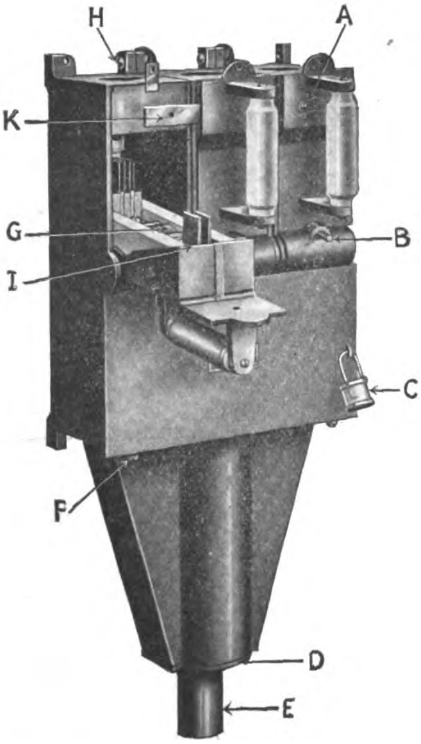

Fig. 3.—Switch Box With Conduit Terminals.

Boxes of smaller capacity are arranged so that cable or conduit may enter the box directly, or are supplied with conduit or cable terminals as illustrated in Fig. 3. These terminals are secured in place from the inside of the box, making it impossible to remove them without breaking the seal of the terminal chamber. This form of conduit or cable terminal is designed to slip back over the pipe or cable, permitting the wires to be fanned out, lugs soldered on, and connections made to the switch and cutout, before the terminal is drawn into place.

The cutout designed for open link fuses is built up from single-pole units for either two, four, or five-pole switches, the units being secured to one another by screws at *H*. The covers controlling the action of the switching members are secured to one another by screws *A* engaging cross bar *K*, permitting an outer leg of the switch to be opened individually in emergencies, as illustrated.

Open-fuse detectors are provided on the outer poles as indicated at *B* so that in the case of one of the outer leg fuses of a three-wire service being opened it can be located and repaired without disturbing the operating part of the system.

As the flange of the switch cover *I* closes the opening in the box before the fuses become alive it is practicable to use open link fuses in this form of box as the fuses can only be blown when the cover of the box is securely closed. As the fuses and all accessible current-carrying parts are dead when in an exposed position, it is not necessary, in fact impossible, for the operator to come into contact with current-carrying parts when installing service fuses.

This box may be mounted in any desired position to meet the incoming service wires. The fuses protect the switch, the blades of the switch are dead when the switch is opened, and the switch is arranged so that it cannot fall closed by gravity. The position of the switch in the three cuts illustrates this point.

This box is manufactured by the Palmer Electric & Manufacturing Company, Franklin and Congress streets, Boston, Mass.

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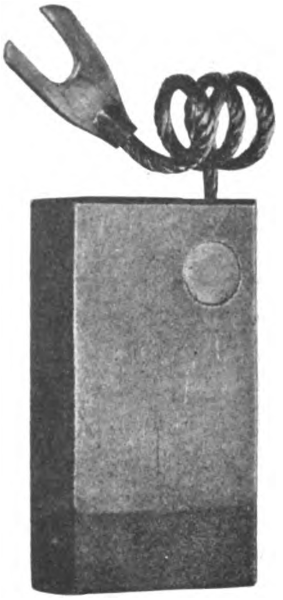
New Pigtail Connection for Carbon Brushes.

Brush manufacturers have for years been trying to develop a pigtail which would give a perfect electrical connection with a brush and at the same time be strong and durable mechanically. There are two types of connections in general use at the present time; those in which the cable is fastened to the brush by some kind of a screw connection, and those in which it is soldered. The disadvantage of most pigtails of the first type is that under the vibration of the motor the screw may possibly work loose and an open circuit or a poor contact will result. It is also susceptible to heat, which will oxidize the metal. The solder in the other type is likely to become heated and either melt or soften so that the cable may come out entirely. Moreover, this melted solder will drop on the commutator and cause severe short-circuit.

The National Carbon Company, Cleveland, O., is making a new patented type of pigtail connection employing an entirely different principle which overcomes the disadvantage of both of the former types. Holes are drilled in the brush as indicated in the photograph, and the flexible cable inserted into the small hole on top, after which its end is spread out in the shap of a fan in the larger hole. A conducting cement is then tamped into the larger hole, making intimate contact between the fan-shaped end of the cable and the brush. After it hardens, it makes a very strong mechanical connection. The cement is of such a nature that it does not shrink away from the sides of the hole, so there is no danger of its loosening and weakening the connection.

This pigtail is said to be the best that has yet come on the market. In the year's time that it has been in commercial use, not a single failure has been reported and those who have tried it are enthusiastic over it. The advantages claimed for it by the manufacturer are as follows: there is no solder to melt, hence it is unaffected by heat; it will not loosen or become oxidized; the contact drop at point of contact is reduced to a minimum; the wire can be brought out at any point along the top of the brush; it can be used on any size or thickness of brush.



Pigtail Brush Connection.

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Western Electric Developments in 1913.

During 1913 the Western Electric Company has maintained the high standard it has established in the past, by contributing a number of new and important developments in electrical apparatus. The following outlines those developments in telephone and power apparatus which are most worthy of note.

Probably the most important addition to the work which is being carried on in mining districts to bring about safety for the workers in the mines has been the perfection of a mine rescue telephone equipment. The mine rescue telephone equipment consists of a transmitter which is arranged to fit the throat of the helmet man, thus permitting of the transmission of the sound waves through the walls of the throat, as the mouth is needed for the breathing in of the oxygen. A head receiver is also furnished, the combination of receiver and transmitter being held in place by a light but serviceable leather harness. The helmet man also carries one or more coils of wire, which connect to the telephone equipment used by the directing party at the mouth of the mine. This wire pays out as the rescue gang advances.

A new test board for way-station service, known as the No. 2 type, has been developed to meet the need for a compact and flexible testing and dispatching equipment. Two sizes are available, the No. 2-A, which is arranged for two metallic circuits, and the No. 2-B, which is arranged for four metallic circuits. The test boards are so designed that all line terminals are made accessible for inspection by merely unhinging the outside cover, and all jack and key terminals by unhinging the apparatus board. The use of these new test boards provides a simple means for minimizing service interruptions.

A series of cordless jack boxes has also been developed for block telephone and telegraph service. These cordless jack boxes are known as the No. 385 type, for a maximum of three lines; No. 386, for a maximum of six lines; and No. 389, for a maximum of twelve lines. They are used to connect the operator's set to any one of a number of lines passing through the way station, by means of a switching plug which is inserted in the jack connected to the line over which the message is to be sent.

The hand set Interphone completes the line of intercommunicating telephones. This type of instrument has transmitter, receiver, and ringing button, all mounted on one handle. When not in use, the hand set can be placed in any position without causing waste of current, as the current is shut off automatically when the pressure of the hand is released. There are two general styles, the flush and the non-flush. The former makes use of a wall box with a face-plate, the same as the combination used for electric light switches, so that nothing projects beyond the wall but the hand set itself. For old buildings, where it is inconvenient to install the flush-type wall box, there are non-flush boxes available.

Switchboard development work has been confined to changes calculated to improve the old as well as the more recent types. The work has centered upon the standardization of switchboard frameworks and parts, and applies principally to the magneto non-multiple switchboards.

A standard local cable, which is the cable connecting the various co-ordinate parts of the switchboard, has been devised, as well as a standard key shelf which has a greater cord capacity than former types, so that more than the usual number of cord circuits can be furnished, as required by operating conditions. A standard method of mounting signals has also been instituted so that line and supervisory signals are now mounted on the same mounting bars.

Two new repeating coils have been developed for phantom-circuit telephone work. These coils, known as No. 46-A and No. 47-A, have the same mechanical and electrical characteristics, and differ only in that the former has two coils on a single base, while the latter is mounted singly.

Their efficiency is such that transmission over a phantom can be obtained about 15 per cent farther than over the original physical circuit. While the loss in the repeating coil amounts to less than two-fifths of a mile of No. 19 gauge cable, per coil, the loss on the phantom circuits is only one-fifth of a mile.

A new type of metal telephone for central-battery use has been developed. This is a semi-flush telephone known as the No. 1357 type, and is intended for the same class of service which the non-flush No. 1333 telephone is designed to give. This includes single-party, two-party selective, or four-party semi-selective signaling, and harmonic selective signaling.

Provision is made for an instruction card on the face of the telephone.

A semi-flush desk-set box, known as the No. 358, has been developed for use with desk stands, and contains the ringer, condenser and induction coil.

The use of insulated transmitters is being extended as rapidly as possible, to all types of telephones. Heretofore the metal frame of the transmitters has been used as one of the conductors, while the cord attached to a small binding post in the interior of the transmitter has served as the other. The insulated type is inherently a safer instrument to use, as the danger of shock is eliminated.

Following the introduction of the one-piece lug holder which added so much to the graceful appearance of the No. 20 type desk stand, a still further improvement has been effected by the development of a single-piece switch hook. This new switch hook is produced by unique punching operations which have been devised for the purpose. The new hook has also been instrumental in making a reduction in the weight of the stand.

A new battery—the Red Label Blue Bell—has been developed for general utility work. It is of the high initial amperage and low resistance type and adapted for use where there is not a constant drain on the current for extended periods of time. Its principal uses are for call bells, railway signaling systems, annunciators, toys, industrial gas-engine work, and all slow-speed ignition service.

Additions have been made to the line of Western Electric-Sturtevant vacuum cleaners so that there is now a size to meet practically every requirement.

A horizontal type of stationary vacuum cleaner has been substituted for the vertical in certain of the sizes. The one-half-horsepower and one-horsepower cleaners retain the vertical type of construction, while the sizes exceeding one horsepower are now made with a horizontal motor-fan combination and a vertial dust collector. This serves to increase the number of bearing points for giving support to the shafting, and eliminates excessive vibration.

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Westinghouse Developments in 1913.

The past year reveals no startling innovations, but rather a consistent advance, particularly along the line of increased capacities and voltages, both in rotating and stationary apparatus.

Alternating-Current Generators.

Several Westinghouse horizontal turbine units with capacities of 15,000 and 20,000 kilowatts, operating at speeds of 1,500 or 1,800 revolutions per minute, for 25 and 60-cycle work, have been installed and put into service during the year, and early performance indicates them to be extremely successful as regards reliable service and efficient operation.

The most notable advance in this line of apparatus is the new design of the so-called "cross-compound" type of turbo unit for ratings of 30,000 kilowatts and above. A recent order was given for three of these by the Interborough Rapid Transit Company, of New York City.

Developments in generators to be driven by other types of prime movers, particularly water wheels, have been largely in the nature of increased capacities and refinements in manufacturing processes, enabling the manufacturer to build units even more reliable and efficient than in the past. Notable among these newer machines may be mentioned single vertical-type units of capacities in excess of 12,000 kilowatts, and operating at very low speeds, for coupling directly to single-runner water wheels. Units ranging in capacity from 12,000 to 17,500 kilowatts have been installed, and are now in operation, showing very satisfactory results.

Rotary Converters, Motor-Generators and Generators.

While large 60-cycle commutating-pole rotary converters and 25-cycle commutating-pole rotary converters were previously developed to a great extent, they have this year fully demonstrated the claims of the manufacturer on performance by their successful operation. The results obtained prove them to be thoroughly satisfactory both from an operating and economical standpoint.

The installation of ten 1,500-kilowatt and two 1,000-kilowatt, 60-cycle rotary converters by the Cleveland Railway Company is worthy of mention, as it is the largest 60-cycle rotary converter installation in the world, and is giving remarkably satisfactory results.

As in other classes of apparatus, the tendency is to the use of the larger units. Although no larger 25-cycle units have been developed during this year, the largest rotary converter that has been built to date has been completed by the Westinghouse Electric Company. Nine of the converters which are of the 2,500-kilowatt capacity, have been built for the Aluminum Company of America.

The field of the 60-cycle rotary converter has also been extended through the purchase by the Southern Power Company of three 500-kilowatt rotary-converter units, consisting of two machines of 250 kilowatts capacity each mounted on a single bedplate and arranged for operation in series on 1,500 volts, direct current; this station is to extend the present operating territory of the Piedmont & Northern Lines.

Another development of great importance this year is the portable substation, which has demonstrated in actual service that it fully meets requirements. In the matter of high-voltage direct-current work, the tendency is shown in the purchase by the Southern Power Company of a portable substation for railway work, the car to include a 500-kilowatt motor-generator to operate through suitable transformer, also mounted on the car, from either a 2,400 or 44,000-volt circuit.

The two 3,750-kilowatt, 180-revolutions-per-minute direct-current generators used with turbine and reduction gear installed the latter part of last year by the Westinghouse Electric Company for the Cleveland Electric Illuminating Company are the largest in capacity at 180 revolutions per minute that have ever been built. They are not only demonstrating that they are satisfactory, but they are demonstrating the practicability of the turbine-reduction-gear direct-current generator unit.

Transformers.

Developments in insulation of distributing transformers to obtain safety as well as durability by providing solid barriers of micarta, which afford great mechanical as well as dielectric strength, are notable. Insulating testing transformers and their control have been further developed. Transformers giving 500,000 volts from high-tension to ground under normal conditions have been put into successful operation.

With the increasing use of feeder regulating equipment, the auxiliary equipment for the automatic control of induction regulators has been developed to give better regulation through quicker response to voltage fluctuations. This has been accomplished by use of quick-acting magnetic brakes and the use of controlling relays with compounding coils that eliminate chattering and hunting.

Particularly noticeable has been the continued growth in the use of transformers for outdoor service. The power-transmission companies and railway companies are beginning to realize the importance of the electrification of the small community and the farm.

On the other hand extensive increases have been made in the high-capacity, high-voltage transformers for hydroelectric systems, as exemplified by the fourteen 150,000-volt transformers recently installed for the Pacific Light & Power Company by the Westinghouse Electric & Manufacturing Company.

Arc Lamps and Street Lighting.

Development in this class of apparatus has been represented during the past year by the design, development and placing on the market of a new line of flame-carbon arc lamps adaptable to all commercial circuits; and the providing of a more elaborate and flexible (with reference to interchangeability) feature, a line of film cutout and adjuster socket street hoods, including bracket of more or less ornamental type and arranged for concealed wiring.

Fan Motors.

Developments along the fan-motor line brought out during the last year have been that of a new six-blade cast-iron-frame exhaust fan with residence-type blades, the 8-inch four-blade induction fan motor and the new six-blade residence, 16-inch desk and oscillating fan motors.

Small Motors.

There is a continual increase in the use of small motor-driven machines for the office, home and store.

There has been a great increase in the demands for motor-driven office machinery such as adding machines, mailing machines, addressing machines, combined computing and typewriting machines. This has been due not only to the perfection of the motor-driven machines, but also to the fact that there is an increasing tendency to analyze the cost of operating offices.

The demand for motor-driven air pumps has increased to a remarkable degree. Air pumps have been principally used in connection with garages for producing compressed air for blowing up automobile tires.

Water pumps have been used in the home, apartment and hotel. There is a particular demand for these in suburban districts and this is often neecssitated by the condition that in several districts throughout the country hard water is plentiful but there is a small supply of soft water. Private supplies of soft water must be obtained and rain water is usually collected and distributed throughout the home and out-buildings by means of an electric pump.

The Westinghouse Company has recently designed and put on the market several sizes of motor-generator sets, especially adapted for arc-welding work. It supplies the accessories, including pencil holder, shield and also control and switchboard apparatus.

Magnet Switches and Control.

The past year has seen the introduction and successful operation of a line of magnet control switches for industrial service that bid fair to very greatly enhance the application of electric motors to severest industrial requirements. Their design was preceded by long and careful study of the needs of this service and by extensive experimental work.

Westinghouse type C magnet-switch controllers for steel mills can be furnished for controlling motors driving every machine used therein.

One particular point of this new type of control is that the control systems have been very much simplified, due to the use of a specially designed series type of contactor. It has recently been demonstrated that magnetic controllers are especially suitable for hoist motion of cranes, especially where controllers of large capacity are used. One special feature, now included in magnetic controllers in particular is dynamic braking, which is very useful in the lowering motion. This feature in the controller permits of a much simpler mechanical construction of the crane, as a mechanical brake is not required. The steel mills of today have practically adopted the magnetic control for the majority of the motor applications, where the service is of intermittent character.

There has recently been developed a very simple system of control for blast-furnace skip hoists. Several of the controllers are in operation.

Large Motors for Steel Mills.

The Westinghouse Electric Company secured an order from the Bethlehem Steel Company about the middle of this year, which is rather unique in character. It is reversing motor equipment to drive the 35-inch blooming mill. Although there are two reversing blooming mill equipments operating in Canada, the equipment for the Bethlehem Steel Company will be the only one in the United States and will be much larger than the Canadian equipment.

Steel-Frame Induction Motors.

For a long time the squirrel-cage induction motor as produced by the manufacturer has been considered nearly the acme of perfection. The last year, however, has seen a further refinement of this motor in the production by the Westinghouse Company of its new steel-frame squirrel-cage induction motor, designed for constant speed, continuous service, 20 to 200 horsepower, 110 to 2,200 volts. Steel is largely used throughout, not only providing great strength, but reducing weight. The rotors are practically indestructible; the bearings have liberal areas, non-leaking and dust-proof. Construction is simple and the number of parts small and interchangeable. Efficiency, power-factor, and overload capacity are unusually high.

Slip-Ring Motors.

A new motor of this type, embodying many advanced features of construction, has also been brought out within the year. It is especially designed for operating small cranes and hoists and for other severe intermittent varying-speed reversing service. It is built in capacities of 2 and 3 horsepower, three-phase, 220 and 440 volts, 60 cycles, 6 poles. The frame is built of rolled steel. The bearings have liberal areas and are non-leaking and protected from dust. Special attention has been given to ease of dismantling, so that in case of accident, repairs can be readily made.

The torque that can be developed is the maximum obtainable for the rating. The speeds are comparatively low. The stator is of the frameless type. The core laminations are riveted together under high pressure between pressed-steel rings called end shields. A one-piece pressed-steel foot is rigidly attached to the end shields.

Each bracket has on its face a machined flange which fits inside the frame and insures rigid support and perfect centering of the bearings.

The rotor is comparatively long and of small diameter, thus reducing the flywheel effect. This feature, together with the perfect balance and secure attachment of the windings, make these rotors especially adapted for frequent starting, stopping and reversing.

Circuit-Breakers.

The carbon-break type has been extended to cover capacities from 200 to 800 amperes, in addition to the capacities of 1,000 to 20,000 amperes as developed in the year 1912.

Oil-type breakers have been built for operation on voltages as high as 165,000. The details of these breakers closely resemble those of standard lower-voltage breakers.

The reactance-type breakers have been developed to cover voltages as high as 110,000. They have been developed along the lines of two forms; one arranged for floor mounting, voltages ranging from 25,000 to 165,000; the other arranged for cell mounting, for voltages up to 22,000. Both forms are nominally rated at 200,000 kilovolt-amperes, ultimate breaking capacity.

Indicating Meters.

Induction-type meters have been changed in design by leaving off the damping disk and providing damping by means of a permanent magnet acting directly on the drum. These meters have withstood service tests under short-circuit conditions which impose a load of 250 amperes on a five-ampere-meter coil, but without bending the pointer or sacrificing the general accuracy of the meter.

The portable seven-day graphic meter has been placed in the market both as ammeter and voltmeter. The meter supplies a continuous seven-day record at either 1-inch or 2-inches per hour.

Portable meters operating on the dynamometer principle are supplied as voltmeters, wattmeters and power-factor meters.

The pocket-size portable meters have been placed on the market for use in testing storage batteries. These are supplied as ammeters, voltmeters, and combinations of ammeter and voltmeter in one case.

Automobile Equipment.

Automobile ignition and lighting generators, combining the ignition coil in the generating unit, practically providing a high-tension magneto and a 6-volt lighting generator in the same unit, eliminate the ignition coil from the dash.

High-speed starting motors both with and without gear sets of the planetary and spur types are now supplied.

Magnetic shift of the pinion for meshing same with the flywheel gear for the application of the automobile starting motor to the flywheel of the motor car has been adopted.

Electrically operated starting switches provide push-button control for starting the engine. There is a new lighting-circuit switch for automobiles—a double push-button type of rugged construction.

An electric priming valve, to furnish a charge of fuel to the cylinders simultaneously with the operation of the automobile starting motor, when carburetion is difficult in extreme weather, is in use.

Mine Material.

A great advance has been made in the application of heavy electric hoisting from both coal and metal mines, the most notable being the recent order placed by the North Butte Mining Company for the largest electric hoist installation in the United States.

The introduction of the self-starting motor for direct current up to 20 horsepower has met with great favor, as it eliminates the complication of automatic starters, or the necessity of starting manually a pump or fan inside the mine every time the circuit-breaker opens due to overload or other causes.

The general demand for the bar-steel locomotive frame construction with the use of commutating-pole motors has shown that this latest development in locomotive construction has been in the right direction, as has also been demonstrated in the use of bronze motor bearings with oil-waste-packed housings in line with the most modern street-railway practice.

Cutler-Hammer Developments in 1913.

A number of types of automatic motor starters and controllers were added to the standard line of these classes of apparatus. One of these is of the series relay type, the resistance of which is cut out of the motor circuit through the closing of magnetic switches. The time of closing successive switches depends upon the motor current, which acts through the relays to close or hold open the switches. These relays are positive in action and respond to the variations in the motor load so that when the motor is started under light load it is accelerated more quickly than if loaded heavily. In the latter case the switches are not closed so quickly, thus allowing the resistance to remain in circuit longer, preventing the current from rising above a predetermined maximum.

The smaller controller is made in capacities up to 15 horsepower for 110, 220 and 500-volt systems while another class having main-line magnetic switch is made in larger capacities. With push-button control the automatic controller itself can be placed out of reach.

For alternating-current motors self-starters operating in a similar manner have also been added for use with pumps, compressors, etc. These self-starters limit the starting current to a predetermined and adjustable value so that the motor is safely started in the shortest time consistent with the starting current.

Two standard lines of these self-starters for high-tension motors, 1,100 and 2,200 volts, were also brought out. Oil-immersed solenoid-operated three-pole switches control the high-voltage motor primary circuit.

Crane Controllers.

To the regular standard inclosed-type crane controllers, new features were added. Because the backward and forward straight-line motion of the drum handle is sometimes desired instead of the usual rotary motion, a vertical arrangement of lever with bevel-gear drive was devised. Another feature was the provision for operating this type of controller by means of ropes.

Pontoon Crane Controllers.

Two very important installations of new magnetic-type controller were made on the United States Navy giant floating cranes. These 150-ton cranes are for Boston Harbor and for Pearl Harbor, Honolulu, and are to be used for unloading to lighters, handling, removing and replacing such machines and apparatus as turrets, boilers, guns, etc.

Fire-Pump Controllers.

A new motor-driven alternating-current fire-pump controller has been brought out. The controller is inclosed in a sheet-iron, splash-proof case, mounted on a pedestal, two feet high. A double-throw knife switch is for transferring the motor from one set of servive lines to another, as connection to two separate power lines is often provided for reliability. For manual operation it is only necessary for the operator, who may be an inexperienced night watchman, to pull the hand lever from the upper position through 180 degrees to the lower or full running position. The lever is held in the running position by an automatic coil.

Automatic control is conveniently incorporated without complicating the hand operation, giving a satisfactory method for maintaining a constant water pressure when a single sprinkler head opens, or when a leak develops in the piping system. Furthermore, the automatic operation provides a safety feature which is not available in a straight hand starter. Watchmen are prone to leave the building or the section of the building where the controller is installed, and in case of fire the automatic-control feature is a decided advantage, as it puts the pump in operation and keeps the pressure up to maintain a sufficient water supply.

The entire controller is built to meet the most rigid fire-pump requirements. There are no iron-to-iron bearings and all parts are designed to withstand the effects of periods of idleness in damp locations.

Printing-Press Equipment.

A complete line of new controllers developed during the past year is the push-button predetermined-speed adjusting self-starting printing-press controllers. These controllers are designed to meet the present-day needs of efficient and convenient printing-press operation and are replacing the hand-operated types. The features of remote control, dynamic braking and easy speed variations are combined in these controllers. Control of the motion of the press from a number of handy stations located where desired insures against accidents to pressmen. These controllers are for mounting on a wall or post near the press, which leaves the running board free and keeps all the motor current-carrying leads from the press. Inching, slow and fast speeds can be secured by manipulation of the buttons of the control stations.

New Inclosed Float Switches.

At the close of the year a line of direct-current and alternating-current inclosed float switches were placed on the market. The switches are made in single, two, three and four-pole types for single-phase, two-phase and three-phase motors. The single and double-pole switches are applicable also for use with direct-current motors. Single-pole switches are used in the pilot motors of such size as may be while the other switches are used with motors of such sizes as may be thrown across the line in starting. An important feature of these switches is the fact that closing and opening occurs with a snap, the latch, which operates both ways, providing this quick made-and-break action. A removable cover permits inspection of the interior and the case is tapped for conduit entrance.

Theater Dimmers.

With the extensive use of tungsten high-efficiency lamps in stage lighting, theater dimmers having a large number of resistance steps became necessary to secure the gradual variation of lamp brilliancy desired. To meet this requirement and also to provide a dimmer that requires but one plate for three-wire circuits up to given capacities, a new type of Simplicity dimmer plate was designed.

The contact buttons are arranged in a circle on one or both sides of the plate. When contact buttons are mounted on both sides the corresponding levers may be arranged to operate together under the control of one operating handle, or independently, each by an individual handle.

Since each side of the plate can be furnished with separate terminals and levers, it is possible to secure by the use of but a single plate not only a complete two-wire dimmer but a complete three-wire dimmer, suitable for controlling either carbon or metallic-filament lamps. With one plate it is also possible to obtain two entirely independent dimmers each of which can be used with either carbon or metallic lamps.

Vehicle Battery-Charging Equipment.

A new Universal unit-type charging panel, the result of a number of years' work, has been finally standardized. These panels are made up of self-contained rheostats assembled in frames in much the same way that the convenient sectional filing cabinets or book cases are assembled, each standard panel accommodating any number of sections up to six. Any number of panels can be assembled side by side according to the space available and regardless of the fact that these may be installed at different times the complete equipment has the same appearance as if installed at one time. These panels are for use on both two-wire and three-wire circuits.

Each charging section is a unit in itself, consisting of a slate front 24 inches by 10 inches, carrying the rheostat contacts and sliding brush; a low-current circuit-breaker; an instrument switch; a pilot lamp and grid-type resistance mounted on the back. On the upper left corner of the front a card holder is provided in which a card bearing the designation of the charging circuit can be inserted. Each section is supported by bolts to the frame and after disconnecting from the bus-bar can be readily removed if these bolts are taken out. For repairs or inspection a section can be taken out about as easily as a drawer or section from a filing cabinet. All levers, etc., are within easy reach and no operating rods are required. The rheostat being arranged adjacent to the controlling switch, eliminates the chance for error in operating the wrong rheostat. Meter readings are made without the charging circuit. The voltage and current may be read at any time by moving the corresponding instrument switch to the "reading" position. When it is desired to stop the charge, the circuit is opened by moving the instrument switch to the "open" point, the arc formed on opening the circuit being taken on the auxiliary contacts which are provided with magnetic blowout. This opening of the circuit de-energizes the low-current circuit-breaker which opens, disconnecting the battery from both sides of the line. When the plug is removed from the vehicle, the charging cable is entirely dead.

The sectional-bookcase idea of standard unit-type rheostats that can be assembled in any quantity seems to meet the garage requirements of not only the present but also the future, because of the ease of making additions.

The increased use of motor-driven baggage trucks has led to the development of a charging equipment particularly adapted to this class of vehicle. The rheostats are so arranged that when several trucks are charged in a group at one time, it is possible to effect a considerable saving in charging current.

Specialty Department.

A new design of a 660-watt push-button porcelain socket was put out of smaller size and more graceful appearance than the original C-H porcelain socket. A line of round-base and rectangular-base surface switches operated by means of push buttons was developed. This type of switch has no protruding key, the push-bar operating parallel with the wall on which the switch is mounted. Bases for use with all kinds of wiring have been developed.

One of the most interesting of the new devices is the No. 7605 "Split" plug. This attachment is small in size and has the appearance of a solid plug. But on removing the screw shell, which is held by an ingenious locking device, the plug separates into two halves making it easy to secure the flexible-cord terminals under the binding screws.

Replacing the screw shell automatically locks the plug. This type of plug is of particular advantage to the manufacturer who supplies plugs with his products. He can save a big labor cost by reducing the time of wiring. Black heat-resisting "Thermoplax" is used for the body insulation of this plug.

A separable-type motor attachment plug is one of the late developments of 1913. The base of this plug carrying the dead contacts, is designed for mounting permanently on vacuum cleaners, portable compressors, grinders, etc., while the cap with hidden contacts is for attaching to a flexible cord or cable such as is used with portable motor-driven devices. This plug is made of tough "Thermoplax" also and has the high rating of 10 amperes, 250 volts.

Through the great increase in the use of electricity for lighting purposes on automobiles a number of new combinations of the C-H quick make-and-break automobile lighting switches have been devised. In addition to the single-pole switch, three-point, three-wire and double-pole switches are made. C-H arrangements for dimming the headlights by means of a dimmer resistance and by the series-parallel connection are now in use on many makes of automobiles while special gang arrangements have also been called for by the automobile manufacturers. An automatic automobile door switch has also been added because of a demand for such a device.

As completing the separable attachment-plug line, three types of attachment-plug receptacles were brought out. With these receptacles made in the flush, wall and molding types, the standard C-H attachment-plug cap can be used.

A two-circuit brass-shell pendent switch has also been designed which has twin mechanisms similar to the mechanism in use in the No. 7007 "Acorn" single-pole brass-shell pendent.

New Magnetic-Type Multiple Disk Brakes.

A new magnetic disk brake having the prominent feature of accessibility of parts is another 1913 product. The mere loosening of the three bolts which secure the magnet coil in place, gives access to the disks which can be slid out of the case along the shaft. No other work is necessary. Ventilation is also secured for the first time in multiple disk brakes. The rotating disks have cored radial passages similar to those in the runner of a centrifugal pump. When set in motion, air is drawn in through inlet passages in the hub and ejected through outlets provided in the side of the inclosing frame, under the cover. The ventilation secures better capacity and wearing qualities and it is claimed that no lubrication is required.

The selection of proper-size brake for different kinds of service is made possible, as this new line is rated in horsepower, maximum torque in pounds-feet, and capacity in foot-pounds per minute.

The same method of thorough impregnation of the magnet coil that is used for Cutler-Hammer lifting magnets is employed in water-proofing the brake coils.

The hand magnet has been redesigned and a new quick make-and-break switch placed in the handle casting. This gives better control of the magnetizing and demagnetizing of the magnet poles.

Further developments in rail and plate magnets were made during the past year as well as in the construction of the motor-driven cable reel and magnet controller.

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Electrical Equipment of National Copper Mining Company.

The electrification of the property of the National Copper Mining Company in the Coeur D'Alene District of Idaho constitutes one of the most interesting that has been made in that district for some time.

Power will be purchased from the Washington Power Company under a contract which makes it desirable for the Mining Company to maintain as high a power-factor on the load as possible. The Mining Company has water rights from which approximately 600 kilowatts can be developed, and it was determined to utilize this to supply part of the power requirements of the mine and mill and at the same time to use these generating stations to improve the power-factor as much as possible. Accordingly two hydroelectric plants will be built on Dead Man's Creek, located so as to secure the maximum amount of power from the available water. In each plant there will be installed an impulse-type water wheel driving a 200-kilowatt, three-phase, 60-cycle generator. These plants will be connected to the load in parallel with the power supply of the Washington Water Power Company. There will be no attempt made to regulate the load taken by these plants, and as a consequence the water wheels will not be supplied with governors of the ordinary design. They will, however, be supplied with overspeed governors which will deflect the water-wheel nozzles in case through any accident the load on either or both of the plants is disconnected, which would tend to allow the water wheel to race. When the machines are connected in parallel with the Washington Water Power Company's lines, the frequency delivered by the Power Company will necessarily fix the speeds at which the generators can run and they will take as much of the mining company's load as the water running through the water wheels will permit. They will, therefore, always be developing as much power as possible, yet their speed will be fixed and held constant by the frequency of the power company's supply lines.

The fields of these generators will be so designed that by adjusting the excitation properly a very high power-factor on the entire load will be secured.

One of these hydroelectric plants will be designed for operation in the usual manner by an attendant in the station. The other plant is designed to run without attendance and the generator may be connected to or disconnected from the load from a distant point (the compressor station at the mine) by means of electrically operated switches. The governor on the water wheel will be also controlled by the same mechanism which operates the switches and the plant will be stopped or started without anyone going near it.

The installation at the mine will consist of approximately 300 horsepower in induction motors, the largest being a 200-horsepower Westinghouse motor driving an air compressor.

The mill, which has been designed and is being built by the General Engineering Company, of Salt Lake City, will be driven by approximately 600 horsepower of induction motors. Each department of the mill will be driven by a separate motor, the two largest individual machines being a 300-horsepower motor on the Hardinge Mill department, and a 200-horsepower motor on the dry-crushing department. All the motors will be equipped with suitable protective apparatus to cut them off from the supply lines in case of overload or in case of failure of power.

Electric haulage will be used underground to handle the ore, and the ore will be transported from the tunnel mouth to the mill over an electric railway, which is rather unique in some of its features. The run from the adit to the head of the mill is about 10,000 feet long and in this distance there is a drop of 459 feet in elevation, necessitating a grade of 4.5 per cent on the railroad. The railroad is built along the side of Dead Man's Gulch and has a 24-inch gauge and is laid with 30-pound rails. The ore will be transported down this railway in trains of from 8 to 12 cars each car carrying from 4 to 5 tons of ore. The equipment is designed to handle a tonnage of 500 tons in two shifts of eight hours each. The average haul within the tunnel will be about 5,000 feet, and the grade on this inside run will only be 0.5 to 1 per cent.

From the above it will be seen that a comparatively light locomotive would handle all of the work inside of the tunnel, but that a locomotive of about eight tons in weight on drivers would be required for the work on the electric railway from tunnel mouth to the mill. It was, however, considered undesirable to have two different types of locomotives which could not be used interchangeably, and this was particularly so in view of contemplated extensions underground which might require the service of an additional locomotive. Accordingly it was decided to standardize on a four-ton locomotive, which could be used independently underground, but which could be consolidated into an eight-ton tandem unit for haulage over the electric railway. This arrangement is of particular advantage in that it reduced the number of motormen required. Other advantages are that a double four-ton tandem unit is easier on the rails than a single eight-ton unit would be, and also that with the gauge in use, adequate motor capacity of good design can be placed between the wheels of the locomotive.

It is estimated that the tonnage handled can be doubled by adding another four-ton locomotive at a later date, and arranging motors so that the two locomotives used underground be used alternatively as the following unit of a tandem couple with a third locomotive operated only on the outside haul.

It was originally intended to install a gravity tram to take care of the transportation of the ore from the adit to the mill, but a careful engineering investigation proved that an electric railway would handle the ore considerably cheaper even on the steep grade involved. In fact, a very careful analysis which was made before the above decision was reached indicated that the saving of the electric railway over that of the tramway would amount to several cents per ton handled. The installation cost of the railway is a little less than the estimated installation cost of an aerial tramway. The saving in operating cost is effected by obviating the necessity of handling the ore at the tunnel mouth, and by reduced labor charges at the mill. With the installation as at present made, the trips will be made up at the ore chutes in the mine and the complete train as made up at that point will proceed out through the tunnel over the railway to the storage bins at the mill, where the same crew, consisting of a motorman and a trip man, who came out with the train, will see to dumping ore.

All of the electrical equipment for this installation is being furnished by the Westinghouse Electric & Manufacturing Company. The electrical design for the mill equipment is in the hands of the General Engineering Company and the electric haulage system is the work of F. Cushing Moore, chief engineer of the National Copper Mining Company, who worked in conjunction with the engineers of the Westinghouse Company.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—J. Lang Electric Company, 423 North Lincoln Street, Chicago, Ill.

"Lang" panelboard cabinet, steel and wood, styles MF, MW, OF, OW, PF, PW, QF, QW, RF, RW, SF, SW and UF.

Samples of this product have been examined and tested by the Underwriters' Laboratories, and found in accordance with standard requirements.

Commercial products of this class, which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced, bear uniform labels by which they can be identified in the field.

Approved November 11, 1913.

FLEXIBLE CORD.—Canadian General Electric Company, Limited, King and Simcoe Streets, Toronto, Can.

Marking: One black cotton thread cabled with the strands.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved December 1, 1913.

PANELBOARDS.—J. Lang Electric Company, 423 North Lincoln Street, Chicago, Ill.

"Lang" two and three-wire panelboards, 125 and 250 volts, with or without knife switches in branch circuits, with open link or National Electrical Code standard cartridge or plug-type fuses.

"McWilliams" metering panel, two or three-wire, 125 and 250 volts.

"Universal" panelboard, two or three-wire, 125 and 250 volts.

Samples of this product have been examined and tested by Underwriters' Laboratories and found in accordance with standard requirements.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced bear uniform labels by which they can be identified in the field.

Approved November 11, 1913.

RECEPTACLES, Standard.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C. E. M. Co." 3 amperes, 250 volts. Molding, catalog Nos. 2756 and 2757.

Approved November 17, 1913.

RECTIFIER.—Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.

Type G, vibrating rectifier for use on 110-volt, alternating-current circuits for charging three-cell storage batteries.

This device consists of a transformer and an electrically operated vibrating reverse switch.

Note.—Vibrating contacts in operation are capable of producing arcs which may, under certain conditions, ignite inflammable vapors. Devices having such contacts should preferably be placed outside rooms likely to contain such vapors, or, if in such rooms, must be installed in compliance with the requirements of the inspection department having jurisdiction.

Approved November 29, 1913.

SWITCHES, Surface Snap.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, round handle, catalog Nos. 400-03 inclusive, 410-13 inclusive; 5 amperes, 250 volts, 10 amperes, 125 volts, round handle, catalog Nos. 420-23 inclusive.

Double-pole, 5 amperes, 250 volts, round handle, catalog Nos. 440-43 inclusive; 10 amperes, 250 volts, round handle, catalog Nos. 450-53 inclusive.

Three-way, 1 ampere, 250 volts, 3 amperes, 125 volts, wing handle, catalog Nos. 358-9; round handle, catalog Nos. 458-9; 3 amperes, 250 volts, 5 amperes, 125 volts, wing handle, catalog Nos. 360-1; round handle, catalog Nos. 460-1; 5 amperes, 250 volts, 10 amperes, 125 volts, wing handle, catalog Nos. 365-6; round handle, catalog Nos. 465-6.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, round handle, catalog Nos. 475-6.

Approved November 20, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

DE GRAFF, MINN.—Bonds will be voted for electric lighting. C. D. Noonan is clerk. C.

CLARA CITY, MINN.—Electric light bonds have been voted and the lights will soon be installed. C.

QUINCY, ILL.—The City Council will soon ask for bids for lighting the streets of the city. Z.

MISSION, TEX.—The town is planning to grant a franchise for an electric-light plant. Address the town clerk.

ELLSWORTH, MINN.—Earl D. Jackson, a St. Paul consulting engineer, is making plans for a light plant in this city. C.

BARBOURVILLE, KY.—The Council is planning to install an electric light plant here. Address the city clerk.

VOLGA CITY, IOWA.—Oscar Weisner has been granted a 25-year franchise to establish an electric light and power plant here.

PARKER'S PRAIRIE, MINN.—An electric light system will be established here. Address the city clerk for desired information.

WYOMING, O.—The citizens of this place are planning to establish a municipal electric light plant. Address William B. Hay, mayor.

PHILADELPHIA, PA.—William C. Dettler is preparing plans and specifications for a power plant, to be erected at Harrisburg. N.

CHARLOTTE, N. C.—The Marshall Field Company is planning to construct a power plant to supply its five big cotton mills near Spray.

HAMILTON, MO.—H. L. Gilbert and David Miller, of Kansas City, have been granted a franchise to construct an electric light plant here.

MALDEN, MASS.—The installation of ornamental street lights on Malden square is about to be undertaken by the city of Malden, Mass. W.

DELL RAPIDS, S. D.—N. C. Draper has been granted a franchise for electric lights and power. James Ridlington is city auditor. C.

ST. PAUL, MINN.—Adolph Meyer, consulting engineer, Germania Life Building, is making plans for a power plant at the high dam. C.

IRVINE, KY.—The city will grant a franchise for an electric light plant to be established here. Address V. M. Gaines, secretary, for particulars.

LUDLOW, ILL.—It is reported the Champaign County Electric Company of Urbana contemplates erecting an electric light plant here. Z.

SIOUX CITY, IOWA.—The Sioux City Gas & Electric Company will expend $100,000 extending its mains. Address L. L. Kellogg, general manager.

JERSEY CITY, N. J.—The Board of Freeholders is considering the installation of an ornamental street-lighting system along the county boulevard.

NORWALK, CONN.—Third District residents plan to build a municipal plant in East Norwalk. Address the City Commissioner in regard to the project.

WATWICK, N. D.—The Utilities Company, of Devil's Lake, will establish a light, power and heating plant here. F. E. Corson, of Fargo, is president of the company.

CASSELTON, N. D.—A franchise has been granted to Hallett & Lynch for installing an electric light plant and furnishing street lighting. W. T. Sprake is city auditor. C.

LA CROSSE, WIS.—A committee has been appointed by Mayor O. J. Sorensen to investigate the feasibility of installing a municipal electric-light plant here.

FLOODWOOD, MINN.—The Commercial Club has appointed a committee to investigate the cost of a municipal electric light plant and water works system. C.

DAWSON SPRINGS, KY.—Dawson Light & Power Company has been incorporated with a capital stock of $10,000 by D. B. Kevil. J. S. Kevil and E. A. Stevens.

MONTICELLO, MINN.—Jacob and Theodore Kautt, St. Paul, have incorporated as Monticello Electric Light & Power Company, and will furnish electric light for the town.

BURKBURNETT, TEX. — Burkburnett Light Company has been incorporated with a capital stock of $5,400 by C. W. Wigham, Ben Schwegler and August Lohenfener.

PADUCAH, KY.—The City Light Company is preparing to construct an underground conduit system in the business section, and will install lighting standards in that district. G.

ST. ANTHONY, IDAHO.—The Utah Power & Light Company plans to build a $75,000 power plant at this place. Address Markham Cheever, chief engineer, for particulars.

CANDO, N. D.—At a mass meeting of the citizens it was decided that if the city would pay for the electricity the business men would install the system. Address the city clerk for further information.

WILLIAMSON, W. VA.—January 5 bids will be received by the City Council for the installation and maintenance of street lighting for a period of five years. Address the city clerk.

LEBANON, PA.—A franchise has been granted to the Weaver Electric Light Company, otherwise known as the Lebanon Valley Company, to operate in this city for a period of 50 years. N.

SIDNEY, ILL.—The Village Board has granted U. S. Thompson a franchise to operate an electrical distributing system in the village. He also has been awarded a contract to light the village streets. Z.

YORKTOWN, TEX.—The Yorktown Light & Ice Company has been purchased by E. A. Clousnitzer, who will make extensive improvements to the electric light plant and extend the lighting system. D.

WASHINGTON, D. C.—The Commissioner of Fisheries is considering the establishment of a fish hatchery at Booneville, Ky. Motor-driven pumps will be purchased if the hatchery is established. G.

MT. VERNON, ILL.—The City Council has voted to the Citizens' Gas, Electric & Heating Company, a 35-year franchise to operate an electric light plant. The company contemplates improvements to its plant. Z.

PORT CLINTON, O.—Plans are being drawn by the United Engineering Construction Company, Cleveland, for the municipal lighting plant, for which a bond issue of $30,000 was recently voted. Bids will be sought soon. R.

BOWIE, TEX.—The Bowie Light & Power Company has been organized here with a capital stock of $50,000. A light and power plant will be erected. The incorporators are Hiram Grosman, Mose Grosman and W. C. Woodlief.

MT. CARMEL, ILL.—The Public Utilities and Service Company has decided to increase its capital to $300,000. It is planned to erect another power plant at some time in the early future. Address Philip Barnhard, of New Philadelphia, O.

FREEHOLD, N. J.—The Monmouth Lighting Company has been granted permission by the Board of Public Utility Commissioners for the issuance of bonds and stock for $6,400 for extensions in its electric lighting system in the vicinity of Marlboro and Englishtown. A.

MANSFIELD, O.—H. Whitford Jones, consulting engineer of Cleveland, will soon be ready to present to the Council complete plans for a new lighting system. Resident and downtown sections of the city will have ornamental lights. Bids will be asked on several different plans. R.

STERLING, ILL.—At a meeting of factory owners a committee consisting of E. J. Cochran and Peter Frantz was appointed to investigate the possibilities of a co-operative electrical generating plant to supply power for driving machinery at the various factories in the city. Z.

BROWNWOOD, TEX.—The City Council is considering the proposition of installing electric equipment at the water works plant. A street lighting contract for eight years has been made with the Texas Power & Light Company for 142 lamps at the rate of $216 per month. D.

PETERSBURG, ILL.—The Abbott Light & Power Company has been incorporated with a capital stock of $300,000 to furnish light, heat and power and manufacture machinery pertaining thereto. The incorporators are Richard H. Abbott, Ira R. Abbott and A. E. Abbott.

DASSEL, MINN.—A movement is on foot among the farmers near here to secure electric light and power to operate machinery on their farms, the farmers to pay expense of building the pole line and the local company to do the work and wiring. Miles Sisson and Peter Stone are interested. C.

LIVINGSTON, TENN.—An ordinance has been adopted granting a franchise to the Livingston Electric Light & Power Company to install and operate an electric-light plant in Livingston. Address D. B. Hayes, city clerk, in regard thereto.

WOOSTER, O.—Business men have taken the proposition of ornamental lighting around the public square up with the City Board of Commissioners and action on the matter is expected soon. It is urged that a system of lighting be installed to conform with the systems of neighboring business houses. R.

REDDING, CAL.—The Pitt River Power Company has been granted a franchise by the Shasta County Board of Supervisors to operate in Fall River and Burney Valleys. A plant is to be erected at Burney Falls, capable of generating 1000 horsepower, which will cost approximately $50,000.

NEW YORK, N. Y.—Aux Cayes & Jeremie Electric Lighting Company has been incorporated, capitalized at $1,000,000, to install and operate electric light and power plants. The incorporators are H. O. Hance, Plainfield, N. J.; J. S. Price, Belleville, N. J.; and L. Durand, of New York City.

WASHINGTON, PA.—The Relief Electric Light, Heat and Power Company has been granted a franchise by the City Council. The new company agrees to furnish service within one year, and also agrees to pay $10,000 to the borough if the franchise should be sold to another company. At present the West Penn Electric Company is the only company which is operating in that field. S.

CALGARY, ALTA.—The feasibility of developing 40,000 continuous horsepower within 50 miles of Calgary was reported on at the annual meeting of the Industrial Bureau. Government engineers have passed upon the power possibilities favorably, and the municipal authorities contemplate the acquisition of the power rights and the construction of four generating plants within the next 18 months. Address the clerk of the Board of Public Works for information.

CLEVELAND, O.—The Council has authorized the expenditure of $60,000 for the purchase and installation of general piping for the new municipal lighting plant, including hot and cold wells, motor and steam driven pumps, piping, fittings, valves, measuring and recording instruments and other appurtenances. It was also arranged that $45,000 be spent for transformers, foundations, wiring, instruments, switchboards, etc. J. W. Springborn is director of public service, and R. E. Collins, city clerk. R.

MILFORD, PA.—The Shohola Falls Hydro-Electric Company has increased its capital from $6,000 to $4,500,000. The promoters of the enterprise plan to develop power on the Delaware River from Belvidere, N. J., to its source and all its principal branches. For this purpose the company has purchased considerable land as sites for dams and power stations. The concern is composed of New York capitalists who several months ago took over certain Canadian interests, paying $1,000,000.

SHELTON, WASH.—D. F. Wright, president of the Mason County Abstract & Title Company, is representing interests which recently purchased a water-power site on the Skykomish River in Mason County, and which will build a large power plant. W. G. Rex, of this city, has already been awarded the contract to clear the dam site and grounds, and erect buildings for a crew, already on the ground. There is an unconfirmed rumor to the effect that the Chicago, Milwaukee & St. Paul Railway Company is back of the movement. O.

BREMERTON, WASH.—Gustav F. Rust, of Colby, Wash., representing capitalists, recently offered to build a lighting and power plant at Elden, on the Hama Hama River, and to extend power lines to Bremerton, and after two years turn the plant over to the City for the sum of $350,000. Proposed plant will develop 10,000 horsepower, sufficient to furnish light and power for several cities in Kitsap County, besides furnishing power for street-railway systems in Bremerton and interurban system connecting other towns nearby. The City Council is seriously considering the proposition, which will be definitely settled shortly after the first of the year. C.

PITTSBURGH, PA.—Merger papers for about 100 electric companies have been filed at the office of the Secretary of the Commonwealth at Harrisburg. All these concerns, operating in Allegheny, Westmoreland, Washington, Greene, Fayette and Armstrong Counties will be combined into one big corporation by the interests owning the West Penn Light Company, of Pittsburgh. The plans contemplate operations under the new order beginning January 1. Under the act creating the Public Utilities Commission in Pennsylvania this body will have authority to pass upon the necessity of incorporation of companies to furnish current, water, gas and other forms of service.

TUCSON, ARIZ.—A hydroelectric power company, headed by Ralph Cameron, Col. Epes Randolph and Eugene S. Ives, has been tentatively organized here to construct a large power dam across the Colorado River at the Grand Canyon near Bright Angel Trail to develop an enormous amount of electrical energy. The power would be transmitted to towns, mining camps and irrigation districts in every part of the state. The reservoir would also furnish water to irrigate large tracts of land. Ralph Cameron, former delegate to Congress from Arizona, controls the water-power rights at the proposed site at the foot of Bright Angel Trail. An option on this proposed power project was formerly held by the Magenheimer interests, which developed the Tucson Farms Company project.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

HENDRICKS, S. D.—The Deuel Telephone Company has been granted a franchise.

BREMEN, N. D.—C. W. Saylor has been granted permission to construct a telephone system here.

LEAVENWORTH, WASH. — The Pacific Telephone Company will build an additional copper circuit between Ole Elum and Blewett to cost $8,000.

HILL TOP, OKLA.—The Hill Top Telephone Company has been incorporated with a capital stock of $3,000 by W. D. Marshall, E. S. Seimenskie and others.

SUSSEX, N. J.—The Mutual Telephone Company will make extensions in its system from Beemerville to Branchville, and from Sussex to Hamburg.

CORA, OKLA.—A charter has been granted to the Moyer Telephone Company. The incorporators are F. H. Lyon, D. C. McMurphy and O. W. Hill, all of Cora. P.

PETERSBURG, ILL.—The Menard County Board of Commissioners has granted a 50-year franchise to the Menard County Telephone & Telegraph Company. Z.

DYERSBURG, TENN.—The Dyer County Home Telephone Company, has been incorporated with a capital stock of $10,000 by W. H. Ward, John N. Parker and others.

HAZEN, N. D.—William E. Welch and Charles Wright, of the Knife River Telephone Company, are endeavoring to interest local men in their telephone stock and telephone system. C.

TEUTOPOLIS, ILL.—Teutopolis Telephone Company has been incorporated with a capital stock of $10,000 by Joe Pudenz, J. W. Wilke and Edward H. Gardewine.

LOS ANGELES, CAL.—An additional expenditure of $60,000 has been authorized by the Pacific Telephone & Telegraph Company for improvements in the Vermont district.

STEUBENVILLE, O.—The Jefferson Telephone Company has been incorporated with a capitalization of $400,000 by P. P. Lewis, E. E. Francy, W. H. Burgoyne, J. A. Heinlein and Fred Meininger.

SILVER HILL, O.—Silver Hill Telephone Company has been incorporated with a capital stock of $1,800 to operate a rural telephone. The incorporators are Eli Carney, T. S. Allen, L. Cain, D. W. Richmond, all of Silver Hill.

NASHVILLE, TENN.—The Timothy Branch of the Home Telephone Company has been incorporated with a capital stock of $1,000 by W. L. Mainard, A. C. Sullivan, T. M. Davis, J. A. Howard, J. H. Eldridge and J. W. Buck

EUGENE, ORE.—Preparations are being made by the Western Union Telegraph Company and the Southern Pacific Company to begin construction on a telegraph line between Eugene and Acme, following the route of the Willamette Pacific railroad. O.

WHEELING, W. VA.—Starting immediately the Central District Printing & Telephone Company will make improvements in the Wheeling subdistrict which will amount to nearly $30,000 and will include the surrounding towns of Warwood, Ulrichville and Altenheim.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MIDDLEBORO, KY. — J. R. Young is considering the construction of an interurban traction line to Pinncale Rock, a distance of 16 miles. G.

JACKSON, TENN.—The Merchants' and Manufacturers' Association is in charge of a project for the construction of a trackless trolley line to Bemis, Tenn., a cotton manufacturing suburb of this city. G.

PRESCOTT, ARIZ.—The Nelson Mining Company will build a narrow-gauge electric railroad from Crown King to its holdings about a mile distant. An electric power plant will be erected at Crown King. D.

NASHVILLE, TENN.—The Nashville, Chattanooga & St. Louis Railroad will install an interlocking system of electric signals on its line. There will be sixty-one operating units. The cost will be over $50,000. G.

WESTON, W. VA.—Weston & Glenville Electric Railway Company has been incorporated with a capital stock of $500,000 by Louis Bennett, Andrew Edmiston, J. A. Chittum, R. T. Goe and Lloyd Rinehart, of Weston.

HERSHEY, PA.—M. S. Hershey, head of the Hershey Chocolate Company, it is announced has decided to extend his electric railway system now running through the rich dairy district in the southwestern section of the county.

KELLOGG, IDAHO.—Chris Wiese, representing Kellogg capital, announces that a street car line will be built from Wardner to Kellogg, during 1914. The Bunker Hill-Sullivan Mining Company of Wardner is interested in the project. O.

EAST ST. LOUIS, ILL.—The East St. Louis & Suburban Railway Company contemplates improvements to cost about $100,000, including a new office building, new cars and tracks and extension of lines. L. C. Haynes, East St. Louis, is vice-president and resident manager.

TROUTLAKE, WASH.,—There is a current report that an electric railway will be constructed from the Columbia River to Troutlake and Glenwood country north of White Salmon. The men who propose to finance the scheme promise to begin operations within 72 hours after rights of way are secured.

PARKER, ARIZ.—Articles of incorporation are being prepared for the Parker & Colorado River Railway Company, a new subsidiary corporation of the Parker Improvement Company, the purpose of which will be to operate an electric railway in this city and vicinity. Application for a franchise has been made to the Board of Supervisors.

RALEIGH, N. C.—A charter has been granted to the Dan River Railway Company of King, for operating interurban electric lines between towns in Stokes and adjacent counties and for developing water powers. The capital is $500,000 and the incorporators are Harlee Miller, B. E. Kapp and others.

LOS ANGELES, CAL.—Mr. R. M. Moore, general manager of the Angels Flight Railway Company, has announced that the entire system will be remodeled. New machinery with greater lifting capacity and stronger cables will be installed. The machinery will consist of a new motor, new controlling gear and an endless cable, tested to support 35 tons.

BLAINE, WASH. — The Blaine-Lynden Electric Railway Company recently filed articles of incorporation for the purpose of building an electric line from Blaine to Lynden, which will connect with the British Columbia Electric Railway extension from Cloverdale through White Rock, to the boundary line between United States and British Columbia. Building operations will begin early in 1914. O.

FORT SCOTT, KANS. — The Fort Scott & Pittsburg Railway Company has been incorporated with a capital stock of $5,000 to build an interurban from Fort Scott through Garland, Arcadia, Mulberry and Frontenac to Pittsburgh, a distance of 38 miles in all. The incorporators of the company are A. B. Dickinson, C. D. Sample, W. J. Calhoun, A. M. Keene, J. R. Kearns, R. B. Barr and Walter Gunz, all of Fort Scott.

MORRIS, ILL.—The Wisconsin, Illinois & Indiana Railway Company has filed articles of incorporation, with a capital stock of $500,000, to construct and maintain an electric line from the northern line of McHenry County, south to the east lines of Cook, Iroquois and Kankakee Counties. The incorporators are J. C. Williams, Evanston; J. B. Huling, Downers Grove; H. M. Walker, Evanston; and James L. Clark and C. H. Seeberger, Chicago.

FRESNO, CAL.—Construction will commence on a new road to be known as the Fresno & Clovis Interurban Railway about February 1 and will be completed during the middle of the summer of 1914. It is said that all arrangements for the financing of this new line have been completed, and its course will be from Fresno to Academy by way of Clovis in this state. The road will run through 21 miles of a hitherto uninvaded fruit and mineral territory. It is said that articles of incorporation will be filed in San Francisco soon and the amount of issued capital will be $500,000.

NASHVILLE, TENN.—Active work on the Nashville Traction Company's plant and tracks in Nashville is to be started in the early future. A meeting of directors has been called for January 3. At this meeting the Detroit & Nashville Construction Company will be organized for the purpose of doing the building work for the traction company. The capital stock, paid up, of the construction company will be $500,000. It is intended to have everything ready to begin construction of the new road by the first of February.

OTTAWA, KANS.—Two hundred residents of Olathe, Ottawa, Baldwin and intervening towns recently met in Kansas City and unanimously indorsed a movement to extend the Strang electric line to Ottawa. Plans for the proposed extension include 33 miles of track and a powerhouse at Olathe, the whole to cost about a million dollars. The cost of the powerhouse will be about $300,000. Among those interested in the project are John P. St. John, former governor of Kansas; F. M. Hartley, president of the Community Club of Baldwin; F. M. Harris, attorney at Ottawa; A. H. Slater, mayor of Ottawa, and the mayor of Kansas City.

NEW PUBLICATIONS.

TESTING OF MATERIALS.—Circular No. 45 of the Bureau of Standards, Washington, D. C., is entitled "The Testing of Materials." It contains general information concerning this activity of the Bureau and the classes of materials tested, and describes separately the tests carried out upon the various materials. A schedule of fees is also given.

ELECTROLYSIS IN CONCRETE.—The Bureau of Standards has published Technologic Paper No. 18 entitled "Electrolysis in Concrete," by E. B. Rosa, Burton McCollum and O. S. Peters. This gives a detailed report of investigation relating to the nature and cause of electrolysis, discusses the possibility of trouble from this source and describes protection measures. A bibliography of the subject is appended.

PROPOSALS.

ELECTRICALLY OPERATED SWITCHBOARD APPARATUS.—Bids will be received on January 29 for the manufacture and delivery of electrically operated switchboard apparatus and accessories.. Address, M. Peterson, Secretary, Winnipeg, Canada.

ELECTRICAL WORK.—In connection with the erection of a new 13-room school, bids will be received up to January 14, by the Board of Education, Lodi, N. J., for electrical work, and heating and ventilating work for the new building. Anton L. Vegliante, First National Bank Building, Garfield, N. J., is architect. A.

MISCELLANEOUS ELECTRICAL FITTINGS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until January 10 for furnishing switchboard, electric cable, conduit and fittings and miscellaneous electrical apparatus, as per Canal Circular 815. Blanks and general information may be obtained from any of the Assistant Purchasing Officers located in all of the large cities of the United States.

FIRE ALARM TRANSMITTERS.—Bids will be received on January 5 for one single-dial, four-number, two-speed closed-circuit fire-alarm transmitter to operate ten closed gong circuits and ten closed joker circuits, making a total of 20 closed circuits. Said fire-alarm transmitter must be supplied with metallic pedestal design, the finish of which shall be acceptable to the director of public safety; also for 16 perfect non-interfering fire-alarm signal boxes and 10 seven-call, two-circuit police signal boxes. Address B. L. Barger, Director of Public Safety, Columbus, O.

MISCELLANEOUS ELECTRICAL SUPPLIES.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until January 13 for furnishing 1,586 feet of single conductor, 660 volts, to be delivered at the Navy Yard, Key West, Fla., as per Schedule 6158; two 100-ampere watt-hour meters, and three transformers, to be delivered at the Navy Yard, Norfolk, Va., as per Schedule 6158; and until January 27 for furnishing six 10-kilowatt turbogenerating sets, to be delivered at the Navy Yards, Boston and Norfolk, as per Schedule 6186.

FINANCIAL NOTES.

The Kaministiquia Power Company proposes to increase its authorized capital stock from $2,000,000 to $2,500,000 and will make an issue of about $200,000 to defray the cost of an additional installation of 12,000 horsepower.

Brown Brothers & Company has acquired the securities of the Lehigh & Northampton Light, Heat & Power Company. The company's gas plant has been turned over to the United Gas Improvement Company to be operated as part of the Allentown-Bethlehem Gas Company. The electric light and power portion of the business has been taken over by the Lehigh Valley Light & Power Company, a subsidiary of the Lehigh Valley Transit Company.

Puget Sound Traction, Light & Power Company stockholders have voted to authorize an issue of notes or short term bonds for refunding $7,500,000 two-year mortgage bonds, maturing February 1, next, and to provide for extensions, improvements and betterments to properties. It is probable the new issue will not extend over five years. To refund a portion of the $7,500,000 maturing notes the company recently issued $2,686,200 new preferred shares at par.

The Shohola Falls Hydroelectric Company of Milford, Pa., has filed notice of an increase of its stock from $6,000 to $4,500,000. Some months ago this company, composed of wealthy New York City capitalists, took over Canadian interests, paying for the same $1,000,000. They propose to use the Delaware River from Belvidere, N. J., the low point, to the source of the Delaware and all its principal branches, for hydroelectric development. The new company has already purchased considerable land, on which to erect dams and power stations.

The board of directors of the American Public Utilities Company, Grand Rapids, Mich., has decided to increase the quarterly dividend on the common stock of the company from one-half of one per cent to three-quarters of one per cent, thus placing the stock on a three per cent basis. The usual dividend of one and one-half per cent was declared on December 11, on the preferred stock.

Dividends.

Central & South American Telephone Company; quarterly of 1.5 per cent, payable January 9 to stock of record December 31.

Central Mexico Light & Power Company; a quarterly dividend of 1.5 per cent, payable December 31.

Chippewa Valley Railway, Light & Power Company; a common quarterly dividend of two per cent, payable January 1 to stock of record December 31.

Citizens Traction Company (Oil City, Pa.); a preferred dividend of $1 per share, payable January 12 to stock of record December 31.

Citizens Traction Company, Philadelphia; a dividend of two per cent on the preferred stock, payable January 12 to stock of record December 31.

Kansas Gas & Electric Company; quarterly dividend of 1.75 per cent, payable January 1 to stock of record December 23.

Mexican Telegraph Company; quarterly of 2.5 per cent, payable January 16 to stock of record December 31.

Mountain States Telephone & Telegraph Company; a quarterly dividend of 1.75 per cent, payable January 15 to stock of record December 31.

Nashville Railway & Light Company; a quarterly preferred dividend of 1.25 per cent, payable January 1 to stock of record December 26.

National Carbon Company; quarterly of 1.5 per cent on the common stock payable January 15 to stock of record January 5.

New England Investment & Security Company; a preferred dividend of $2 per share, payable January 1 to stock of record December 20.

Porto Rico Railways; a preferred quarterly dividend of 1.75 per cent, payable January 2 to stock of record December 20.

Southern New England Telephone Company; a quarterly dividend of 1.75 per cent, payable January 15 to stock of record December 31.

Stark Electric Company; a quarterly dividend of 0.75 per cent, payable January 1 to stock of record December 29.

United Gas & Electric Company; the regular semiannual dividend of 2.5 per cent on the preferred stock; payable January 15 to stock of record December 31.

Westinghouse Electric & Manufacturing Company; regular quarterly of 1.75 per cent on the preferred and one per cent on the common stocks. The common is payable January 30 to stock of record December 31, and the preferred January 15 to stock of record December 31.

Reports of Earnings.

YOUNGSTOWN & OHIO RIVER RAILROAD.

	1913.	1912.
October gross ....$	23,070	$ 23,226
Net after taxes.......	9,046	9,041
Surplus after charges.	4,900	4,875
Four months gross....	94,485	89,209
Net after taxes........	36,689	35,352
Surplus after charges.	20,022	18,685

NEW YORK RAILWAYS.

	1913.	1912.
October gross ....$	1,264,953	$1,255,203
Net after taxes........	412,787	400,889
Other income	37,126	37,976
Total income	449,914	438,866
Interest on underlying bids	222,667	224,788
Interest on refunding 4s	54,320	54,331
Total interest	276,987	279,119
Balance	172,927	159,747
Passengers carried.....	25,045,960	24,227,565
Four months gross....	4,838,743	4,740,667
Net after taxes........	1,490,273	1,457,049
Other income..........	122,461	138,286
Total income........	1,612,733	1,595,335
Interest on underlying bids	890,223	899,014
Interest on refunding 4s	217,279	217,322
Total interest	1,107,502	1,116,336
Balance	505,231	478,999
Passengers carried.....	95,464,889	91,475,490

NORTHERN TEXAS ELECTRIC.

	1913.	1912.
October gross ....$	201,479	$ 201,567
Net after taxes.......	100,362	111,857
Surplus after charges.	76,196	86,917
Twelve months gross.	2,089,688	1,727,037
Net after taxes.......	946,535	810,392
Surplus after charges.	658,398	551,636

LAKE SHORE ELECTRIC.

	1913.	1912.
October gross ....$	117,720	$ 110,504
Net after taxes........	45,030	46,728
Interest	35,119	35,083
Surplus after charges	9,911	11,644
Ten months gross.....	1,193,592	1,109,024
Net after taxes........	492,606	478,655
Interest	351,324	349,500
Surplus after charges	141,281	129,154

GALVESTON-HOUSTON ELECTRIC.

	1913.	1912.
October gross ....$	193,411	$ 175,449
Net after taxes........	78,533	71,035
Surplus after charges.	43,039	37,310
Twelve months gross.	2,322,357	1,932,298
Net after taxes........	994,468	792,340
Surplus after charges.	578,925	415,133

HUDSON & MANHATTAN.

The report of the Hudson & Manhattan Railroad Company, for the nine months ended October 31, 1913, compares as follows:

	1913	1912
Gross ....$	4,065,186	$3,935,520
Net after taxes........	2,180,623	2,247,129
Deductions other than bond interest.........	202,161	173,333
Bond interest...........	*1,504,243	....
Balance	†474,219	....

*Prior to February 1, 1913, and not comparable.

†Available for interest on adjustment income bonds.

NORTHERN OHIO TRACTION & LIGHT.

	1913	1912
October gross...........$	279,360	$ 249,148
Net	105,039	100,056
Surplus after charges..	43,001	47,339
Ten months' gross.....	2,724,058	2,497,014
Net	1,078,701	1,090,351
Surplus after charges...	492,585	622,294

UNITED LIGHT & RAILWAYS.

(Subsidiary Companies.)

	1913	1912
October gross...........$	525,629	$ 467,674
Net after taxes.........	208,761	201,490
Surplus after charges	105,517	106,050
Twelve months' gross..	5,950,947	5,213,345
Net after taxes.........	2,422,180	2,128,614
Surplus after charges	1,225,585	1,019,656
(Holding Company.)		
October gross...........$	136,468	$ 110,649
Net after expenses and interest	96,926	77,306
Balance after preferred dividends....	52,284	44,651

Twelve months' gross, $1,425,566; net after expenses and interest, $972,003; balance after preferred dividends, $471,868.

BLACKSTONE VALLEY GAS & ELECTRIC.

	1913	1912
October gross...........$	116,100	$ 113,138
Net after taxes.........	41,166	43,386
Surplus after charges	23,704	26,667
Twelve months' gross..	1,312,529	1,212,768
Net after taxes........	514,190	369,763
Surplus after charges	314,470	255,197

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 29	Dec. 22
American Tel. & Tel. (New York)	123	122½
Commonwealth Edison (Chicago)	127	127
Edison Electric Illuminating (Boston)	241	236
Electric Storage Battery common (Philadelphia)	46¾	46
Electric Storage Battery preferred (Philadelphia)	46¾	46
General Electric (New York)	140	138
Kings County Electric (New York)	129	119
Manhattan Transit (New York)	1¼	1½
Massachusetts Electric common (Boston)	13	10¼
Massachusetts Electric preferred (Boston)	63½	64
National Carbon common (Chicago)	132	134
National Carbon preferred (Chicago)	113	113
New England Telephone (Boston)	132	131
Philadelphia Electric (Philadelphia)	25⅞	25¾
Postal Telegraph and Cables common (New York)	76	77½
Postal Telegraph and Cables preferred (New York)	65	65
Western Union (New York)	57¾	57½
Westinghouse common (New York)	66	64
Westinghouse preferred (New York)	112	112

PERSONAL MENTION.

MR. ROY BALDRIDGE, of Macomb, Ill., has been made manager for the Central Illinois Public Service Company at Plymouth, Ill.

MR. HARRY J. FRITH has resigned his position as district manager for the Central Illinois Utilities Company, with headquarters at Watseka, Ill., effective January 1.

MR. WILLIAM E. FINLAY, who resigned recently from the Chicago Fuse Manufacturing Company, has joined forces with the Detroit Fuse & Manufacturing Company, of Detroit, Mich., and will act as special representative for the territory he is familiar with, making his headquarters at 629 West Jackson Boulevard.

MR. JOHN KILGOUR has retired as president of the Cincinnati & Suburban Bell Telephone Company, a position which he has held since 1901, and has been succeeded by his son, BAYARD JOHN KILGOUR, who has been vice-president and general manager. John Kilgour will remain a member of the board of directors and also as president of the Cincinnati Street Railway Company. Bayard Kilgour will retain his position as general manager, with R. T. McCOMAS as assistant general manager.

MRS. WILLARD W. LOW and MRS. J. WARD THOMAS were the chaperons at the semi-annual luncheon of the Eta chapter of the Theta Sigma Phi, held at the Chicago Athletic Club, followed by a box party at the Illinois Theater, on December 27. Those present were Misses Virginia Austin, Lufrerry Low, Berna Honkamp, Frances Peck, Helen Southard, Florence McGuire, Hazel Hafner, Victoria Ready, Florence Wenham, Virginia Millner, Dorothy Work, Marie Page, Rani Boomer, Dorothy Bacon, Corinne Dewey and Ethyl Bishop.

MR. A. R. BONE, division commercial superintendent of the Chicago Telephone Company, who was elected president of the Electric Club of Chicago on December 4, will take office together with his associates at the annual meeting of the Club to be held on the evening of January 6. Mr. Bone was born at Shelbyville, Ind., June 25, 1871, and early in life entered the telephone business, associating himself with his father with the Greensburg (Ind.) Telephone Company. Mr. Bone has been engaged in telephone work almost continuously since that time, covering a period of 26 years, entering the employ of the Chicago Telephone Company in 1898 as solicitor. He was later made district superintendent, then manager of the Aurora (Ill.) exchange, and later was made special agent.

A. R. Bone.

MR. JOHN BELLAMY TAYLOR, after 14 years' connection with the General Electric Company, has given up his most recent position as engineer of the foreign department in order, as was announced in last week's issue, to take up work independently as a consulting engineer. Mr. Taylor was graduated from the Massachusetts Institute of Technology in 1897 in the electrical engineering course, following preparatory studies in the schools of Brookline, Mass., where he was born in 1875. Following graduation and before joining the forces of the General Electric Company, he was with the New England Telephone & Telegraph Company. Coming to the Boston office of the General Electric Company, in 1899, in the office of the district engineer, he remained there until 1902, when transferred to the railway engineering department at Schenectady. Mr. Taylor devoted considerable study to disturbances in telephone and telegraph lines, due to railway power, and in 1909 presented to the American Institute of Electrical Engineers a paper entitled, "Telephone and Telegraph Systems as Affected by Alternating-Current Lines," which embodied the results of his researches. He was engaged as expert adviser by the Western Union Telegraph Company in connection with the electrification of the New York, New Haven & Hartford Railroad. He has also pioneered much development work in acoustics, and in applying the oscillograph to the solution of telephone and telegraph problems. His original work in the study of the "overshooting" of tungsten filaments in incandescent lamps attracted widespread attention. Other matters which have engaged Mr. Taylor's attention and upon the study of which he has made a deep impression, are color photography, work with the stereoscope, microscope and spectroscope. In 1905 Mr. Taylor was awarded a prize of 1,000 francs by the *Association des Industriels de France Contre Les Accidents Du Travail* "pour son indicateur d'etat de charge d'un conducteur electrique." He has taken an active interest in the work of the American Institute of Electrical Engineers and other scientific and engineering societies. The past year he was chairman of the Schenectady Section of the American Institute of Electrical Engineers. He is an honorary member of the Association of Railway Telegraph Superintendents. Mr. Taylor is keeping his residence in Schenectady, where he has his laboratory, and expects to divide his time between there and New York City.

John Bellamy Taylor.

MR. JOHN F. CALDERWOOD has resigned as vice-president and general manager of the Brooklyn Rapid Transit Company. It is said that the office of general manager will be abolished. A new vice-president has not yet been selected. Mr. Calderwood has been associated with the company since 1902. He has been in the railroad business for 30 years. He will be connected in an advisory capacity with the company. In retiring Mr. Calderwood said that everybody connected with the company is to be congratulated upon the excellent showing made in the past and upon the great possibilities for the future.

MR. E. J. PIETZCKER, formerly Southwestern sales manager of the Standard Underground Cable Company, has been made Western and Southwestern sales manager in charge of the Chicago and St. Louis offices of the company, the combined territory of which, broadly speaking, embraces the Mississippi River Basin; he will divide his time between these two offices. Mr. Pietzcker has been connected with various branches of the wire and cable industry substantially throughout his entire business experience. He was born in Rochester, Ohio, December 22, 1857, and at first was connected with Sanborn and Warner, who operated under territorial contracts with the Washburn & Moen Manufacturing Company; upon their expiration in 1891 he was regularly connected with the latter company as Southern sales agent, for the states of Texas, Louisiana and Mississippi and the Republic of Mexico; in 1897 he was transferred to Chicago in charge of city sales until the Washburn & Moen Company was absorbed by the American Steel & Wire Company, for which company he later attended the Paris Exposition as a representative, in 1900, and was subsequently connected with its Chicago office as salesman and expert in the rail-bond department. In 1902 he joined the forces of the Western sales department of the Standard Underground Cable Company under Mr. J. R. Wiley in Chicago, where he continued until January 1, 1905, when the St. Louis office was established under Mr. Pietzcker's charge. Mr. Pietzcker is a member of various organizations, including among others the Missouri Athletic Club, Midland Valley Country Club, St. Louis Amateur Athletic Club, Engineers'

E. J. Pietzcker.

Club, League of Electrical Interests; he is also a Mason and a Shriner; member of the Knights of Pythias, Knights of Honor, an associate member American Society of Mechanical Engineers and American Institute of Electrical Engineers, and member of the Jovian Order. MR. W. M. ROGERS, formerly chief clerk and assistant to Mr. J. R. Wiley, in the Chicago office of the Standard Underground Cable Company, is appointed assistant western sales manager with headquarters at Chicago. Mr. Rogers has been connected with the Chicago office of the company since December, 1900, and is well known personally to very many of the company's customers in that territory. MR. R. C. HOUCK has been appointed assistant southwestern sales manager with headquarters at St. Louis. He has been connected with that office of the company since its organization in 1905, during which time he has represented the company as a salesman throughout its extended territory in the Southwest. MR. E. E. WOODBURY is added to the selling force of the St. Louis office and is transferred for that purpose from the general sales department of the company at Pittsburgh, with which he has been connected for the past six years.

NEW INCORPORATIONS.

LOS ANGELES, CAL.—The Pacific Electric Car Company has been incorporated here with a capital stock of $10,000 by J. C. Wormley, H. D. Hattel, and C. H. Van Velsor.

PHILADELPHIA, PA.—Machinery Equipment Company has been incorporated under the laws of Delaware to manufacture and deal in engines and to carry on a general mechanical and electrical engineering business. The capital stock is $100,000.

HORNELL, N. Y.—The Bond Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $5,000, to engage in electrical contracting. The incorporators are Platt M. Bond, Hornell; William S. James and Carl D. Miller, Buffalo, N. Y.

CISSNA PARK, ILL.—Electric Service Company of Cissna Park has been incorporated, capitalized at $15,000, for the purpose of generating electricity for light, heat and motive power. The incorporators are Ernest F. Lindner, Emma S. Lindner and Dorothy Watkins.

ALBANY, N. Y.—The Electrical Safety Device Manufacturing Corporation has been incorporated with a capitalization of $20,000. The incorporators are Horace E. Nichols, Schenectady, N. Y.; William Addison, Albany, N. Y.,; and Smith O'Brien, Albany, N. Y.

NEW WASHINGTON, O.—The New Washington Electric Company has been incorporated to deal in electric current and electrical apparatus. The capital stock is $10,000. J. H. Donaldson, L. O. Uhl, F. W. Reynolds, M. M. Kibler and John Wallacker are the incorporators.

PITTSBURGH, PA.—The Hovey Electric Service Company has been incorporated with a capital of $100,000 to manufacture, purchase, sell and deal in and with devices for light, heat and power. The incorporators are Allyne C. Hovey, Benjamin C. Tinnison, Charles J. Winkle, all of Pittsburgh, Pa.

NEW YORK, N. Y.—Case Heating Signal Company, Incorporated, has been granted articles of incorporation to manufacture electrical machinery, etc. The capital stock is $25,000 and the incorporators are Charles A. Case, New Rochelle, N. Y.,; William S. Kain, and Joseph Hahn, New York City.

DATES AHEAD.

Independent Telephone Association of America. First annual convention, Hotel La Salle, Chicago, Ill., January 6-8.

National Independent Telephone Association. Annual convention, Chicago, Ill., January 13-15.

South Dakota Independent Telephone Association. Sioux Falls, S. D., January 14-15.

Wisconsin Electrical Association. Annual convention, Milwaukee, Wis., January 15-16.

Electrical Contractors' Association of the State of Illinois. Annual meeting, Springfield, Ill., January 16-17.

Efficiency Society. Annual convention. New York, N. Y., January 26-27.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27.

Northwestern Cedarmen's Association. Annual convention, Escanaba, Mich., January 27-28.

American Electric Railway Association. Mid-year meeting, Engineering Societies Building, New York, N. Y., January 29-31.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20.

American Electrochemical Society. Twenty-fifth general meeting. New York, N. Y., April 16-18.

With the Electrical Manufacturers

Producers' Mica Company, Chicago, has sent out to its friends a very unique New Year card made of a sheet of mica, 3 by 4.5 inches, and bearing the best wishes of the company imprinted in letters of gold.

Multi-Refillable Fuse Company, 817 Washington Boulevard, Chicago, Ill., announces that L. Jay Campbell, manufacturers' agent, Cincinnati, O., has been appointed its agent for that city and surrounding territory.

Steel City Electric Company, Pittsburgh, Pa., announces the appointment of the George A. Schardt Company, Empire Building, Pittsburgh, as its sales representative in the territory of Pennsylvania west of Altoona, and for the state of West Virginia.

Brown Instrument Company, Philadelphia, Pa., is distributing a handsomely printed calendar for 1914. The illustration shows a 12-inch gun in action at Fort Wadsworth Harbor, New York. Brown pyrometers are used on the furnaces at the Washington Navy Yard for annealing these guns.

H. W. Johns-Manville Company, New York City, states it has sold several hundred of the Audiffren-Singrun refrigerating machines, for which it has the American manufacturing and selling rights. The construction and operation of these machines was described in our issue of April 5, 1913.

The Laco-Philips Company, 130 Hudson Street, New York City, is sending to its friends and customers a very attractive white porcelain ash tray in the shape of the well known Laco wire-drawn tungsten lamp. With black lettering and the brass cap in burnished gold, this makes a very useful as well as appropriate and seasonable gift.

Brookfield Glass Company, 2 Rector Street, New York City, manufacturer of glass insulators, announces the opening of a southern office in 415 Fourth National Bank Building, Atlanta, Ga. D. R. Peteet, formerly an official of the Southern Bell Telephone & Telegraph Company, will be in charge and have every facility for rendering quick service to patrons.

Hazard Manufacturing Company, Wilkes-Barre, Pa., manufacturer of bare and insulated wires and cables, has sent out to its patrons and friends a large wall calendar showing a picture of a limited train passing under a signal bridge at full speed. This illustration calls attention to the company's railroad signal wires and cables, which are used in some of the most important railway systems in the country.

The Electric Storage Battery Company, Philadelphia, Pa., announces that owing to its increase in business it has been necessary to secure more commodious quarters in Atlanta, Ga., for its Exide battery depot. Since January 1, the depot occupies the Georgia Railway & Power Company warehouse at 20 Piedmont Avenue, where the Exide Battery Depot, Incorporated, has 13,500 square feet of floor space.

The Richmond Electric Works, Richmond, Va., has opened offices in the Hudson Terminal Building, New York City, in charge of C. W. Cragh, district manager for New York and Connecticut. The company will carry a large stock of motors in New York to take care of this territory. The company also announces that it has appointed the Barber-Dwinnell Electric Manufacturing Company, of Kansas City, Mo., its district sales agents for Kansas, western Missouri and Nebraska.

The Detroit Insulated Wire Company, Detroit, Mich., is making another Christmas and New Year's day distribution to its employees. Salaried employees who have been continuously in the service of the company for 12 months or more will receive one per cent of their entire salary for the yearly period ending December 15, 1913. Hourly rate employees continuously in the employment of the company for 12 months or more will receive two per cent of their entire wages for the yearly period ending December 10, 1913.

Nungesser Carbon & Battery Company, Cleveland, O., is distributing a fine little calendar for 1914. The calendar pad measures about three by three, and is convenient for either the flat-top or roll-top desk. The legend states that the Nungesser batteries "cost least because they last longest." Other products of the company are amorphous carbon electrodes, carbon rods and tubes, carbon shapes and specialties, Acme brand brushes especially adapted for traction motor service, graphite and metal composition brushes, "1900" dry batteries, etc.

Burnley Battery & Manufacturing Company, North East, Pa., is sending a letter to the trade announcing that as owner of the Burnley patent No. 608,973 for soldering paste, it has brought suit for infringement of this patent against dealers in the "Allen Soldering Paste," and the "Nokorode Soldering Paste," and that all persons handling said soldering paste and any other soldering paste made and sold except that made and sold by the Burnley Battery & Manufacturing Company, and that made and sold by the Highland Electro-Chemical Manufacturing Company (licensee under the Burnley patent) are infringing this patent.

The Electric Storage Battery Company, Philadelphia, Pa., has prepared a souvenir entitled "The Building up of an Industry." This relates to the silver anniversary of the company, which was established in 1888. A vivid tale is told of the beginnings of the storage-battery industry and what has been accomplished in 25 years, giving the story of the history, the product, the factory and the men of the Electric Storage Battery Company. In addition to the very interesting text, there are numerous illustrations of the leading men in the organization, illustrations of the various types of batteries manufactured by the company and their applications, the various factories and intimate details of equipment. The souvenir is handsomely printed on a beautiful heavy coated stock, embellished with an embossed cover in silver, a sliver border illuminating each page.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports receipt of the following among recent orders: Salt Lake & Utah Railway Company, Salt Lake City, Utah, six 250-kilowatt, 750-volt direct-current, self-starting rotary converters mounted in pairs on a common bedplate for operation in series at 1,500 volts; six 150-kilowatt, 44,000-volt, single-phase transformers with triple secondaries to operate any two or three rotaries at one time, and two seven-panel switchboards for the above. Chambersburg & Shippensburg Railway Company, Chambersburg, Pa., one 200-kilowatt, 600-volt direct-current, self-starting rotary converter; three 75-kilowatt, 13,500-volt single-phase transformers and one switchboard. Sand Springs Railway Company, Tulsa, Okla., one 200-kilowatt, 600-volt, self-starting rotary converter; two 110-kilowatt, 2,200-volt single-phase transformers and switchboard. Greenville Traction Company, Greenville, S. C., one 500-kilowatt, 600-volt, self-starting rotary converter; three 185-kilowatt, 12,900-volt, single-phase transformers and one switchboard. Seattle Lighting Company, Seattle, Wash., two 110-kilowatt, 250-125 volt, three-wire, engine-type generators complete with field rheostat and balance coils.

Record of Electrical Patents.

Issued by the United States Patent Office, December 23, 1913.

1,081,941. **Electrically Controlled Signaling Apparatus.** H. W. Aylward, New York, N. Y. Includes electromagnetically controlled drums with symbols thereon.

1,081,947. **Outlet Box.** E. W. Buffington, Fall River, Mass. Has angular side portions with special means for locking conduits within their outlets. (See cuts.)

1,081,990. **Telephone Indicator.** T. L. Savin, Pine Bluff, Ark. Ringing of the bell in the absence of a subscriber closes the circuit of a motor that raises the receiver hook and causes a phonograph to give a message to the transmitter.

1,082,012. **Incandescent Lamp.** A. G. Davis, assignor to General Electric Co. Combined with a refractory metal-filament loop having its bend reinforced with metal is an anchoring device loosely engaging the bend.

1,082,021. **Electrical Switch.** H. R. Gilson, assignor to National Metal Molding Co., Pittsburgh, Pa. A snap switch for mounting on metal molding.

1,082,026. **Motor Vehicle.** R. Huff, assignor to Packard Motor Car Co. A bracket for the radiator fan carries a support for high-tension wires.

1,082,032. **Connecting Device for Electric Conductors.** N. D. Levin, assignor to Jeffrey Mfg. Co., Columbus, O. Electromagnetic connector.

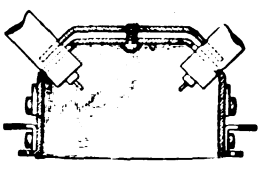
1,082,036. **Station Indicator.** C. P. McDonnell, Kansas City, Mo. Electromagnetically actuated.

1,082,048. **Trolley.** G. L. Robertson, Philadelphia, Pa., assignor of one-fourth each to L. H. Schwartz and T. K. Schwartz. Covers details of the harp construction.

1,082,058. **Process for Casting Artificial Teeth.** H. A. Wienand, Frankfort-on-the-Main, Germany. The metallic duplicate is electroplated with nickel.

1,082,063. **Carriage-Return Mechanism.** W. Ammerman, Franklin, Tenn., assignor of one-half to T. Berry. For a typewriter; motor driven.

1,082,079. **Lamp Bracket.** H. A. Goff, assignor to T. Drake, Egham, England. For an electric automobile lamp.



1,081,947.—Outlet Box.

1,082,083. **Controlling Means for Machine Recorders.** A. C. Johnson, assignor to Automatic Production Meter Co., Chicago, Ill. Includes a timing device in circuit with an electric recording device.

1,082,086. **Loom Stopping Mechanism.** A. G. Koechlin, assignor to Draper Co., Hopedale, Mass. An electromagnetic trip for the motor controller and a means for automatically starting the loom after a certain interval.

1,082,092. **Relay Device.** A. Orling, assignor to Orling's Telegraph Instruments Syndicate, Ltd., London, England. Comprises a primary pivoted element carrying a screen, a secondary pivoted element and a stream of fluid directed to impinge on the screen and secondary element.

1,082,093. **Electrical Snap Switch.** C. F. Paul, Peekskill, N. Y. Includes a rotatable elliptical contact member combined with a yielding terminal of spring metal bent to zigzag shape.

1,082,095. **Train Control and Signal System for Double-Track Railways.** F. A. Pierce, Wheeling, W. Va. An electric block signaling system.

1,082,110 and 1,081,111. **Electric Regulation.** J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. For axle-driven car-lighting system; effected both by the generator voltage and battery current.

1,082,134. **Water-Tight Joint for Magnetic Circuits.** R. C. Patton, assignor to D. & W. Fuse Co., Providence, R. I. A calking joint for a flat magnetic chuck.

1,082,148. **Multirate Electric Meter.** A. W. Burke, Wilkinsburg, Pa. A transformer is arranged to change the voltage across the potential coil of the meter.

1,082,168. **Electric Heater.** F. Philp and G. Kemp, Port Arthur, and W. H. Gibbons, London, Ont. Of tubular type inclosed within an outer casing.

1,082,181. **Electric Lamp Socket.** W. C. Tregoning, assignor to Tregoning Electric Mfg. Co., Cleveland, O. Covers details of the key switch mechanism.

1,082,183. **Rotary Motor and Pump.** J. B. Vernon, assignor to Lee S.

Smith & Son Co., Pittsburgh, Pa. A portable motor provided with self-ventilating means.

1,082,184. Track-Contactor. C. W. Ward, Lakewood, O. A movable abutment adjacent to the third rail is arranged to be moved by the contact shoe of a train.

1,082,187. Apparatus for Charging Storage Batteries. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Electromagnetic resistance regulator.

1,082,195 and 1,082,196. Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. The upper electrode passes through or between the charging chutes.

1,082,210. Switch Mechanism. E. J. Face, assignor to National Street & Station Indicator Co., Los Angeles, Cal. Electromagnetic switch for a street indicator.

1,082,221. Radiotelegraphic Station. G. Graf von Arco, Berlin, Germany. Comprises a vertical antenna for transmitting and a low horizontal antenna for receiving, the latter being symmetrically disposed adjacent to the vertical antenna to avoid mutual disturbance. (See cut.)

1,082,243. Mixing Device. W. G. Shelton, New York, N. Y. Motor driven.

1,082,248. Condenser Telephone. J. Unterholzner, Zweibrücken, Germany. A perforated electrically charged condenser is operatively joined to the diaphragm.

1,082,272. Static-Pressure System for the Protection of Electrical Conductors. G. N. Kercher, assignor to Safe, Vault & Protection Co., Los Angeles, Cal. Comprises a tube, a gasometer to seal one end of the tube and a circuit-closing fluid trap to seal the other end of the tube.

1,082,286. Diaphragm for Electrolytic Apparatus. H. D. Ruhm, assignor to Niagara Alkali Co., Niagara Falls, N. Y. Comprises inner layers secured in position and outer layers loosely retained in place.

1,082,289. Telephone Receiver. M. Setter, assignor to First Trust & Savings Bank, Chicago, Ill. Relates to details of the electromagnet construction.

1,082,295. Electropneumatic Control-Valve Mechanism. W. V. Turner, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Electrically controlled valve for releasing air from the application chamber.

1,082,310. Relay. John Erickson, assignor to Automatic Electric Co., Chicago, Ill. The armature carries an adjustable arm.

1,082,311. Advertising Medium. G. T. Fielding, New York, N. Y. Motor driven and electrically lighted display.

1,082,322. Lighting Fixture. E. F. Guth, St. Louis, Mo. Has a flat reflector surrounding the lamp socket; a diffusing and reflecting glass hemisphere is suspended from the flat reflector.

1,082,354. Automatic Weighing-Machine. B. P. Mulloy, New Albany, Ind. Has an electrically controlled spout gate.

1,082,368. Safety-Barrier for Windows. B. B. Swanson, Fortage, Pa. An electromagnet holds a detent that keeps a guard from dropping by gravity across a cashier's window.

1,082,397. Self-Locking Lamp Bulb. C. Blass, New York, N. Y. In a longitudinal groove in the screw part of the lamp base is a locking bolt.

1,082,398. Electric Hoist. A. S. Blowers, Portland, Ind. A reversing motor drives a drum on which the operating cables are oppositely wound.

1,082,401. Sparking Plug with Removable Electrode and Central Telescoping Electrode. A. L. Cadé, Paris, France. The central electrode consists of two rods and a tube.

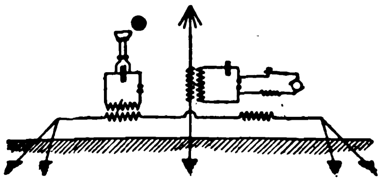
1,082,402. Two-Cycle Explosive Engine. J. L. Campbell, Barryton, Mich. Special electric ignition arrangement.

1,082,404. Electric Lamp Socket. A. W. Clauder, assignor to Bryant Electric Co., Bridgeport, Conn. Relates to the key switch mechanism.

1,082,417. Automatic Fuse-Resetter. J. B. Elkin, Columbia, S. C., assignor of one-half to J. H. Berry. An escapement device regulates a rotary plate with spring clips to hold the fuse wires.

1,082,429. Current-Distributer for Power Looms Having Electrical Stopping and Signaling Devices. A. G. Koechlin, assignor to Draper Co., Hopedale, Mass. A sleeve and pin arrangement.

1,082,436. Signaling System. J. Olsen, Rolfe, Iowa. A rotating drum circuit-closer for the local circuit of a wireless system.



1,082,221.—Wireless Antenna Arrangement

1,082,459. Electric Furnace. J. Burke, assignor to Burke Electric Co., Erie, Pa. An arc furnace with six electrodes connected to the independent secondaries of a three-phase transformer.

1,082,475. Vibrator. I. C. Orswell, assignor to Orswell Igniter Co., Boston, Mass. Electromagnetically actuated.

Reissues.

13,661. Screw Press to Form Insulators. R. G. Hemingray and C. Hawk, assignors to Hemingray Glass Co., Muncie, Ind. Original No. 909,595, dated Jan. 12, 1909. A rotary table carries a number of molds arranged to be successively brought to the pressing position.

13,663. Electric Signaling System. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Fa. Original No. 882,276, dated Mar. 17, 1908. Block signal system with continuous track rails reinforced at the block terminals to increase the impedance at those points.

Patents Expired.

The following United States electrical patents expired December 29, 1913:

573,874. Drum for Electric Controllers. S. Harris, Johnstown, Pa.

573,884. Automatic Telephone Exchange. A. E. Keith, Chicago, Ill.

573,905. Electric Locomotive. J. F. McLaughlin, Philadelphia, Pa.

573,911. Electric Arc Lamp. L. H. Page, Chicago, Ill.

573,924. Fire-Alarm System. A. C. Rogers, Plainfield, N. J.

573,932. Electropneumatic Block-Signal System. A. H. Thorp, Toledo, O.

573,948. Circuit-Closer for Electrical Alarm Circuits. J. C. Wollin, Williamsport, Pa.

573,962. Searchlight. A. E. Colgate, New York, N. Y.

573,966. Insulator Hanger. R. Duncan, San Francisco, Cal.

573,979. Apparatus for Varying Speed of Electromotors. L. Imhoff, Berlin, Germany.

573,992. Keyboard Apparatus. F. R. McBerty, Downer's Grove, Ill.

574,005. Telephone Circuit. C. E. Scribner, Chicago, Ill.

574,006. Test System for Multiple Switchboards. C. E. Scribner.

574,035. Method of and Means for Regulating Alternating-Current Generators. B. G. Lamme, Pittsburgh, Pa.

574,038. Electroplating Apparatus. R. J. Marks, Hartford, Conn.

574,045. Electric Arc Lamp. C. E. Scribner, Chicago, Ill.

574,046. Toll-Box for Telephones. C. E. Scribner.

574,101. Insulator. C. B. Martin, Schenectady, N. Y.

574,117 to 574,119. Electric Arc Lamp. H. A. Seymour, Washington, D. C.

574,120. Electric Car-Brake. E. A. Sperry, Cleveland, O.

574,124. Combined Opera Glass and Phone. G. J. Wainwright, New York, N. Y.

574,125. Handle and Phone Attachment for Opera Glasses. G. J. Wainwright

574,171. Electric Railway. J. A. Roche, Chicago, Ill.

574,203. Electric Branding-Stamp. J. M. Kirker, McG. Miller and J. A. Williams, Louisville, Ky.

574,215. Electromotor Magnet. C. Partington, Newport, Ky.

574,217. Voltage Regulator for Dynamos. T. M. Pusey, Kennet, Pa.

574,221. Telephone-Exchange System. C. E. Scribner.

574,222. Selective-Signal System. C. E. Scribner.

574,223. Selective Signal. C. E. Scribner.

574,224. Springjack for Telephone Switchboards. C. E. Scribner.

574,225. Signaling Apparatus for Telephone Lines. C. E. Scribner.

574,231. Current Controller or Rheostat. E. E. Werner, Dallas, Tex.

574,245. Telephone Switch Box. W. A. Houth, Parker, S. D.

574,255. Telephone-Exchange Apparatus. F. R. McBerty, Downer's Grove, Ill.

574,279. Signaling Circuit for Telephone Trunk Lines. C. E. Scribner.

574,280. Automatic Signaling Device for Telephone Exchanges. C. E. Scribner and F. R. McBerty.

574,281. Plug for Telephone Switchboards. C. E. Scribner and F. R. McBerty.

574,301. Electric-Lamp Base. W. C. Bryant, Bridgeport, Conn.

574,320. Electric Water-Wheel Governor. A. Giesler, Dayton, O.

574,322. Electrode for Secondary Voltaic Batteries. G. A. Grindle, Prestwich, England.

574,327. Electrical Annunciator. R. L. Hunter and H. B. Higgins, Minneapolis, Minn.

Electric Vehicle Section

The Boston Edison Garage.

At the meeting of the New England Section of the Electric Vehicle Association of America, which was held at the Edison Building, Boston, on December 18, Charles F. Smith, head of the garage of the Boston Edison Company, presented a paper describing the features of the garage and its equipment.

Charles F. Smith's Lecture on the New Edison Company's Garage.

A proper conception of the work of the Transportation Department of the Boston Edison Company, can best be obtained through a knowledge of its relations to the various other departments of the company.

As indicated by its title, its functions are to render transportation facilities to other departments whether by freight, express, horses or automobiles.

The department is divided into three divisions, under the superintendent of transportation, and three divisions, the clerical, horse and wagon and automobile are each controlled by a division head. As this description is principally of the Edison Company's garage and garage practices, the latter division is the one chiefly considered herein.

When the work of a department warrants the use of an automobile, an authorized application is made to the transportation department, and after due consideration as to the type, etc., desired, the purchase is approved and made. The vehicle is assigned to the department making the application and is charged for at a fixed monthly price, with or without a driver, as conditions warrant. This fixed cost includes factors that do not vary from month to month, such as depreciation, insurance, etc. To this fixed cost is added, in the monthly charges, running expenses which includes such items as tires, oil, gasoline and labor.

The vehicles of the company are used chiefly by the installation, maintenance, soliciting, collecting, electrical engineering, construction and generating departments, though practically every other department in the company uses them to some extent. Provisions are also made to furnish machines by the hour, day or week when the exigencies of the service so demand.

The automobile equipment of the company now consists of 116 machines in use and 29 on order. As these 29 machines are now being delivered, the total will shortly be 145 in use, 87 of which are electric vehicles, 23 being passenger and 64 commercial. Sixteen of these machines will be garaged in public garages in the outlying districts. A reserve of approximately 10 per cent of the total number of machines owned by the company are held for spare vehicles so as to insure a continuity of service when cars are laid up for overhauling, painting or emergency repairs.

The rapid growth of the Boston Edison Company during the last four years rendered the service facilities of a few years ago wholly inadequate to meet existing conditions and made necessary the construction of the present new service buildings. The buildings (eight in number) consist of a power and heating station, linemen's quarters and supplies, administration building and stock rooms, garage, laboratory and welfare buildings. They occupy a 12-acre tract of land. This set of buildings has been erected with a view of giving the most efficient service possible to the public and having in mind the comfort and welfare of the company's employees and the maintenance of beauty in architecture and design. The buildings are principally of reinforced concrete construction with offices finished in mission.

The service plant is located at the eastern apex of the Edison teritory, which is somewhat fan shaped, 1½ miles from the L Street Station. As the crow flies, the distance from the garage to the northern, southern and western extremities of this teritory is approximately 30 miles, in each direction, thus giving it a most advantageous location when considering load centers, bases of supplies and territorial layout. The territory is upwards of 600 square miles in area and has a population of over 2,000,000. A study of this map of the territory may in some degree account for the company's present use of a few gasoline cars, especially when it is borne in mind that emergencies insist that the speediest, practical methods of transportation are none too swift, also the reasons for garaging cars elsewhere than in our own garage.

The Edison garage is 316 feet in length and 110 feet in width, 80 feet of the front facing Massachusetts avenue. It is of three-story construction and is utilized as a gasoline garage, repair and paint shops, chauffeurs' assembly room, dormitories and storage for robes, etc. Leading from the first floor is the fireproof oil room where greases, oils, alcohol, etc., are stored. The tanks in this room are equipped with self measuring and registering pumps and facilities for speedily transfering the contents of containers to the various tanks. The main gasoline pump is located in the open garage floor and is connected to two five hundred gallon tanks that can, through by-pass arrangements, be used as a single tank of 1,000 gallons capacity, or can be pumped from separately in case of trouble or leakage, or either tank may be shut off and held for reserve.

The repair shop is located on the third floor. It is complete in every detail, being equipped with the best type of machinery and appliances for handling overhaul work and emergency repairs. One side of this shop is assigned to cars laid up for their annual overhaul, there being one crew of men whose uninterupted time is devoted to this class of work. The opposite side of the room is used for minor repairs and adjustments. The most work of this nature is performed at night by men experts on this class of work, Adjacent to this shop is a blacksmith shop where a full equipment of blacksmith's tools are to be found, also oxy-acetylene welding apparatus and oxygen carbon removing devices. The predominating feature governing the policy of the transportation department is perpetual service to the assignees of its cars and every effort is directed towards giving such service. Every possible device that can be utilized in emergencies, such as breakdowns on the road, is taken advantage of. One of these is an emergency wheel to be used in cases of broken axles and is taken to a car so disabled and placed in position in 10 minutes' time. The car can then be towed any distance as well as though it were on its original wheels.

One corner of the repair shop is screened off for the machine tools. No attempt is made to make parts that can readily be obtained from car manufacturers or their agents. These machines are used to produce such parts as cannot readily be secured and on special and experimental work. Special lighting fixtures are placed over the vises and machine tools. For repair shop work, these fixtures have proven to be most satisfactory as they can be set in any position desired and will maintain that position. The general lighting throughout the garage, both natural and artificial, is practically perfect. If anything, the artificial is superior to the natural, there being no dark corners and practically no shadows existing.

Special attention has been given to washstand illumination which is secured by trough reflectors suspended from the ceilings by rope and pulleys enabling them to be raised out of the way when not in use. These lights can be set at any height from the floor and afford perfect illumination for the washers. Each stand is fitted with two independent swivel hose outlets and two washers can work on a car entirely independent of each other.

The chauffeurs' assembly room is on the second floor of the garage adjacent to their lockers, shower baths, lavatories and dormitories. In this room are installed signal systems and other devices that lend themselves to efficient service. There are four sleeping rooms and they are occupied by men called car dispatchers, who are experienced chauffeurs capable of handling any vehicle owned by the company and on active duty are located at the car dispatcher's desk, handling all orders for cars and checking cars in and out of the garage. When an emergency order for a vehicle is received, the car dispatcher signals for the dispatcher on call duty and immediately proceeds to fill the emergency order. A friendly spirit of rivalry exists between these men as to which can make the best time in getting a car onto the road and the record to date for a dispatcher to take an order, get into his outer clothing and out of the garage is 24 seconds. On a test emergency call the writer put in recently at midnight from a point four miles from the garage, it was 13 minutes and 57 seconds from the time the call was given until the car called for arrived at this point.

Another instance of recent occurrence, illustrating the class of service rendered by the transportation department, is as follows: A few minutes after midnight, emergency calls for cars began to come in so rapidly that three telephones were required to receive them. In eight minutes eight cars had left the garage; in 14 minutes, 12 cars, and in 20 minutes later seven experienced drivers were on hand to take out additional cars if called for. Emergency men are not urged to speed on the road unless the case be of extreme emergency, the greatest effort being made in getting out onto the road.

One of the duties of the car dispatcher is to keep a record of the assignment of the various cars owned by the company and this board, called a "Car Directory" has been so designed that at a glance the disposition of any car may be ascertained. The plugs designating regularly assigned cars are of brass and spare cars are represented by nickel plugs. When a car is laid up for painting, repairs, etc., its plug is transferred to a corresponding column. If a spare car be furnished in its place, a nickel plug corresponding to the spare car's number is moved into the regular car's space.

The electric garage joins the gasoline garage in the rear and is 236 feet in length and 110 feet in width with a line of steel columns down through the center. It is of single-story construction and has capacity of 110 vehicles without resorting to banking. Each car is assigned a permanent position or stall. These stalls are numbered over the car and this number, called the circuit number, appears on the wattmeter fuses and switches at the car and at the switches on the charging panel. Attached to the circuit number over the vehicle is the car's number that occupies that position and this number also appears at the switches on the charging panel in connection with the circuit number, leaving small chances for error in current rates.

Cars are grouped so that each panel serves batteries of the same voltage, thus enabling us to take advantage of the double-voltage system, with which these panels are equipped. By a three-bus arrangement, the busses are normally served with 90 and 125 volts, either of which can be connected to the charging circuits by the double-throw switches at the bases of the panels. By this arrangement, an 11 per cent saving over the single-voltage system is made. The bus voltages can be raised or lowered 30 volts at the power house.

All charging circuits are coppered for 100 amperes and current is provided from two 200 and one 50-kilowatt motor-generators. The busses have a carrying capacity of 4,000 amperes. The rheostats are so arranged in relation to each other that any one of them may be removed without disturbing the one above or below it, by simply removing three small screws and a taper pin. Heat from these rheostats is carried off through ventilating fans located above the bank.

Adjacent to the panel room is the battery room, The panels control the charging circuits terminating in the battery room and the switch arrangements are such that a battery may be discharged through the same rheostats that govern the charging currents. Two of these circuits are connected to the recording volt and ammeters. These instruments give a graphic record of the performance of a battery on charge and discharge, the complete cycle being on the same chart.

In order to get the dry, hot steam required to leave the batteries in an absolutely dry state after cleaning, 90 pounds pressure is carried. An insulated nozzel having a one-eighth inch opening attached to a 12-foot length of steam hose is used in directing the jet of steam against the batteries.

A water distilling plant is maintained for furnishing water for the batteries. This has a capacity of 250 gallons per day when both units of the distiller are used. The units may be used separately if desired however. The storage reservoir on which the distiller sets and discharges into will hold a week's supply of water. Beneath the distilling plant is located apparatus for charging ignition batteries, also apparatus for charging and discharging from one to 10 vehicle cells that may require individual attention.

Connecting the garage and stock room is a glass-covered, brick-paved area way 70 feet wide and 236 feet long having a self-sustaining roof. This areaway is entered directly from the garage or at the ends. On the stock room side there is a loading platform, the entire length of the areaway on which are located individual steel lockers. Night men draw the necessary stock for each truck's work for the following day and place it in these lockers. The trucks are backed up to this platform in the morning and but a few minutes is required to transfer the loads to the vehicles.

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Edison Storage Battery Company Exhibits at New York and Chicago Automobile Shows.

The Edison Storage Battery Company, of Orange, N. J., will exhibit the Edison alkaline nickel-iron storage battery for ignition, lighting and traction, at the New York and Chicago 1914 automobile shows. During the past year a new size has been added to the line of vehicle batteries, having a rated capacity of 187½ ampere-hours). The A-5 is used in and is intermediate between the A-4 (150 ampere-hours) and the A-6 (225 ampere-hours.) The A-5 is used in passenger vehicles, in 1,000-pound delivery wagons, in baggage, freight and industrial trucks and for other service where the A-6 would be more than ample. It was the A-5 cell which Lord & Taylor adopted for its new electric delivery wagons a month or two ago.

Batteries for ignition and lighting of gasoline cars will be shown in two capacities, 40 ampere-hours and 80 ampere-hours. They are made up in 6½-volt sets assembled in steel boxes or wooden trays. The electric vehicle batteries will be shown separately and in the Edison type of tray which permits easy loading and unloading, but keeps the weight down to a minimum.

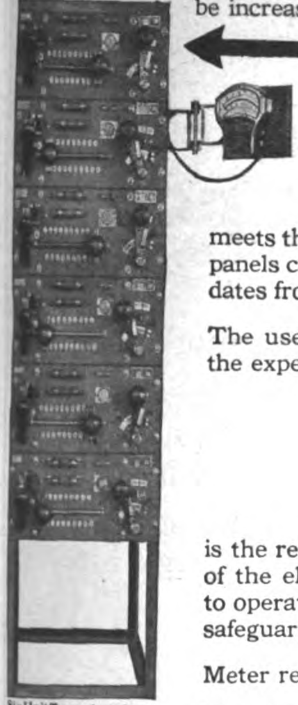
Edison batteries are today made in practically the exact form that they were five years ago and a peculiarity of the nickel-iron battery is that this same type is used for all services, stationary and traction.

CUTLER-HAMMER

A Single Charging Unit

The Cutler-Hammer engineers have perfected the unit type battery charging equipment made up of simple complete units that can be assembled as easily as a sectional book case. Starting with one or two charging units the equipment can be increased to a hundred or more.

One of the new Unit Type charging sections or rheostats, 24 in. wide, 10 in. high and 20 in. deep. Each section with its resistance is a complete unit in itself and for inspection or repairs can be removed as easily as a section from a sectional book case.



Six Unit Type charging sections mounted on standard frame.

A Panel of Several Units

meets the requirements of the small garage, but it also provides for future growth. More panels can be added as needed, each one just like the original. A standard panel accomodates from one to six units, all within easy reach to be operated without the use of a rod.

The use of one meter on swinging bracket serves for a number of panels and reduces the expense of making additions. The

New Universal Unit Type Battery Charging Equipment

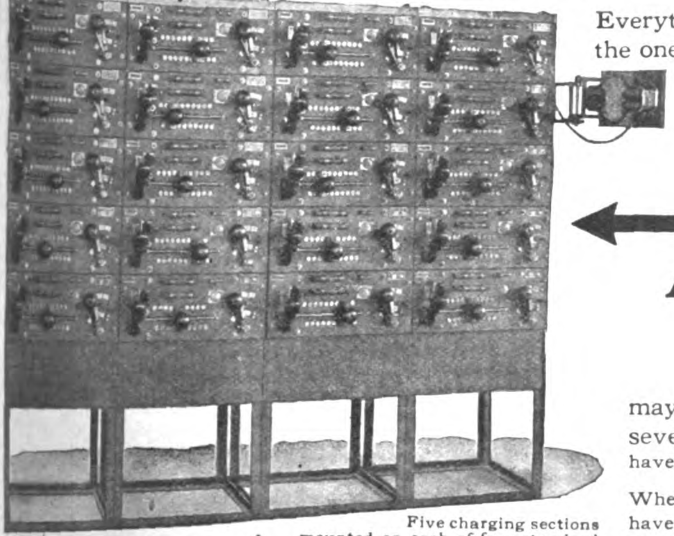
is the result of our long experience in the design of charging rheostats since the advent of the electric vehicle. It includes every desirable feature. It is easy to install; easy to operate; easy to augment; economical of current used. Every convenience—every safeguard is provided.

Meter readings may be taken at any time without opening the charging circuit.

The rheostat sliding handle is adjacent to the controlling switch and eliminates chance of error in operating wrong rheostat.

Everything for one charging circuit is complete on the one unit section front.

Batteries cannot discharge back into the circuit or into one another, should the service fuses blow.



Five charging sections mounted on each of four standard frames bolted together, giving the appearance of one complete switchboard. Another section can be added in place of blank at bottom of each panel.

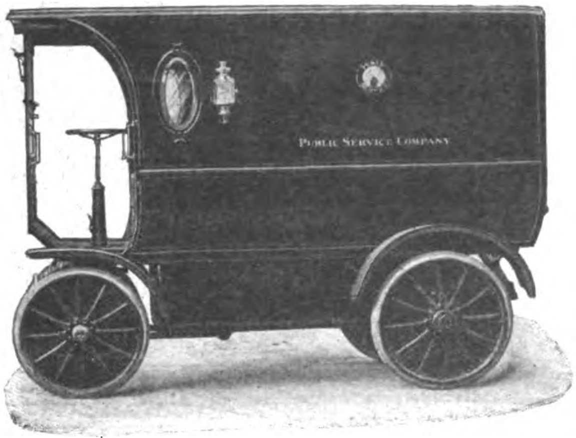
A Charging Outfit of Several Panels

may be installed at one time or during the course of several years. The result will be the same. You will have a uniform equipment installed in the smallest possible space.

Whether you need battery charging equipment or not, you should have a copy of Bulletin 8530 which describes and illustrates this new Universal Unit Type Charging Equipment, the latest development of the Cutler-Hammer engineers.

THE CUTLER-HAMMER MFG. CO. MILWAUKEE

NEW YORK [illegible] Church Street CHICAGO Peoples Gas Bldg. PITTSBURG Farmers Bank Bldg. BOSTON Columbian Life Bldg.
PHILADELPHIA 1201 Chestnut Street CLEVELAND Schofield Building CINCINNATI Fourth Nat'l Bank Bldg.
PACIFIC COAST AGENTS: H. B. Squires Co., 79 Howard St., SAN FRANCISCO, [illegible] Chamber of Commerce Bldg., PORTLAND
and W. B. Palmer, 416 East 3rd Street, LOS ANGELES



1000 pound capacity Model F chassis with high grade panel body

1000 pound capacity Model G commercial runabout

WALKER VEHICLES

Drive—**Walker Balance Drive,** "The Standard of comparison in the Electric Commercial Vehicle field."

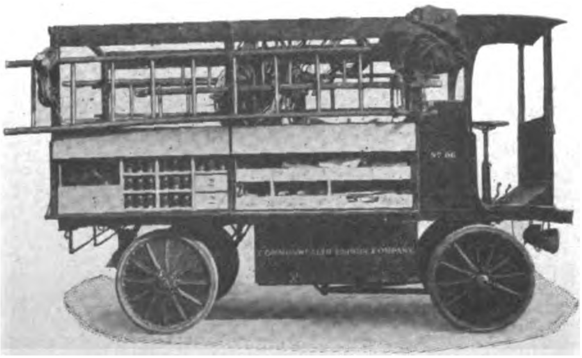
BATTERIES **WHEEL BASE** **MOTOR** **TIRES** **BODIES** **MILEAGE**	We first learn *your service requirement,* and then furnish the best combination to give you maximum service in every respect.

We make a specialty of Electric Commercial Vehicles for Public Service Companies

Load capacities 1000 pounds to 3½ tons

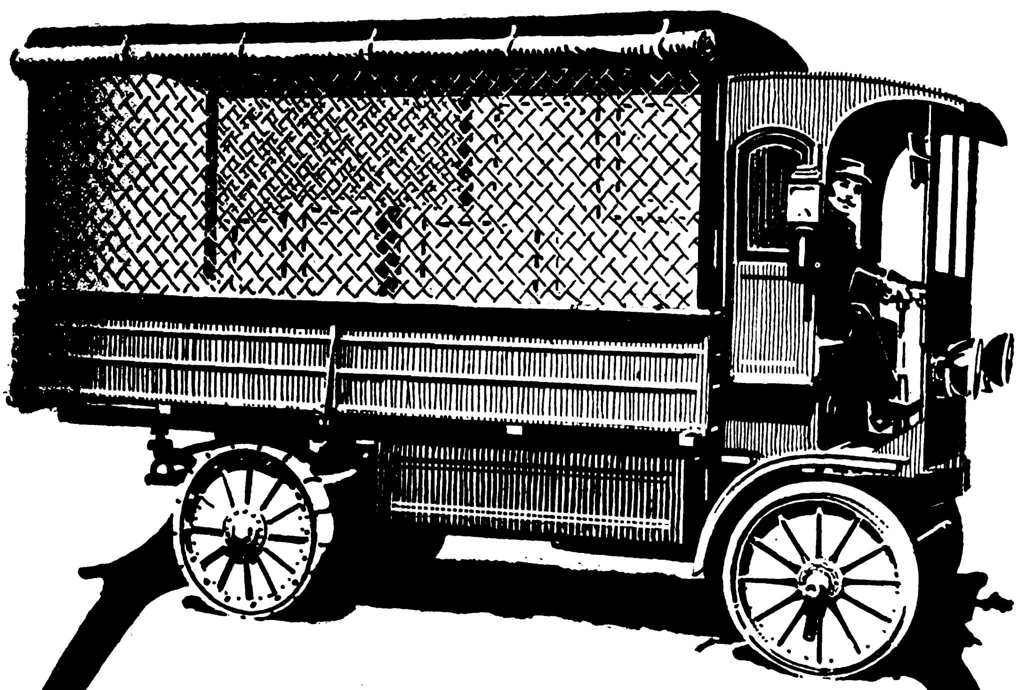
WALKER VEHICLE COMPANY

Main Office and Factory	**Branches**	**Agencies**
CHICAGO	**New York-Boston-Cincinnati**	**Other Principal Cities**



One of Commonwealth Edison Company's fleet of Overhead Service Department trucks

Rear view of Commonwealth Edison truck



The Best Endorsement for the "Electric"

is the consistent use made of it by Central Station Companies throughout the United States in their own business.

The Ninety-Nine Electric Vehicles used by the Commonwealth Edison Company help every day to keep "Edison Service" at the high standard for which it is known. Their easy, speedy running overcomes transportation difficulties in all kinds of weather, while their use attracts attention to the desirability of the Electric Vehicle as well as Electric Light and Power.

Our Electric Vehicle Experts
Are At Your Service

Commonwealth Edison Company
120 West Adams Street
CHICAGO

Boosting.

The Electric Storage Battery Company has published an instructive booklet on the subject of "Boosting". While copies of this booklet may be secured from the company it is of such merit that is is published herein in full:

Boosting.

The term "boosting" as applied to vehicle batteries may be defined as "auxiliary charging." It usually implies a partial charge given in a comparatively short time and at current rates higher than normal. A battery may be boosted when fully discharged or when only partially discharged, although the latter case is more usual.

Modern methods of operating electric vehicles have developed situations where boosting can frequently be applied to advantage, and in many cases this is not realized by the vehicle owners or operators. It is the purpose here to show how boosting can be advantageously used and how it may be practically applied to batteries of the "Exide" types.

The fact that overcharge at high rates is injurious to lead batteries has caused a very general misapprehension as to the ability of the "Exide" types to absorb current at high rates under proper conditions. The only factors in high-rate charging which act injuriously are gassing and heating, and these appear only when more current is being passed through the battery than the plates can utilize. Therefore any current rate which the cells will absorb without gassing is not injurious, and it is upon this principle that boosting is applied. The more nearly discharged a battery is the higher charging current it can take, and by starting the charge at a high rate and tapering to a low rate at the end a large proportion of the discharge can be put back in a very short time.

To illustrate what can be accomplished by boosting, the following table gives the additional battery capacity which can be obtained by constant-potential boosts with the battery in different states of discharge:

	20-minute boost increase	40-minute boost increase	1-hour boost increase
Battery fully discharged	22%	38%	50%
Battery three-quarters discharged...	19%	33%	42%
Battery one-half discharged	15%	26%	32%
Battery one-quarter discharged	10%	16%	20%

Expressed in terms of mileage, this would mean that a vehicle, after having given 40 miles on a complete discharge, could have its battery boosted as follows:

In 20 minutes so as to give 9 miles additional.
In 40 minutes so as to give 15 miles additional.
In 60 minutes so as to give 20 miles additional.

As a concrete example, suppose a delivery truck has to cover a mileage in one day beyond the capacity of the battery to deliver. Say that up to the noon hour 70 per cent of the battery capacity has been used and it is desired to cover an equal distance in the afternoon. Under the straight daily charging system, it would be necessary to have a spare battery and change over, or else to provide a single battery of sufficient capacity for the entire day. Under the boosting system, however, the battery can be put on charge during the noon hour, and in that time it is possible to get in sufficient charge to duplicate the morning run. That is, 140 per cent of the battery capacity is obtained in one day by simply giving a boosting charge of one hour at noon.

A situation where the ability to boost is advantageous arises from the extra demand upon batteries under bad weather conditions. A battery may have ample capacity to give the desired mileage under normal conditions, but not when the roads are heavy, as after a snow storm, and the car draws an abnormally high current. By boosting when the conditions are bad, the battery can be made to meet the extra demand and no inconvenience result.

There are several methods by which boosting can be practically applied to batteries of the "Exide" types, and the method to be chosen depends upon the available charging facilities and other conditions in individual cases.

TIME AVAILABLE FOR BOOSTING.

Ampere Hours Discharged	¼ hour Amperes	½ hour Amperes	¾ hour Amperes	1 hour Amperes	1¼ hours Amperes	1½ hours. Amperes	1¾ hours Amperes	2 hours Amperes
10	8	6	5	5	4	4	3	8
20	16	13	11	10	9	8	7	6
30	24	20	17	15	13	12	11	10
40	32	26	23	20	18	16	14	13
50	40	33	28	25	22	20	18	16
60	48	40	34	30	26	24	22	20
70	56	46	40	35	31	28	25	23
80	64	53	45	40	35	32	29	27
90	72	60	51	45	40	36	33	30
100	80	66	57	50	44	40	36	33
110	88	73	63	55	49	44	40	37
120	96	80	68	60	53	48	43	40
130	104	87	74	65	58	52	47	43
140	112	93	80	70	62	56	51	47
150	120	100	86	75	67	60	54	50
160	128	106	91	80	71	64	58	53
170	136	113	97	85	75	68	62	57
180	144	120	103	90	80	72	65	60
190	152	127	108	95	84	76	69	63
200	160	133	114	100	89	80	73	67
210	168	140	120	105	93	84	76	70
220	176	147	126	110	98	88	80	73
230	184	153	131	115	102	92	84	77
240	192	160	137	120	106	96	87	80
250	200	167	143	125	111	100	91	83

Explanation.—In the left hand column find the figure nearest to the ampere hours discharged from the battery; follow across to the column headed by the available time The figure at this intersection is the current to be used.

Example.—Ampere hour meter reading, 103 ampere hours discharged; time available for boosting, one hour. Start at 100 in the left hand column; follow across to the column headed 1 hour and find 50, which is the current to be used.

1. Constant Potential. Where conditions permit, this is probably the ideal method, since it is entirely automatic and requires little attention. It is applicable where there is available a voltage of about 2.3 per cell of battery (e. g., 110 volts for 48 cells) and the charging equipment and wiring have sufficient capacity for current rates up to four or five times the usual starting charge rate. A voltage higher than 2.3 per cell can be cut down by having a set of counter E. M. F. cells, figured at 3 volts per cell, which are always put in series with the battery when it is boosted. Thus, if the line voltage is 110 and the battery consists of 40 cells, there will be 18 volts to be taken up by counter cells, and six of them will be required.

With the charging voltage thus fixed at 2.3 volts per cell, a battery in any state of discharge can be put on charge and will receive in a short time a large proportion of the amount of discharge which has been taken out. The current will automatically taper from a high rate at the start to a low rate toward the finish, and no attention nor adjustment is required. The cells will not reach the free gassing point or, under normal conditions, a high temperature, and therefore no harm will result from their being inadvertently left on charge longer than necessary.

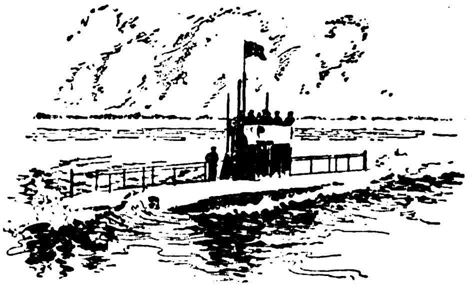
2. Approximate Constant Potential, with Fixed Resistance in Series with the Battery. When the time available for boosting is limited to one hour or less, the following method is often simplest. Connect a rheostat in series with the battery and adjust the resistance so that the voltage across the battery terminals corresponds to that given in the table below for the appropriate number of cells. The circuit can then be left without further adjustment for an hour or less, and the current will taper off as the voltage of the battery rises. The table is figured for a line voltage of 110-120, and the voltages given are too high for a boost of more than one hour's duration.

Number of Cells	Voltage at Battery Terminals.
48	110
44	98
42	92
40	86
38	80

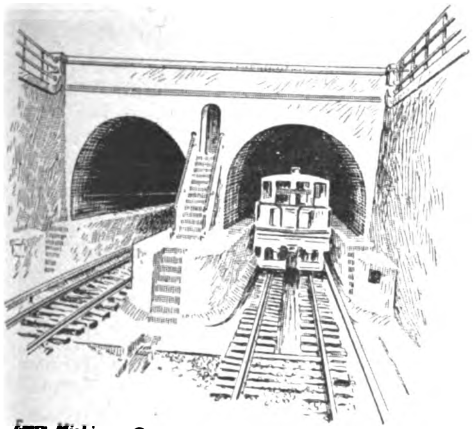
3. Constant Current. In some cases it is more convenient to give a boost at a constant rate of current, and as there is generally a limited time available, it is desirable to know under any given conditions what rate is safe. A convenient rule for determining this is as follows:

GOULD VEHICLE BATTERIES

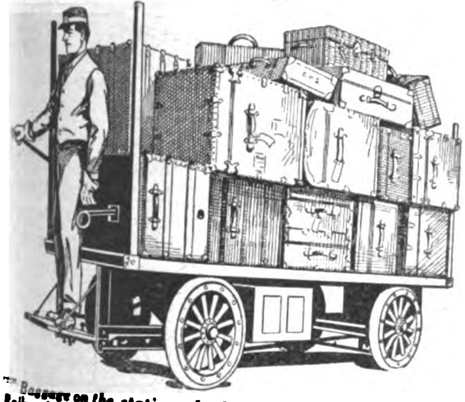
Chemically Powerful Mechanically Strong



The fully charged Gould Storage Battery of a submarine vessel in our navy has enough power to drive 130 automobiles 100 miles. The Russian, Austrian and Japanese navies have similar installations.



Every Michigan Central train that goes through the Detroit River Tunnel depends on a Gould Storage Battery for power. This battery is large enough to keep 300 automobiles running 100 miles every day.



Baggage on the station platforms of the Pennsylvania Railroad and Grand Central Terminals, New York, is handled in trucks driven by Gould Vehicle Batteries.

Gould **Vehicle** Batteries were designed by the same brains and with the same facilities that made the Gould triumphs indicated by illustrations herewith.

The strong friendship of experienced electric vehicle users for the Gould Battery comes from the economical and dependable service assured by our simple construction and by our provision for continued high electrical capacity.

The Gould positive plate construction produces high energy output per unit weight of battery, and does so through the use of a **hard** oxide composition that absolutely prevents the troubles common to the usual **soft** paste composition. The active particles, being better bound into the plate, **must** do maximum work before shedding, especially that only a thin surface layer, instead of the whole mass of oxide, becomes active to produce full electrical capacity. **Much longer plate life** is thus secured through slower natural wear, immunity to shedding from jarring and vibration of the vehicle, and less harm from too long or too rapid charging.

This has been proven time and again where Gould plates have been used for renewals in batteries of other make. Almost invariably renewal with Gould plates increases the service radius of a vehicle and cuts maintenance cost to the low limit.

AN AGENCY OPPORTUNITY FOR DEALERS AND CHARGING STATIONS

Gould Vehicle Batteries and renewal plates (which fit jars of any make) quickly establish a reputation which makes subsequent sales come easy. Our liberal treatment of customers further tends to play into our representatives' hands and make an agency for Gould Batteries extremely desirable. Our proposition would enable you to make good money. Ask for particulars.

Gould Storage Battery Co.

General Offices: 30 East 42nd St., New York City. Works: Depew, New York

BOSTON—89 State Street
PHILADELPHIA—613 Betz Bldg.
AGENTS: Topeka, Los Angeles, Seattle
CLEVELAND—American Trust Bldg.
DETROIT—Boyer Bldg.
CHICAGO—The Rookery
SAN FRANCISCO—904 Rialto Bldg.

Canadian Representative: R. E. T. Pringle, Montreal, Toronto, Winnipeg, Vancouver

$$\text{Charging current (amperes)} = \frac{\text{ampere hours already discharged}}{1 + \text{hours available for boosting.}}$$

This gives the maximum current which can be used for the time specified without reaching the gassing point. The method is most conveniently applied where the car is equipped with an ampere-hour meter.

As an example, suppose that 100 ampere-hours have been taken out of the battery, and there is one hour available for boosting. Then

$$\text{Charging current} = \frac{100}{1+1} = 50 \text{ amperes.}$$

In general, the above method will not put in as much charge in a given time as the constant-potential method, and the current must not be continued beyond the time for which the rate is figured, as injurious gassing and heating will result.

In order to save calculations there is given on page 62 a table based on this formula. Knowing the ampere-hours discharged and the time available for boosting, the proper charging current-irrespective of the size of battery, can be read off at a glance.

When any considerable time for boosting is available and it is convenient to regulate the current at intervals, a greater amount of charge can be put in by dividing the time into several periods and finding the current for each period separately.

One of the methods outlined above is almost sure to meet the requirements of any individual case; but whatever method is used, remember:

To obtain the advantages of boosting without injury to the battery, **avoid gassing and keep the cell temperature below 110 degrees Fahrenheit.**

A general realization of the possibilities and advantages of boosting can result only in a wider field for the electric vehicle.

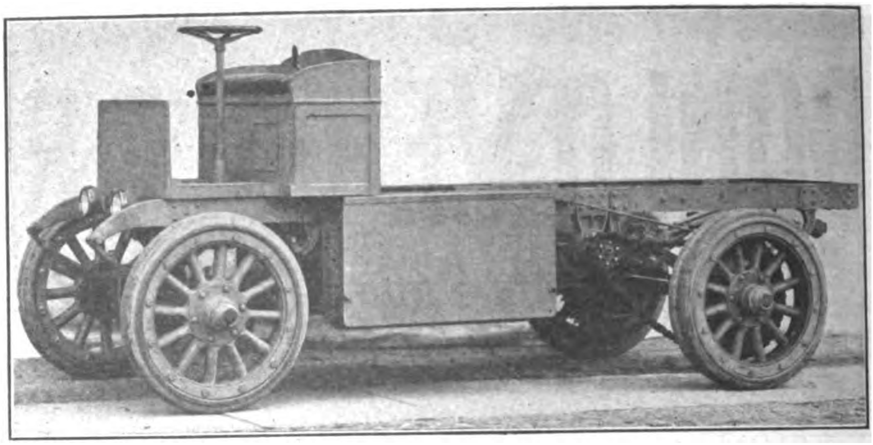


Fig. 1.—Showing Construction of Ward Motor Vehicle Company's Trucks.

◆

Ward Electric Motor Vehicles.

To provide for the variety of demands of users of electric motor wagons and trucks, the Ward Motor Vehicle Company, Concord Avenue and East 143rd Street, New York City, has manufactured five types, ranging in live-load capacity from 625 to 10,000 pounds. The lightest of these cars, known as the type EO, has a radius of from 50 to 75 miles on one charge; the EA type, with a capacity of 1,250 pounds, has a radius from 45 to 60 miles; type EB, rated at 2,500 pounds, has a radius from 40 to 50 miles; the EC type, with a capacity of 5,000 pounds, has a radius of 35 to 45 miles; the largest size, type ED, or five-ton size, has a radius from 30 to 35 miles.

The general character of construction of these types is similar and is well shown in the view of the chassis in Fig. 1. The framework is of rugged construction. The suspension is strong but flexible. The axles are rectangular in section and extra large in size. All spindles are fitted with Timken roller bearings, and in every case after the truck is loaded with its full live load there is a large factor of safety before the bearing is subjected to its rated load. Special tires are provided of generous size; in the larger trucks the rear wheels are equipped with dual type tires.

The control equipment is of the continuous-torque type, providing four speeds forward and two reverse. Extra large series motors, either of Westinghouse or General Electric manufacture, are furnished. The battery equipment includes either 42 cells of standard lead battery or 60 cells Edison battery. The capacities of these batteries range for the five different sizes of trucks from 21.25 to 59.5 amperes discharge at the six-hour rate.

An inclosed-style Morse chain is provided from the motor to the countershaft and Whitney detachable roller chains connect the countershaft with each of the rear wheels. These chains are of generous size to conform with the liberal dimensions of all parts of the car. Two brakes of the contracting band type are provided for operating on the rear hubs. The brake sizes range from 2 to 3.5 inches in width, and in diameter from 10 to 18 inches.

Fig. 2 shows the general appearance of the type EB truck, which has a capacity of 2,500 pounds of live load. This truck can easily make from 40 to 50 miles on average level roads at a speed of eight to ten miles per hour. As in the other Ward trucks, the steering gear is of the wheel type, providing for minimum lost motion. The body is made either of the open or closed type to suit the desires of the purchaser. The driver's seat is protected by a storm curtain. Among the trimmings provided are head lamps, tail lamp, bell and hub o'dometer; also a complete tool equipment, including a jack.

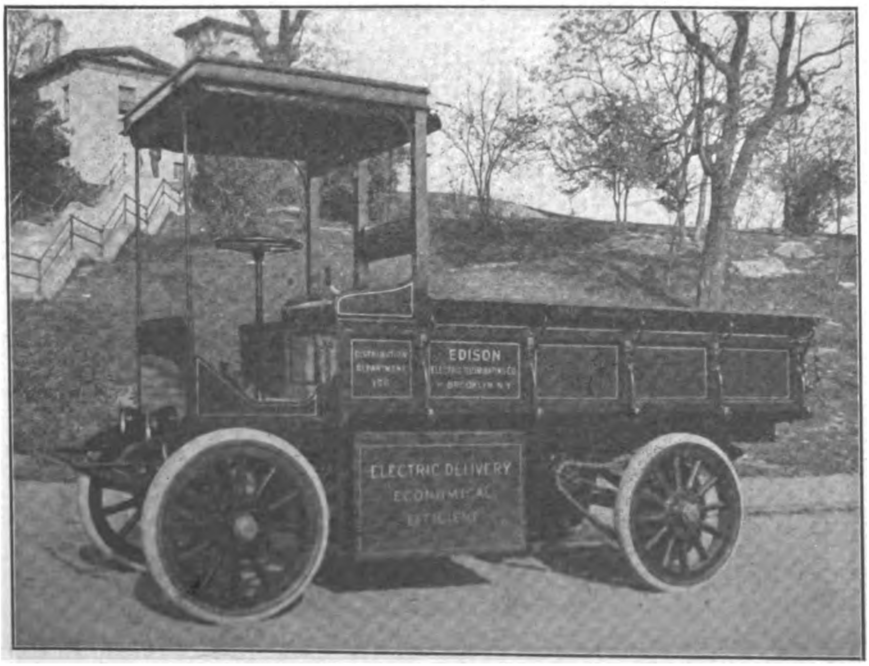
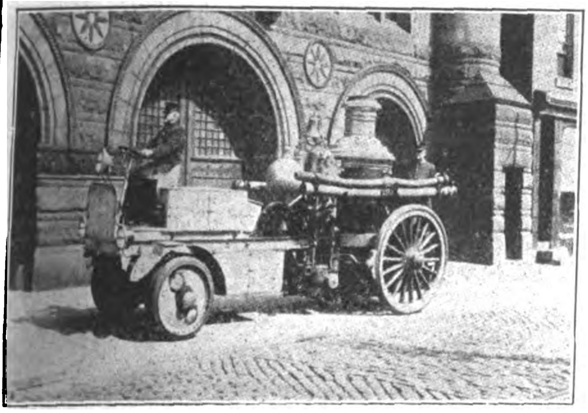
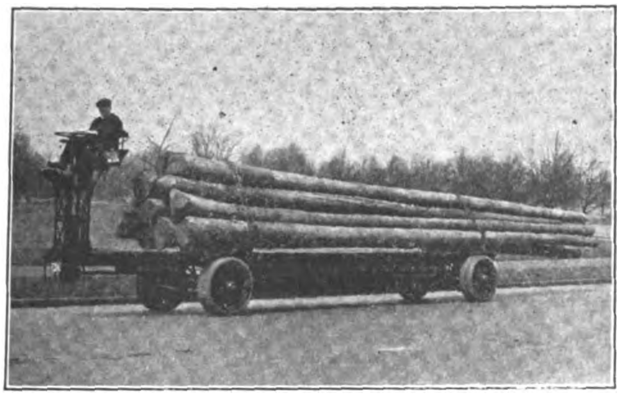


Fig. 2.——Showing the General Appearance of the Ward Motor Vehicle Company's Type EB Truck.



Electric Tractor applied to fire engine, owned by the City of Philadelphia, equipped with 88 cells, type MV-11, "Ironclad-Exide" Battery.



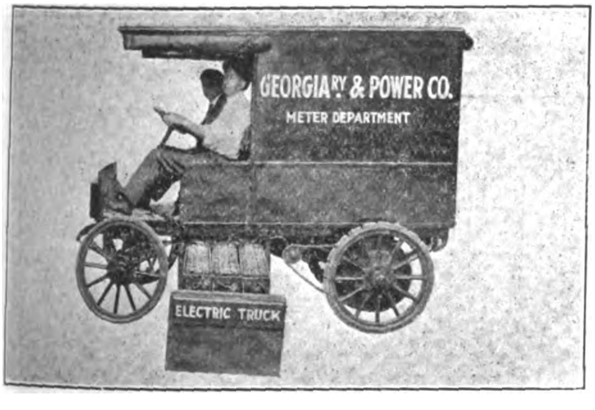
Six ton Electric Pole Truck owned by the Philadelphia Electric Co., equipped with 42 cells, type MV-21, "Exide" Battery.

Dependable Battery Service will help to increase the use of "Electrics"

The 4 "Exide" Batteries

"Exide", "Hycap-Exide", "Thin-Exide", "Ironclad-Exide"

are built for the efficient and economical operation of "Electrics." Their superiority is proved by the fact that they are used by the largest electric vehicle users



Electric Delivery Wagon owned by the Georgia Railway & Power Co., Atlanta, Ga., equipped with 44 cells, type MV-7, "Ironclad-Exide" Battery. This car ran 24,000 miles in 19 months and was only out of service two working days.

Five ton Ice Truck and Trailer. The truck is equipped with 44 cells, type MV-31, "Thin-Exide" Battery. This truck hauls from 50 to 60 tons per day over the hills of Cincinnati.

THE ELECTRIC STORAGE BATTERY CO.

MANUFACTURER OF

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"Exide" Inspection Corps

Baker Motor Vehicle Company Delivers Big Fleet in Cleveland.

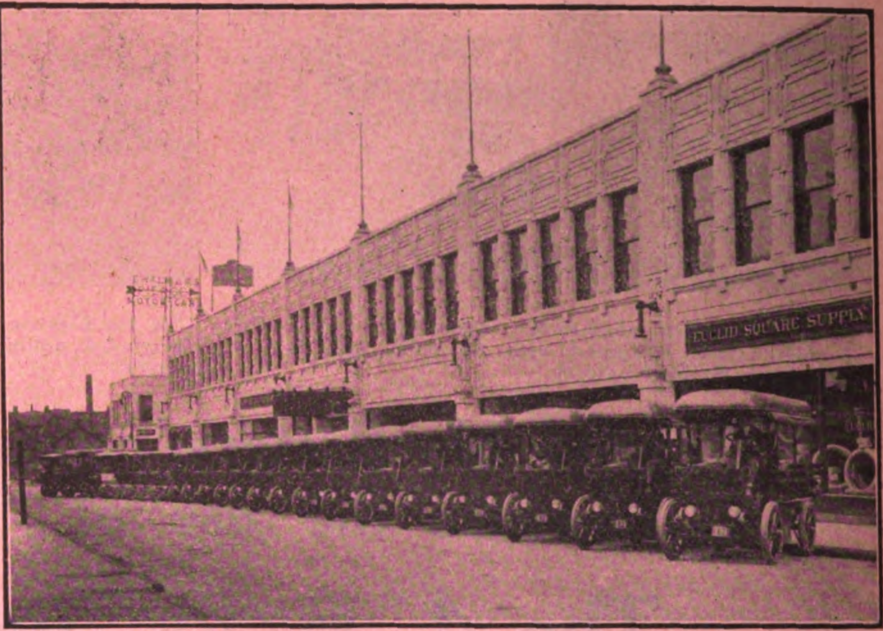
The Baker Motor Vehicle Company, of Cleveland, manufacturers of Baker Electrics, have reported the sale of 25 trucks, ranging from 1,000 pounds to 4 tons, to The Delivery Company, of Cleveland. This, the company states, is the largest single order ever placed by a delivery company.

During the month of November, which is the first month the delivery company operated, these trucks averaged 41 miles per day and carried an average of 181 packages per car per day. At this rate these trucks will carry over 1,500,000 packages during 1914.

About half of the trucks are rented on a yearly basis to Cleveland concerns for their exclusive use. Such companies have no expense whatever in connection with the continuous daily guaranteed operation of the trucks, other than the contract rental charge based on the size of truck. Others are operated by The Delivery Company for delivering packages in varying quantities for a number of Cleveland companies on a per package basis, depending upon the distance the package has to be hauled.

At the present time The Delivery Company is handling the retail delivery of 175 Cleveland merchants. The total number of Cleveland merchants who are now either renting or operating Baker electric trucks numbers more than 200.

The Delivery Company will occupy its own building about February 1, the size of which will be 100 by 140 feet, and will be one of the largest garages in this city. It will have accommodations for 75 trucks and the company is planning to operate at least 75 Baker electric trucks before the end of 1914. Three gas cars are also used for hauling mechandise to distant points in the suburbs.



Fleet of Baker Motor Vehicles for The Delivery Company of Cleveland, Ohio.

Although the bulk of the cars exhibited at the Fourteenth Annual Automobile Show in Grand Central Palace, New York, which opens January 3, are gas cars, many electric cars will be exhibited by the leading manufacturers, including Baker Motor Vehicle, Anderson Electric Carriage, Rauch & Lang, Waverly, Ohio Electric Car and Ward companies.

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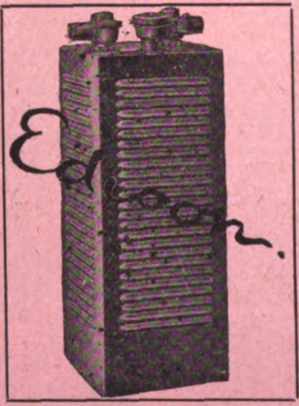

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an Edison Storage Battery by overcharging it, completely discharging it, or letting it stand idle. It is one of those good servants that require no watching—working or loafing.

There is a book which gives a non-technical description of the construction, application and operation of Edison Cells. Did you get it? It's called Bulletin No. 1015. :: :: ::

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CHURCH HEATING AS AN OFF-PEAK LOAD.

The principal developments in the use of electrical energy for heating buildings in this country have occurred in those sections of the West where power is supplied from hydroelectric plants and where the demand for mechanical power has been low during the cold season of the year. This applies especially to those projects which have a large connected load in the form of pumping plants used for irrigation purposes. In such cases heating of buildings is decidedly an off-peak load and since the operating costs in hydroelectric plants are small, the managers of these are in a position to offer attractive rates to heating customers.

Any form of a load that comes off the peak can be favored with a low rate by any power company, although of course the conditions are not so favorable and the rate offered cannot be so low with steam plants as with hydroelectric plants. Nevertheless any operating company should be in a position to offer rates for energy to be used for heating buildings whenever this can be limited to such hours of use that there will be no demand for power at the time of peak load.

One class of buildings which in almost any territory will come in this category is the church. The principal use of churches is, of course, made on Sunday, a day when power requirements are at a minimum. Even though afternoon and evening services should require heating of the building after nightfall, the extra load at the time of the usual lighting peak is offset by the fact that in the business sections of the city the lighting load is much less than upon other days. Office buildings, stores, and other commercial buildings use very little light upon Sunday.

It is true, of course, that many churches are in use upon other days of the week. Where evening meetings are held the demand for heating would probably not begin until after the day power load had been cut off, so that these two loads would not be likely to coincide. In other cases where the church would have to be heated during the daytime on week days there would be greater conflict in demand. Most of this heating load, however, would come during the early part of the day when the lighting load is small, and no doubt in all cases arrangements could be made to keep the heating load from coinciding with the afternoon lighting peak. Contracts for service could definitely specify that energy was not to be used during the peak hours, if this were considered necessary in order to provide a low rate, but in the case of many churches, especially those having few activities during the week, it would be safe for the power company to offer special inducements without limitations as to the hours of use.

It should be remembered in this connection that many churches are only heated at present, by means of furnaces, on days when services are to be conducted, and frequently a new fire must be started in every such case. This means extra work and a greater fuel expenditure than would normally be required for supplying heating during the same period on a continuous-heating basis. This fact should make the proposition for electric heating especially attractive to this class of customers.

Electric heating for church buildings has been tried for some time in certain parts of Continental Europe, such as Switzerland and Germany. News now comes that an installation of this character has been made in Christiania, Norway, where the rate for this service is 0.8 cent per kilowatt-hour. It is doubtful whether a rate as low as this could be made by many American power companies, but it is probably not necessary to make such a low rate in this country to secure the business.

HELPING THE ELECTRIC RAILWAY.

Several decisions by the Massachusetts Public Service Commission at the close of its 1913 docket point to an appreciation of the burdens of the electric railway which is most gratifying. Without going into the cases individually it is noteworthy that in practically every instance the Commission resisted a proposed reduction in revenue on lines where the rates are less than 1.5 cents per passenger-mile, figuring on the maximum distance available upon a single-fare unit. It is true that in most instances the popular demand was for the extension of transfer privileges—a program which the public often supports without the least idea of its net effect upon the company's income; but the Commission appeared thoroughly alive to the increased cost of living as it bears upon the great industry of electric traction and dismissed the petitions. Most of these affected the Bay State Street Railway, which operates a mixed urban and rural service upon nearly 1,000 miles of track in Eastern New England.

Massachusetts distinguished itself as a pioneer in permitting the advance to a six-cent fare on many lines in place of the shrinking nickel, and it augurs well for the future that its oldest public-utility regulating body continues to appreciate the limitations of the usual five-cent charge. There is little question that, the country over, many electric railways are receiving too small a return for the service which they render; shareholders in such enterprises are timid about further investments of the same character; and the situation needs the sort of treatment referred to above to insure the development of electric traction for which the demands of increasing population and business are calling.

IMPROVING BANK-COUNTER LIGHTING.

In view of the desirability of bank-counter lighting as a central-station day load, the study of this class of service is important. A noteworthy improvement in bank illumination is apparent in many cities as the result of the tungsten lamp's development, and in new buildings devoted to this business may be found some of the best work of the lighting expert. Counter lighting is becoming more and more important as the convenience of the depositor is studied, and two representative installations of recent design deserve examination.

In the first instance, the bank uses four 25-watt tubular lamps in a horizontal glass-backed reflector for every three feet of reflector length, the lamps being installed on horizontal axes 20 inches above the counter, which has a width of 18 inches. Each lamp is 10 inches long and the resulting illumination is all that could be desired, the energy expenditure being three watts per inch of counter length. The second bank employs 15-watt lamps with the ordinary pear-shaped bulbs, the lamps being installed in a metal reflector with dull white inside finish and spaced 27 inches apart, the energy consumption being about 0.5 watt per inch of counter length. The counter width is 18 inches and the lamp axes, which are horizontal, are located 12 inches above the counter.

A comparison of these installations indicates that either the first is extravagantly equipped or that the second is inadequately illuminated. The latter is the case, notwithstanding the great difference in its favor on the score of lamp height above the working plane. In the second bank only one-sixth the amount of energy per foot of counter used in the first installation is employed, but the use of pear-shaped bulbs on the wide spacing in vogue establishes noticeable dark areas between each pair of lamps, while the quality of general illumination is poor at the counter level. A polished reflecting surface, enamelled or glassed over with mirrors would help materially, and if the lighting units should be exchanged for tubular lamps of the same rating the distribution would be much improved.

By substituting fifteen 10-watt lamps for the eight 15-watt units now employed in a counter length of 20 feet, the watt expenditure per inch could rise to 0.625 and the results would probably show a marked improvement over the existing installation. It is apparent from a comparison of the two counters that a lower expenditure of energy than three watts per inch of counter length can safely be used where it is considered desirable to economize, and that for such spacings as the above mentioned, with intermediate values as well, an expenditure of from 1 to 2 watts per inch with tubular lamps or frequently installed pear-shaped bulbs in high-class reflectors, will insure results alike beneficial to the customer and to the banking institution.

COST OF ELECTRIC SUPPLY IN LARGE CITIES.

At the December meeting of the Institution of Electrical Engineers in London, England, a paper was presented by Dr. G. Klingenberg entitled "The Electricity Supply of Large Cities." This paper made a comparison between the cost of supply in Berlin, London and Chicago, and will be found in part upon other pages of this issue. Dr. Klingenberg is a director of the Allgemeine Elektricitäts Gesellschaft, of Berlin, Germany, and the results of his study will be of interest to American readers, although the points which were brought out have especial significance for London.

London differs from most other large cities in having its electric supply determined by its political division into a large number of small boroughs, so that there are in all 64 different power plants providing independent supply in their respective territories. As a result the average size of plant and of generator is much smaller than in the other cities; the standby capacity is larger; the investment per kilowatt is larger; and both fixed charges and operating costs are larger. Although many of the London plants are municipally owned and operated, and the average net profit is small, the consumer nevertheless pays for the lack of efficiency in production in a higher average rate for electrical energy. The problem before London is to consolidate her supply so as to avail herself of the efficiencies possible in large generating stations, and her engineers are fully prepared to do this and have realized its desirability for some time, but the political situation makes it impossible at the present time.

In Berlin, as in Chicago, the supply is largely in the hands of a single operating company. These two large cities are about equal in population and have had an almost identical growth since the German capital about a half century ago struck its modern gait. The investment per kilowatt in Berlin has been less than in Chicago, labor costs are smaller, and the electrical energy produced per pound of coal has been larger, but these advantages are largely counterbalanced by the lower price of coal in the American city.

There is a marked difference in the character of the load in the different cities. The Chicago company had a load-factor in 1911 of 41 per cent; Berlin, 33 per cent; and London, 25 per cent. The lighting load still predominates in London, while Chicago is unique in the extent of its railway load. A proper comparison between the three cities cannot be made without taking such conditions into account, and this Dr. Klingenberg has done by using a "utility-factor," which is the ratio of the average load to the capacity of the power plant. This factor is, of course, proportional to the load-factor, but differs from it by the introduction of the element of reserve capacity. It is a convenient term to express the ratio which defines it. Chicago is shown to have had a utility-factor of 33 per cent, while that for Berlin was 18 per cent, and that of London only 12 per cent. By taking this factor into account a better comparison between the cities can be made and the curves connecting the utility-factor with cost per kilowatt-hour are found to be fairly close for the three cities. The large difference in costs is consequently due to this element, but there is still an additional difference due to such elements as the size of plants. The latter feature could be improved in the case of London by a consolidation of her generating stations, which would reduce operating costs 40 per cent, but the larger difference could only be kept down by the acquisition of those elements of load which would tend to equalize the demand upon her stations and increase the utility-factor.

METER CONFERENCE.

The custom initiated last year by the Ohio Electric Light Association of holding conferences of metermen in various parts of the state proved a valuable innovation, and will no doubt become a permanent feature of that organization. This practice not only permits of more meetings of the men interested in the work of the Meter Committee, but as the various conferences are held in different parts of the state, it permits participation in the discussions by a larger number of men than would ever be brought together at the annual convention of the state association, or at that of the National Electric Light Association. This is especially true in Ohio, since the state conventions are always held at the same point.

This year's committee, which is again under the chairmanship of Mr. A. H. Bryant, has called a meeting in Cleveland, O., for the afternoon of January 16, open to metermen from all electric companies in the state. It will be held in the new meter building of the Cleveland Electric Illuminating Company, which will be inspected in connection with the meeting.

Other state committees might find it advantageous to adopt this conference idea, and thus add to the advantages which membership in a state association brings to the member companies.

CROSS AT THE CROSSINGS.

The rapid increase in the use of electric and other power vehicles in all of our large cities makes the problem of regulating street traffic more serious year by year. Since the motor vehicles have ordinarily higher speeds than horse-drawn trucks, the question of traffic regulation assumes greater importance than formerly. In considering the question of safety, danger to the pedestrian must be given consideration, and the regulation of the traffic of foot passengers is being considered. In Chicago the experiment of permitting pedestrians to cross streets only under the directions of traffic policemen, as indicated by whistle signals, has been tried, but not put into general practice. In some other cities pedestrians are prohibited from crossing diagonally at street intersections. Accidents frequently occur because pedestrians step into the street without noting the approach of vehicles, especially the silent power cars. The only safe rule for pedestrians to follow is to cross at the crossings.

Annual Meeting of Electric Club of Chicago.

The annual meeting of the Electric Club of Chicago, marking the close of the 1913 administration was held at the Hotel Sherman, January 6. Following the dinner, which was served at 6:30 p. m., George Keech, retiring president, briefly reviewed the activities of the club during the past year. Reports were then presented by the retiring treasurer and secretary, C. W. Forbrich and Fred M. Rosseland.

Mr. Forbrich's report showed the club to be in a healthy financial condition and despite unusual expenses during the past year a profit of $587.17 was made. The total receipts during the year amounted to $3,383.33 and the expenditures, $3,797.83. The latter includes the cost of an additional $1,000 bond which, with the three other bonds of like amount, makes the total assets of the club $4,234.97.

As chairman of the Membership Committee for 1913, F. W. Harvey reported a gain of 171 during the year, making a total membership, on December 31, of 512 members.

A. R. Bone, incoming president, was then introduced and spoke briefly of the future before the club. The slogan for 1914 will be "1,000 members." William C. Berry and H. Ehrlich were also called upon.

Elaborate entertainment features were provided. The Commonwealth Edison Company orchestra under the leadership of M. L. Eastman and the Edison Glee Club, led by Harold Wright, rendered selections during the evening. A vaudeville program of four numbers concluded the festivities.

Chicago Section, Electric Vehicle Association of America Meets.

John F. Gilchrist, vice-president of the electric Vehicle Association of America, was the speaker at the regular weekly meeting of the Chicago Section on January 6. He spoke briefly of the work before the Association and of its chief function—the bringing together of central-station interests and vehicle manufacturers.

Regarding conditions in Chicago Mr. Gilchrist said that the development had been exceptionally pleasing. The Commonwealth Edison Company on December 1 reduced its garage rate from 5 cents per kilowatt-hour to 4 and on March 1 the rates for residences will be reduced so that vehicle charging will earn a 3-cent rate, providing the energy used otherwise equals the amount necessary to come under the lower rate. The local company is also considering the plan of renting batteries, fully charged, as inaugurated in Hartford, Conn.

In conclusion Mr. Gilchrist called attention to the street improvement which is continually going on in Chicago and to the absence of grades. These conditions, together with low rates for electricity should have a marked influence on electric-vehicle development.

The meeting on January 13 will be held jointly with the Chicago Garage Owners' Association, at the Lexington Hotel.

Eye Strain in Telephone Work.

There are in the United States about 125,000 telephone girls, whose average term of service is three years or less. The working hours are about eight per diem; the average number of calls is about 140 per hour, running, at the peak, to 225 or more. When the person calling raises his receiver, a light flashes on the switchboard, and this light continues to burn until the operator plugs the number and receives the call. She then plugs the number called for and this light burns until the called person raises his receiver from the hook. When the receivers are finally replaced on their hooks, both lights flash and burn until the operator removes the connecting plugs. To complete one call means four flashes of light. As the average number of calls is 140 per hour, with 225 or more during the rush hours, the operator's eyes are exposed to from 500 to 1,000 flashes of light every hour, resulting in fatigue to the eyes, to say nothing of the mental and physical strain under which the operator works. The Bell System, in 1911, spent $720,953 for rest-rooms and lunch-rooms for the operators, and it has secured sufficient air space and good illumination, yet, although only young and healthy girls are selected, the average length of service does not exceed three years, reports the American Medical Association. The symptoms of eye-strain which the girls develop are headache, dullness, indigestion, exhaustion, nerve strain, insomnia, colds, and so forth. The two or three short years of telephone work possible to the girls, as well as nine-tenths of all their suffering, is probably due to the constant near-range eyework, without proper protection for the eyes.

Indirect Lighting Before Chicago Jovian Club.

On Monday, January 5, at the regular noon-day meeting of the Jovian League of Chicago, T. H. Aldrich, engineer for the National X-Ray Reflector Company, delivered an address, illustrated with many pictures, on "Modern Illumination of Interiors."

A feature of the meeting was the presentation of framed resolutions to Past Statesman George C. Richards, by Past Jupiter Sam A. Hobson, for services rendered as statesman and in organizing the Chicago Jovian Club.

F. W. Harvey, appointed alternate statesman, vice E. H. Waddington, who has moved to Cleveland, O., presided.

Flicker Photometry.

At the meeting of the Philadelphia Section of the Illuminating Engineering Society to be held Friday, January 16, 1914, two papers will be presented: "Deficiencies of the Method of Flicker for the Photometry of Lights of Different Colors," by C. E. Ferree; and "A Reflecting Marker for All Books," by J. N. Rhoades.

As usual the meeting will be preceded with a dinner at 6:30 p. m. at the Engineers' Club, at which place the meeting of the Section also will be held.

Central-Station Fires.

The plant of the Mauch Chunk Electric Light and Power Company was destroyed by fire December 27. The fire was caused by sparks falling on the roof of the boiler house. The estimated loss is $80,000, covered by insurance to half that amount.

On December 1 the plant at Rockwell City, Iowa, was burned while being remodeled.

The electric light plant at Quenemo, near Ottawa, Kans., was partly destroyed by fire recently, the loss being estimated at $4,000. Insurance amounted to $2,400. Incendiarism is suspected.

New York Trade School Courses.

The Board of Education, New York City, has announced that the second term at the Murray Hill Trade School began on January 5. Evening sessions are held on Monday, Tuesday, Wednesday and Thursday evenings. Free courses are offered during this term in a large number of subjects, including electrical wiring and installation, and motion-picture operation. Enlarged facilities and additional equipment make it possible to accommodate a larger number of students and the courses are thoroughly practical.

"White Way" Lighting Contract Secured at Minot.

The city of Minot, N. D., in addition to renewing the present street-lighting contract with the Consumers Power Company covering 12 arcs and 212 series incandescent street lights, has contracted with the company for current for the operation of a new system of "white-way" lighting consisting of 60 ornamental standards, each carrying one 60-watt and four 40-watt Mazda lamps.

Electricity in Ice-Making.

It is estimated that there are about 2,000 steam-operated ice plants in this country, which, if operated by central-station power, would mean a consumption of from 600,000,000 to 700,000,000 kilowatt-hours per year. This in itself is a large field for the central station but there is a steady increase in the number of plants, all of which, without question, should be operated with purchased power. General information and specific operating data are given in this article.

Until a time not exceeding three years ago practically all ice plants of the larger size were operated by steam engines. The reasons for this condition are explained by C. H. Stevens, of the Brooklyn Edison Company, as follows: (1) These plants were making ice from distilled water and were obtaining the greater part of this distillate from exhaust from their engines; and (2) with this handicap of the engine exhaust to overcome, the central station did not consider the field sufficiently important to adopt new rates, where necessary, to apply directly to this business.

While this condition actually did exist three years ago, there are at the present time at least 15 artificial ice plants of over 90 tons capacity which are operating exclusively on central-station service in this country and giving the highest satisfaction, both from the standpoint of efficiency and economy.

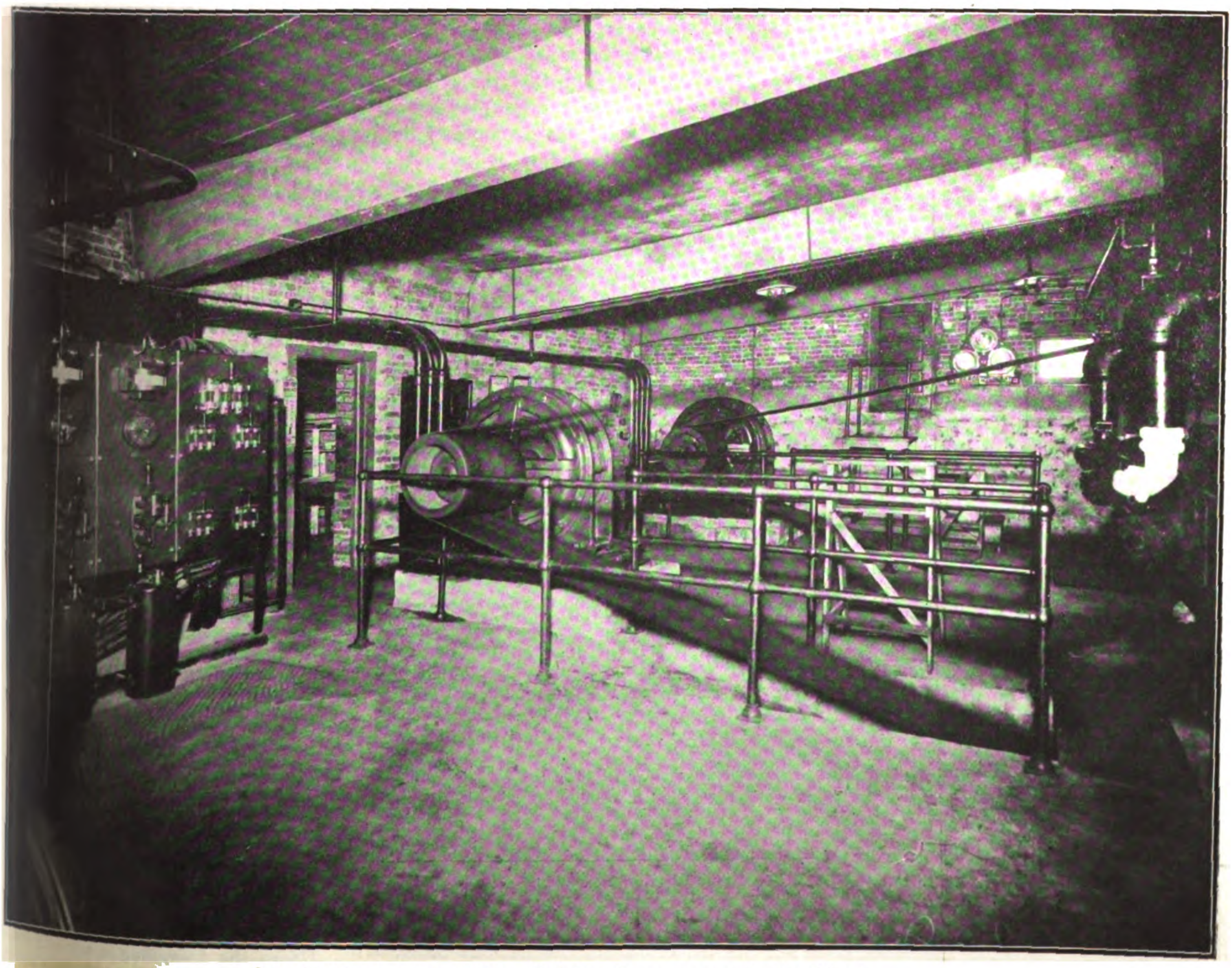
To occasion this marked change in the situation, it is obvious that the former conditions which were against the central stations must have been met and overcome in a very decisive manner, owing to the large proportion of this business which has been secured since that time.

The determining factors which brought about this change were: the use of multiple-effect evaporators in connection with the distilled-water plants; the advent of the raw-water system of making ice; and central-station rates applying directly to this business.

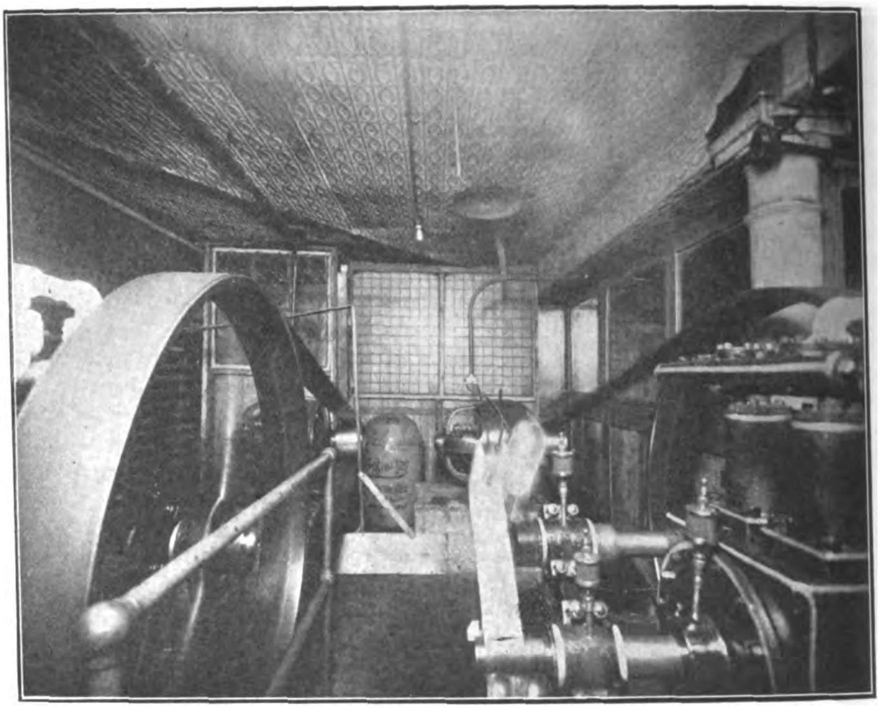
The use of high-pressure multiple-effect evaporators in connection with the distilled-water plants was a most important step in bringing about this change. With this efficient piece of apparatus very high evaporations were obtained—in some instances as high as 50 tons of distillate per ton of coal with an 8-effect evaporator. This made it entirely feasible to drive the compressors and pumps electrically and to produce the distilled water economically direct from the evaporators.

The advent of the raw-water system of making ice was a still further advancement in the science and put the ice plant distinctly within the field of the central station. In this system obtaining distilled water is a secondary and an unimportant item in the cost of production.

With the handicap of steam for distilling purposes removed from both types of plants it was then purely a matter of rates for current that would compare favorably with other sources of power for driving the compressors.



Two 50-Horsepower Motors Driving Compressors In Ice Plant.



Motor-Driven Compressors.

At the Chicago convention of the National Electric Light Association the Committee on Refrigeration, of which George H. Jones, of the Commonwealth Edison Company, was chairman, presented an exhaustive report on the subject which treated at some length the subject of ice-making. These data were based, to a large extent, upon the investigations and experiences of Mr. Jones who has made a special study of the subject and who has succeeded in obtaining several large plants in Chicago for the Edison Company. These plants include The Consumers Company (three plants) with a total connected horsepower of 1,435; the Englewood Distilled Water Ice Company, 500 horsepower; Mutual Manufactured Ice Company, 306 horsepower; Crystal Manufactured Ice Company, 285 horsepower; Lincoln Ice Company, 535 horsepower, and other smaller plants. The data Mr. Jones presented in this report are extracted herewith, these being the most authoritative treatment of the subject so far presented.

One of the principal advantages of the electrically operated ice plant is that it may be built at or near the center of the territory to which it is to supply ice, irrespective of railroad facilities. This is a very important point, as it is a well established fact that a very large item of cost in the ice business is that of delivery to the consumer. The ideal arrangement is to install plants of from 80 to 100-ton capacity about two miles apart, so that each plant will supply the territory within a radius of a mile, thus reducing delivery to a minimum. One other point of advantage is that better ice can be produced, as the trouble frequently encountered in steam-driven plants of having oil carry over from the engine cylinder is entirely eliminated.

In view of these conditions the question is how large a proportion of this business can be secured to the mutual advantage of the central station and the manufacturer. The fact that at the present time most of the ice plants are steam-driven should not discourage the central-station men, as it is only recently that this matter has been investigated and gone after by the central station.

Before proceeding further with this discussion it might be well to point out a few physical facts in connection with the manufacture of ice.

(1) Chemically pure water free from air will freeze solid and clear.

(2) Water containing impurities in solution tends in freezing to force impurities out of solution. The slower the process of freezing the more completely is the purification effected.

(3) Ice formed in still water sends out long slender crystals, which increase in number and size, forming a meshwork which gradually becomes a solid mass.

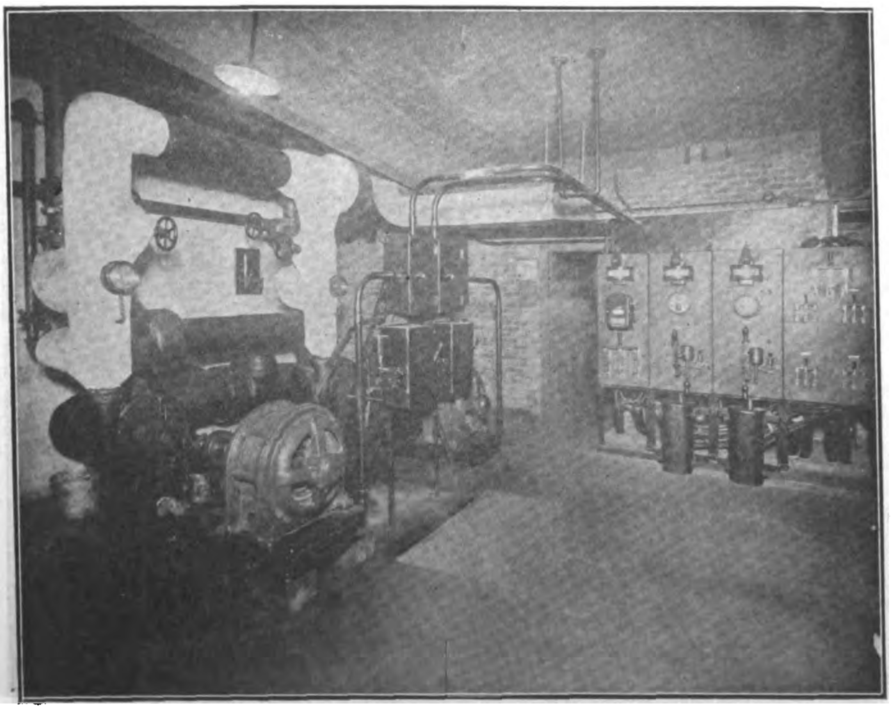
(4) Agitation of water during freezing aids in the separation of impurities and is, therefore, of value in the forming of solid clear ice.

(5) Practically all natural waters contain air and more or less organic or inorganic material in solution. These substances tend to cause the ice formed to be opaque, but as they are frozen out of solution, those that are light rise and collect near the surface, and heavier ones stay near the bottom.

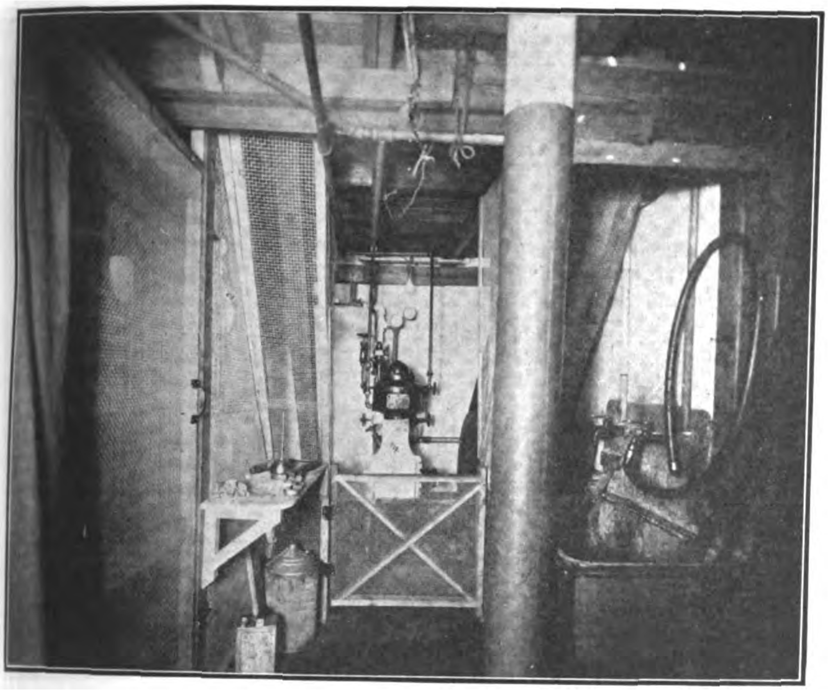
(6) The rate of ice freezing increases as the thickness already formed increases. The time required to freeze increases as the square of the thickness to be frozen. The formation of natural ice is from the top down and impurities frozen out of solution fall. This and the motion of the water, especially in quiet-running streams, tend to make natural ice transparent. American manufacturers of ice have always tried to duplicate this clearness, although in foreign countries opaque ice is frequently used commercially.

Distilled-Water Ice-Making.

From the foregoing it will be noted that distilled water will freeze solid



Motor-Driven Pumps in Ice Plant.



Motor-Driven Centrifugal Pump.

and practically clear. This is doubtless one of the main reasons why such a large number of plants now in existence are making ice from distilled water. The plan was to utilize the condensed water from the engines for a large part of the distillate. It might be thought by a casual observer that this was an ideal arrangement against which purchased power could not compete. The situation has been met, however, in two ways, (1) by making raw water ice, i. e., freezing the water without first distilling it, and (2) in cases where distilled water ice is desired, by securing the necessary distilled water by means of a multiple effect evaporator. This is an efficient piece of apparatus for securing a very high evaporation of water per pound of coal. With this apparatus six times as much water can be evaporated per pound of coal as with the ordinary boiler. To secure this result, advantage is taken of the fact that water will under vacuum evaporate at a much lower temperature than under ordinary conditions.

Evaporators for ice-plant work are classified broadly into two types—exhaust and high pressure. With the former type we are not directly interested, except that it represents the economy of the steam-driven plant which we must offset with the other advantages of central-station power. In a standard non-condensing steam-driven ice plant the losses vary from 10 to 20 per cent, and hence 100 tons of distilled water in the cans means at least 115 tons produced or handled. Of this amount the compressors and auxiliaries will furnish not over 90 tons, hence a make-up of 20 to 25 tons must be bled from the boilers at the average rate of evaporation of the plant. The exhaust-steam evaporator in single effect with an economy of 8 tons of distillate per 10 tons of steam, supplies this make-up with a consequent direct saving in coal represented by this evaporation in the boiler less pump charges. With two effect plants operating from a few pounds above atmosphere to, say, 25 inches of vacuum, the economy may be increased to a ratio of 2.25 to 1 of steam.

If the plant be put upon a standard compound condensing basis a still greater efficiency exists, say 60 per cent of the total coming from the evaporators, and the cost of production is still more against central-station power. Evaporators for the service may be two or more effects, depending upon the price of coal. Their economy may run to as high as 5.5 to 1.

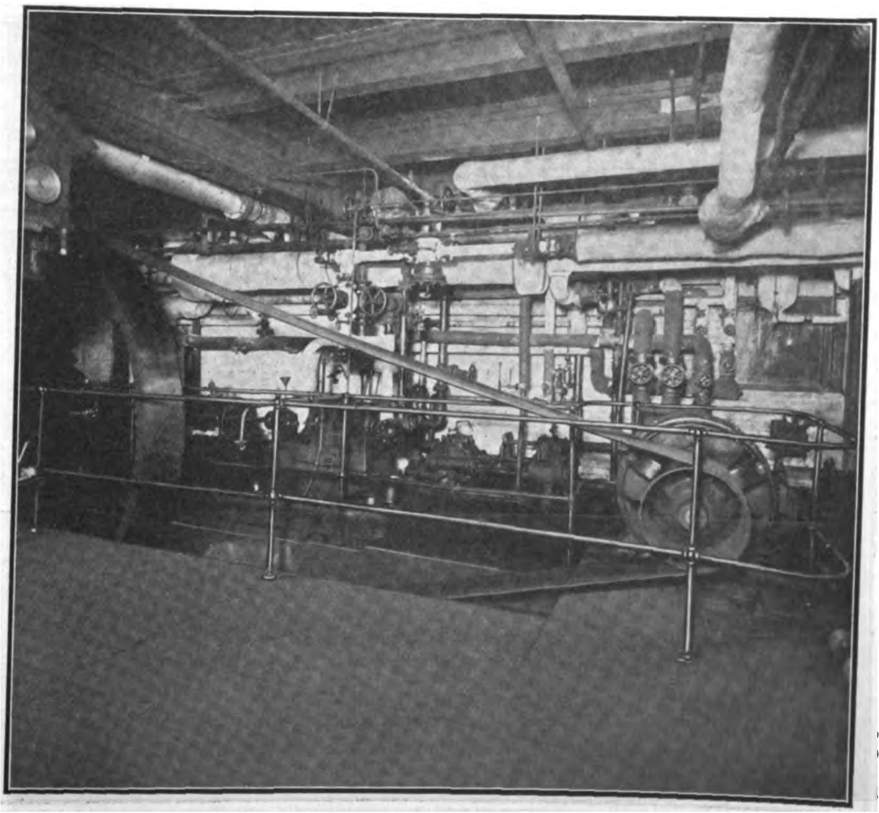
For motor-driven ice plants the problem is merely to produce the distilled water as cheaply as possible, and resolves itself into a consideration of capital investment versus efficiency, and the governing factor is usually the price of fuel. With motor-driven pumps, and eight-effect plant will give an economy of 6 to 1, and hence produce with average western coal and boiler performance, 45 to 48 tons of distilled water per ton of coal. It is seldom economy to exceed eight effects.

When central-station power is being considered by the ice-plant operator the assumption is justifiable that his fuel cost is at least moderately high. With this premise it is easy to point out to him that in securing the benefits of electric drive he is also gaining something from the operating point, some of the benefits being as follows:

(1) He can secure an absolutely oil and air-free distilled water by use of the evaporators.

(2) His cost to produce this water is very low per ton of ice made.

(3) His investment may be so pro-



50-Horsepower Motor Driving Compressor.

Ice-Making Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Lincoln Ice Company, Chicago, Ill. This company has a capacity of 120 tons of ice per day. The actual output during the year covered by the consumption figures was 27,839 tons. The raw-water, can system is employed. Plant operates 168 hours per week.

Total connected horsepower, 511. Total number of motors installed, 11. Average kilowatt-hours per month, 121,255. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
March.	76.600	July	237,500	November	71,308
April	97,100	August.	224,000	December	32,001
May	127,300	September.	192,551	January	48,447
June	167,300	October	112,419	February	68,486

Load-factor, 43 per cent.

The electrical energy consumption per ton of ice manufactured is 52.2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 230 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	150	514	Slip-ring motor belted direct to one 60-ton Giant compressor.
1	300	514	Slip-ring motor belted direct to one 120-ton Giant compressor.
2	15	900	Each belted direct to an air compressor.
1	2	1,120	Belted direct to an agitator.
1	2	1,120	Direct-connected to one distilled-water pump.
2	1	1,120	Each direct-connected to a vacuum pump.
2	10	900	Each driving one condenser.
1	5	1,120	Direct-connected to an ice hoist.

Crystal Ice Company, Chicago, Ill. This is a raw-water ice plant using the can system. The rated capacity of the plant is 60 tons of ice per day while the actual output during the 10 months covered by the kilowatt-hour consumption figures was 9,656 tons. Plant operates 168 hours per week.

Total connected horsepower, 235. Total number of motors installed, 7. Average kilowatt-hours per month, 62,218. Average kilowatt-hours per month per horsepower connected, 254.

Kilowatt-hour consumption for 10 months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
June	91,200	October.	45,959	January	24,243
July	123,400	November	32,064	February	29,450
August	119,800	December.	933	March	45,450
September	109,697				

Load-factor, 49 per cent.

The electrical energy consumption per ton ice manufactured is 64.5.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 230 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	150	500	Belted direct to one 60-ton Wolf compressor.
1	25	900	Belted direct to a 15-ton Wolf refrigerating machine.
1	20	900	Belted direct to air compressor.
2	5	1,120	Each belted direct to an agitator.
1	25	900	Geared direct to a deep-well pump.
1	5	1,120	Geared direct to an ice hoist.

Knickerbocker Ice Company, Chicago, Ill. This plant manufactures ice from distilled water, employing the can system. The rated capacity of the plant is 120 tons of ice per day, while the actual output during the eight months specified was 32,500 tons. Running hours per week, 168.

Total connected horsepower, 564. Total number of motors installed, 20. Average kilowatt-hours per month, 182,239. Average kilowatt-hours per month per horsepower connected, 323.

Kilowatt-hour consumption for 8 months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
May	117,000	August	216,700	November	152,445
June	190,000	September	205,802	December	160,619
July	211,000	October	204,312		

Load-factor, 59 per cent.

The electrical energy consumption per ton of ice manufactured is 44.7 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Application.
2	200	Each belted to a 50-ton York compressor.
8	2	Each belted direct to an agitator.
1	75	Geared to deep-well pump.
1	40	Geared to contrifugal water pump.
2	5	Driving two centrifugal brine pumps.
1	10	Geared to elevator mechanism.
2	1	Each geared to ice hoist.
1	3	Driving coal hoist.
1	3	Driving mechanical stoker.
1	3	Geared to coal conveyor.

portioned to his fuel cost that the cost to produce the distilled water will be a minimum under all conditions.

(4) His boiler plant is reduced to approximately one-sixth of the capacity required with a steam-driven plant.

(5) The amount of condensing water required for his steam condenser is likewise reduced, it being necessary only to condense the vapor from the last effect, for the reason that each evaporator forms the condenser for the previous effect.

(6) The system of heat exchangers employed permits the boiler feed as well as the evaporator feed to be heated to a high temperature which conduces to high economy.

(7) The modern evaporator construction enables the operator to clean the evaporator with less trouble than the average boiler can be cleaned.

(8) The amount of distilled water produced and hence of coal burned may vary with his requirements, whereas, in a steam plant his production of distilled water remains almost constant.

(9) The only water losses in a motor-driven plant are filling losses which are the smallest water losses in the plant.

In distilling equipment of this kind it is essential that all piping be tinned on the inside so as to prevent the distilled water from attacking iron and thus discoloring the water.

Raw-Water Plants.

In order to do away with the necessity of using distilled water many raw-water plants have been built and are giving very good results. One of the items which must have an important bearing on the establishments of such plants will be the character of the water supply. In some sections of the country where the water contains a large amount of mineral substance in solution, it may be difficult to secure clear raw-water ice, but ordinarily there is very little difference in the appearance of distilled-water ice and raw-water ice as manufactured in the best plants.

The methods of manufacture of raw-water ice can be classed under two general heads—the first known as the can system and the second as the plate system. Practically all of the plants now in operation are of the can type, although there are a few of the plate variety.

In a can plant the ice is formed in large cans in which filtered raw water has been placed, these cans being immersed in tanks of refrigerated brine which is being constantly circulated by means of pumps. During the process of freezing the water in the cans is agitated by means of compressed air, which agitation is necessary in order to secure clear ice, as previously explained. The water in the cans is permitted to freeze until the core is reached, at which time the core water is replaced by distilled water and the cake frozen solid, leaving simply a feathery effect through the middle of the cake. This removal of the raw water from the core is necessary in order to secure a clear cake of ice, as, of course, it would be impossible to agitate the raw water until it is entirely frozen. Then, too, the water which has been removed from the core contains practically all of the impurities from the entire can. This process involves the use of between 15 and 20 per cent of distilled water which can be supplied by means of a small multiple-effect evaporator, such as is used in regular distilled-water establishments.

In the plate type of plant hollow plates through which cold brine or ammonia can be made to circulate, are immersed vertically in tanks filled with water which is agitated. The ice forms gradually on both sides of the plates, thus ridding itself of any air or other impurities on its surface. In the can system these impurities concentrate toward the center, forming an impure core which is removed as previously explained. With the plate system it is not necessary to distill or boil water which is otherwise pure for ice making. The plate plant, however, requires more skill to manipulate it successfully, and is more expensive to install and keep in repair.

In this system when the ice is formed to the desired thickness, it is loosened from the freezing plates by various thawing arrangements. The ice cakes, often 9 feet by 16 feet by 12 inches in thickness, are lifted from the tanks by overhead cranes, and are carried to a table where they are cut to commercial size.

In order that the successful operation of an electrically driven ice plant may be assured, it is necessary that a proper equipment be installed. One of the important features is the type of motor to be used. In all probability the great majority of the plants to be considered will be located in territory in which the central-station supply is alternating current; in fact, all of the large plants thus far constructed have been equipped with three-phase motors.

There is some difference of opinion as to whether motors should be designed for constant speed or variable speed. In any event, they should be of the slow-speed, slip-ring induction type, and equipped with drum controllers. In case constant-speed work is desired, the resistance to be furnished with the controller need be large enough simply for starting the motor. If at a later time it becomes desirable to operate the motor at variable speed, the only change required will be to install additional resistance. The use of multi-speed motors has been suggested for this class of work, but this practice should be discouraged, as the efficiency of the motor at full load is not quite as high as the standard motor, and, furthermore, the power-factor is considerably lower.

While some of the companies have adhered to the standard practise of using 220-volt motors, others have adopted the plan of operating the large compressor motors at primary voltage of approximately 2,300 volts, using lower voltage on motors operating the auxiliaries. The efficiencies of three-phase motors are the same at either 230 volts or 2,300 volts. The factors involved in making a choice are the economies in operation due to the elimination of transformer losses, and the comparative costs of first installation. The use of primary voltage on motors, however, introduces a certain risk to attendants which many of the large companies hesitate to assume.

The question is often asked whether or not an electrically operated plant can be made to operate as cheaply as a steam-driven plant when the location is favorable to the steam plant, that is, when ample railroad facilities are available so that coal can be brought in under the best conditions. This question is best answered in the words of one of the largest ice operators in the country, who has a number of distilled-water ice plants, both steam and electric. He states that under his conditions of operation there is practically no difference in the cost of manufacture under the two systems. Under the electric plan of operation, however, he can locate plants to best suit his needs, and, furthermore, the possibility of contamination from oil is removed, which is a point of much value.

Data on several electrically operated ice plants are given in the accompanying data sheets.

New York Edison 1914 Calendar.

The New York Edison Company is noted for the fine quality of its printed literature. The company maintains an extensive advertising department presided over by one of the most eminent advertising experts in the country. The company's 1914 calendar is in line with the other products of this department, showing the Edison service man leading Father Time. The illumination is furnished by an incandescent lamp held on a platter.

Commercial Practice
Management, Rates, New Business

Unique Test Demonstrates Efficiency of Boston Edison Employees.

A unique test to determine the facilities of the company for handling a serious accident at night was recently conducted by the Edison Electric Illuminating Company, of Boston, and the results are interestingly chronicaled in *Edison Life* as follows:

What would happen in the event of a serious accident to any of the company's property in any part of its territory, interrupting service to our customers?

That is a question which may have arisen in the minds of all of us and caused various lines of speculation. There is one thing that surely would happen—and that is that every man directly interested in and intimately connected with the successful operation of the system would be on the spot within a very short period of time, ready to do his part toward restoring the service to its usual high plane. Several slight accidents have previously demonstrated this fact, but our general superintendent desired to make a test on a broader scale, and evolved a plan that proved the greatest surprise that Edison men have had sprung on them for some years.

"I have been planning in my own mind to test the efficiency of the working force in an emergency at a convenient opportunity," Mr. Atkins confided in Mr. Hancock as they were returning from a business engagement on the evening of December 4, "and this is the night." LaRue Vredenburgh and John Buckley who were in the party were "let in" to take charge of details. They all proceeded at once to the heart of the Edison system—L Street Station—and there Mr. Atkins unfolded his plans.

It was just 11:10 p. m. when W. J. Kennedy, chief engineer of the L Street station, was called in by telephone. Being a night owl, he had not yet retired, so he at once pressed his private car into service, and arrived from Dorchester at the station at 11:25, only 15 minutes after the message was received.

Another telephone call at the same time found W. F. Crowell, of the telephone division, in bed. "Come to '39' for a test" was the message, and Crowell hurried to 39 Boylston Street where he arrived at 11:33, and with the assistance of three night operators made plans to send out calls to all those on the emergency list.

On the stroke of 12 o'clock, midnight, the telephone system commenced its part of the program. Telephone bells were soon arousing the families in scores of Edison homes. Within 37 minutes, each one of the 45 names on the list had been called up, and the terrible message, "Serious trouble at L Street" had been transmitted with instructions to report at once for duty.

The test was really not a call to L Street only, it was a call to duty, whether to L Street, to the garage, telephone or stock room. Men called by the operator passed the call to certain of their men for assistance.

The message sent by Superintendent Larrett of the maintenance department, brought all the district foremen to their respective stock rooms. These men are in charge of the lines in large territories, each including several cities and towns. They waited at the stock rooms for "orders." Superintendent W. F. Stevens of the supply department relayed his call to men who reported at the main stock room, service buildings; and were ready to furnish supplies upon receiving the word. In the same manner Superintendent Smith sent messages to chauffeurs that were needed. Twenty-one men were available as drivers including his night men.

Of course all these calls required considerable time, since in many cases it was necessary to make use of toll lines and messenger service.

The busy scenes enacted in many of the homes at this time in the early morning can be imagined. While the men were scrambling into their clothes their wives were telphoning instructions and seeking information. In this connection honorable mention should be accorded to members of the Edison families who gladly assisted their husbands in their hurried get-away, proving in this way that the spirit of Edison loyalty has pervaded the homes of our employees.

Automobiles, taxis, hacks and anything else which could be found on wheels, rushed their startled occupants toward the scene of the imagined calamity. On the way some of the men hailed gangs of workmen, who were engaged in night work on the line, and started them towards the one spot foremost in all minds. From 12:15, the time of the first arrival at L Street, until about 2 a. m. men came rushing in from all quarters, dressed in all fashions ready to work. They descended upon the place like a swarm of bees, until something like 100 faces had been transformed from a frown of dismay to a smile of relief.

Pierce Kent, who lives about 100 yards from the station, arrived at 12:15, just four minutes after he had received his notice; while J. C. Norcross, who lives 16 miles from the L Street station, travelled in a local taxi and reported in one hour and 19 minutes.

Besides the hundred and more that reported at L Street there were two score men who reported at the various stock rooms, and the garage. Unfortunately the time of arrival of everyone could not be checked, some of the men failing to register. An analysis of the data at hand shows that notwithstanding the delays, satisfactory results were obtained as follows:

Time of arrival	Average distance from L St.	Average time
12:11-12:30	3 miles	17 minutes
12:30-1	3¾ "	34 minutes
1-1:30	4½ "	45 minutes
1:30-1:52	9 "	67 minutes

Echoes of Louisville Merger.

Charging that excessive rates for gas and electricity have followed the merger of the gas and electric companies of Louisville, Ky., the People's Protective League has been organized in that city for the purpose of taking legal steps to dissolve the merger, which resulted in the organization of the Louisville Gas & Electric Company. The organization of the league has followed putting into effect the agreement between the company and the city, by which the Louisville Gas & Electric Company, in return for constructing a natural-gas line from West Virginia and enabling gas to be sold at 35 cents, was permitted to increase its rates for electric lighting, which had been depressed by the competition between the companies formerly in the field. On this account, many uninformed people have agitated for a return to the old conditions. The company has franchises created by the city for its operation, as well as a definite contract, so that there appears to be little chance for the reduction.

Growth of the Western States Gas & Electric Company.

Since the Western States Gas & Electric Company (Richmond, California, Division) was taken over for management by H. M. Byllesby & Company, the company's connected load has increased as follows:

	Nov. 1913	Dec. 1910	Increase	Increase %
Number of customers	2,733	1,163	1,570	135
Kilowatts Ltd. load	2,440	979*	1,517	155
Flatirons	1,320	432	888	205
Signs	48	12	36	300
Horsepower motors	4,443	1,582	2,861	180
Total KW. all purposes	5,812	2,279*	3,533	150

*March, 1911.

The ratio of meters to population has more than doubled, there being one meter to every four of population now as compared with one meter to every 8.4 of population in 1910.

Richmond is one of the fastest growing communities in the United States today. Ten years ago the present business section was a prairie. Today the city has a population estimated at 16,000 people. It is strictly a manufacturing town. With the approval of the Rivers and Harbor Board at Washington of the proposed harbor, Richmond will have when completed the best harbor and the closest one to Golden Gate of any city on San Francisco bay.

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Public Policy Advertising in Louisville.

In a recent issue we called attention to a new trademark and slogan which the Louisville (Ky.) Gas & Electric Company had adopted and the policies for which it stands. The accompanying advertisement appeared in all Louisville newspapers during Christmas week and is the second of a series that will be published in familiarizing citizens of the city with the spirit of the slogan the company has adopted, "Your Partner."

The text is indicative of the most modern thought in public policy attitudes and is reproduced in full herewith.

"At this time when the subject of Good Will is emphasized in the mind of the world, it seems proper to discuss the good will which should and can prevail between the people and utility corporations.

"Good will cannot be bought or had for the mere asking. It must be deserved and must come as a reward for patient, devoted effort.

"We want the good will of every person in this city, and vicinity—man, woman and child.

"We cannot expect to win active good will in a few weeks or a few months. Within a reasonable time we shall demonstrate our right to the confidence which begets good will.

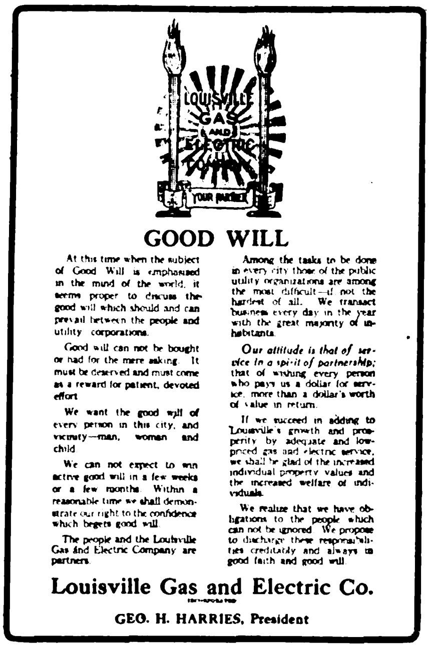
"The people and the Louisville Gas & Electric Company are partners.

"Among the tasks to be done in every city those of the public-utility organizations are among the most difficult—if not the hardest of all. We transact business every day in the year with the great majority of inhabitants.

"Our attitude is that of service in a spirit of partnership; that of wishing every person who pays us a dollar for service, more than a dollar's worth of value in return.

"If we succeed in adding to Louisville's growth and prosperity by adequate and low-priced gas and electric service, we shall be glad of the increased individual property values and the increased welfare of individuals.

"We realize that we have obligations to the people which cannot be ignored. We propose to discharge these responsibilities creditably and always in good faith and good will."


LOUISVILLE GAS AND ELECTRIC COMPANY
YOUR PARTNER

GOOD WILL

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We realize that we have obligations to the people which can not be ignored. We propose to discharge these responsibilities creditably and always in good faith and good will.

Louisville Gas and Electric Co.

GEO. H. HARRIES, President

Public Policy Advertisement of Louisville Company.

The advertisement is signed by George H. Harries, president of the company, who personally designed the trademark. The text was prepared by the publicity department of H. M. Byllesby & Company, Chicago, under the supervision of William H. Hodge, manager.

◆

New Plan for Financing "White Ways."

Red Lake Falls, a town in Minnesota, served electrically by the Red River Power Company, of Grand Forks, N. D., has evolved a new plan of financing a "White Way." A "White Way" ball will be given, the tickets to be sold at $5 each, and every public spirited citizen is expected to be present or at least purchase a ticket.

Jacksonville Votes Against Municipal Ownership.

A bond issue in Jacksonville, Ill., for the purpose of rebuilding the municipal electric light plant, was defeated on December 20.

The Jacksonville Railway & Light Company offered to install four times as many lights as the municipal plant has in service, the price offered being less than the present cost of maintaining the municipal plant. An advertising campaign carried on by the company was devoted principally to setting forth the terms of the company's proposal, and the resultant advantages to the city.

The defeat of the bond issue is expected to mean the abandonment of the municipal plant, as it cannot be operated successfully in its present condition. This will result in the letting of a contract for the street lighting.

◆

Central-Station Service for Stock Farm.

The Public Service Company of Northern Illinois, Joliet, Ill., has recently closed a contract with the Stockdale Farm for 42 horsepower in motors. The installation serves what is known as a feeding farm. Sheep are shipped from the west to the farm, and are there sheared and fed for market.

The Stockdale Farm is a large one of its type, having a capacity for 30,000 sheep. A 15-horsepower motor will be used in the grinding room and the balance for pumping and shearing, and one 15 horsepower motor is to be used as a portable outfit for general purposes. Three gasoline engines were replaced.

◆

Electric Heating for Churches.

The electric heating installation of the Petrus Church, Christiania, Norway, has been completed. This is the first installation of its kind in Scandinavia, but others are to be installed. The electric heating of churches was first started about ten years ago in Germany and Switzerland, where it has proved satisfactory. The electric heating is effected by means of radiating pipes laid close to the floor, and the installation is said to be comparatively cheap. The price paid for current is only 0.8 cent per kilowatt-hour, the demand, of course, generally coming on at times of light load at the power station.

◆

Lehigh Company Moves Office.

The general offices of the Lehigh Navigation Electric Company will be moved from Lansford, Pa., to Hazleton, according to a recent announcement. The latter location is more adapted to the purposes of the company's offices.

Electrical Construction

INTERIOR WIRING WITH SPECIAL REFERENCE TO ITS EFFECT ON LIGHTING SERVICE.

By C. Edward Fee.

The activities of the electrical contractor constitute a very vital influence upon the progress and development of the electrical industry. You are in direct contact with the ultimate consumer of electricity. You know his needs as well as or better than anyone else. This makes it essential that you should direct your efforts to such considerations as would tend to give the consumers of electricity the most complete, most economical and most satisfactory service.

The service which the great majority of electric consumers desire, is lighting service, with the added desire for the use of the modern domestic and other electrical accessories which have done so much to popularize the use of electricity. The majority of the electrical contractors are co-operating to this end and are giving their customers the best possible service from every standpoint.

Lighting Service as Affected by Voltage Drop.

The term "lighting service" may be used to designate the degree of satisfaction which a customer derives from the use of electricity as a means of producing light. Due to the high efficiency of modern electric lighting, the use of other illuminants is rapidly becoming less widespread than was the case a few years ago. The safety, convenience, adaptability and economy of such illuminants as the tungsten-filament lamp, for instance, have given a strong impetus to this branch of central-station service.

In electric lighting and particularly in incandescent lighting, as in no other one branch of the electric supply industry, satisfactory operation depends upon a very close co-operation of the voltage of supply and the rated voltage of the lamps.

The larger central stations maintain so-called "flying squadrons" who make periodic tests of the line voltage at the service switch on the premises of their customers. This enables the central station to maintain a fairly uniform voltage at the point where the service enters the premises of its customers. But this takes no account of the voltage drop between the service switch and the lamp sockets. An incandescent lamp fulfills its rated performance with respect to wattage, candlepower, and life only when burned exactly at its rated voltage. If the voltage supplied is less than the lamp voltage, its wattage consumption is decreased in a certain proportion and the candlepower in a much greater proportion, thus decreasing the efficiency of light production. If the voltage supplied is greater than the lamp voltage, the wattage, the candlepower and the efficiency are increased, but the life of the lamp may be unduly shortened.

As far as the quality of lighting service is concerned, if undervoltage burning exists, it makes no difference whether it is caused by the selection of an improper lamp or by lack of detailed knowledge of the exact voltage conditions existing on the system—the result is the same, less light, poorer quality of light, less revenue to the central station, dissatisfied customers and an opening for competing illuminants.

Operation of Accessories as Affected by Voltage Drop.

The effect of a considerable drop in voltage on the operation of the various auxiliary electric appliances is somewhat similar to the effect on an incandescent electric lamp. In other words, the manufacturers of these appliances have established definite voltage ranges within which their operation will give satisfaction. The impression has existed that incandescent lamps require much closer voltage regulation than any other class of load, but it is found that various electric appliances (other than those motor-driven) require nearly as close voltage selection and voltage regulation as is necessary for the successful operation of lamps. Appliances of the heater class, such as flat-irons, curling-iron heaters, warming-pads, etc., are rated by their manufacturers in steps of from 5 to 10 volts, showing that the voltage limits for satisfactory operation are from 2.5 to 5 volts either side of the rating. Appliances of the cooking clas~~s, such~~ as toasters, percolaters, grid-irons, broilers, etc., which demand somewhat closer temperature regulation, are rated in smaller steps of from 3 to 7 volts, showing that the voltage limits for satisfactory operation are from 1.5 to 3.5 volts either side of the rating. If the voltage supplied to the apparatus is lower than that at which it was intended to operate, the time required for producing the heat necessary for economical and successful accomplishment of the work in hand is too great. The result is, in many cases, a return to the earlier heating methods in use before electricity became economically and satisfactorily available. These close voltage limits in the ratings of appliances have been adopted by the manufacturers because they recognize that the economical and satisfactory operation of a majority of these appliances depends upon the time required to attain a certain heat and this in turn upon the voltage at which current is supplied. The importance of proper selection of apparatus with regard to the voltage at the point of attachment will therefore be fully appreciated.

Object of Investigation.

In previous work on voltage conditions, the author found numerous cases where lighting service had been seriously impaired by interior drop. Some of the particular instances were so flagrant, and the resultant dissatisfaction with electric service was so great, that it seemed that an investigation of the subject of interior voltage drop might bring forth facts which would be of general benefit. The object, then, of this investigation of voltage drop between the service switch and the lamp sockets was to obtain, if possible, some information which would show an approximately average drop for various classes of lighting. Further, to show, in some measure, the importance of taking this factor into consideration in the selection of lamps and appliances for use on central-station circuits.

In securing locations for tests no attempt was made to select buildings which to the previous knowledge of the author might show abnormal conditions. The only criterion in the selection was the consent of the occupants of the building. It was attempted to include in the investigation such buildings as would be typical of the main classes of lighting load, such as industrial, commercial and residential. In order to eliminate from the data the effect of slight fluctuations of line pressure, it was necessary to take simultaneous voltage readings at the service switch and at the lamp socket. This was accomplished by the use of stop watches. Readings of the service voltage were taken every half minute, and all readings at lamp sockets were taken at times corresponding. The voltmeters used were very carefully calibrated, and any difference in their indications has been eliminated from the data.

Since practically all of the voltage measurements were taken during daylight hours, it was necessary to turn on the lamps during the test. An effort was made to avoid loading the circuits beyond the point which would be representative of the installation. In the case of residences the tests indicate load conditions somewhat heavier in comparison to the maximum demand than in the case of commercial and industrial installations. This is due to the fact that in residences the tests were made on the house as a whole, while in industrial and commercial installations separate tests were made on each floor or subdivision of the building. In the case of residential tests, the data on drop due to lighting load were supplemented by data on the drop caused by the addition of various appliances, such as flat-irons, toasters, heating pads, percolators, etc.

In residential service and particularly in apartments the number of risers from the services to the secondary distributing panels may be very small, hence, it might be expected that the average drop would bear some relation to the total load.

It is evident from the tables that a figure of at least two volts for the average interior drop indicates in a conservative manner the conditions which may be found throughout the country.

Examples.

It might be interesting to note the extremes of conditions which were encountered in various tests. In one large residence which had nearly a kilowatt of lighting demand, the average of seven readings taken at various places about the house showed an average drop of only 0.7 volt. This was the only residence encountered which had separate and special provision for the conveyance of current to electric appliances. In contrast to this may be mentioned the case of a large residence in which a drop of 20 volts was found. The no-load voltage was 105 volts (using 110-volt lamps); with an 1,800-watt load the voltage dropped to 85 volts.

Another illustration of the effect of poor wiring is given in an article by C. E. Van Bergen, secretary and general manager of the Duluth Edison Company, Duluth, Minn., in the *Central Station* for July, 1911, part of which is quoted as follows:

TABLE I.—INDUSTRIAL SERVICE.

No.	Description or product—	Maximum volts drop	Average volts drop	Total Lighting load. Kilowatts	3-wire or 2-wire
1	Brass specialties	9.4	4.1	5.3	3
2	Lamp factory	3.2	1.9	3.0	3
3	Boiler and plate shop*	5.5	3.1	11.2	2
4	Machine shop	3.8	2.1	6.1	2
5	Foundry	4.5	2.5	4.2	3
6	Varnish	2.0	1.7	2.2	3
7	Clothing factory	4.4	2.4	6.0	3
8	Heavy castings	9.2	3.4	4.8	2
9	Plate and structural iron	9.4	4.6	10.5	2
10	Brewery	6.5	4.5	4.7	2
11	Machine shop	3.8	3.1	3.1	2
12	Machine shop	4.3	3.2	9.1	3
13	Stove factory	6.2	4.2	8.3	2
14	Box factory	3.2	3.0	2.7	2
15	Knit-goods factory	3.3	2.2	4.2	3
16	Fixture factory	3.6	2.1	4.4	3
17	Machine shop	3.2	2.0	3.9	2
18	Machine shop	3.7	2.4	5.2	3
19	Carding mill	8.1	4.7	5.3	2
20	Art glass	3.5	2.1	1.2	3
21	Awnings	4.7	3.4	2.2	3
	Average	5.02	2.94	5.1	

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*220 volts only.

TABLE II.—COMMERCIAL SERVICE.

No.	Description or product—	Maximum volts drop	Average volts drop	Total Lighting load. Kilowatts	3-wire or 2-wire
1	Wholesale hardware	4.7	2.8	4.0	3
2	Hotel	4.9	2.9	1.0	3
3	Hotel	4.6	3.1	48.0	3
4	Restaurant	5.2	3.9	3.0	3
5	Wholesale hardware*	14.2	11.3	4.3	3
6	Cigars and billiards	3.8	2.7	1.2	3
7	Wholesale hat	3.0	3.3	0.6	3
8	Office supplies	5.3	2.5	12.3	3
9	Office building	5.9	4.3	60.0	2
10	Restaurant	2.2	2.0	0.5	2
11	Restaurant	2.5	2.2	1.0	2
12	Club building	2.9	2.0	3.2	3
13	Small office building	3.1	2.8	3.1	3
14	Retail furnishing	6.8	4.4	13.4	2
15	Small theater	7.2	2.2	3.4	3
16	Storage	2.1	1.1	2.7	3
17	Storage	2.9	2.0	4.4	3
18	Department store	3.9	2.2	7.7	3
19	Small office building	2.1	1.4	1.4	3
20	Wholesale liquor	3.4	2.9	1.3	3
21	Retail glass and paint	2.4	0.9	1.4	3
22—	Garage*	21.0	20.0	2.7	2
	Average	3.94	3.03	10.9	

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*Excluded from average, since these are evidently isolated cases of abnormal conditions.

TABLE III.—RESIDENTIAL SERVICE.

APARTMENTS.

No.	Floor	Lighting Load				Increment due to Accessories		
			Volts drop					
		Watts load	Maximum	Average	Average per kilowatt	Watts load	Volts drop	Volts drop per kilowatt
1	2	475	2.2	1.3	2.7			
2	1	1000	2.7	2.0	2.0			
3	3	400	4.2	3.5	8.8	900	6.5	7.2
4	3	400	1.4	1.2	3.0			
5	4	300	4.4	3.7	12.3	990	7.8	7.9
6	1	420	1.4	0.9	2.1			
7	1	260	1.2	0.9	3.5			
8	2	350	1.8	1.4	4.0			
9	2	300	1.7	1.5	5.0			
10	1	475	2.4	2.2	4.6			
11	2	375	1.7	1.3	3.5			
12	1	735	3.2	2.4	3.3			
13	2	600	2.9	2.2	3.7			
14	2	425	2.1	1.8	4.2			
15	3	750	2.5	1.7	2.3	500	2.1	4.2
16	2	520	1.8	1.7	3.3	1000	7.5	7.5
17	2	260	0.8	0.6	2.2			
18	1	280	2.3	2.1	7.5	500	2.5	5.0
Average		462	2.26	1.80	4.33	798	5.28	6.36
HOUSES.								
1		435	2.0	1.1	2.5	560	2.0	3.6
2		600	1.6	0.6	1.0			
3		1485	2.3	1.6	1.1	440	3.3	7.5
4		440	1.7	1.3	3.0			
5		400	1.2	1.0	2.5	1250	3.1	2.5
6		525	1.2	0.9	1.7			
7		640	1.0	0.8	1.2			
8		475	2.0	1.7	3.6			
9		960	1.5	0.7	0.7			
10		345	1.3	0.9	2.6			
11		860	0.9	0.6	0.7			
12		685	3.4	2.7	3.9			
13		500	1.5	1.0	2.0			
14		825	4.3	3.1	3.8			
Average		655	1.85	1.29	2.16	750	2.80	4.52
Average for Residential Service—		547	2.08	1.57	3.38	767	4.35	5.68

"One of our customers made complaint the past winter of poor light, together with statement that the more lights turned on, the less illuminaion secured. Upon investigation, it was found that one circuit had only bell-wire in it, carrying six lamps, and as stated, one lamp gave fair light, while with six turned on, the filaments were only more than red. This house was wired over 20 years ago."

He also referred to the keeping of the matter of illumination before architects, "the tendency being ever to cut out and economize on this portion of building expense. An instance of this false economy came recently to our attention when we were asked to make an estimate on the expense of installing a heating circuit in a large residence only two years old. No provision had been made for baseboard outlets for the stand lamp in the reading room, and this lamp having been attached to the wall bracket, the bracket became loosened and presented anything but a pleasing appearance. Each new house should have provision made for a heating circuit on which may be used a luminous radiator, electric iron or a vacuum cleaner."

The customer's opinion of lighting service, as influenced by the matter of interior drop, may be illustrated by the case of a large garage. In this place the service had been changed from an isolated plant to that of the central station. At the time of this change, the proprietor replaced a number of 60-watt carbon lamps with 250-watt tungsten-filament lamps. The readings taken throughout this building showed that under the increased load condition, the average drop was 20 volts, with a maximum drop of 21 volts. This resulted in a loss of candlepower amounting to 50 per cent.

Drop on Standard Wiring.

In Table IV are given some figures on the amount of voltage drop which may be anticipated on standard wiring. Columns 2 and 3 show for various sizes of wire the maximum allowable current carrying capacity and the resulting drop for a length of circuit which is assumed as an average for all classes of lighting installations, namely, 100 feet. Column 4 shows the drop for a current of 6 amperes, corresponding to a load of 660 watts at 110 volts.

TABLE IV.—DROP ON STANDARD WIRING.

Size of wire. B & S	Allowable current-carrying capacity, rubber insulation. Amps.	Volts drop when carrying maximum allowable current. Volts	Per 100 feet of circuit when supplying 660 watts at 110 volts, i. e., 6 amperes. Volts
No. 14	12	6.05	3.02
No. 12	17	5.40	1.90
No. 10	24	4.78	1.19
No. 8	33	4.14	0.75
No. 6	46	3.63	0.47

Conclusion.

The foregoing tables show that in commercial and industrial lighting installations, the average interior drop of three volts corresponds almost exactly with the maximum drop which could be expected if all circuits were of minimum size of wire and ran direct from the service. Due to lighter loads, residential lighting shows only about half as great an average drop.

Since the question of interior drop is not ordinarily taken into account in the co-ordination of the voltage rating of lamps and appliances with the voltage of the circuit, it is vital to the welfare of the electrical industry that this drop be kept as low as possible.

With this fact in mind, the author would recommend that a committee be appointed to confer with the Underwriters and see what steps can be taken toward securing the specification of No. 12 wire instead of No. 14 as the minimum allowable size for interior wiring.

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Revised Installation Rules.

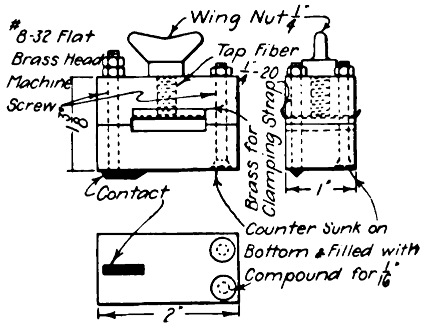
The Department of Water Supply, Gas and Electricity, New York City, has issued in printed form the 1913 Electrical Code, which is revised every two years for local use. While in the previous edition there were 110 differences between the City Code and the National Electrical Code, the present edition contains but 35 points of difference. Some of these are merely differences in phraseology, while others are due to local laws and a few honest differences of opinion, based upon experience in that city.

The Commissioner of Wires of Boston, James E. Cole, has issued the 1914 edition of the rules and requirements in that city for overhead, underground and interior wiring. The principal changes refer to inside work, designated as class C. A few changes have been made in the rules for underground and outside work, and a new section added, which requires transformers of ten kilowatts or higher capacities when installed upon poles to be suported by approved knee and platform construction.

The Underwriters' Equitable Rating Bureau, of Portland, Ore., has issued a second edition of "Wiring Data for Direct and Alternating-Current Motors." Changes have been made in some of the tables and additional pages have been added, including among other things data on copper conductors and wiring formulas. This booklet is supplied to persons outside of Portland for 20 cents, upon application to F. D. Weber, electrical inspector, P. O. Box 745.

A Device for Testing Armatures.

Two sliding contacts are made of fiber, with two machine bolts for holding the parts together. Another bolt has a piece of brass soldered to it for the contact. On the other end of this bolt nuts are arranged for clamping leads for test. A wing-nut is used with a piece of sheet brass for clamping the belt. This belt has a buckle and suitable holes for tightening up and holding the contact device on the commutator. Loosening up the wing-nut allows contacts to be moved to any point around the commutator. The size of contacts shown is for fairly large commutators; for smaller sizes it is best to make up another set of contacts, making the contact and belt smaller. This device will stand very rough usage and I think they are almost indispensable in making tests with millimeter on armature or commutator.


Wing Nut ¼"
#8-32 Flat Brass Head Machine Screw
Tap Fiber ¼"-20
⅝
Brass for Clamping Strap
Contact
1"
Counter Sunk on Bottom & Filled with Compound for 1/16"
2"

Device for Testing Armatures.

H. W. Parsons.

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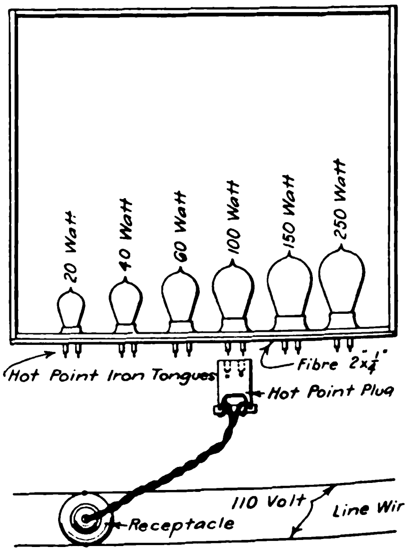
Case for Displaying Lamps.

The accompanying illustration shows a case made for displaying lamps in the sales department. Many customers, although desiring lamps, do not know what size is wanted and have little idea how much light is given by the different sizes. With this arrangement the salesman can plug current on a lamp of any size without de-



Scheme for Displaying Lamps.

lay and let the customer see the lamp burning. It works as simply as a telephone switchboard and saves much time. The front of the case is covered with plain glass and can be opened at any time to change lamps. The case is 38 by 38 inches and 6 inches deep, and the wiring is all concealed in this case, although it could have been run open.

M. J. Kenney.

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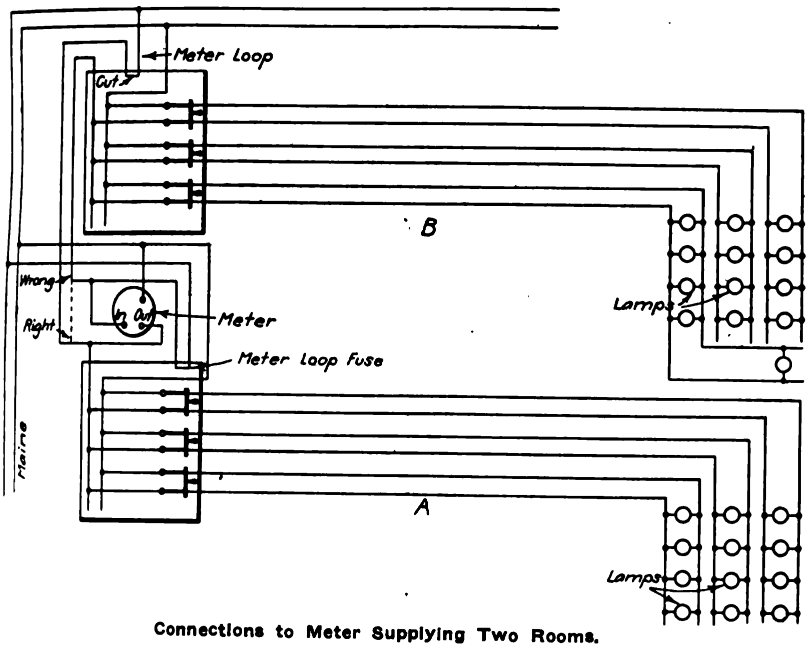
Wrong Connection to Meter.

A case of trouble arose recently due to connecting the lamps in a second store to a meter already supplying one store room. When the lamps in one room were turned on, the meter ran forward, but when the lamps in the other room were turned on the meter ran backward.



Connections to Meter Supplying Two Rooms.

When the merchant decided to connect the lamps in the two different rooms to one meter the wireman ran two wires from the meter to supply the second room. The meter tester traced the connections through and found them to be as shown in the accompanying diagram. It will be seen that part of the current feeds through the meter and part flows around the meter so that the circuit is fed through both meter loops. In order to have the meter register correctly it was necessary to cut the loop, as shown in the figure, and to change one connection, as shown by the dotted line alongside the meter, thus permitting all the current to flow through the meter in the right direction and leaving but one feed wire.

H. L. Reagan.

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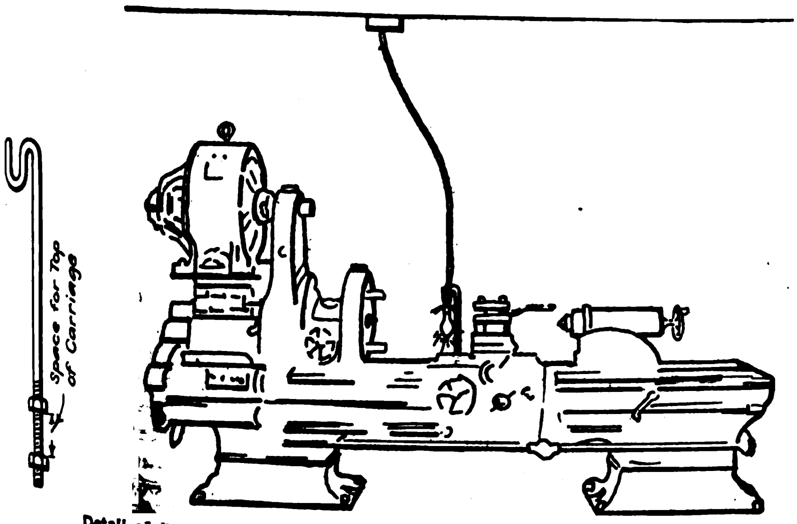
Lighting Lathe Work.

An all-around adaptable scheme for concentrating light on the cutting tool of a lathe has yet to be designed, but the accompanying illustration shows one successfully used in a particular case. A piece of one-half-inch iron rod is threaded on one end to accommodate two nuts and the thickness of the top of the carriage of the lathe next to the groove in which it slides. The other end of the rod is bent so as to afford a support for a lamp provided with a reflector. The lamp can be easily removed to look for tools, etc., and when in the position illustrated throws light directly on the tool with which it travels.

H. G. Wilson.



Detail of Rod for Holding Lamp, and Its Position on Lathe.

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Transformer Cutouts Short-Circuited by Smoke and Dirt.

A transformer on a 2,200-volt circuit was mounted on a 40-foot dry chestnut pole and three secondary lines were run to a pole line, from which taps were taken and brought down to boxes near the ground containing switches and cutouts. I had occasion to remove the end pole on the secondary circuit and consequently had the fuse plugs pulled out on the primary side of the transformer, so that there would be no danger of having the secondary wires alive in case they should get crossed. Shortly after the plugs were removed, the man who had gone up the pole to untie the lines said that the secondaries were still alive. I then made sure that the fuse plugs had been removed and found them on the ground at the foot of the transformer pole, but the line man still claimed that the secondary was alive. By putting test lamps across the switch blades in the nearest box I found that they would light up.

The explanation is as follows. The transformer pole was located near a smoke stack of a low building where coke was generally used for fuel. The gases and smoke from this stack had thoroughly covered the porcelain cutouts in the primary circuit, so that there was a complete conducting circuit across terminals and current could pass regardless of whether the fuse plugs were in position. After installing new cutouts the condition was entirely changed. I later had the deposit on these plugs analyzed and found that it consisted of more than 90 per cent metal.

William E. Rhodes.

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Transformers with Motion-Picture Outfits.

The Commonwealth Edison Company has issued a circular letter to contractors calling attention to the fact that after January 1, 1914, the company will require the transformers used in connection with arc lamps for motion pictures or spot arcs to be wound for 230 volts. This is considered necessary to avoid interference with general lighting service.

DON'TS FOR ELECTRICIANS.[1]

By H. M. Nichols.

Don't use open fuses.

Don't handle moving belts.

Don't use rotten belts.

Don't neglect storage batteries.

Don't overfuse circuits.

Don't allow belts to slip.

Don't throw water on burning oil.

Don't use acid salts in soldering.

Don't leave joints without soldering.

Don't put too much tension on brushes.

Don't put water on hot bearings.

Don't use emery cloth on brushes or commutators.

Don't fail to replace cracked insulators.

Don't step over, under, or through, moving belts.

Don't strip the threads on foundation bolts.

Don't use pliers with uninsulated handles.

Don't burn the insulation on wires, when soldering joints.

Don't burn contacts on knife switches, by opening them slowly.

Don't hang clothing or other material on wiring.

Don't use high-potential leads that are not properly insulated.

Don't leave tools lying near a motor or generator.

Don't expose electrical machinery or apparatus to moisture.

Don't use lubricating oil in transformers.

Don't use oil, in transformers, which has been exposed to moisture.

Don't put a motor or generator on a shaky foundation.

Don't run a booster without a speed-limiting device.

Don't install an outdoor circuit without a lightning arrester.

Don't do wiring without consulting the National Electrical Code.

Don't try to save wire by freak layout circuits.

Don't leave loose or dirty contacts on switchboards.

Don't forget the value of sand in fighting electrical fires.

Don't meddle with circuits you are not familiar with.

Don't run motors and generators without inspecting the bearing occasionally.

Don't put up wiring without the proper fuses or circuit-breakers.

Don't attempt to adjust series arc lamps with the current on.

Don't start a motor without making sure that the field circuit is all right.

Don't run a motor with a weak field.

Don't make adjustments on motors and generators when they are running; this applies particularly to brushes.

Don't bring a motor up to full speed too quickly when starting.

Don't send a new man on a job which he does not thoroughly understand; it is dangerous for all concerned.

Don't cut the blades on knife switches by adjusting the contacts too tightly.

Don't block up the space in front of switchboards so that the switches cannot be reached immediately.

Don't do high-potential testing, without first erecting red danger signs.

Don't get your face over commutators, as there is always danger of a flash over.

Don't handle meters roughly.

Don't expose your watch to heavy currents, if you expect it to keep good time.

Don't fail to read regularly at least one good engineering paper.

Don't run a motor or generator until the windings get hot enough to smoke.

Don't operate transformers without having the secondary windings grounded.

Don't discharge storage batteries too low, and don't let them stand when discharged.

Don't install conduit without grounding it.

Don't leave packing boxes and other inflammable materials in the power house.

Don't burn the contact buttons on starting boxes.

Don't use brushes that are not properly fitted.

Don't use both hands when working on live apparatus.

Don't leave joints without taping.

Don't fail to have a wiring diagram attched to each switchboard.

Don't run a belt with the tight side on top.

Don't run motor or generator with a loose pulley.

Don't use pulleys or couplings having exposed setscrews or bolts.

Don't neglect to fence in all exposed belts and shafting.

Don't allow dirt and oil to collect on the windings of motors and generators.

Don't use the back of switchboards for clothes racks.

Don't fail to treat every wire as though it were alive, until you have determined otherwise.

Don't stop motor without seeing that the rheostat arm falls back to the starting position.

Don't lean against machines or switchboards.

Don't open a main feeder switch, under full load, except in the case of emergency.

Don't fail to renew the oil occasionally in the bearings of motors and generators.

Don't use a rigid coupling where a flexible one can be used.

Don't connect alternating-current generators in parallel without first being sure they are in synchronism.

Don't run a motor or generator with loose pole-pieces.

Don't fail to ground lightning arresters.

Don't spill oil on the floor.

Don't store gasoline for blow torches in the power station.

Don't handle the blow torch carelessly around inflammable materials.

Don't neglect to remove temporary wiring.

Don't use copper wire to replace blown fuses.

Don't use plugs, for series arc switchboards having defective handles or frayed leads.

Don't forget that 500 volts, or less, is sometimes fatal.

Don't run a motor or generator which is vibrating badly.

Don't couple two machines together without making sure that the alinement is perfect.

Don't start a new motor for the first time without making sure that the armature turns freely.

Don't install rheostats and other sources of heat without separating them from inflammable materials.

Don't use wooden switchboards.

Don't drive nails where there is danger of their coming in contact with concealed wiring.

Don't put telephone or other signal wires above power wires.

Don't cut open a cable and leave it exposed to moisture.

Don't stop a motor by releasing the starting rheostat arm without having first opened the main switch.

Don't cut the strands in skinning the insulation from lamp cord.

Don't throw a switch unless you know positively to what circuit it is connected.

Don't leave oily waste in any place except metal waste cans.

Don't fail to use the proper-size starting rheostats for motors.

Don't allow a single-phase induction motor to run on the starting winding.

Don't neglect to run down grounds, and remedy them as soon as they show up on the ground detector.

Don't start a series motor without first making sure that it is properly loaded to hold down the speed.

Don't forget that there is danger of injury from short-circuits on low-tension wiring, when tools are handled carelessly around bare contacts.

Don't fail to consult the nameplates on motors and generators and make sure of having the proper voltage before putting them in service.

Don't start a motor by throwing in

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[1] From *Power*.

the main switch, without first seeing that the starting rheostat arm is in the off position.

Don't connect different makes of transformers in parallel without first making sure that the polarity is the same in both.

Don't open the field switch on a generator with the resistance all cut out of the control rheostat.

Don't forget that there is always a possibility of low-voltage wires becoming dangerous, by accidental contact with high-voltage wires.

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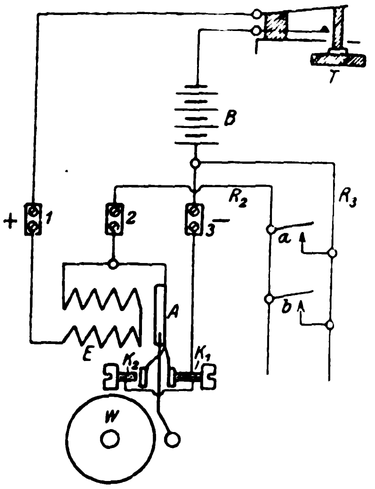
Wiring System for Alarm Circuits.

In door-signalling installations for shops, signalling circuits in factories and other similar installations, it is usual to employ either wiping contacts—giving quite a short signal—or continuous contacts, yielding a signal which continues till the circuit is broken by, say, the reclosing of the door. In the first case the short signal given may easily escape attention, whereas in the second case the sustained signal is likely to prove a nuisance. Of the latter, readers have doubtless had many experiences in shops when a customer has entered and left the door slightly ajar. It is, of course, possible to provide a master switch by which the signalling circuit can be interrupted behind the counter or in any other convenient place, but this arrangement introduces the obvious risk that the attendant may forget to reclose the master switch, thus leaving the signalling installation inoperative.

In the Hydra system, described in *Electricity*, as translated from the *Elektrotechnischer Anzeiger*, this danger is overcome, while retaining the advantages and overcoming the disadvantages of a sustained signal, by the use of a special type of bell, which permits the ringing of the bell to be interrupted from any desired number of control points, while allowing the equipment to revert automatically to its operative condition directly the door is shut.

Referring to the accompanying diagram, when the door contact T is closed, current flows from the negative terminal of the battery through T to the bell terminal and thence through the bell magnet winding E to the armature A, the contact screw K_1 and the positive terminal of the battery. The screw K_1 is so set that the bell circuit is interrupted before the current flowing reaches its maximum strength, and under these conditions the bell continues to ring in the ordinary manner so long as T is closed. Should the signal be unduly prolonged for any reason, it is only necessary to press one of the buttons, *a*, *b*, etc. (of which any number may be placed wherever required). Current then flows through *a* instead of A and K_1 and the current no longer being interrupted before reaching its maximum strength, the armature A is pulled in by E until contact is made at the screw K_2. On releasing the push button *a*, the bell hammer is still held by E, and the ringing of the bell is suspended, although T is still closed. When T is opened, however (by the closing of the shop door in this case), E releases A, and once this has occurred a fresh alarm is given directly T is again closed.

By connecting a low resistance in series with a push button in parallel across E it is possible, by pressing this master button, to demagnetize E (even should T still be closed), and on releasing the master switch the alarm signal will again commence should the shop door still be open. The resistance of the winding E being 40 ohms, the current consumption is quite small whether the bell be ringing or whether (T being closed) the bell is placed out of action by the means described above.



Wiring for Alarm Circuit.

It is claimed that two ordinary dry cells are sufficient to operate the Hydra system. Exactly the above arrangement can be applied to a variety of signalling duties, the contact T being closed by a water-tank float, by a thermostat or by any other apparatus designed to indicate the actual state of a condition which has to be kept under control.

◆

Among the Contractors.

Contracts have been awarded to H. L. Dollahan & Company, of Dixon, Ill., for wiring and fixtures for the new Loveland School and for the new hospital addition in that city.

The Baird-Osterhout Company, 1112 Chestnut Street, Philadelphia, Pa., was awarded a contract for the electrical equipment in the Hospital for Criminal Insane, at Fairview, Pa.

The United Electric Construction Company, Philadelphia, Pa., was awarded the contract for installing a complete electrical equipment, including wiring for light and power, in the building of the Ford Motor Car Company, now in course of construction at Broad Street and Lehigh Avenue.

Hampton & Buerke, Tampa, Fla., have been awarded a contract to install a "White Way" at Boca Grande. This involves building two miles of a three-phase line. The electrical equipment at the Charlotte Harbor and Northern Railway terminal will be remodeled and transformers, with a capacity of 700 kilowatts, will be installed.

The Vedder Electric Company, Cleveland, O., has received the contract for wiring and installing electrical apparatus in a new four-story addition to the Taylor Arcade. The Cleveland Railway Company has also engaged the Vedder Company to wire and install apparatus in three new shop buildings now under construction.

The Guth Electrical Company, Perth Amboy, N. J., has been organized with a capital of $50,000 to engage in a general electrical business, including electrical supplies. Marius J. Dahl, Albert Guth and D. Guth are the organizers.

E. S. Thorne, electrical contractor of Coatesville, Pa., is installing the wiring, including electric clock, telephone and bell systems, in the Coatesville Graded School. The work, which is nearing completion, is in conduit throughout.

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Minneapolis Jovians Meet.

The members of the Jovian Order in Minneapolis, Minn., gave a banquet on the evening of December 30 at the Minneapolis Commercial Club, the guest of the evening being R. W. Babson. Mr. Babson made an address upon business conditions, which was illustrated by a number of charts. His investigations indicated that the point of lowest business depression was passed last September and that conditions are now improving.

He discussed the public ownership of public utilities and the relation of street railways to the investigation carried on by the Russell Sage Foundation regarding congestion in the large cities. He advocated extending the street railways beyond the points where traffic ceased to pay for them, for the purpose of making the open country more accessible to city people.

He advocated publicity in the banking business and then went on to describe a conversation with Thomas A. Edison, in which the latter had stated that of his inventions, the phonograph had brought him the greatest fame, motion picture films the greatest financial returns, while he himself regarded the electric lamp as the greatest of all.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Telephone Head Receiver.

A very convenient method of utilizing a telephone head receiver for testing wiring and fixtures is as follows. Take an ordinary head set with four or five feet of cord connected, and cut one wire near the terminal on the receiver. Connect these two open ends to the two terminals of a flash-light battery. This battery is then taped to the head band and terminals are put on each end of the telephone leads for making contact to the circuit to be tested. The battery is then in series with the telephone receiver and upon connecting to any closed circuit a click will be heard.

Howard H. Douglas.

Three-Quarter Conduit in One-Inch Box.

While doing a job with one-inch conduit I had junction boxes with one-inch knockouts. I had, however, to run some three-quarter-inch conduit for certain of the lamps. In order to connect this into the boxes with one-inch holes, I threaded a three-quarter-inch conduit coupling which fitted in the one-inch hole all right. In many cases this will save time which would be wasted in waiting for a reducing bushing or in drilling a smaller hole in the box. It makes a satisfactory and solid job.

A. A. Vilter.

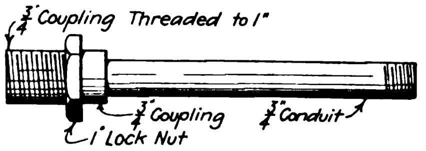

Fig. 1.—Showing Use of Coupling.

Catching Dirt From Ceiling Outlets.

A kink has already been given describing a device attached to a bit for catching the dirt while working on a ceiling outlet. For over 30 years I have used a different scheme, which is to hang an umbrella upside down to the outlet. I always carry an umbrella along with my kit and find it useful for the above purpose as well as for customary use in rainy weather.

L. R. Payson.

Hanging Fixtures Straight in Frame Building.

Fig. 2 illustrates how an electric fixture can be put up straight in a frame building. *A* and *A* indicate two pieces of conduit set in the floor beams, the top of the conduit being flush with the beams. They are screwed into a tee until they butt together. Into the bull-nose part of the tee a piece of threaded conduit *C* is screwed. This is long enough to come within one inch of the bottom of the floor beam. *D* represents the outlet box; *E* and *E* are two locknuts. *G* is the crowfoot or hanger. The outlet box can be raised or lowered as may be required in any particular case by loosening the locknuts and tightening them up when the fixture has been adjusted. This makes a good support for the fixture also.

William Weller.

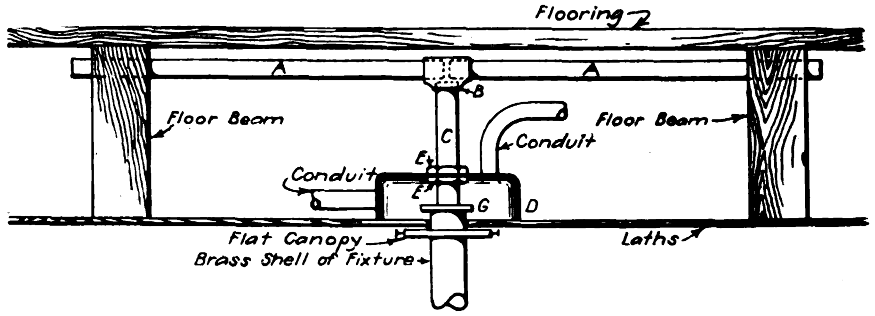

Fig. 2.—Method of Hanging Fixture.

Soldering in Outlet Boxes.

Wiremen find it a difficult matter to solder joints in outlet boxes without dirtying the surrounding ceiling, owing to the burning of loose threads of braid. To remedy this I first do all splicing, pasting, etc. I then take a piece of stiff asbestos paper about eight inches square and cut a hole in the middle of it about the same size as the outlet boxes. When I am ready to solder I place this in position around the box and secure it to the ceiling by means of three or four drawing-board pins. These hold the asbestos in place very nicely if all work in the box except the soldering has been done beforehand

John Short.

Alarm for Chicken Thieves.

Fig. 3 illustrates a method of wiring a burglar alarm to catch chicken thieves who are familiar with ordinary methods. Take a tap from the house circuit through an eight-candlepower lamp (in order to limit the current on a low-voltage relay) and after passing through the relay run to a strip on the window casing, which is always in contact with another on the sash. Then put a contact on the window sill, which is in contact with the sash only when it is closed and from this run to the other lead wire in the house. Connect a battery and bell in series with the relay contact, so that the bell will ring whenever the current through the winding of the relay is broken. Run a third wire to the chicken house and connect to a contact, so that the circuit will be closed when the window is raised. The bell will then ring when the window is opened, even though the two main wires on the lighting circuit are short-circuited before the window is opened. With this arrangement the bell is rung if the house lines are cut or if the window is opened after short-circuiting them. If desired, a bell-ringing transformer may be used in place of the lamp in series with the relay, thereby eliminating high voltage on the bell wires.

E. V. Smith.

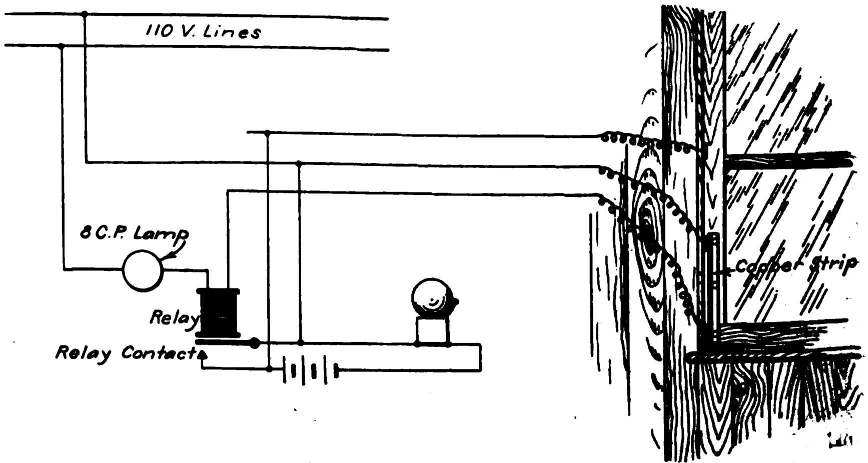

Fig. 3.—Wiring for Burglar Alarm.

Public Service Commissions

ILLINOIS.

The Public Utilities Commission has been completed by the appointment of the fifth member, Owen P. Thompson, a former judge, of Jacksonville, Ill. The Commission met for organization on January 2, at Springfield, and conducted a hearing in Chicago on January 5.

MASSACHUSETTS.

The public Service Commission of Massachusetts has approved an issue of 450 shares of common stock and 6,650 shares of preferred stock by the Massachusetts Northeastern Street Railway Company, at $100 per share. The proceeds of 4,150 shares of preferred stock are to be issued in exchange for $200.000 mortgage bonds of the Hudson, Pelham & Salem Street Railway Company; $145,000 of the Haverhill, Plainstow & Newton Street Railway Company; $25,000 of the Lowell & Pelham Street Railway Company, and $45,000 bonds of the Seabrook & Hampton Beach Street Railway Company. These properties are located in Northern Massachusetts and Southern New Hampshire. The proceeds of 2,500 shares of preferred stock and the 450 shares of common stock are to be used to pay floating indebtedness and for improvements and additions.

The Public Service Commission has disapproved of the construction of an electric railway by the Berkshire Street Railway Company to the summit of Greylock Mountain, on a location proposed by the company. The Commission says that the company might better expend the large sum required, over $1,000,000 as estimated, in the construction of extensions that would bring more benefit to the public through the development of territory for residential or agricultural purposes. The proposed line would penetrate the state reservation on Greylock, in Western Massachusetts, and would be in operation only in summer for tourist travel.

NEW JERSEY.

The Board of Public Utility Commissioners has granted the Public Service Electric Company permission to issue $3,000,000 of its capital stock at par, the proceeds to be used for improvements and additions to the company's plants and system.

The Board has approved of an agreement between the Eastern Pennsylvania Power Company and the Delaware & Atlantic Telegraph & Telephone Company, providing for a joint-pole arrangement.

OHIO.

The Public Utilities Commission has refused its consent to the purchase by the Bolivar Light & Power Company from H. L. Lash of the electric light plant at Bolivar. The reason given is that the price proposed is greatly in excess of the value of the property.

WISCONSIN.

The Railroad Commission has authorized the Manitowoc Gas Company to increase its rate for gas from $1.00 net per thousand cubic feet to $1.05 net. The present value of the property was fixed by the Commission at $176,960 and the cost of reproduction at $205,456. The utility contended for a valuation about $225,000 in excess of that allowed, of which $130,800 was for going value. In refusing to grant an allowance for bond discount, the Commission called attention to the fact that the value of the bonds was in excess of the property by which they were secured and that they took the form of liabilities which had been outstanding. The rates authorized in the order will permit the utility to enjoy an adequate rate of return upon a fair valuation of the property concerned.

The city of Menasha has been authorized to extend its commercial lighting business and to substitute a graduated rate schedule, ranging from eight cents per kilowatt-hour to four cents per kilowatt-hour, for the present flat rate of six cents per kilowatt-hour.

The Milwaukee Electric Railway and Light Company has been empowered to issue $3,500,000, par value, of 4.5-per-cent refunding and extension mortgage bonds, to be deposited with the Bankers Trust Company as security for a similar issue of bonds carrying a higher interest rate.

The Commission has authorized the Green Bay Gas and Electric Company to issue $78,000, par value, of bonds to be used in discharging an existing indebtedness of $70,200. To enable the Wisconsin Public Service Company to acquire the property of the Green Bay Gas and Electric Company, authority has been granted the former to issue $78,000, par value, of five-per-cent bonds with which to purchase a like amount of bonds to be issued by the latter company. Authority to take over the remainder of the property will be made the subject of an order soon to be issued.

A new phase of public-utility regulation was manifested recently when the engineers of the Commission took temporary charge of the Neshonoc Light and Power Company's plant to determine whether the utility's contention that a sufficient increase in business could not be obtained to justify the expenditures necessary in complying with the Commission's past orders for improved service. Sufficient business was solicited to warrant the establishment of day power service with every prospect of its becoming profitable within a short time after its establishment. It appeared that past failures to extend the plant's business could be charged directly to a lack of faith and confidence in the management. As a result of the above investigation, the utility will be ordered to completely rehabilitate its plant and to make such additions and extensions as may be necessary to render adequate service both day and night.

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Enlarged Electric Plant for Manchurian Colliery.

The electric plant in connection with the three shafts at the Fushun coal mines in Manchuria had a capacity of 4,500 kilowatts, and the demand for current for operating the light electric railway has made it necessary to increase the capacity of the plant by 3,000 kilowatts. The installation of the supplementary power plant is almost completed. The electric railway mentioned will also be brought to completion in the near future, and it is expected that the new power plant will supply current in January, 1914. The increasing output of the collieries will necessitate the installation of additional power in the near future, and it is thought that a capacity of at least 13,000 kilowatts will eventually be required to operate the lighting system and provide the needed motive power.

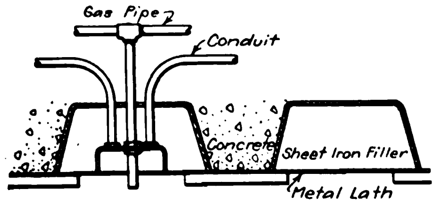
Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 183.—Purity Test for Sal Ammoniac.—I would like to know a simple but accurate way to test sal ammoniac. I find that considerable of this material being sold is adulterated with common salt or other cheap chemicals. The burning test is not accurate enough. I would like to be able to test about what percentage of the test sample is pure sal ammoniac and how much of it is adulterated.—F. H. W., Brooklyn, N. Y.

No. 191.—Code Problems.—1. Should rule 59*f* of the National Electrical Code be construed to require all outlet boxes to be independently supported? If so, I would like a few suggestions as to how it could best be done in the construction shown in the accompanying sketch, where sheet-iron fillers are used in place of tile and all outlets must be under these fillers, thus leaving no concrete to support the box.—2. Rule 28*f* states that gas pipes must be securely fastened in outlet boxes. How should this be done when the gas fitter merely drops a nipple through the box?—E. L. L., Bowling Green, O.

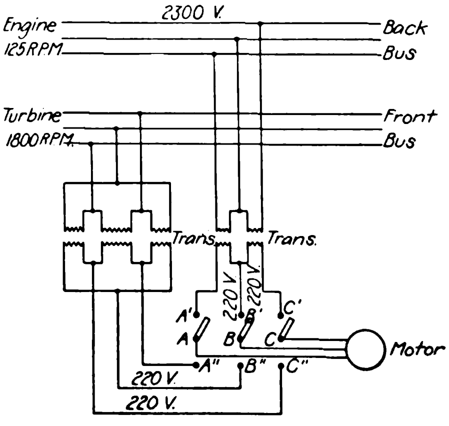


Support of Outlet Boxes.

No. 192.—Gas Pipe as Neutral Conductor.—Some time ago I came across an installation where the electrician, instead of putting in another wire to make a three-wire circuit out of a two-wire circuit, used the gas pipe for neutral conductor. The customer complained to me that ever since this was done his electric bill has increased considerably. I would like to know if using a gas pipe as neutral (which, of course, is not permitted) would of itself cause increase in current consumption and, if so, why?—W. F., New York City.

No. 193.—Repairs to Spark Coils.—Is there any way to remove the wax so as to permit making repairs on the coils of a jump spark coil box, such as used on automobiles, without spoiling the finish of the wood?—J. F. P., Canton, O.

No. 194.—Motor Circuit. In operating a hot-well pump, we use a 220-volt three-phase motor, which derives its energy from a bank of three five-kilovolt-ampere transformers that are in turn fed from an outgoing power circuit. Any outside disturbance on this particular line would always drop the switch and consequently shut down the pump. In order to avoid this difficulty we used two transformers of 7.5-kilovolt-ampere capacity and which were fed from the back busbars, the leads being clamped to them. The secondary leads were run to the upper and lower terminals of a triple-pole double-throw knife switch, using the hinge terminals for the leads to the motor, as per diagram herewith. At the time of phasing out so as to keep direction of rotation the same, one turbine-driven generator was operating on the front buses, and an engine-driven generator on the back buses. In testing we used two 110-volt lamps in series and from terminal *A'* to *A"* there was no light, from *B'* to *B"* no light, and from *C'* to *C"* no light, but from *A'* to *C"* the two lamps burned dimly. We could not secure any light from any other connection. Thinking possibly that the dim burning of the lamps between *A'* and *C"* was caused by the generators coming up to synchronism, we inserted the plugs, but they were nowhere near that point, as the lamps on the synchronoscope and the instrument itself plainly showed. I have tried this over a great many times with the same result, which I cannot account for. Can some of your readers explain it?—R. J. H., Mason City, Iowa.



Circuit for Motor-Driven Pump.

Answers.

No. 175.—Two-Rate Meter.—Has any American central-station company employed two-rate meters for residences and other small customers connected to its miscellaneous lighting circuits? What method is used to change from the low rate to the high rate during the time of peak load and back again? What effect has this had on the peak? Is the time of high rate adjusted during the different seasons to correspond with changes in the station peak? Does the two-rate meter eliminate the need for primary and secondary rates based on maximum demand? What is the relative cost of a 10-ampere, two-rate induction meter compared with a similar standard meter?—V. P. B., Milwaukee, Wis.

(1) Yes; in fact, several types of two-rate meters are on the market and they seem to be gradually taking the place of the other meters in some places. (2) The two-rate meter as brought out by the General Electric Company is a regular Thomson recording meter provided with two dials and two recording trains. The meter is also provided with an electrically operated self-winding clock movement that throws either one or the other recording train into gear at whatever times the clock is set for. For example, the clock might be set so as to record on the lower-rate dial from 12 p. m. to 6 p. m. and then be switched over to record on the high-rate dial from 6 p. m. to 12 p. m. The changing over from one dial to the other is accomplished by means of two small friction clutches controlled by the clock. (3) In my estimation it would have no great effect on the peak. (4) The clock can be set to suit the company supplying this power and changed from month to month, when the meter reader makes his call. (6) Any company manufacturing meters will send price lists and descriptions of meters upon request, so that one interested in them can be given a better understanding as regards prices of the different types.—W. T. E., Seymour, Conn.

No. 182.—Searchlights.—Is a yellow-colored searchlight beam more penetrating on a foggy night than a white beam? What is the greatest distance that a searchlight has been seen on a clear night?—W. M. L., Baltimore, Md.

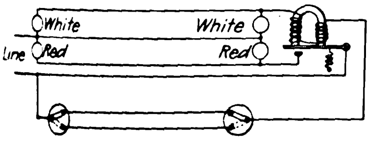
(1) Yes, if the other conditions, such as intensity of the light at the source and character of reflectors and lenses (if these are used), are the same in each case. The reason is that the small particles of solid matter, such as water, smoke, etc., constituting the fog have the property of refracting and dispersing the beam of light. The difference in the relative amount of dispersion of lights of different colors is due to the difference in wave-length of the various colors in the spectrum. In fact, it is the difference in wave-lengths which causes the effect which we call "color." The shorter the wave-length, the greater the refraction and consequent dispersion. The longest rays give the sensation called red; hence red light is least refracted. The next in order is orange, then yellow, green, blue, indigo and violet. The same order holds good whether the night be foggy or clear. (2) This is a difficult question to answer, since the curvature of the earth and the sea limits the distance any object or light can be seen. Hence the elevation of the light, as well as its intensity and color, affect the problem. Very feeble lights can be seen on the horizon at sea, as a matter of common experience. The writer made an exhaustive search for published data and the most striking instance found was that in an article on the electrical equip-

ment of the Lewis Publishing Company's building in St. Louis, appearing in the *Electrical World and Engineer* of November 12, 1904. In it is described what was then claimed to be the largest searchlight in the world with a parabolic mirror 80 inches in diameter and a positive cored carbon 2.25 inches in diameter and a solid negative carbon 1.75 inches in diameter passing a current of 300 amperes. It was located on a building 135 feet high, on rising ground which gave the lamp an elevation of 300 feet above the general level of the surrounding country. When directed downwards it was claimed that newspapers could easily be read at points three miles distant. When projected upward at an angle of 30 degrees, the beam was reported to have been discerned at points from 200 to 300 miles from St. Louis.—H. A. C., Pittsburgh, Pa.

No. 186.—Special Three-Point Switch Control.—A pair of white lamps in a hall is to be controlled by a pair of three-point switches, one at each end of the hall, but instead of turning the lights out a pair of red lamps is to light up when the white lamps are switched off. In other words, when either switch is turned it will merely change the circuit from the white lamps to the red lamps or the reverse, there being no "off" position to the switches. I would like to arrange such a circuit and want to know if it can be done and how?—J. C. M., Del Mar, Cal.

I would suggest accomplishing this as follows.

Connect one side of the circuit to one side of all four lamps, so that the side connected will be alive all the time. Connect the other side of the white lamps only to the wire coming from the three-point switches as regularly connected and connect in series in this wire an electromagnet so that when the white lights are off, contact is automatically made (through the dropping of the armature) with the opposite wire to light the red lamps. When the whites are turned on the reds will go off because the armature will be drawn up. The diagram shows the arrangement. The magnet coils must be capable of carrying the lighting current used and should be inclosed in an asbestos-lined box or cabinet so that possible arcing at the armature contact will do no harm.—H. P., New York City.



Three-Point Switch Control Connections.

No. 187.—Wiring in Packing House.—I want to install the most approved system of wiring and up-to-date material in a packing house with very damp rooms and cellars. Which is best—iron-pipe conduit, lead-covered cable or flexible-steel conduit? It seems to me lead-covered cable would be best, as water can hardly be kept out of conduits and causes untold trouble. I should like to hear from some readers that have had experience in such work.—J. McQ., Cincinnati, O.

Wiring in damp locations requires the use of either rigid conduit or lead-covered cable properly protected against mechanical injury or, what is the same thing, flexible steel conduit with the wire therein lead-covered. When rigid conduit is used provision must be made for condensation to drain off, although this is small once the system is cooled and kept at the working temperature. The source of most of the water in the system is usually due to leakage at the fittings. Lead cable, and flexible with lead sheathing, must have the lead soldered at the outlets. All light and switch fittings should be the marine type, absolutely water-tight and kept so by rubber gaskets at all points where non-permanent joints have to be made in the conduit system. All joints in the conduit, when other than lead is used, must be made up with taper threads in place of the straight threads usually used in conduit work and the threads leaded or otherwise made water-tight.—W. M. P., Seattle, Wash.

Your querist seems to be aware that he is "up against" one of the most trying situations with which the electrical construction man has to cope. It is my opinion that in this particular situation, the use of what might be called "old-fashioned" materials and methods will prove to be the right solution. It is the "most approved and up-to-date materials" or at any rate those which have the approval of popular use today, which will lead the shortest and most unhappy career when subjected to the trials of packing-house life. Of course I refer, as does your querist, to the wet and steamy sections of the factory. Both rigid-metallic and flexible-metallic conduit, while admirably adapted to the protection of conductors in most situations are at a serious disadvantage when placed in the situation under consideration, for the simple reason that they are made of steel and will inevitably succumb to corrosion—natural and electrolytic as well. Only by reason of the most careful planning and execution by the most skillful and conscientious workmen, can such a job be made to put up a good showing when first installed, and deterioration is rapid and certain. It means tight joints, drained runs, no "traps" for water, and better insulated-wire splices than the average wireman can, or will, make. Lead-covered wires and cables, if properly installed, give some promise of permanency, but here again extra-high-grade workmanship is necessary, and the well-known frailty of the lead covering, its inability to withstand mechanical injury, is fatal. A very small puncture may be followed by a train of widespread and serious electrical troubles.

The use of iron pipe, or metallic conduit, as a raceway and protection for the lead-incased wires would seem to be an easy solution, and it is comparatively simple as far as mechanical protection goes, but its life is limited due to corrosion, as indicated above, and the difficulty of insuring permanent insulation in junction boxes and fittings, is as great, or greater, than with an ordinary installation of conduit and rubber wire.

Lead-sheathed conductors, with a flexible steel armor are no better, if as good, and this is a very difficult material to work. The writer favors open wiring on insulators, on account of the high initial insulation readily attainable, and more likely to be maintained. He would suggest the use of high-grade rubber-covered wire, carried on petticoat insulators where moisture conditions are most severe (the insulators to be installed in their natural upright position). Where appearance does not count and space permits, they should be mounted on impregnated wood pins in wooden cross-arms, elsewhere to be on malleable-iron pendent ceiling brackets. In less trying locations and where ceilings are low, use large porcelain knobs, mounted on wood cleats, saturated with moisture-repellant compound. Use for fastenings nothing but galvanized nails or screws; these, although not common, are easily obtained. In the matter of knobs, if the inspectors having jurisdiction possess the saving sense of humor, they will abrogate Rule 16*b*, and permit the use of solid tie knobs *throughout*, as well as "at the end of runs." If this consent can be secured, then use no knobs smaller than No. 4½, even for No. 12 and 14 wire, but compensate the inspection department for the concession, which is really a forward step and not a backward one, by applying two layers of friction tape for a space of six or eight inches, to the line wire at every insulator, before tying-in. Splices must be carefully re-insulated, using splicing compound well kneaded and united with the rubber, after the braid has been stripped back, then taped with friction tape and given a heavy coat of good insulating paint. Sockets should be of the vapor-proof globe type, suspended on stranded rubber-covered conductors. There is nothing novel or original about this construction. It has been described in detail in good illustrated articles in back numbers of this magazine, to which the editor can supply the needed reference. I firmly believe it is the best construction for the place under discussion.

The writer's reason for preferring solid knobs and petticoat insulators to split or two-piece knobs, is that since every insulating support is a point of leakage (a fact well known to all thinking electricians), then the reduction of such leakage to its minimum should be the endeavor. A long leakage surface is necessary in wet places. This is assured in the highest degree by petticoated insulators. The next in efficacy is the solid knob with a long path down the base of the knob in one direction, and up over the head to the screw, or nail, in the other direction. The poorest design imaginable is the ordinary split knob which has a very short and direct path from the wire, across the crevice between top and bottom pieces, to the screw in which water collects and soon forms a bridge of rusty slime connecting the wire and screw, reducing the required separation of the wires of "one inch from the surface wired over" to zero.—C. A. H., Pittsburgh, Pa.

No. 189.—Number of Outlets per Circuit.—In the December 20 issue of the Review I see mention of a rule in Cleveland regulating the number of outlets per lighting circuit. Like most rules on this point it restricts the total load to 660 watts and also the maximum number of outlets to 12. Now where a circuit is arranged with nothing but 25-watt lamps and larger lamps could not be used satisfactorily, would it be permissible to run 20 of them on one circuit?—F. N. K., Maywood, Ill.

If the work was to be done according to the rules of the National Electrical Code, I should say that the use of more than 16 sockets dependent on one cutout would not be approved, except in the case of work done in theaters or moving-picture establishments when according to rule 38*d* footlights may have 26 receptacles, lamps not to require more than 1320 watts. Also there are some other exceptions that may be noted on reference to the book of rules, but I have been informed by an inspector that the rule for residence work is to have not more than 16 sockets or receptacles and the total load not to exceed 660 watts.—W. A. M., Cold Spring, N. Y.

No. 190.—Vehicle Batteries.—What number of cells is most commonly used at the present time for the storage batteries of electric vehicles? Is there likelihood of standardizing this so as to simplify the charging equipment and raise the efficiency of charging?—P. S. J., Rockford, Ill.

The number of cells which is commonly used at the present time for the passenger electric is 40, and that which is commonest for the commercial car is 44. There seems some likelihood of standardizing this number, namely 40, for all types of electric automobiles, though the principal reasons given for making 40 cells the standard are not logical. The reason given is on account of the fact that this number of cells is charged with the least I^2R loss from the usual direct-current line. Inasmuch, however, as 95 per cent of all direct-current lines are 220-volt three-wire lines, any considerable current draw on one side serves to unbalance the line, and a more reasonable number of cells for any battery would therefore be such a number as could be most economically charged from 220 volts direct current, with least I^2R loss in the rheostat, which would be either 80 or 84 cells. While such a standard would necessitate doubling the number of cells, the ampere-hour capacity could be diminished and it would be found upon mathematical calculation that a greater effective kilowatt-hour capacity would be available. This would be on account of the smaller loss in wires, brushes and motors.—R. L. L., Minneapolis, Minn.

Suggestion Plan of Automatic Electric Company.

Fifty employees of Automatic Electric Company, of Chicago, manufacturers of automatic telephone apparatus, received tangible evidence of the company's appreciation of the helpful suggestions offered during the past year, when they were presented with watch fobs during a banquet given by the firm's employees on December 22, 1913.

Joseph Harris, president of Automatic Electric Company, made the presentations after thanking the men for the interest they had shown in their work, and also announced that the year 1913 had been the most satisfactory both in quality and volume of production, since the manufacture of automatic telephone apparatus began 22 years ago.

The fobs bear on the face a facsimile of the familiar dial calling device used in connection with the automatic telephone, with the initials of the recipient in the center. On the back are the words, "Presented by Automatic Electric Company for Helpful Suggestions, 1913."

The following employees received fobs: J. Turner, G. S. Rudolph, F. Voss, H. B. Perrott, J. Forrest, G. Green, J. Henning, A. Hopkins, G. Anderson, R. Ramsey, B. W. Johnson, S. Gross, J. Evers, J. Meyers, M. Larsen, A. Emmons, E. Jesse, C. Shay, R. Fisher, B. W. Freda, F. H. Borson, R. Stokely, H. Obergfell, A. Stannelle, T. E. Meyer, E. J. O'Brien, G. A. Meacher, R. Hughes, A. Bernsten, G. Henning, F. R. Quayle, J. J. Higgins, L. F. Wilke, S. E. Witt, E. C. Neumann, C. L. Martin, H. R. Wright, H. Thielberg, C. W. Hinman, Wm. Ross, C. Matthies, G. H. Ayers, J. Klusak, A. E. Wollny, J. J. Kain, H. F. Pfaff, B. Kindred, J. F. Probst and George Lawson.

About two years ago Automatic Electric Company started the suggestion plan, which is briefly as follows: A suggestion form is supplied to the employees, upon which all foremen are required to report at least once a week. They may send in one or a dozen such forms, but one is the minimum, and it must either contain a suggestion, or the words, "No suggestions to make this week."

The present plan is a modification of the original idea, under which suggestions were received at any time, but no weekly minimum was set. The result was that the men would forget it for weeks and this prompted the change.

When a suggestion is received, the factory superintendent notes it and refers it to an engineer, who makes an investigation, secures opinions from the employees affected, reports as to the changes in equipment necessary to put the plan into operation, and estimates the saving which will result. With these data the suggestion is returned to the factory superintendent for approval or rejection. A notice is then sent to the maker of the suggestion advising him of the action taken and of the reasons, if it has been rejected.

During the past six months, a further modification of the plan has been tried, whereby a special subject for suggestion during a certain period is announced. The employees are informed that while suggestions on any subject will be appreciated, special attention is invited to this particular theme. The following subjects have been dealt with in this way: Safety First; Water, Light, Power and Gas; Bonus Work; Care of Material; Inspection; Material and Finish; Scheduling Work, Chasing, Requisitioning and Transferring Stock.

Various ways of creating and maintaining an interest in the suggestion plan have been utilized. Reminders have been sent through the mail to all heads of departments; cards have been printed and fastened to the transmitters of telephones, while blotters, bearing a list of subjects for suggestions, have been distributed.

Very real benefits have flowed from the suggestion plan, for while Automatic Electric Company's plant was planned and systematized by efficiency experts of recognized ability, it has been found that "the man on the job" is often able to improve the details of the general system, thus materially adding to the efficiency of the methods employed, and eliminating many causes of waste and expense.

The suggestion plan has also had an additional value in giving the employees a keener interest in their work and in providing a useful channel for the criticisms always found among workers. The company has taken the attitude that present methods are not necessarily permanent ones, that better and quicker ways of accomplishing results are always in demand, and the reply to the often heard remark, "If I were the boss," has been "Tell us what you would do."

Reversing Motor Drives and Automatic Control.

As chairman of the Shop-Practice Committee of the Association of Railway Electrical Engineers, George W. Cravens compiled and submitted before the recent convention of that association, some interesting data on motor drives and automatic control from which the subjoined notes are taken.

Among the many important changes in shop practice due to the widespread application of electric motors there is probably none of greater importance than those due to the application of automatic reversing motor drives to planers, shapers, slotters, etc. While a great many shop men appreciate the great saving in power and the increased production due to this practice, it is doubtful if the true importance of it is fully realized. Usually, the saving in transmission losses is the only thing considered and, even though this may be 50 or 60 per cent of the total power required, it is often only a small part of the real saving. The principal gain is in the increased production and decreased cost.

It is easily seen that the most efficient tool is the one which will do the most work in a given time without straining either the tool or the work; do it accurately and at the lowest cost for power and maintenance, and with the least loss of time between cutting operations. With tools that perform their work with a rotary motion of either the cutting tool or the work, such as lathes, boring mills and drills, it is possible to make the tool work 100 per cent of the time it is running, but with tools that operate with a reciprocating motion of either the cutting tool or the work, such as planers, shapers and slotters, a portion of the time is lost when returning between cutting strokes. So, the relation of cutting stroke and return stroke has an important influence on the amount of work that may be done in a given time.

With the direct-coupled automatic reverse drive the cutting and returning speeds are controlled independently, so it is possible to make the ratio between return and cutting speeds anything that may be desired, up to the practical limit. The speeds commonly employed for planing range from 50 to 100 feet per minute for the return stroke and from 25 to 50 feet per minute for the cutting strokes, the speeds depending upon the nature of the work.

From this it will be seen that the ratio between the return and cutting speeds will be 2 to 1, and motors giving this ratio are easily obtained. But, if a ratio of 3 to 1 is obtained there will be a gain of 12.5 per cent in time required to do a given amount of work, while with a ratio of 4 to 1 the gain will be 20 per cent. We find, however, that the latter is hard to obtain unless the planer is made heavy enough to stand this service, on account of the shock produced in accelerating and stopping the platen or table when the speed exceeds 100 feet per minute.

In order to reduce the cutting time to a minimum it is necessary to maintain as high a cutting speed as possible without injury to the work or to the tool, so the nature of the work must be taken into account. If the piece is small or sets low on the platen the speeds of both cut and return may be greater than if the piece is heavy or sets high above the platen. The weight of the platen itself must also be taken into account.

The reason a direct-coupled reversing planer drive is so effective is that there is no power wasted in intermediate belts, pulleys or shafts and there is no slippage. Since the power necessary to operate a planer or any other tool is the sum of the power required to do the work and the power used to overcome the friction and other losses in the driving mechanism, it is evident that, for a given job, a comparison of the no-load powers will show the difference between any two systems of drives. We find by a large number of comparisons that the saving made by using direct-coupled motor averages over 40 per cent. With a direct-coupled motor using dynamic braking, the most common method, the current used on reversals is less than with the shifting belt method because enough must be taken from the line, in the latter case, to stop the planer in addition to that required to start it and run it. With dynamic braking it is only necessary to use energy enough to start and run the planer, the energy developed in stopping the planer being absorbed in the motor armature and the resistances.

The cost of maintenance, where belts are used, must include the labor and material for repairing and replacing belts; labor and material for pulley, countershaft and bearing repairs; value of time lost while making repairs, if any; cost of general maintenance, oiling bearings, tightening belts, etc., and maintenance of motor and its controlling apparatus. When direct-coupled reversing motors are used the only item to consider is motor and control maintenance.

No accurate general figures could be obtained as to the time lost in production due to the use of belts, because the labor necessary to repair and replace belts varies so in different shops, but we know the productiveness of the tools is increased when reversing motors are applied because there is no belt slippage; no flywheel effect or inertia of pulleys to overcome; the cutting speed is adjustable to suit materials and cuts; the return speed can be adjusted to suit the work; no belts or countershafts are to be repaired, and a large amount of time is saved when setting up the work because the platen may be moved any required amount at will.

We have also found that where direct-coupled automatic reversing variable-speed motors have been installed on planers formerly equipped with belt drive the increased production averages 33 per cent. This means that if a shop has three planers and is so busy as to require a fourth one, the floor space and operating expense of the fourth can be saved by equipping the three existing ones with automatic reversing motors and controllers. The cost of three such equipments of medium or large size, for corresponding planers, will be about one-half that of the fourth planer, thus adding to the sum saved by the change.

The various makers have worked out variations in the details of their equipments, but all follow the same fundamentals; that is, the motor must accelerate, stop and start in the reverse direction, and the speed must be adjustable. The planer must also be protected in case of trouble on the power circuit, for if the voltage should go off while the machine is running the platen might run off the bed unless the motor stopped and held it. The essential parts of all control systems are three in number; a contactor panel, a master switch and a resistance.

Automatic Control.

If it is true that one of the most important advantages of motor drive is increased output, it is equally true that motor control is also important, for it is only through proper control that increased output can be had. So long as a motor is no more than a driving element it is but very little better than a belt from a line shaft, but when that motor is made to vary in its action as required it then becomes a really valuable adjunct to any machine tool.

Nearly all of the power-consuming work done in machine shops consists in removing metals in the form of chips. That is, the output of any machine is generally measured in terms of the amount of metal it can remove in a given time. Hence, anything which will help a machine remove more metal in a day is a decided and very valuable improvement. It has been estimated that an increase of but 5 per cent in the output of the average machine tool will increase the earnings enough to pay back the cost of applying the motor drive and control inside of two years. When the control of that machine is made as nearly automatic as possible, the gain is still greater.

A machine gives maximum output when worked at the highest economical speed and when operated on productive work the maximum amount of the time. Plenty of power must be supplied to and at the cutting tool and the speed must be variable over a wide range if the machine is to work at its highest economical speed at all times. Proper control and large motors are necessary to this end, and we find that a large number of railroad shops have been equipped in first class manner along both of these lines. In fact, we feel that it is along the line of adopting automatic control for machine tool motors that a very large part of the advance in shop practice will proceed.

Shunt-wound, adjustable-speed direct-current motors, or alternating-current motors of essentially those characteristics, are used for most machine tools, but they require suitable controlling apparatus before they are really satisfactory. Automatic control of a motor provides the limiting of the starting, stopping or reversing current to a predetermined value; starts, stops or reverses the motor in the proper amount of time protects the motor from grounds, short-circuits and commutator troubles, and limits the torque in the motor and in the machine it drives.

Automatic control not only relieves the operator from the physical acts of starting, stopping and reversing his motor but also relieves him from the mental exertion necessary to the proper regulation of a motor by a hand controller. He will seldom turn the handle at just the right speed, whereas the automatic controller gives him the fastest safe control and leaves him entirely free in mind and body for his part of the work. This not only makes the employment of a cheaper grade of labor possible, but all of the operations of control will be done in exactly the same way and in the same time, no matter how often they may be repeated after being determined.

In general, any system of automatic control, to be satisfactory, should provide for (1) the motor must start from rest and attain the speed corresponding to the setting of the field rheostat in the shortest safe time and with the current held within safe limits; (2) the motor must be reversed in the same manner and with the same automatic protection; and (2) the motor should be stopped by dynamic braking or any other similar and suitable method. Preferably this should be accomplished by means of push-button control when required.

Automatic control has been satisfactorily applied to machines with heavy inertia loads, such as punch presses, shears, bulldozers, forging and upsetting machines and others with heavy flywheels for both starting and stopping them. In place of clutches for connecting and disconnecting the motor and machine, the automatic controller allows of starting the motor quickly and safely and stops it by means of dynamic braking in the minimum of time. This type of control has also been applied to shapers, slotters and planers to good advantage.

One of the most important applications of automatic control in railroad shops has been to lathes and boring mills, as it allows the start, stop and reverse to be done from any desired point, and an electric brake may be used for quick stopping; friction drives may be replaced by positive drives; quick stops may be made for measuring and a large amount of time saved; the motor can be made to start only on the slow speed and then to quickly accelerate to the proper cutting speed, as predetermined; the motor can be made to automatically drop back to a safe current value in case of overload, and then come back automatically to the proper cutting speed after the overload has passed, and the operator can start and stop without disturbing controller.

The tendency in railroad shops is to demand automatic controllers which will protect both the motor and the machine from mishandling by careless operators and which will insure the doing of certain things in a certain time. Increased applications of motors demand the development of new controlling devices, and, conversely, the new controllers open up new fields of application for motors. This will result in taking the responsibility from the operator and placing it upon the electrician who installs the equipment and takes care of it.

An automatic controller is not so simple as a hand-operated device for the same service, and it is not always easy to take hold of one and install and operate it, but it must be done by all of us at some time, so let us find out all we can about the present state of the art before it is too late.

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Special Cooking Rate in Atchison.

The Atchison (Kans.) Railway, Light & Power Company has announced a reduction in rates to five cents per kilowatt-hour, effective immediately, for cooking purposes. The rate for lighting will be 10 cents per kilowatt-hour, as in the past.

A CURRENT-LIMIT SWITCH FOR THE ACCELERATION OF DIRECT-CURRENT MOTORS.

By **M. H. Erdmann.**

Wherever direct-current motors of a larger horsepower than 0.25 are used it is advisable to use some sort of starting device to accelerate them, by means of which an external resistance in the motor circuit is gradually decreased until it is entirely cut out and the motor is receiving full line voltage at its terminals.

There are several methods of accomplishing this end, the original being to step-by-step short-circuit the external or starting resistance by hand. This method is more or less unsatisfactory when applied to motors above 10 horsepower (unless a competent man is employed to start the motors), due to the fact that there always exists the tendency to accelerate the motor either too rapidly or too slowly. If the tendency is toward too rapid acceleration the current drawn by the motor will be excessive and either the line fuses will be blown or the motor windings will in time burn out. On the other hand, if the motor be accelerated too slowly the starting resistance, not generally being proportioned for continuous duty, will burn out. If the starting of large motors is to be done manually it is highly imperative that an ammeter be placed in the circuit and that an educated electrical man be instructed to watch the ammeter while he is accelerating the motor so that the current drawn from the line will not reach a dangerous point and that it will not flow through the starting resistance for a long enough period to cause damage.

But it is not always expedient to have a good electrician available for the sole duty of starting motors. In some plants where individual motor-driven machines are used such a position would keep dozens of men busy all of the time. This is entirely out of the question. The most politic move for the motor users to make, then, is to install some form of automatic starting device on their several motors, by means of which the mere pressing of a button or the closing of a switch will cause the motor under the control of that one starter to be automatically accelerated in the shortest safe time consistent with the driven load.

This can only be done by means of current-limit acceleration; i.e., utilize the current drawn by the motor during acceleration to govern the proper length of time required to bring that motor up to its normal speed.

To obtain true current-limit acceleration it is necessary that the accelerating switches which will automatically cut out the starting resistance be constructed so as to adapt themselves for connection in series with the motor to be accelerated.

Fig. 1 is a cross-sectional view of such a switch. In this illustration *I* is the operating coil. This winding is carried by a brass tube within which the core *E* is free to reciprocate vertically. The upper end of the core *E* carries a non-magnetic stud to which is attached a copper contact plate *G*, adapted to make contact with a pair of contact brushes *H* when the circuit is closed. The lower end of the core *E* is reduced in cross-section and forms a stem *F* which meets the body of the core to form a shoulder. This stem *E* passes into a hollow plug *C*, which is of magnetic material. The winding of the switch is inclosed and protected by a semi-cylindrical iron casing *A* which also constitutes the return member of the magnetic circuit. The upper member of the frame *A* is provided with a pole-piece *B* of magnetic material.

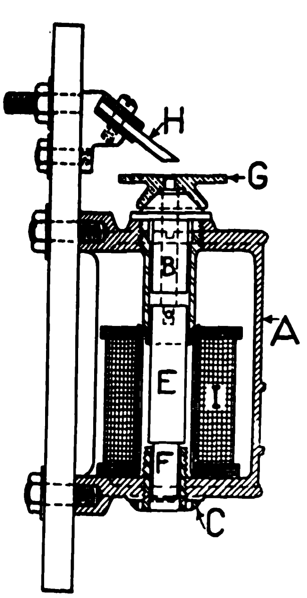

Fig. 1.—Cross-Section of Switch.

When current flows through the winding *I*, magnetic flux passes between the plug *B* and the upper face of the core *E*. Substantially, all of this flux is normal to the face of the core *E* and is effective in producing a magnetic pull tending to close the switch. At the lower end of the core, however, the flux has two paths. One of these paths is from the horizontal portion of the frame *A*, into the sleeve or hollow plug *C*, and from the upper face of this sleeve through an air gap to the shoulder on the core. This portion of the flux takes a direction practically normal to the face of the shoulder and produces a magnetic pull which tends to move the core downward, or, in other words, tends to prevent actuation of the switch. Through the second path at the lower end of the core a portion of the flux passes directly into the stem or extension *F* in a direction at right angles to the direction of motion, and this portion of the flux is therefore not effective in producing a pull on the core in a vertical direction. The total flux divides between these two paths inversely as their reluctances. With a small current in the winding *I*, substantially all of the flux passes directly into the extension *F* this path being of much less reluctance than the path including the air gap. This extension, however, is of restricted cross section, and as the magnetic force is increased the reluctance of this path increases and more and more of the flux is crowded into the air gap.

The core *E* is then acted upon by two forces—one the magnetic pull at its upper end which tends to close the switch, and the other made up of the weight of the moving parts plus the downward magnetic pull at the shoulder on the core. When the current is below a certain critical value, the upward pull is greater than the downward pull plus the weight of the moving parts, and the switch will close. When the current is above this critical value the downward pull plus the weight of the moving parts predominates and the switch cannot close.

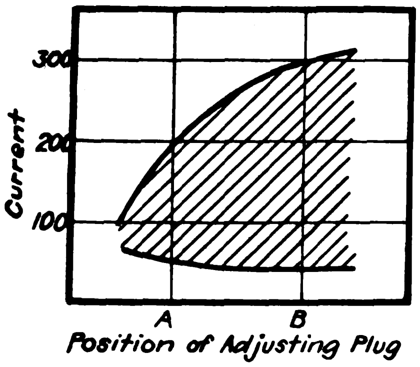

Fig. 2.—Operating Curves of Switch.

The critical value below which the switch will close and above which it will "lock out" is adjusted by screwing the plug *C* in or out, which adjusts the lower air gap. This has the effect of altering the reluctance in the path including the air gap with respect to the reluctance of the path including the stem *F*. Screwing the plug in and thereby shortening the air gap has the effect of decreasing the value of the current at which the switch will "lock out," while increasing the air gap has directly the opposite effect.

Fig. 2 is a reproduction of the operating curves of one of these switches. The ordinates of these curves read in amperes and the abscissas in fractions of an inch showing the length of the lower air gap.

The upper curve is the "lock out" curve, and the lower curve shows the minimum current at which the switch will close. The switch will close at any value of current between these two curves as measured on an ordinate corresponding to the length of air gap under consideration.

It will be observed that the lower curve is substantially a horizontal line, which shows that the minimum current at which the switch will close is very little affected by altering the lower air gap. After the switch has closed it is held closed by practically a closed magnetic circuit and will therefore be held closed until the current in its winding has fallen almost to zero. Since both the winding of the switch and its contacts are in the controlled circuit, the switch will not open until the current has fallen to nearly zero, it follows that there can be no arcing at the switch contacts, and hence blow-outs or other arc-rupturing devices are not required. With such a construction the friction of pivots and pins and that of flexible shunts is avoided and the switch acts accurately as a relay.

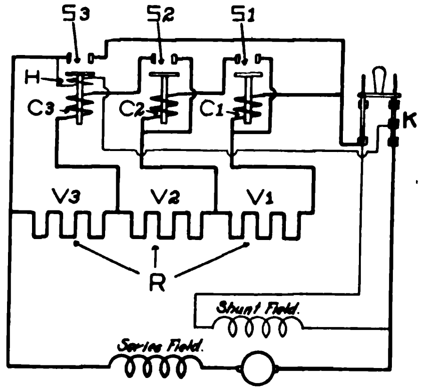

Fig. 3.—Connections of Automatic Starter.

A simple form of automatic starter employing series-wound switches to obtain current-limit acceleration and used in connection with a compound-wound motor is shown in Fig. 3. The starting resistance *R* is proportioned so as to allow only 150 per cent of full-load current to flow through the motor when it is in circuit immediately after the knife switch *K* is closed to start the motor. This current will "lock out" the accelerating switch S_1. As the motor gains in speed the current drawn from the line will decrease until the value is reached at which S_1 will close, short-circuiting the first section of resistance V_1 and at the same time energizing the operating coil of S_2. This will cause a sufficient rise in current to "lock out" S_2. Then as the current decreases again it will reach the value at which S_2 will close, cutting out a second section of resistance and energizing the operating coil of S_3. When S_3 closes the motor is connected directly across the line and is receiving full voltage at its terminals.

In addition to the regular operating coil, S_3 is also equipped with a shunt-wound holding coil *H*, which is supplied with voltage equal to the counter electromotive force of the armature, and which is designed to hold the plunger of S_3 up when it is once in the closed position. The magnetic flux produced by this coil is sufficient to hold S_3 closed but not enough to close it until the current in its operating coil has dropped to the value for which the switch is adjusted. When the knife switch *K* is opened to stop the motor it opens the circuit to the shunt-holding coil, which, in turn, allows S_3 to open immediately, making it possible to close *K* again to accelerate the motor before the armature has come to rest. If this provision were not made the starter would be very undesirable in case it should ever be required to accelerate the motor prior to the armature coming to a dead stop, for with S_3 in the closed position and the motor running at a low rate of speed, if *K* were closed it would connect full line voltage across the motor's terminals.

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German Electric Furnaces for American Steel Concern.

An order has recently been placed by the American Iron and Steel Manufacturing Company, a Pennsylvania concern, with the Siemens & Halske Company, of Berlin, for two 20-ton induction furnaces of an improved type that has been developed from the combined patents of Kjellin, Roechling-Rodenhauser, and Frick.

These furnaces, which are now in course of construction, will be of the double-ring form and will be supplied with power from separate single-phase alternators. The generators will supply current at 5,000 volts. The normal power consumption of the furnaces will be 1,800 kilowatts each, and they will be employed for the refining of molten open-hearth steel, which will be used chiefly for the production of rails. The output of each furnace will be about 160 tons per day of 24 hours, depending upon the grade of steel produced. The importance of this order will be more thoroughly understood when it is considered that up to this time the largest furnace of this type had a capacity of only 12 tons per day.

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The St. Louis & San Francisco Railroad dismissed over 400 telegraphers just before they threatened to go on a strike. The telegraph has been abandoned as a dispatching medium and the telephone used instead.

LIGHTING OF STORE OF NEW CASTLE DRY GOODS COMPANY.

By Louis B. Round.

The interior illumination consists of 33 500-watt tungsten lamps in 16-inch Haskins globes, 12 100-watt lamps in 8-inch globes and 1,250 five-watt, 10-volt lamps arranged in the mezzanine floor, which in conjunction with the interior decoration of the building, presents a very pleasing appearance. In addition to these there are 180 25-watt tubular tungsten lamps on the show cases. The illumination of that part of the second floor used as display rooms consists of 25 250-watt lamps in 12-inch Haskins globes. The balance of the second floor and all of the third floor are given over to offices, of which there are 50.

The windows are illuminated by 48 100-watt tungsten lamps, using Bailey reflectors concealed in such a manner as to reflect only on the goods and present a very pleasing appearance.

The outline lighting consists of 3,500 five-watt, 10-volt tungsten lamps wired on the three-wire system and supplied from transformers located on the roof, in addition to which there are 60 15-watt tungsten lamps around the portico and six tungsten posts containing five 100-watt tungsten lamps each. The conduit for the outline lighting was laid in the brick during construction, the lamps only being visible. They present a very pleasing appearance in the daytime and are especially beautiful at night, being visible for miles around. This was the first installation of outline lighting in this city, and since this time several other merchants have installed them.

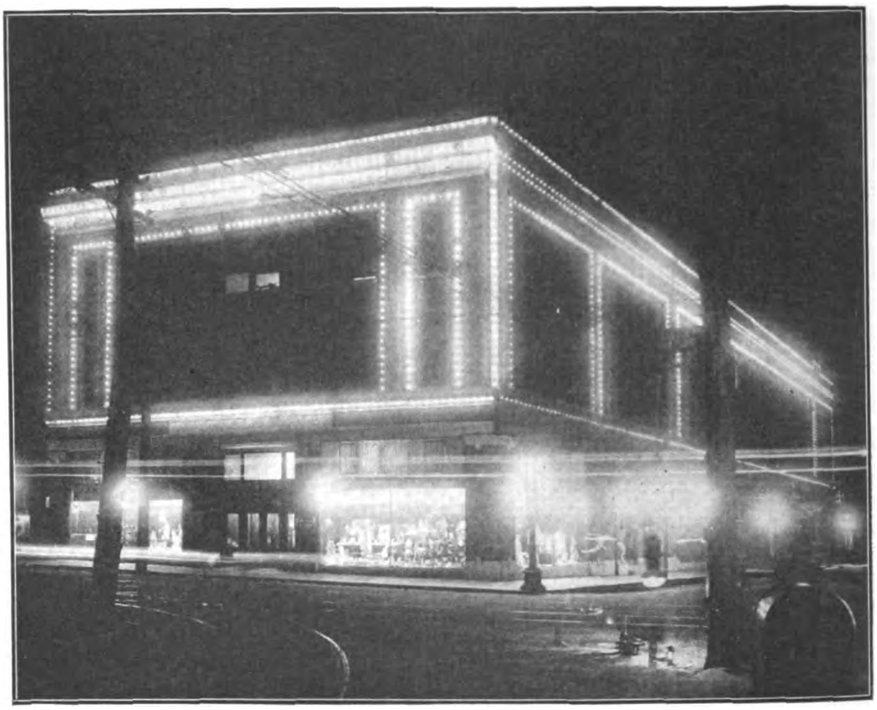
The total connected lighting load is 52 kilowatts, wired on the three-wire system by the Modern Electric Company, of Wilkinsburg, Pa., under the personal supervision of Al. Keene. The fixture work was installed by The John Electric Company, of New Castle, Pa.

The total connected power load is 75.5 horsepower, in 220-volt, 60-cycle, two-phase motors, including one 40-horsepower and one 15-horsepower elevator motors. The balance are pumping, cash-system and ventilating motors, all of small capacity.

Both light and power are supplied from transformers located in a transformer vault in the basement, the service being carried into this vault in iron conduit and lead-covered cable at 2,300 volts and distributed from a main switchboard located in the sub-basement and about 10 feet from the transformers, thus insuring good secondary voltage.

All lighting and power is measured through 60-cycle single-phase Westinghouse watt-hour meters located on the main board, the average total consumption for three months being 7,400 kilowatt-hours per month.

It was the original idea of the owners to install a private plant but the representatives of the New Castle Electric Company had no trouble in proving the superiority of central-station service, M. A. Pooler, superintendent, securing the contract.



Lighting of New Castle Store.

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The use of electric flatirons is very rapidly gaining popularity in England. In many tailor shops they are replacing gas irons.

ELECTRICITY SUPPLY OF LARGE CITIES.[1]

By G. Klingenberg.

Electricity is now universally acknowledged to be the most suitable form of energy supply for large cities, and apart from the convenience and reliability, its wide range of application makes it superior to gas, which 20 years ago had no competitor in this field. Although electricity was originally intended exclusively for lighting, its extensive application for power soon followed, and in many towns the power demand nowadays exceeds the lighting consumption. Electricity has introduced a radical change in the means of communication, by permitting the successful introduction of rapid-transit systems (underground and elevated railways) which are regarded as indispensable in large cities at the present day. A further field has been opened in its application to heating and cooking. The fact that electricity, notwithstanding its obvious advantages, has hitherto been unable to drive its competitors entirely out of the field, is solely due to the difference in price for the same amount of energy, necessitated by the cost in some of its forms of application.

Any reduction in price therefore results in its increased use, and it may be said without exaggeration that there would be no demand for other forms of energy if all electric supply undertakings would fully recognize the advantages which our present-day knowledge and experience places at their disposal, and furthermore, if they could rid themselves of the restrictions originally placed upon them in the supposed interests of the consumer, which restrictions are now very often found to be a hindrance to both consumer and producer.

It is the purpose of the present paper to explain the nature of these conditions and draw attention to those factors which would contribute towards a reduction in the cost of electricity and facilitate its more extensive employment.

Referring to existing conditions, I have confined myself to three examples which I consider to be typical. The material at my disposal enabled me to extend my investigations to details which will be of value when forming an opinion on the entire question. The cities selected are:

Berlin—Berliner Elektricitätswerke.

Chicago—Commonwealth Edison Company.

London—The municipal authorities and authorized supply companies in and around London.

The figures are based on the following years:

Berlin	1911-12
Chicago	1911
London	1910-11

Berlin.

In Berlin the electricity supply began with the purchase and operation of generating sets by commercial undertakings solely for their own requirements, and without intention of selling energy to outside consumers. This system was found to be convenient as it was not necessary to lay conductors in the streets, and as complete independence of municipal authorities was possible. A number of these so-called "block stations" still exist, their combined output being estimated at nearly 40,000,000 kilowatt-hours.

The Berliner Elektricitätswerke alone formed an exception in this respect; they were intended from the outset to supply current to outside consumers. They were authorized to supply current outside Berlin on the condition that the city plants as well as those outside the city within a radius of about 20 miles could be taken over by the city authorities upon the expiration of the contract (1915). The tariffs are subject to the approval of the city authorities, who have decreed that the price at which the current is supplied must be reduced when the net profit exceeds 12.5 per cent on the capital. The city also participates in the profits, and receives 10 per cent of the company's gross income, and half the net profit after paying 6 per cent on the share capital up to $5,000,000, and again half the profit left after paying 4 per cent above this amount. The sum paid out in this manner during the past financial year, for example, was $1,650,000, which considerably exceeded the dividend paid on the company's share capital of $15,000,000. The development of the Berliner Elektricitätswerke may be seen from the following figures for the energy sold:

1900-1, 69,700,000 kilowatt-hours.
1905-6, 126,200,000 kilowatt-hours.
1910-11, 192,100,000 kilowatt-hours.
1912-13, 244,300,000 kilowatt-hours.

Although the city has formally notified the Berliner Elektricitätswerke of its intention to exercise its rights to take over the whole concern in 1915, no definite decision has yet been reached.

The distribution in Berlin is on the direct-current system throughout with the exception of the suburbs and a section of the city in the north, which are fed directly with three-phase current.

Apart from the Berliner Elektricitätswerke and the above mentioned block stations, a number of separate traction power stations exist, which supply energy to the underground railways and a part of the tramway system.

Chicago.

The Chicago electricity supply originated in a large number of small supply companies (approximately 36) which were amalgamated between the years 1892 and 1906 to form two large companies: The Chicago Electric Company, and The Commonwealth Electric Company. In 1907 these two companies were amalgamated under the title, The Commonwealth Edison Company.

All the small power stations have been shut down since then, and the whole supply is obtained now from four large power stations.

The concession extends over a period of 50 years, dating from the year 1897, and it stipulates the maximum rates to be charged by the company, and a payment of 3 per cent on the annual gross receipts to the city.

The development of the company may be seen from the following figures for the energy sold:

1900, 33,700,000 kilowatt-hours.
1905, 93,000,000 kilowatt-hours.
1910, 550,000,000 kilowatt-hours.
1912, 712,000,000 kilowatt-hours.

The substations are fed with three-phase current at 9,000 volts, 25 cycles, and in part at 20,000 volts, 60 cycles. The distribution in the interior of the city is on the direct-current system, while in the outlying districts three-phase current at a frequency of 60 cycles is adopted.

London.

If I understand the history of the electricity supply in London correctly, it began, as in the case of Chicago, with a number of private companies. Their development was hampered, however, in the earlier stages by legal restrictions which limited the concessions to a period of 21 years, and divided the current supply of the city into a number of districts corresponding to the administrative divisions, without taking into account the natural development of the distribution system. Every authorized supply undertaking was obliged to erect its own generating station and to lay out its own distributing network. An amalgamation of the different concerns was therefore out of question until in 1908 the original act was modified by a new law. Since that time constant endeavors have been made to combine the numerous companies, to centralize the generation of energy, and to standardize the different distribution systems as far as possible.

Discussion of the Factors Determining the Cost to Consumers.

It has already been mentioned in the introduction that the development of the electrical industry in large cities is chiefly dependent upon the price of the electrical energy, and I now propose to discuss the factors which determine this price.

Cost of Plant.—The specific cost of the plant, i.e., the cost per installed kilowatt, should be mentioned in the first instance. As each kilowatt installed is only capable of supplying a given number of kilowatt-hours, the increase of cost will be in proportion to the capital expenditure per kilowatt, provided that other conditions remain unaltered.

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[1] Portion of address delivered before The Institution of Electrical Engineers in London, Eng., December 4, 1913.

A distinction must be made here between the costs for the power station and for the network. In the power station the cost per kilowatt decreases rapidly as the size of the generating sets increase. This applies the more the generation of the energy is centralized in large power stations. For works with modern generating sets of 1,000-kilowatt capacity the installation costs are found to be approximately $75 per kilowatt, whereas for units of 20,000-kilowatt capacity they only amount to one-half of this sum. Bearing in mind that for large cities outputs of several one hundred thousand kilowatts are required, one will realize that units of less than 20,000-kilowatt capacity are unsuitable and too expensive for this purpose, and the installation of 30,000-kilowatt sets appears to be fully justified. In consequence of this development the specific cost of power stations has fallen in about 10 years to nearly a quarter of its former value.

The conditions are not so favorable, as a rule, for the network. When the energy transmitted is increased by using cables with larger sectional areas, the economic limits are soon reached, since the permissible specific load on the conductor, and therefore its effective utilization, decreases as the sectional area is increased. On the contrary, the idea of extended centralization has the reverse effect on the cost of network, since these costs are increased by longer feeder cables without any direct gain being secured in the network itself.

It is, nevertheless, also possible to economize on the capital outlay of the distribution system. In this connection the use of higher working voltages should first be mentioned. The customary feeder cables for pressures of 6,000 to 10,000 volts no longer meet present-day requirements in large cities. The additional cost of transforming when the cable pressure exceeds 10,000 volts is counterbalanced even in the case of short distances by the saving effected in the cables. Whenever extensions are contemplated, pressures of 20,000 to 30,000 volts should be adopted, even should this entail a further transformation at some points where stations with different pressures have to be connected up.

At the above pressures it is possible to transmit outputs of more than 10,000 kilowatts through one cable. The cost of the feeder cable is reduced to about 60 cents per kilowatt transmitted and per kilometer, so that this part of the installation cost becomes of less importance for the short distance over which the energy has to be transmitted in cities.

A further means of reducing the cost of the network is found in the conversion of the entire system to a uniform alternating-current system, by laying ring mains and by interconnecting the various sections of the city.

Charges on Capital.—The determination of the price for the current should be preceded by the fixing of the rate for capital charges which must be regarded as the minimum for the prosperous development of the undertakings in question. In many instances the low rate of interest forms an obstacle when new capital is required, it prevents the concern from adopting progressive measures for improving the economy of the plant, and indirectly keeps the cost of the current unnecessarily high. On the other hand, it will be agreed that an undertaking which has to make use of public streets and thoroughfares, and is granted certain privileges by local authorities, is under an obligation to consider the interests of the general public in addition to its shareholders' interests.

The demands of the authorities, however, have unquestionably on many occasions exceeded reasonable limits, and by hampering the entire undertaking have impeded rather than assisted public interests. In my opinion, interest at 6 to 8 per cent on the value of the plant represents for undertakings of this kind the lowest limit which would ensure a favorable market for the company when it requires further capital. As regards the sinking fund and other reserves, an average figure of 3 to 4 per cent seems to be reasonable for power stations, substations, and distribution system; for long-distance transmission lines and feeder cables in which the conducting material (copper) represents a high percentage of the total value, about 2 per cent may be sufficient. I have therefore based the following calculations upon uniform capital charges of 10 per cent for power stations, substations, and distribution system, and 8 per cent for transmission lines and feeder cables, and I have called the current prices calculated from this basis "normal prices."

Cost of Operation.—The direct operating costs affecting the price of electricity chiefly consist of the following items: coal, stores, wages, repairs, taxes, insurance, and general expenses such as wages, management, office costs, etc. The costs resulting from the losses between the power station and the point of consumption must also be included here.

The costs of generation are directly dependent on the size of the power station, or on the size of the generating sets. Power stations with units of 20,000-kilowatt capacity consume only about three-quarters of the quantity of coal at full load compared with works in which modern 1,000-kilowatt sets are installed, and only half or even less of that consumed in older power stations with units of this size. The operating staff required depends chiefly upon the number of machines and not upon their size, this being all the more the case in modern power stations in which human labor is replaced wherever possible by automatic machinery. Therefore labor costs are far more favorable in plants with large generating sets. The same applies to the sums required for repairs, stores, and general expenses.

The operating costs for the network are not directly dependent upon the size of the undertaking. By subdividing the distribution system in accordance with the best engineering practice, by simplifying the organization and by standardizing the plants, one can effect economies. Here again attention should be drawn to the superiority of the alternating-current systems over the mixed systems.

Transmission Losses.—The transmission losses, which in the old plants amount to about 20 per cent of the energy generated, and thus represent from 10 to 15 per cent of the selling costs, can unquestionably be reduced to half this figure with the enlargement and standardization of the plant, this being all the more the case in view of the fact that lower generating costs also reduce the cost of the losses.

Utilization of the Plant.—A comparison between different plants and the prices at which they sell their current is only possible when the extent of their utilization is known.

By the term "utilization" I mean the ratio of the kilowatt-hours sold within a given period (usually taken as a year = 8,760 hours) to that number of kilowatt-hours which the plant would have been capable of generating if all the machines had been running constantly at full load during this period.

The utilization of the plant can thus be expressed by the following formula:

$$n = \frac{\text{kilowatt-hours sold per annum}}{\text{installed capacity of plant} \times 8{,}760} = \frac{\text{average load sold}}{\text{installed capacity}}$$

This term has been in use for some years on the Continent. I have called it the "utility factor" (n) of the plant. The following particulars will show that the use of this factor affords valuable assistance in arithmetically following up the somewhat intricate relations between the cost of the current and the utilization of the plant.

In determining these functions it is necessary to ascertain the current costs (or proportionate current costs) both for the entire plant and parts of it when working permanently at full load, these values being characteristic and practically constant for each individual plant.

With regard to the capital charges (interest, dividends, sinking fund, etc.) this value (A_z)is obtained by dividing the annual interest by the product of the total capacity and number of hours per year. If, for example, the capital charges are K_z and the total capacity of the plant L kilowatts, the characteristic value for the capital charges is given by the formula

$$A_z = K_z/8760L.$$

The capital charge per kilowatt-hour sold is A_z/n……………………(1)

In a similar manner one can show how the direct-operating costs (coal, repairs, wages, etc.) depend on utilization. Here, however, the characteristic costs per kilowatt-hour for full load are partly independent of utilization. The relation between utilization and operating costs can then be found from the expression:

$K_b = a_b/n + b_b$ per kilowatt-hour sold..(2)

It can be shown that the value a_b represents those costs which would be entailed if the plant had to be kept ready for service without supplying useful energy; in other words a_b are the no-load costs. The recognition of this fact enables the values a and b to be separated. Thus the proportion of the running costs to the current selling price can be determined for any utilization in accordance with equation (2).

In determining the value a (no-load consumption) for the fuel of the power station, the time during which each set is run must be taken into account. It can be shown that this is done with sufficient accuracy for practical purposes by making the following modification of equation (2):

$K_k = (n+1)a_k/2n + b_b$ per kilowatt-hour sold ……………………………(3)

The transmission losses may be expressed by a similar formula on the assumption that the copper losses, which really vary as the square of the load, are supposed to be proportional to the latter. This simplification appears to be permissible, since the costs for losses only form a small part of the total costs.

The total selling costs per kilowatt-hour are thus found to be equal to the sum of proportion of costs referred to the power station including capital charges; proportion of costs for the transmission and distribution losses including capital charges; proportion of costs for the operation of the transmission system including capital charges.

They can be represented by a single equation:

$K = 1/n + a/n^2 + b$ per kilowatt-hour sold ………………………………… (4)

which is called the costs characteristic for the entire plant. With this equation one can ascertain the average energy costs for the entire plant, and one can also graduate the prices payable for the various classes of consumption in correct steps as soon as their individual influence upon the utility-factor is known.

Determination of the Utility-Factor.—In view of the importance of the utility-factor in connection with the selling price of the current, I now propose to discuss those points which determine the value of this factor.

One of the first points to be considered in this respect is the load-factor, *m*, which is given for the entire plant by the ratio between the average load of the power station and the peak load. This value is proportional to the utility-factor.

Whereas in small plants irregularities in the consumption are perceptible in the power station, and the load-factor in such stations may be affected by a single consumer; in large stations load fluctuations are equalized as the size of the plant increases. It is therefore possible to determine the form of the load curve, and therefore load-factor, for large plants with sufficient accuracy from the outset, provided the general nature of the consumption is known. Leaving out heating and cooking, three principal classes of consumption remain: power, traction, and lighting. Each of these classes possesses a special load curve which is similar in all large cities, and only varies for lighting according to the latitude. Whereas the power and traction load curves remain approximately constant throughout the whole year (with the exception of Sundays), the lighting load varies according to the season, so that both the average annual load and the maximum load in winter must be known, in order to determine the load-factor. Characteristic load-factors are, excluding Sundays, for light, 18 per cent; power, 50 per cent; traction, 50 per cent.

From standard curves we can obtain the resultant load curve and also the resultant load-factor m for any desired combination of light, power, and traction consumers.

From Fig. 1 the resultant load-factor can be taken directly as soon as the percentages for power, traction, and lighting are known. If, for instance, the kilowatt-hours consumed comprise 20 per cent lighting, 12 per cent power, and 68 per cent traction (this approximately resembles the conditions in Chicago for 1911) then the resultant load-factor lies at the intersecting point of the curve

$$r_k = 12/20 = 0.6,$$

with the abscissa value

$$r_b = 68/(12+20) = 2.13,$$

according to which a resultant load-factor of 40 per cent for the above relationship may be expected and which approximately corresponds to the actual value obtained, namely 41 per cent.

This diagram demonstrates the important fact that by superimposing power and traction curves (top curve, $r_k = \infty$) the

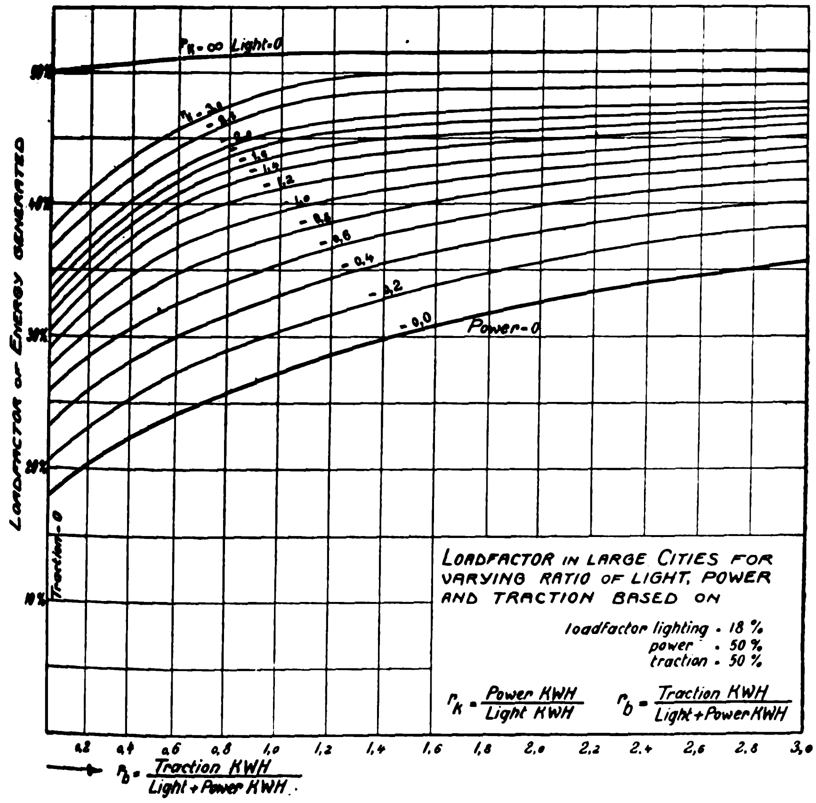


Fig. 1.—Curves Showing Effect of Character of Load Upon Load-Factor.

load-factor may be improved only by 2 to 3 per cent, while on the other hand by combining the power and traction supply with a lighting load of about 12 per cent, the resultant load-factor is materially decreased.

Next to the load-factor, the efficiency of the network has to be taken into account in determining the utility-factor. This efficiency is expressed by η, and is the ratio of the kilowatt-hours sold to the kilowatt-hours at feeder busbars.

This value again is in direct proportion to the utility-factor.

So far as the selling price of the current is concerned, this means that the improvement of the distribution efficiency not only produces a saving in costs for losses, but also (through the increase in the utility-factor) causes a reduction of the remaining costs.

The third point is the amount of stand-by; the utility-factor being inversely proportional to the capacity of the stand-by. Although it is difficult to express any rule for the percentage of stand-by to total plant, this percentage can be reduced with the increase in size of the total plant. This is mainly due to the fact that in the smaller stations the load curve is subject to more violent fluctuations. Therefore, in addition to stand-by for overhauling and repairs, reserves are required to meet such variations in load. The stand-by factor r is the ratio of installed output to peak load in station, where the decimals indicate the percentage in spares. The relation between utility-factor, load-factor, distribution efficiency, and stand-by is given by the formula:

$$n = m \times \eta \times 1/r \quad \text{.......................} (5)$$

By inserting this value in equation (4) for the cost characteristic of the plant, the influence of any of the above factors upon the cost can be ascertained.

In view of the important effect on the utility-factor resulting from a combination of various classes of consumers, a few remarks should be made here bearing upon the practical possibility of such a combination.

In the early stage of electricity supply, separate feeders and even separate generators were used for power and lighting. While in the meantime this practice has been abandoned, it is still usual in large cities at the present day to separate the supply for traction from that for lighting and power, or to provide special power stations and net-works for traction. It must be pointed out that this method, which might be justified with a number of small plants, can only be condemned in the case of large power stations, since, as has been shown in Fig. 1, owing to the inferior utilization, this entails a waste of capital and a permanent disadvantage to consumers.

No disturbances are likely to arise from sudden current rushes caused by traction loads, as these are easily compensated for in large power stations. The statement made by supporters of separated systems that the traction demand is sufficiently heavy to justify a special plant is fundamentally wrong, since they overlook, first, that practically no traction station has yet reached the economical limits as regards size, and secondly, that the point of chief importance is not the reduction of costs for the traction demand, but of those for lighting and power supply.

Comparison of Works Statistics in Berlin, Chicago and London.

It is now proposed to give a summary of the operating conditions in the Berlin, Chicago, and London plants, thus providing an opportunity for checking the foregoing statements by applying them to practical conditions.

TABLE I.—GENERAL DATA.

No.	Item.	Berlin, 1911-12.	Chicago, 1911	London, 1910-11.
1	Company.............	Berliner Elektricitätswerke	Commonwealth Edison Company	Authorities and companies in and around London
2	Population, approx....	2,600,000	2,200,000	6,500,000
3	Power stations:— Number.............	6	6	64
4	Installed capacity...	137,000 kilowatts	221,700 kilowatts	298,400 kilowatts
5	Average size........	23,000 kilowatts	37,000 kilowatts	4,670 kilowatts

TABLE II.—CAPITAL.

No.	Item.	Berlin, 1911-12.		Chicago, 1911		London, 1910-11	
6	Assets.................	$39,000,000		$68,000,000		$133,000,000	
7	Sinking fund, etc......	7,380,000		3,440,000		27,200,000	
8	Real Value............	$31,620,000		$64,560,000		$105,800,000	
		Cost per kilowatt installed	Per Cent		Per Cent		Per Cent
9	Power station.........	86.50	38	116	40	161	45
10	Distribution System, including meters..	144.	62	176	60	193	55
		230.5	100	292	100	354	100

TABLE III.—WORKING RESULTS.

No.	Item	Berlin, 1911-12	Chicago, 1911.	London, 1910-11.
	Capacity—			
12	Total peak load, kilowatts.................	94,600	199,300	185,500
13	Peak load per power station...............	15,800	31,700	2,900
14	Kilowatt-hours generated	274,000,000	684,000,000	405,000,000
15	Kilowatt-hours purchased	——	32,000,000	——
16	Kilowatt-hours sold	216,300,000	640,000,000	319,243,000
	Comprising—			
17	Lighting	24 per cent	19 per cent	61 per cent
18	Power	45 per cent	12 per cent	27 per cent
19	Traction	31 per cent	69 per cent	12 per cent
	Factors—			
20	Load-factor (at power house)..............	33.1 per cent	41 per cent	24.9 per cent
21	Efficiency of transmission system—ratio sold to generated......................	0.79	0.894	0.788
22	Reserve factor	1.450	1.11	1.61
23	Utility-factor (total)	0.18	0.33	0.122
	Coal—			
24	Price per ton..............................	$4.25	$1.95	$3.11
25	Consumption per kilowatt-hour sold, pounds	3.04	3.54	5.2
26	Overall efficiency of plant, per cent.......	9.7	7.6	5.0
	Working Costs—			
27	Revenue from kilowatt-hours sold.........	$8,340,000	$14,060,000	$15,160,000
28	Expenses	$4,290,000	$7,020,000	$6,760,000
29	Profit absolute	$4,050,000	$7,040,000	$8,400,000
30	Percentage of real value..................	12.83	10.87	7.85
	Operating costs per kilowatt-hour sold, in cents—			
31	Selling price	3.85	2.20	4.75
	Expenses—			
32	Fuel	0.581	*0.278	0.742
33	Oil, stores, etc..........................	0.0095	0.011	0.064
34	Wages	0.124	0.149	0.254
35	Repairs, maintenance	0.228	0.202	0.360
36	Rent, taxes, insurance, etc................	0.0845	0.148	0.360
37	General expenses	0.204	0.203	0.339
38	Current purchased	.....	0.040	.....
39	Municipal participation	0.746	0.066	.....
40	Total expenses	1.977	1.097	2.119
41	Profit (gross)	1.87	1.10	2.63

*The conversion to kilowatt-hours sold includes the number of kilowatt-hours purchased therefore the actual value is approximately 4-5 per cent higher.

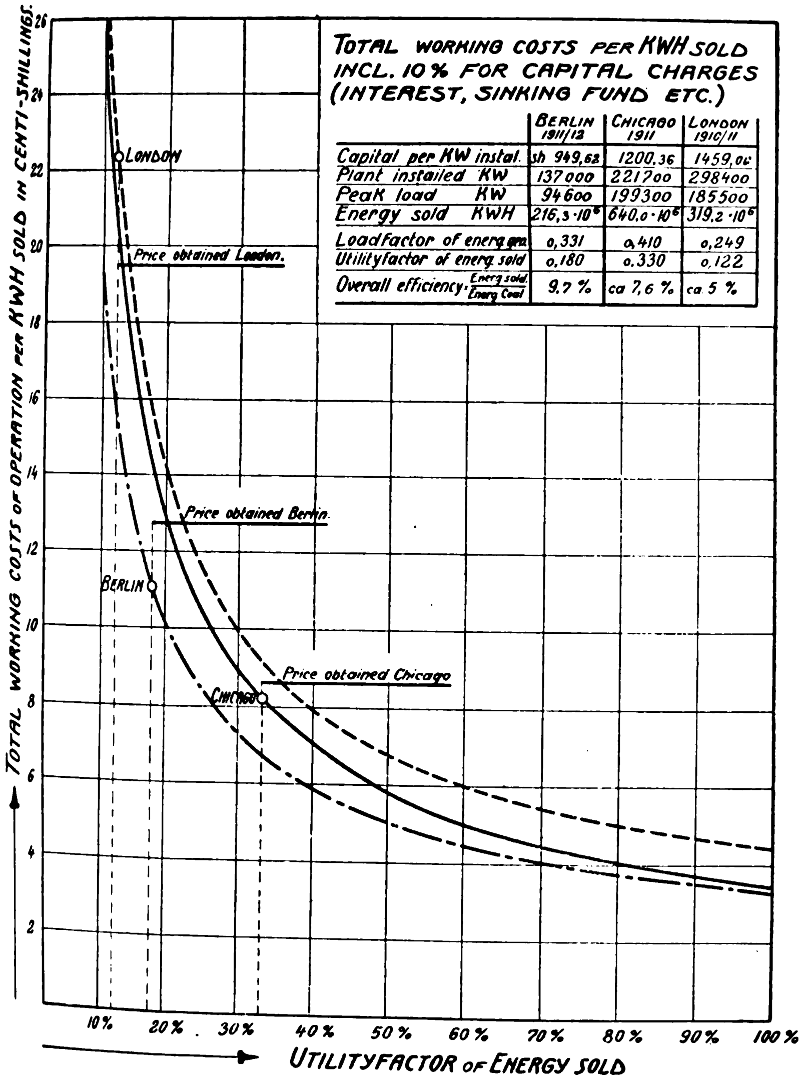
TABLE IV.—EQUATIONS FOR OPERATIN G COSTS OF EXISTING PLANTS.

n = Utility-factor.

Working Costs including Capital Charges per kilowatt-hour sold, in cents.

Portion of Plant.	Berlin, 1911-12.	Chicago, 1911.	London, 1910-11.
Power station (exclusive transmission losses)—K_c..........	$0.154/n+0.391$	$0.260/n+0.252$	$0.252/n+0.473$
Transmission system—K_n.....	$0.1995/n+0.008$	$0.271/n+0.014$	$0.270/n+0.0063$
Transmission losses—			
(a) V_k = kilowatt-hours.......	$\frac{1}{n}\times 0.028+0.111$	$\frac{1}{n}\times 0017+0.068$	$\frac{1}{n}\times 0.022+0.088$
(b) Costs....................	$V_k \times K_c$	$V_k \times K_c$	$V_k \times K_c$

For this purpose the material at disposal has been tabulated in such a manner that the items relating to the three plants can be directly compared with on another. The author has also succeeded, by making some assumptions, in determining the relation between working cost and utility-factor, and has thus obtained the equation for the costs characteristic of all three plants. This conversion appeared to be necessary since the plants in question have a totally different kind of consumption, and therefore work with different utility-factors. Any attempt to draw general conclusions on the advantages of one system over the other is bound to be misleading, unless this is done. Moreover, this analysis seemed to be the only means of obtaining a positive indication of the influence which the difference in centralization of the three plants exercises upon the working and current costs.



	BERLIN 1911/12	CHICAGO 1911	LONDON 1910/11
Capital per KW instal.	sh 949,62	1200,36	1459,06
Plant installed KW	137000	221700	298400
Peak load KW	94600	199300	185500
Energy sold KWH	$216,3\cdot10^6$	$640,0\cdot10^6$	$319,2\cdot10^6$
Loadfactor of energ.gen.	0,331	0,410	0,249
Utilityfactor of energ.sold	0,180	0.330	0,122
Overall efficiency: $\frac{\text{Energ.sold}}{\text{Energ.Coal}}$	9.7 %	ca 7,6 %	ca 5 %

Fig. 2.—Curves Showing Relation Between Utility-Factor and Cost.

The comparative data have been summarized in Tables I to III. The energy consumption per head of population cannot be compared directly from the figures given, since both in London and Berlin the energy is generated in special traction power stations, and in the case of Berlin that generated in block stations must also be included. Unfortunately reliable data in this connection could not be secured; the figures for current consumption in kilowatt-hours per head of population for the years in question may be assumed, however, to be approximately as follows:

Chicago	310
Berlin	170
London	110

These figures, although somewhat approximate, show that in the two latter cities the consumption should be capable of a considerable rise, even assuming Chicago to have reached the point of saturation, which, in the author's opinion, is not the case.

It is a striking fact that in London the generation of energy is split up among a large number of small stations, whereas Chicago stands pre-eminent as regards centralization.

The proportion of the average peak loads in the different stations is approximately as follows:

London	1
Berlin	5
Chicago	10

It is noticeable that the costs per kilowatt of the Chicago plants are about 25 per cent higher than those in the Berlin plants, although the former are of nearly double the capacity. This may be attributed to a certain extent to the costs incurred in buying up the competitive companies, the power stations of which have been put out of commission. This sum amounts to about 9 to 10 per cent of the total costs. The explanation of the difference which then remains between the Chicago and Berlin costs may possibly be sought in the different method of design, and in the more expensive living conditions prevailing in the United States. It is impossible, therefore, to draw any conclusions regarding costs per kilowatt.

A comparison is, however, possible between Berlin and London, where methods of design and living conditions differ less. From such comparison it will be seen that the total costs per kilowatt installed, with power stations of about 5,000 kilowatts, are approximately 50 per cent greater than for power stations of about 25,000 kilowatts; this difference appears to be still greater, namely 80 to 90 per cent, when the costs of the power stations alone are compared. The proportion of the costs of a power station to that of the network (including meters) is also noteworthy; for Chicago and Berlin it is approximately 40:60, and for London 45:55. It can thus be seen that the cost of the power station decreases as the size of the plant increases.

With regard to the consumption, the three plants can be characterized as follows:

Chicago: traction load predominating (about 70 per cent).

London: lighting load predominating (about 60 per cent).

Berlin: power, lighting, and traction loads in a more even ratio.

London is considerably below the other two cities as regards the utilization of its plant, owing to its predominating lighting load. Fig. 1 shows that in London the load-factor cannot be improved appreciably by centralization; what is necessary is to alter the nature of the consumption.

As reserve factors for power stations are altered with each extension, especially in the case of large units, it is advisable to take the average for a considerable number of years. Thus the figure of 11 per cent for Chicago seems too low, and the figure of 45 per cent for Berlin too high, while for London, where the largest machine unit is about 5,000 kilowatts, the value of 61 per cent should be approximately correct. I consider the load-factor should not largely influence the percentage of reserves. What affects the spares most is the size of the whole plant.

In view of such considerations the following reserve factors (r) appear to meet the normal requirements of large cities:

With a maximum load on individual stations of 30,000 kilowatts, $r=1.25$.

With a maximum load on the separate stations of 15,000 kilowatts, $r=1.4$

With a maximum load on the separate stations of 3,000 kilowatts, $r=1.6$.

It is assumed that each power station

is equipped with at least one complete generating set as a stand-by.

Owing to the fact, expressed in equation (5), that the utility-factor depends not only upon the load-factor, but also on the network efficiency and the reserve factor, the utility-factors of the three plants differ to a greater extent than should be expected from the nature of the consumption alone. The ratios are shown in round figures as follows:

London, utility-factor, 12 per cent; load-factor, 25 per cent.

Berlin, utility-factor, 18 per cent; load-factor, 33 per cent.

Chicago, utility-factor, 33 per cent; load-factor, 41 per cent.

These results, together with the remaining items in Tables I and II, enable their dependence upon the utilization to be determined, and by means of the costs characteristic thus found the working conditions can be compared on an equal basis. Fig. 2 shows the total costs characteristic of the plant.

All costs include the capital charges, and in all three cases the normal rate of 10 per cent referred to above has been taken.

The actual utility-factors, Item 23, Table III, are indicated in Fig. 2 by a circle. They therefore represent the "normal price" of the current, i.e., the price at which the works should earn a gross interest of 10 per cent on their capital, neglecting any special sums to be paid to authorities.

The prices indicated in Fig. 2 by a horizontal line represent selling prices actually obtained by the works during the year in question (after deducting special expenses), and therefore permit a direct comparison with the normal value.

Results of Comparative Calculations.

From the cost characteristics it will be seen that as regards total costs the Berlin works, notwithstanding their smaller power stations, work more economically than those in Chicago, while the costs of the London works are the least favorable. Nevertheless, the actual energy prices (based on equal utilization for all three plants) are approximately the same. The reason for this is that the selling price in London is about 13 per cent lower and in Berlin about the same percentage higher than the "normal" value.

The relatively high working costs in Chicago, as compared with those in Berlin, are due in my opinion chiefly to the higher costs of the plant (Item 11, Table II) and the higher wages and salaries. Moreover, the Berlin plants show a decided superiority in fuel consumption, although this is counterbalanced by the appreciably higher prices for coal (see Items 24-26, Table III).

The importance of the utility-factor for all three plants will be recognized from the form of the costs characteristic. The curves show that within the values for this factor of 10 to 30 per cent, the selling price can be reduced by more than 3 per cent for each advance of 1 per cent made in utilization, without necessitating extensions or other alterations to the existing plant.

Independent Telephone Association of America Meets in Chicago.

The first annual convention of the recently organized Independent Telephone Association of America was held in Chicago at the Hotel La Salle on January 6, 7 and 8. The convention was exceptionally well attended, considering the youth of the Association, and evidences were present on all sides that the organization is an energetic one. President E. B. Fisher, of Grand Rapids, Mich., presided at all of the sessions, the first of which was opened shortly after 10 a. m. on Tuesday.

L. D. Mathias, of the corporation counsel's office of the city of Chicago, made an address of welcome, to which D. M. Neill, Red Wing, Minn., responded on behalf of the Association. Mr. Neill strongly urged the need of competition as the salvation of maintained quality of telephone service. He compared the rates in large cities where competition exists in the telephone service to those in cities where there is no competition. Long-distance lines must be placed at the disposal of all on a non-discriminatory basis.

Mr. Fisher's presidential address dwelt at length on the recent revised public and governmental attitude toward trusts and monopolies. He quoted extensively from addresses and writings of Past-President Taft and President Wilson, particularly the latter. The keynote of the present federal administration is competition and freedom of business development. Mr. Fisher also quoted from a memorial of the Inventors' Guild and from engineering papers, showing that monopoly greatly hinders developments of inventions and improved processes. Reviewing the history of competition in the telephone industry, Mr. Fisher said that it was the backbone of the industry until recent years, when a number of independent telephone men became lukewarm in this direction. As the result of this tendency the new association was organized to stand for the old ideals. Referring to commission regulation, he expressed his conviction that state public service commissions can do much good, but the commissioners must be urged to be broadminded and fair. In the telephone industry it has been shown that monopoly never tended to popularization of this service. The idea held in some places that telephone service is a natural monopoly, has no basis and should not be allowed as an exception to the general rule that competition is highly valuable. In closing he referred to the energetic part played by the new association in the investigations made by the United States Department of Justice in the telephone field, which resulted in the now famous letter issued by the Bell interests on December 19, and he claimed that this was a vindication of the organization of the new association.

B. J. Hubbell, Buffalo, N. Y., then referred to the various steps that had been taken in organizing the new association, in which he felt proud that he had taken a prominent part. In the independent telephone field there have arisen many making every effort to keep in the business and many apparently making every effort to sell out and quit the business. The new association was organized to help the former. Recently there have been some of the most important developments in the telephone business, which have culminated as the result of a prolonged campaign. He said there was need of a new organization to crystallize the sentiment of independent telephone men, since the old National Association apparently no longer seemed to do so. The outline of the final agreement submitted by the Bell interests to the Government officials was practically the same as that suggested by the leaders of the new association.

A brief address was made by Mr. Thompson, who said he at first questioned the wisdom of dividing independent telephone interests into two groups. Although he was convinced of the value of the new association, he suggested that negotiations be entered into with the old National Independent Telephone Association to join with the new organization.

On Tuesday afternoon the session was opened with an address by J. B. Middleton, of Portland, Ore., who submitted a communication from Samuel Hill, president of the independent company of that city. He then spoke of the telephone developments in the Northwest and of the long fight which culminated in the suit brought against the American Telephone & Telegraph Company, in Portland. He then showed many fine views of Portland and vicinity.

W. A. Alexander, of Chicago, made an address on "Liability Insurance and Workmen's Compensation Acts." He pointed out the difference between liability insurance and what is now going to be known as workmen's compensation. The former was based on the old common law and involved the several defenses of contributory negligence, etc., that were of great value to the employer in suits brought by employees. Compensation acts, on the contrary, provide for immediate medical aid and subsequent compensation, usually up to a limiting term of eight years, and sometimes even for life pensions for disability. Such compensation acts are in force in 19 states and legislation thereon is pending in several others. Within a year probably the majority of the states will have such acts in force, although in most of the states where these laws have been enacted employers have the option of coming under their jurisdiction or remaining under the old rules. They usually are penalized for choosing the latter course. These compensation acts do not apply to injuries to the general public, but only to employees. Although telephone companies may have the impression that they are quite free from accidents to their employees, he cited figures of many cases showing that they are by no means immune.

Charles E. Merriam, alderman in the city of Chicago, made an address entitled "The City's Relation to Public Service Corporations." He referred to the growth of public sentiment toward utility companies and pointed out that one of the evils connected with utility service heretofore has been the pernicious political activity of the utilities. This has been the bane of public life. Such activity must cease, for the welfare of both public and the utility. He strongly urged legal control of local utilities. The relation of the public to the utility are invariably improved by driving out the promoter and so-called financier and replacing him by local investors. In rate regulation the basis must be a fair return on the actual investment; the public will not stand for fictitious values. He thought that much money has been spent in clever publicity to apparently deceive the public as to the quality of service rendered. He thought that every municipality should have reserved the legal and financial power to take over utilities within its boundaries. He compared foreign cities in this regard with the hampered conditions prevailing in nearly all American cities. In conclusion he said that American utilities are passing through a period of probation in which they must decide either to submit to stringent regulation or to public ownership and operation.

The session on Wednesday morning was opened by an address by C. B. Randall, St. Paul, Minn., who talked on "Independent Telephony—What Shall It Be?" He explained in detail the origin of the new association, which was formed originally a year ago as the United Independent Telephone Association of America by a group of independent men who felt convinced that the old association was no longer alive to the important problems before the independent telephone industry. There never have been so many matters of importance to this industry presented at one time. He narrated the various stages of the federal investigation of the telephone business, in which private independent men took an active part, due to the failure of the old National Association to take the initiative. Many telephone men hesitated to support the independent forces before efforts were renewed to reform the old association. Since the latter had failed, however, the scope of the new association was enlarged last fall and it was fully organized, so as to extend over the entire country. It now has membership from most of the states. The new association has taken a most active part in presenting the case of the independent interests before the government officials. It must continue to take such an active part in further investigations that are doubtless to be made. He attacked the attempt at monopoly of telephone manufacture by one large company and strongly urged the need of retaining an aggressive association to stand for the best interests of the independent movement.

J. C. Crowley, Superior, Wis., described the plan developed by the service department of the Association for issuing bulletins, whose aim will be particularly to reach the smaller companies so as to improve their service and help them achieve economies. Through personal investigation he has found that through lack of proper maintenance the life of telephone equipment in the small towns is very short. This it is hoped to remedy by aid from the service department. President Fisher emphasized the need of co-operation to help the smaller companies both in improving their service and in making proper reports to commissions.

John W. Coffey, Indianapolis, Ind., presented an illustrated paper describing an account system which he said was simple, flexible, practical, and meets the requirements of state and national commissions.

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New York Automobile Show.

At the fourteenth annual Automobile Show, which opened at the Grand Central Palace, New York City, on Saturday, January 3, there were in position 352 exhibits of gasoline and electric cars. Only six different makes of electric cars were exhibited and 78 different makes of gasoline cars were on view. Electric starters and gear-shifting devices and incandescent lighting systems were seen in increasing numbers, electrical accessories of this nature now forming part of the standard equipment of many of even the moderate-priced gasoline cars.

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A cable dispatch from Paris states that a pocket-style wireless receiver has been developed which has a receiving-zone radius of 30 or more miles.

CHOOSING THE LAMP AUXILIARY.

By H. C. Meredith.[1]

In a great many cases, efficiency alone is taken as a basis in choosing a reflector for a particular installation. As a matter of fact, whether a glass or metal reflector is being considered, there are several things of more importance than its absorption.

A lighting system should be installed which will give the desired intensity of illumination with the highest degree of uniformity for the least expenditure of energy. Assuming that the distribution curves of units which are being considered are such that these units will give uniform illumination when properly placed, the factors upon which the merits of the reflectors depend from the standpoint of efficiency are the percentage of total lamp flux in the zone from zero to 60 degrees, the percentage of the total lamp flux in the zone from 120 to 180 degrees and the amount of light between these two zones, with particular attention to that light in the zone from 60 to 90 degrees. (Light vertically downward is designated as in the zero-degree direction, and vertically upward as at 180 degrees; other directions are designated in degrees from 0 to 180).

That one reflector has a higher efficiency than another, as shown by a photometric test, is due in many cases to the first showing a greater amount of light about the 90-degree position or in the upper hemisphere. The light which is in the zero to 60-degree zone falls upon the plane of illumination and is directly useful. Of that light which is in the zone from 120 to 180 degrees, a large amount is absorbed, but the remainder reaches the plane of usefulness. The percentage of this light upward which reaches the plane of usefulness is dependent upon the color of the ceiling; the whiter the ceiling, of course, the more light will be reflected and diffused downward. The amount of light in the zone between 60 degrees and 120 degrees should be as small as possible, since it must be reflected many times before it can reach the plane where it is useful. There should, however, be sufficient light to avoid a dull appearance of this part of the reflector, or a gloomy effect upon the wall.

Glare is attributed to polished surfaces, and if the inside of the reflector is a polished surface, that light from the zone between 60 and 90 degrees is the most harmful; the light flux in this zone should therefore be small. Uneasiness of the eyes and injurious effects often result from placing reflectors with highly polished surfaces within the range of vision.

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[1] National Lamp Works of General Electric Company.

None of the factors mentioned affecting the choice of lamp auxiliary should be neglected, but the two 60-degree zones from zero to 60 degrees and 120 to 180 degrees are of the greatest importance, and of these, the zone from zero to 60 degrees should receive first consideration. The object in each case is to determine the energy cost for each candlepower in these zones. If the reflectors compare well in this respect, the efficiency should next be considered, especially if the reflectors are made of glass, as a higher efficiency will indicate that the total light is greater. Another thing which should be taken into consideration in determining a reflector for a certain installation is its appearance, especially where illuminating glassware is to be used. Wherever possible, the glassware should harmonize with the architectural features and finish of the interior.

In considering the case of street-lighting balls, care should be taken to use glassware through which neither the filament nor the light source can be seen. The ball should be one which diffuses the light sufficiently well to cause it to appear as the light source itself. It does not always follow that the ball giving the best diffusion will have the highest absorption, for there are very poor street-lighting balls which absorb as much light as good ones. Sufficient light of a diffused character, properly distributed, gives excellent and satisfactory illumination.

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The Problem of Electric Ore-Smelting in Norway.

While electric iron-ore smelting is making decided headway in Sweden, where some of the largest and best managed concerns in the iron industry are adopting the process on a large scale, the new departure did not prove a success at the first serious attempt in Norway—that at the Hardanger Electric Iron & Steel Works. The unsatisfactory working there of a process which it was hoped would prove of marked advantage towards the exploitation of the country's iron-ore deposits, has been very fully gone into by experts, the causes have been laid bare, as far as possible, and fresh experiments now point to the drawbacks being overcome.

The matter was the subject of a very interesting discussion in the Polytechnical Society in Christiania, several leading experts being present and giving their opinions and experience. Gustaf Odquist went fully into the causes of the Hardanger failure, and agreed with the electrometallurgical committee that the unsatisfactory result was the outcome of several co-operating circumstances, but disagreed with the committee as to the type of furnace adopted not contributing its part to the failure. The type in question was not, in his opinion, suitable for coke as a means of reduction. Besides, the ore used was too poor, and a displacement of phases reduced the calculated efficiency of the first furnace by one-third; several things also pointed to the fact that electrodes of too large a diameter had been used at Hardanger. It was difficult to exploit the available power economically, there having been too large variations in the current. It thus proved necessary to have at disposal 800 kilowatts more than the average. The numerous stoppages in the working had also a most unfavorable effect, both technically and financially. The experiences at Hardanger had shown that electric iron-ore smelting, with coke as means of reduction, could very well be worked, but it would not prove financially advantageous with the system used at Hardanger. The iron produced there was from $3.25 to $3.75 more costly per ton than the iron which had been produced in Sweden with charcoal as means of reduction, although charcoal was considerably more expensive than coke. The problem was to find a cheaper agent for reduction than charcoal, and a furnace where coal or coke could be used with advantage.

Captain Thome, a member of the electrometallurgical committee, on the whole endorsed the report of the committee, but stated that a new and more exhaustive report would be forthcoming in the course of the winter. Two other members of the committee, who were prevented from being present at the meeting, had, he stated, found that the electric pig iron produced at Hardanger from very poor and rather impure ores, exceeded their expectations as regarded its quality.

Dr. Lindermann stated that Professor Farup had recently undertaken a series of laboratory experiments, the results of which would soon be made known. These results showed that, if electric iron-ore smelting were resumed at Hardanger, it would have to be worked on different lines, and then good financial results could be brought about. It had been demonstrated by these experiments that is would be an easy matter to produce, with coke, iron which, in quality, could fully vie with the Swedish.

General Olesen gave some interesting information about the ore smelting at Tinnfos, which, among other things, proved that very good results could be obtained also from the poor ores. At Tinnfos they are now going to adopt the electric production of steel by conveying the pig iron direct from the blast furnace to the steel furnace. German experiments had shown that this could be done with advantage.—*Engineering*

BOOK REVIEW.

"Government Ownership of Railways." By Samuel O. Dunn. New York: D. Appleton & Company. Cloth, 400 pages (5x7½ inches). Supplied by the Electrical Review Publishing Company for $1.50.

The question of the nationalization of the American railways is discussed from various points of view, the cost of capital, efficiency of management, economies of consolidation, adequacy and quality of service, safety, rates and their adjustment, and the effects upon labor and upon political conditions. As would be expected of the editor of *The Railway Age Gazette*, the author favors the present system of private ownership, but he presents both sides of the question with fairness. That freight rates are more important than passenger rates is emphasized. The author frankly and ably defends the "what-the-traffic-will-bear" principle in the determination of rates, and shows that the whole tendency of private ownership is toward this principle, while government ownership tends toward the distance principle in determining rates. He seems to consider the best solution of the railway problem to be a progressive and active but broad-guage policy of governmental regulation.

Competition, both among railroads and in the commercial world generally, is given more weight than it is given by most present-day writers on economic subjects. One would expect a chapter devoted to the much discussed questions of the present extreme concentration of control, of interlocking directorates, and of whether under present conditions directors do, as is widely believed, sometimes play the double role of buyers and sellers in purchase of branch lines, real estate, etc. The author dismisses the matter very briefly with the statement that these were the shortcomings of the past, but this will hardly satisfy the public mind after reading current discussions of such cases as the Frisco and the New Haven.

The book contains a great store of information both statistical and of general interest of the railways of all the leading and many of the minor countries of the world. Whether the reader believes in private or in government ownership, he will find the book both profitable and interesting reading. P. G. Agnew.

◆

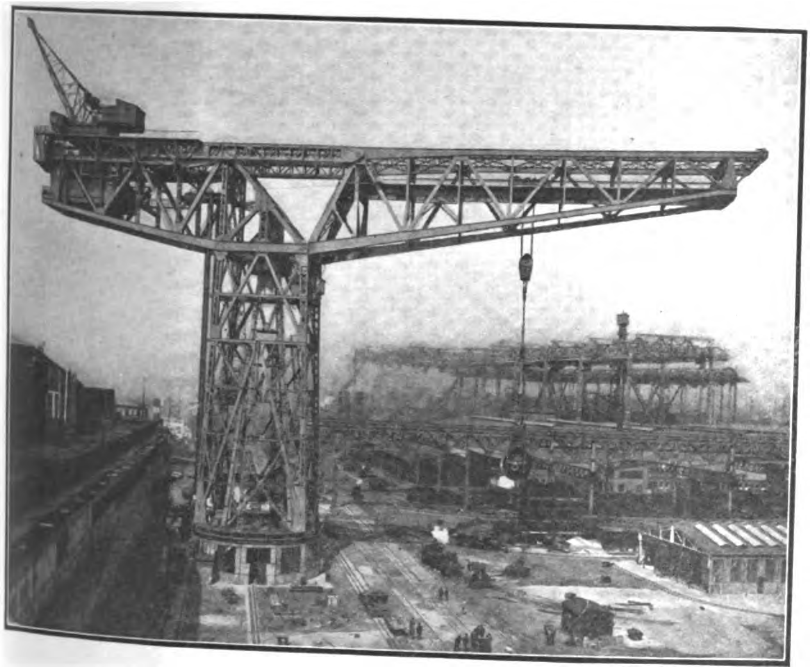
Lessons From the Ohio Flood.

At a meeting of the Western Society of Engineers to be held in the Monadnock Block, Chicago, on the evening of January 19, John W. Alvord will present a paper entitled "The Engineering Lessons From the Ohio Floods."

New Electrical and Mechanical Appliances

Hamburg 250-Ton Electric Revolving Wharf Crane.

The 250-ton electric revolving wharf crane seen in the accompanying illustration was installed at the fitting-out berth in the Blohm & Voss shipyard in Hamburg, Germany, and was erected primarily for handling the heavy machinery and materials that entered into the construction of the great steamship *Vaterland*. This crane was built by the Deutsche Maschinenfabrik and is a new design of hammer type crane, having a movable jib that can be raised to nearly a vertical position. It was chosen on account of the great dimensions of modern ships and the correspondingly great height of the masts.



Gigantic Electric Shipyard Crane.

It is stated by the designers of the crane that while the largest ships now in existence can pass underneath the jib in its horizontal position, it is expected that the luffing motion will be needed in the future. When it is necessary to raise the jib, the main trolley is locked to the end of the boom, raised with same, and performs the same function as the top sheave of an ordinary jib crane.

This great crane has the top of the runway rail 200 feet above water level. The maximum load of 250 tons can be lifted at a radial distance of 113 feet from the center of the crane and the capacity decreases with increasing out-reaches and is 110 tons at the maximum out-reach of 174 feet. The lifting speeds of the large crane are fully 26 feet per minute for loads up to 50 tons, 13 feet per minute for loads from 50 to 100 tons, 6.5 feet per minute for loads from 100 to 200 tons, and 5 feet per minute for loads over 200 tons. The crane can make a full revolution in about 12 minutes and the jib can be raised to its highest position in 30 minutes.

Besides the main trolley, which runs inside of the jib girders, a revolving traveling jib crane of 20 tons capacity at 33-foot radius is provided. The auxiliary jib crane lifts loads up to 16 tons at a speed of 65 feet per minute. The traveling speed is 160 feet per minute, a full revolution can be made in about two minutes and the raising of the jib requires about three minutes.

By means of the small crane it is possible to pick up loads up to 10 tons at a distance of 240 feet from the center of the crane and deposit them 164 feet back of the center of the crane without revolving the main structure, covering a total distance of over 400 feet. The area covered by the crane is 180,000 square feet, or more than four acres and the arrangement of the traveling jib crane on top of the main structure is an innovation that considerably increases the efficiency of the giant crane, as it permits of the transportation of small loads at high speed and makes it easy to handle masts and other parts of a ship located at an elevation.

The Leonard system of electric control is utilized and the motors together have a capacity of 550 horsepower. It is stated that only one man is needed to operate the large crane, and his cabin is located directly under the hinge of the big jib. When the small crane is working, the operator takes his place in the cabin arranged in front of the small jib, where he controls all the motions of the jib crane and also the revolving motion of the main structure. The two spindles that are employed for raising the jib are 19 inches in diameter and 65 feet long. This great electric crane shows the latest and most up-to-date practice in electric revolving wharf-crane construction.

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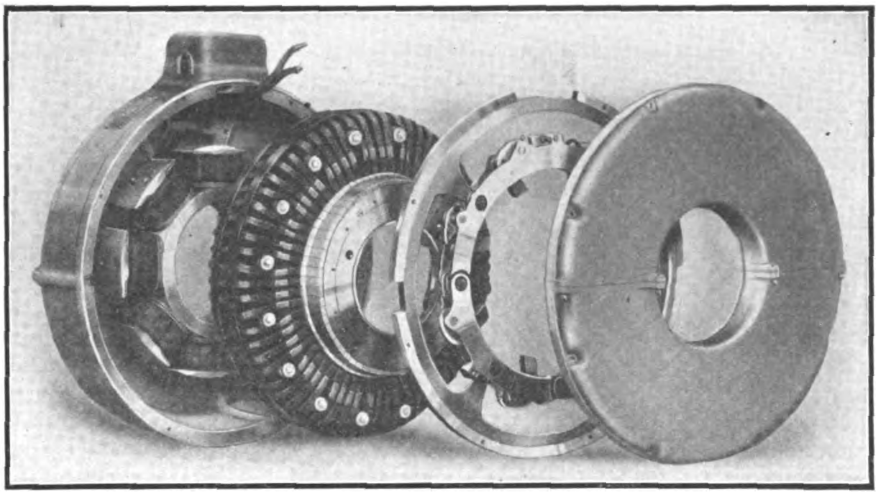
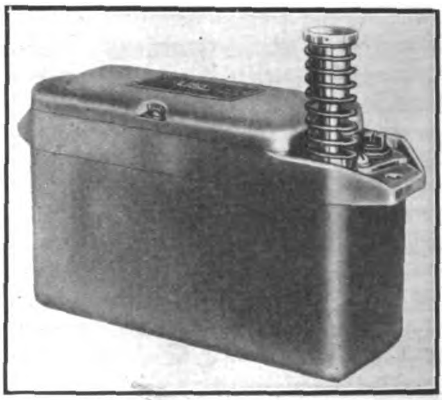
New Inherent-Regulation Feature of 1914 U-S-L Electric Starter and Lighter.

The United States Light & Heating Company, Niagara Falls, N. Y., has developed a new type of the U-S-L electric starter and lighter for 1914 which employs a novel method for controlling the generator output at varying engine speeds. This method, termed inherent regulation, is unique and distinctive both in principle and results accomplished. All external regulating devices, such as carbon piles and other resistances commonly used for the purpose, have been eliminated, the regulation being secured by means of a new generator design with special disposition of the copper wire coils, which are anchored in a fixed position in the machine.

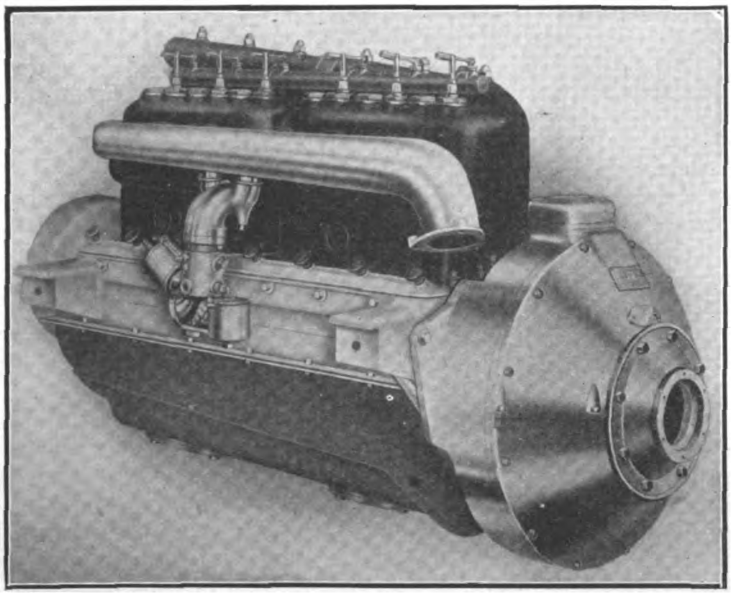
Inherent regulation, as used in the U-S-L system, is the result of concentrated effort on the part of the company's engineers to develop a method of generator control that would not only be an improvement over existing methods, but would in addition do away with adjustments and external regulator mechanism and thereby preclude any possibility of injurious tinkering by inexperienced persons. Tests, conducted both in the company's laboratories and on the road over a long period of time, have conclusively proven the merit of the U-S-L inherent-regulation principle and equipment. Among the advantages claimed for the system are first, increased generator efficiency, since there is no necessity for dissipating an excess of energy through the regulating system; second, exceptionally low cutting-in speed, or speed at which the generator commences to charge the battery; third, entirely automatic action; fourth, absolute elimination of adjustments and opportunity for tampering.



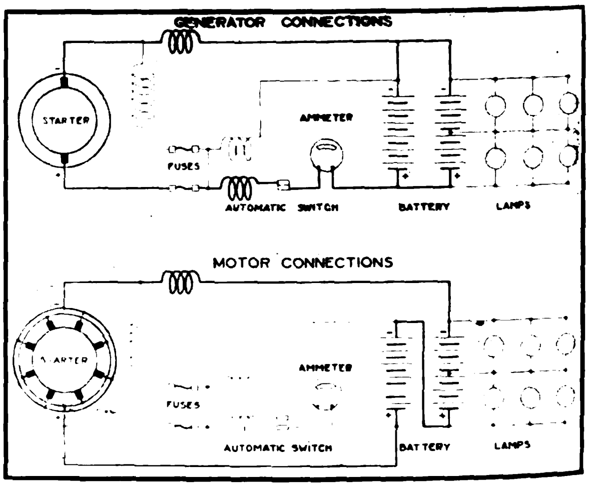
Motor-Generator Disassembled.



Starting Switch.



U-S-L Starter and Lighter on Sheffield-Simplex Engine.

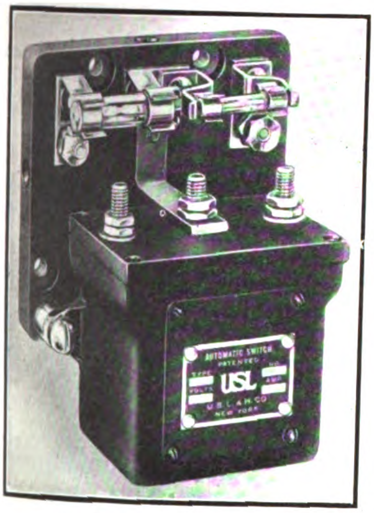


Connection Diagram of Starter and Lighter.

Aside from the regulating feature, the U-S-L equipment remains practically the same as before. It consists essentially of four units, the motor-generator, a starting switch, the storage battery, and a small automatic switch which opens and closes the battery-charging circuit.

The U-S-L motor-generator, or perhaps more correctly the dynamotor, is a combination motor for starting and a generator for charging and lighting in one machine. It has three main parts, the field, armature and brush rig. The armature is of flywheel size and weight and is bolted to the flange of the engine crankshaft in place of the cast-iron flywheel. This armature, which is the only moving part in the U-S-L system, is built in a special size for each particular make of car and has precisely the same inertia characteristics as the original cast-iron flywheel which it displaces. The armature has a large radius and surrounds the field poles. The fields and brush rig are stationary at all times. When the starting button is pressed, current flows from the battery through the armature and fields, causing the armature to revolve at 200 to 400 revolutions per minute. Since the armature is connected directly to the crankshaft, there is no need for objectionable power-transmitting devices such as gears or chains. The engine necessarily spins at the same rate of speed as the flywheel armature. The motor-generator is nothing more than a flywheel with electrical functions added. The design simply takes advantage of mass and space already provided. The inert mass of the cast-iron flywheel is so utilized that instead of one kind of work the flywheel on the U-S-L-equipped car does three kinds of work. There are no bearings to oil, nothing to be damaged by back-firing, no excess weight is added to the car; and no off-center load is thrown on the chassis. The pull of the starter is absolutely uniform, extending completely around the circumference of the armature. This distributes the stresses and equalizes the pressure on the bearings. Any of the operating switches may be closed at the wrong time accidentally, but no damage can be done.

The U-S-L electric starter and lighter is distinctive not alone because of unique design, but also because of the effective manner in which it performs its function. As a starter it will spin, at a speed of over 200 revolutions per minute, a six-cylinder engine, 4-25-inch bore by 6-inch stroke, requiring an initial pull of 170 pounds on a 12-inch crank. It is designed in a range of sizes from a 60-foot-pound starter for a small four-cylinder engine to a 400-foot-pound starter that spins a certain motor fire-pump engine having eight cylinders, 6 by 6 inches, at a speed above 200 revolutions per minute. These speeds are maintained even in the coldest weather and promote efficient carbureting and ignition. Automobile engineers agree that high starting speeds, 200 revolutions per minute and over, are essential for cold-weather starting with the low grade of fuel now being used. The starting speed of the U-S-L equipment is ample for the most adverse conditions, and the generator has ample capacity for even the slowest driver, and the fastest driver cannot overcharge his battery.



U-S-L Automatic Switch.

The makers of the U-S-L system claim an energy consumption, measured in watt-minutes per engine revolution, that is surprisingly low. A large six-cylinder engine having a 5.125-inch stroke is spun by the equipment at 340 revolutions per minute with an energy consumption of 5.5 watt-minutes per revolution; a typical four-cylinder engine of five-inch stroke, spinning at 280 revolutions per minute, consumes 5.25 watt-minutes per revolution; another four-cylinder engine of 4.5-inch stroke, requiring a torque of approximately 70 foot-pounds to start, is spun at 350 revolutions per minute with 3.15 watt-minutes per revolution used.

After the foot-button has been pressed down and the engine commences to fire, the button is released and the motor-generator is automatically converted from a starting motor to a charging and lighting generator driven by the engine. At a definite engine speed the automatic switch closes and permits current to flow from the generator into the battery. In a test conducted under city driving conditions, a U-S-L-equipped car was stopped and started every two blocks. Forty starts were made per hour over a period of six hours. An average speed of ten miles per hour was maintained. The generator, therefore, had sufficient capacity to replace in the one and one-half minutes available after each start for charging, the energy just taken from the battery in starting. The outfit has been developed to meet all the peculiar requirements of automobile operation. It can be designed to furnish any amount of current at any speed.

The decided angle at which the brushes ride on the commutator tends to make them hug the commutator surface and also prevents chattering. The brushes will wear on an average of one-thirty-second-inch per 1,000 miles and with at least one inch of wearing length, it is calculated that they will last 32,000 miles of driving. The aluminum housing, which extends over the brush rig, effectually protects the motor-generator and has the same appearance as the housing for the flywheel and clutch of a unit power plant.

The storage battery used with the outfit is of U-S-L manufacture and is especially designed for starting and lighting duty. The cells are contained in a hardwood case and are firmly imbedded in a high-melting-point sealing compound. This construction effectually insulates all the cells and prevents vibration and breakage. All brass and copper connections are incased in a heavy layer of lead to prevent corrosion. The special and mechanically strong plates and the heavy connectors and terminals render the battery capable of giving a heavy momentary discharge with a minimum loss in voltage.

The starting switch is installed beneath the floor-board of the car with the push-button protruding within easy reach of the driver's foot. It is of the revolving drum type and has contacts similar to those used in street-car controllers. The contacts break in a bath of oil. The switch has two positions, starting and charging. When the foot-button is pressed down as far as it will go, starting connections are made. When the foot-button is released, charging connections are made.

The automatic switch is simply a small magnetically operated carbon-break switch which closes the charging circuit when the generator voltage is sufficient for charging, and opens when the generator voltage falls below that of the battery. The small fuses, attached to this unit, are a protection against damage to the apparatus due to tampering.

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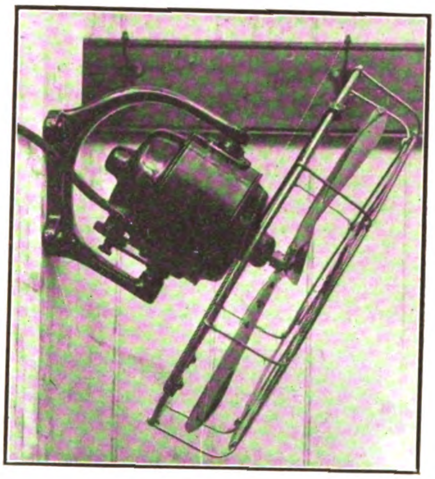
Extensive deposits of platinum susceptible of easy exploitation have been discovered in Westphalia, Germany.

Ball-Bearing Bracket Oscillating Fan.

The wall type oscillating fan illustrated herewith was originally designed for textile mills manufacturing cotton fabrics, the idea being to impart an even distribution of moisture-laden air to the fabrics. For this use the fan body is entirely inclosed and moisture-proof.

Owing to the demand for a fixed wall oscillator for general commercial use the original design of the fan was slightly changed to meet conditions. The outfit consists of a cast-iron bracket inclined at a fixed angle of 25 degrees, equipped with ball bearings allowing the fan body to oscillate with a minimum of friction. The oscillating mechanism is entirely concealed within the rear end cover leaving visible nothing but the revolving disk and lever. By twisting a knurled head in the disk the arc of oscillation may be varied in three steps from 90 degrees to zero, at which point the fan stops oscillating. To take up the forward thrust the fore part of the shaft is supported by a ball bearing. The body casing and end covers are of pressed metal and the motor frame is composed of laminations adding materially to the efficiency of the fan.



New Diehl Oscillating Fan.

A speed regulation giving three running speeds has been designed for use with this fan, but is furnished only on special order and at an additional price. The Diehl Manufacturing Company, of Elizabeth, N. J., is the manufacturer of this fan.

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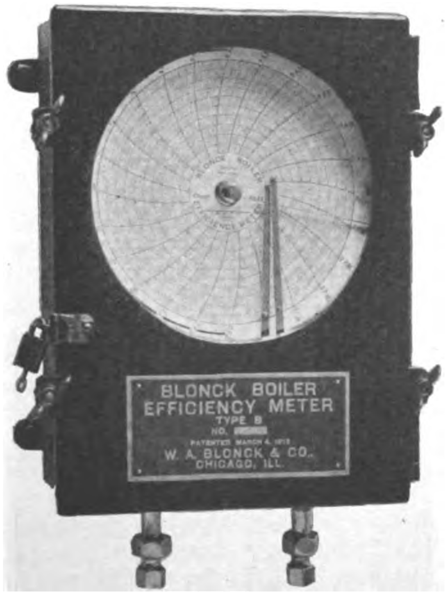
Stock Given to Employees.

In recognition of faithful and efficient service the board of directors of the Monongahela Valley Traction Company voted to set aside $25,000 of the company's preferred stock for distribution among its employees. About 350 men will benefit by this generous gift from the company.

Blonck Recording Boiler-Efficiency Meter.

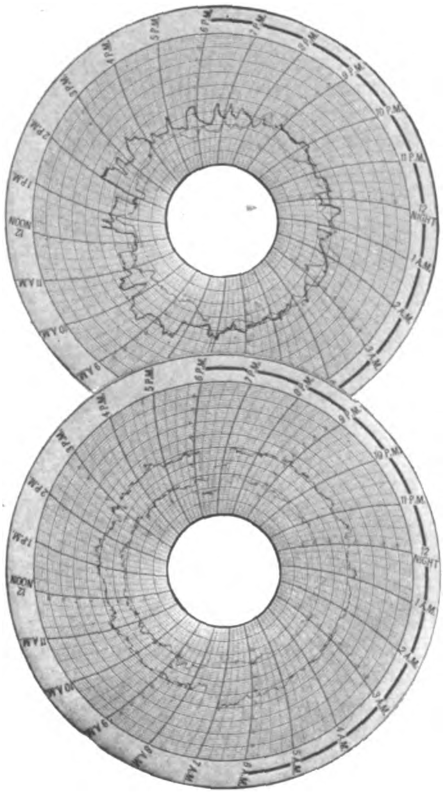
In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 12, 1912, and February 15, 1913, there appeared a description and a discussion of the results of using an indicating type of boiler-efficiency meter developed by W. A. Blonck & Company, Fisher Building, Chicago. This firm has now placed on the market a recording type of meter embodying the same ideas as in the former type and intended to be used in connection with it. As in the indicating meter, the new recording meter shows the draft resistance of the fuel bed and the drop in draft between furnace and damper. Both these records are made on the same chart, one of them being registered in red and the other in blue ink. The recording meters are installed in the office or some convenient place where the chief engineer or superintendent of the plant may have ready access to them; the indicating meters are installed at the boiler fronts for the immediate guidance of the firemen.

The general appearance of the new meter is shown in the accompanying illustration. It is connected by means of two tubes to the boiler furnace in the same manner as the indicating type of meter. The new meter differs from the latter in that, instead of using liquids to show the draft, there are provided two very sensitive copper bellows, each of which is connected to one of the recording styluses. The instrument is hermetically sealed.



Recording Boiler-Efficiency Meter.

The charts shown in the second illustration show the operating conditions of a boiler furnace before and after Blonck meters were applied thereto and their use explained to the fireman. The boiler from which this record was obtained, is a 500-horsepower horizontal water-tube boiler provided with a traveling chain grate. The total available draft was slightly over 0.8 inch water gauge and an investigation showed that for highest efficiency under normal conditions of load the draft through the fuel bed should be 0.3 inch and that through the boiler 0.5 inch. The upper of the two charts shows the record before the fireman was instructed. It will be observed that the draft distribution was irregular, extreme variation occurring at short intervals. The draft through the fuel bed varied from a maximum of 0.5 inch at about 2 a. m., to a minimum of 0.18 inch at 2 p. m. Without changing the damper position a decrease in the draft through the fuel bed resulted in the admission of excess air and resultant fuel waste. Since excess air means greater volume of gases flowing through the boiler for each unit of time and therefore an increase in the draft between furnace and damper, this causes the peculiar converging and diverging of the record lines in the chart. During the brief periods shown on the upper chart when the lines run practically parallel (as at 9 a. m.) the draft conditions remain uniform. When the record shows a decrease in both the draft through the fuel bed and that through the boiler this indicates a decrease in the rate of combustion and also a decrease in steam output, but no change in efficiency. When an increase in both furnace and boiler draft is shown this indicates an increase in the rate of steaming without change in efficiency.



Records of Boiler Performance Before and After Firing in Accord with Boiler-Efficiency Meter.

A striking contrast is noticed in the lower of the two charts which records the draft conditions after the fireman began to operate the furnace in accordance with the indication of the Blonck boiler-efficiency meter. It shows that the efficiency can be maintained very closely and the value of such a record is in giving the chief engineer or superintendent of the plant a check on the performance of each furnace.

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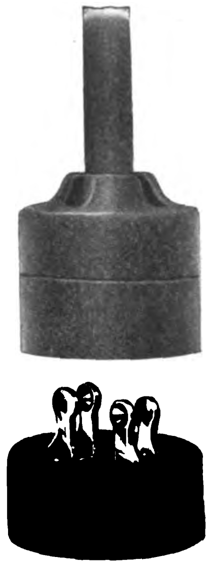
New Motor Attachment Plug.

The extensive and increasing use of portable and small motor-driven devices, such as vacuum cleaners, grinders, floor polishers, compressors, etc., has created a demand for a separable type of motor attachment plug that can be permanently secured to the motor frame. The new motor plug recently designed by the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis., which is shown in the accompanying illustration, is made for this purpose. The base can be permanently secured to the motor frame and this carries the rugged double lugs which are like those used on the caps of the standard line of C-H attachment plugs. These contacts are dead when the device is not in use, while the live contacts of the part attached to the flexible cord are sunk in below the surface.

Rugged heat-resisting Thermoplax, having proven eminently adapted for plugs, is used in the construction of this plug which has the high rating of 10 amperes, 250 volts. The design of the heavy double lugs and contacts permits of separating the plug by a pull at any angle, a feature which is considered of considerable advantage in separable attachment devices. This plug has been approved by the Underwriters' Laboratories.



Cutler-Hammer Motor Attachment Plug.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—H. T. Paiste Company, Philadelphia, Pa.

Edison-base type, 660 watts, 250 volts, catalog No. 400.

Approved December 6, 1913.

BRAKE SOLENOIDS—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Solenoids for operating mechanical brakes.

Bulletin Nos. 7710, 7720, 9865.

Approved December 6, 1913.

CABINETS. — Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Steel cabinets, catalog Nos. 2-Std., 953 and 954, with sheet-metal meter adapters for inclosing the connections to meters, also four-inch to ten-inch sheet-metal connectors.

Must be installed with the surfaces beneath the meter adapters covered with sheet metal at least one-sixteenth inch thick.

Approved December 6, 1913.

CUTOUT BASES, Cartridge Fuse.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Porcelain Base:

250 volts, 0-30 amperes, catalog Nos. 19,353, 21,353, 21,653, 21,993, 25,693, 25,873, 29,653, 80,423.

250 volts, 31-60 amperes, catalog Nos. 19,356, 21,356, 21,656, 21,996, 25,696, 25,876, 29,656, 80,426.

600 volts, 0-30 amperes, catalog No. 25,694.

600 volts, 31-60 amperes, catalog No. 25,697.

Slate Base:

250 volts, all capacities, catalog Nos. 8,000-05, inclusive, 8,010-15 inclusive, 8,019, 8,021-25 inclusive, 8,030-35 inclusive.

600 volts, all capacities, catalog Nos. 8,050-54 inclusive, 8,060-64 inclusive, 8,070-74 inclusive, 8,080-84 inclusive.

Approved December 6, 1913.

CUTOUT BASES, Link Fuse.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Meter-testing cutout bases for repulsion fuses:

Catalog No. 189, 31-60 amperes, 250 volts, for use in cabinet 953.

Catalog No. 190, 61-100 amperes, 250 volts, for use in cabinet 954.

Approved December 6, 1913.

FIXTURES.—Illuminating Engineering Company, 17 Washington Avenue, Detroit, Mich.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved December 10, 1913.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

FUSES, Open Link.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Repulsion-type fuses, 60 and 100 amperes, 250 volts, for use in cutout bases 189 and 190.

Approved December 6, 1913.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

"G. E." heaters, 95-250 volts.

Industrial heating devices:

Glue pots, types 1-1, 1-2 1-4, 1-6, 1-15 to 1-18 inclusive, and 1-31; 20 to 1,100 watts.

Air heaters and luminous radiators:

Tubular air heaters, types A-6 to A-17 inclusive, 1,200 to 5,000 watts.

Luminous radiators, types A-4, A-23 and A-24; 500 to 2,000 watts.

Individual contact plug, catalog No. 78 839, for use with "G.E." heaters.

Approved December 10, 1913.

PHOTO PRINTING MACHINE.—Stadler Photographing Company, 1322 Wabash Avenue, Chicago, Ill.

"Webster Photo Printer." Five 250-watt tungsten lamps.

This device consists of a sheet-metal box, in which are installed receptacles for lamps, provided with a glass plate at the top and a rolling felt pad to cover negatives and paper placed on the glass. When the felt pad is pulled over the glass the lamps are automatically lighted for a predetermined time and extinguished by a falling weight and escapement mechanism which opens a switch.

Approved December 17, 1913.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant Flush Receptacles:

"Junior" 6 amperes, 250 volts, 12 amperes, 125 volts, catalog Nos. 393, 394, 411, 1,508, 1,509; with plugs, catalog Nos. 375 or 1,510.

Edison type, 660 watts, 250 volts, catalog No. 1,708.

"Chapman" 12 amperes, 250 volts, catalog Nos. 1,108, 1,363, with fuseless attachment plug, catalog Nos. 397 and 1,110.

Disappearing door type, 10 amperes, 250 volts, catalog No. 430; plate for same, catalog No. 431; plug for same, catalog No. 432.

Chapman-to-Edison adapter, 660 watts, 250 volts, catalog No. 472.

Approved December 13, 1913.

RHEOSTATS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Pressure-controlled speed regulators. These devices each consist of a pressure regulator, direct-connected to the contact arm of a speed regulator. Bulletin Nos. 3,310, 9,370.

Not approved for use in connection with automatic sprinkler or similar fire protective equipments, for which service their merits have not been investigated.

Approved December 8, 1913.

SOCKETS, Weatherproof.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" 660 watts, 250 volts.

Porcelain shell, catalog No. 9,496.

Approved December 19, 1913.

SWITCHES, Automatic.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

Pressure switches:

10 amperes, 250 volts, 20 amperes, 125 volts, catalog Nos. 99,817, 99,818, 99,819, 190,381, 190,382.

Not approved for use in connection with automatic sprinkler or similar protective equipments, for which services their merits have not been investigated.

Approved December 16, 1913.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Elevator control and safety devices:

Elevator-car switches, bulletin Nos. 7,730, 7,790, 7,791.

Limit switches, bulletin Nos. 7,740, 7,741, 7,750, 7,751, 7,752, 7,760, 7,770, 7,771, 7,772.

Slack-cable switches, bulletin No. 7,780, 7,781, 7,782.

Elevator door switch, bulletin No. 7,800.

Push-button switches, bulletin Nos. 7,810, 7,815, 7,820, 7,835.

Belt switch, bulletin No. 7,825.

Quick-make-and-break double-pole switch, bulletin No. 7,830.

Reverse switches, bulletin Nos. 9,850, 9,855.

Floor stop device, bulletin No. 7,805.

Approved December 6, 1913.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Pressure regulators (making and breaking pilot circuit), bulletin No. 6,761.

Not approved for use in connection with automatic sprinklers or similar fire protective equipments, for which services their merits have not been investigated.

Approved December 8, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

PORTLAND, ORE.—The Portland Railway, Light & Power Company will install 200 arc lamps. O.

SHERIDAN, MONT.—The Chamber of Commerce has started a movement for ornamental lighting. C.

SPRINGFIELD, S. D.—$10,000 will be expended for a municipal lighting plant. Address the city clerk.

ELLSWORTH, ILL. — Wartena Brothers are interested in a project to establish an electric lighting system here. Z.

RIVERSIDE, CAL.—The Council will extend the street lighting system a distance of one mile. Address the city clerk.

IRONTON, MINN.—The Village Board is reported to be contemplating the construction of a municipal electric light plant. Z.

WYNDMERE, N. D.—The question of establishing municipal lighting is being considered. Address the city clerk for particulars.

WINONA, MINN.—An agitation has been started for a "White Way" lighting system on the business streets. George Hirson is interested. C.

ROCK FALLS, ILL.—Citizens here have approved a proposition to issue bonds for the improvement of the municipal electric light plant. Z.

GLYNDON, MINN.—Glyndon Light & Power Company has been incorporated by A. J. Fitzsimmons, L. M. Lowe and others. The capital is $5,000. C.

MONMOUTH, ILL.—Stockholders of the Monmouth Public Service Company have ratified plans for improvements to cost about $100,000. Z.

BELTRAMI, MINN.—This village is considering securing electric current for lighting from the new power dam now being erected near Crookston. C.

DALLAS, TEX.—The Texas Power & Light Company will soon commence the construction of a plant at Waco. Address J. F. Strickland, president.

HAZELTON, N. D.—A co-operative company is to be formed here for the purpose of installing an electric light plant. Address the city clerk.

PITTSBURG, TENN.—The Pittsburg Power Company has been incorporated with $15,000 capital stock by A. Rex Flinn, L. D. Gasteiger and others.

SPOKANE, WASH.—Commissioner Fassett has been instructed to secure estimates for installing a separate plant for the generation of electrical energy for light and power at the municipal building.

ELLENDALE, N. D.—J. L. Tucker, representing the St. Paul Electric Company, met with the Council in regard to establishing an electric light plant in this city. C.

BEVERLY, MASS.—This city is about to make extension in its street lighting system. The board of aldermen has appropriated $580 for the purpose.

MT. OLIVET, KY.—This city is considering the construction and equipment of an electric lighting plant. The estimated cost of the proposed plant is $5,000. G.

CLEVELAND, O.—The Otis Steel Company has secured a permit to construct a power plant as part of a group of new buildings. Equipment soon will be purchased. R.

AURORA, ILL.—The Dayton & Ottawa Power & Light Company has been incorporated with a capital stock of $100,000 by Fred W. Simpson, Dewitt E. Northam and others.

WINCHESTER, KY.—This city is considering the establishment of an electric light plant for the operation of an ornamental lighting system which was recently installed. G.

VINE GROVE, KY.—The Citizens' Lighting Company has been organized with $3,000 capital stock to operate a going plant. W. E. Crutcher is the principal stockholder. G.

DALLAS, TEX.—Bowie Light & Power Company has been incorporated with a capital stock of $50,000. The incorporators are Hiram Grosman, Mose Grosman and W. C. Woodlief.

MARION, S. D.—Marion Light & Power Company has been incorporated with a capital stock of $25,000 by J. A. Heeren, John Groepel, M. H. Dains and S. H. Dains, of this place.

McCLUSKY, N. D.—McClusky has an opportunity to secure an electric-light plant by furnishing a site and granting a franchise to Philip Kiefer, of Moorhead, Minn., who has made this offer.

CHATTANOOGA, TENN. — The Chattanooga Armature Works is to build a new plant and will need a considerable amount of additional equipment. Motor-driven traveling cranes will be installed. G.

CHICAGO, ILL.—Consumers Power & Light Company has been incorporated with a capital stock of $100,000 to manufacture electricity for power. The incorporators are Charles Kiper, Jerome N. Frank and Harvey R. Willard.

EUGENE, ORE.—George S. Edmonton, engineer for the Oregon Electric Company, has completed a preliminary survey for the development of 45,000 horsepower within the next five years at Clear Lake, 75 miles from here.

WARSAW, N. Y.—The Warsaw Gas & Electric Company has arranged with the village to take all its poles off Main Street in the business section and substitute cables in under ground conduits along the edge of the sidewalk.

MELVIN, ILL.—The Village Board has granted a franchise to the Central Illinois Utilities Company to operate an electrical distributing system in Melvin. The company will be given a contract to light the village streets. Z.

NEPONSET, ILL.—The Village Board has granted the Kewanee Light & Power Company, of Kewanee, a 25-year franchise to sell light and power in the village. A transmission line to Sheffield will supply the power here. Z.

SAN DIEGO, CAL.—The United Light, Fuel & Power Company has filed an amended application with the Railroad Commission asking authority to issue $188,000 of stock, part of the proceeds to be used for extending its system.

HARRISBURG, PA.—The Ludlow Electric Light Company has been chartered with a capital stock of $5,000 to supply electric light, heat and power to Hamilton Township. The incorporators are Homer Shoemaker, George F. Barntt, and others.

BEND, WASH.—The Washington Water Power Company, of Spokane, has purchased the plant of the Big Bend Light & Power Company, including its interests in this section. It is the intention of the purchasing company to improve the service. O.

PRIEST RIVER, IDAHO.—L. V. Smith and a party of engineers have been looking over the power sites belonging to the Pan Handle Railway Company. As soon as the situation warrants, a modern power plant will be built on Priest River to supply nearby towns with electric current.

INDEPENDENCE, MO.—This city is holding bids for a new engine for the municipal lighting plant, pending the settlement of a proposition by a cold storage company. The latter has offered the city of Independence current at such a rate that the city will be able to retail it profitably, it is said. M.

NAVASOTA, TEX.—The Navasota Light & Power Company has increased its capital stock from $20,000 to $200,000 and changed its name to the Navasota Ice, Light, Power and Water Company. Extensive improvements and additions will be made to its light and power and waterworks plants. D.

WAUSAU, WIS.—The first application for permission to build a power dam under a new law enacted by the last legislature has been made by C. M. and J. M. Arnquist, of this city. They will build a 400-foot dam in the Apple River near the village of St. Frairie and erect an electrical plant and sell current to other towns. C.

WAKEFIELD, MICH.—The Gogebic & Iron Counties Railway and Light Company has obtained a five-year franchise from the village of Wakefield to furnish it with electricity. The electric company will do the building to the pumping station and the village the wiring in the town. Address Charles Smeed, consulting engineer, for particulars.

SPRINGFIELD, MASS.—Plans for the improvement of the street lighting system are under way, and it is proposed to make radical changes after May 1, when the present lighting contracts expire. The city board of supervisors will inspect various efficient lighting systems to the end that the most approved system may be adopted for Springfield.

HONESDALE, PA.—A first mortgage has been recorded by the Pennsylvania, New York & New Jersey Power Company in the sum of $25,000,000. Upon the strength of this certain improvements being carried on will be completed. The company is at present engaged in building several dams along the Paupack for the purpose of generating power. N.

TUCSON, ARIZ.—The Arizona Power & Water Company has been organized as a subsidiary company of the Cababi Mining Company, which operates mines in southwestern Pimo county, with a capitalization of $5,000,000. The purpose of the organization is to utilize waters that flow down the Cababi Canyon in the Rincon Mountains for the generation of electrical energy.

SHARON, PA.—Advices are that President Stevens of the Mahoning & Shenango Railway & Light Company, a subsidiary of the Republic Railway & Light Company, has announced that the former company will spend about $300,000 in improvements and extensions to properties the coming year. The principal part of the expenditures will be for enlarging the equipment in the central generating station at Lowellville, O., which was placed in operation a year ago.

WINCHESTER, ILL.—An electric light company has been formed by R. W. Frost, E. J. Frost, Ed D. Smith, Albert Hainsfurther, G. A. Clark, W. D. Gibbs, C. W. Banes, James T. Wilson and R. M. Riggs. The City Council has granted a 25-year franchise to the company on the condition that work upon the construction of a plant must begin within three months and the plant must be ready for service within nine months. It is planned to issue stock to every consumer of electricity. Z.

BILLINGS, MONT.—Surveys for an electric railway from a point about two and one-half miles west of Custer to the mouth of the Big Horn Canyon have been completed under the supervision of A. W. F. Koch for the Big Horn Canyon Irrigation & Power Company. The line will be 68 miles long. In addition to supplying electric power for the railroad which will connect with the Northern Pacific at Custer, Hardin and other towns along the Big Horn will be furnished with electric lighting. Surveys will be started in March by B. Lillis of Billings.

ATLANTA, GA.—The Southern Ferro Concrete Company, Engineers and Contractors, Atlanta, Ga., have been awarded the general contract for the erection and completion of the Columbus Hotel, Columbus, Ga., including the reinforced concrete skeleton frame, elevators, plumbing, heating, electrical work, fixtures, refrigeration plant, kitchen equipment, etc. The building will be ten stories high, and will cost $200,000. Those interested in furnishing sub-bids should address Southern Ferro Concrete Company, Trust Company of Georgia Building, Atlanta, Ga.

LOS ANGELES, CAL.—Attorneys and engineers representing this city recently appeared before the State Board of Water Power Control with plans to develop a municipal power project in Mono County, involving an expenditure of $10,000,000. One of the most pretentious features of the proposed undertaking is a tunnel 26 miles long to carry water from streams tributary to Mono Lake into the Owens River Valley, where it will be merged with the Los Angeles aqueduct project. In view of the proposed project, opposition was entered to the application of E. G. Ryan for permits to appropriate waters from Rush Creek and other Mono county streams in the vicinity of Mono Lake.

VALDOSTA, GA.—A proposition to develop the water power on the Withlacoochee River near this city, which has been discussed for several years, bids fair now to be pushed to a successful end. Preliminary surveys of the stream, beginning at a point three miles northwest of Valdosta, are being made by A. F. Langford, a well known civil engineer, for parties in South Carolina, who are interested in the development. The surveys indicate a powerful fall in the river near where the Valdosta, Moultrie & Western railroad bridge crosses, and it is believed that enough power can be developed there to turn every wheel in this and neighboring towns. Mr. Langford will be prepared in a short while to make a comprehensive report, which will decide the question of development.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SILVIS, ILL.—The Village Board has granted the Tri-City Automatic Home Telephone Company permission to establish an exchange in Silvis. F

MARIETTA, O.—The Washington Telephone Company has been incorporated with a capital stock of $300,000 by G. L. Lund, F. L. Alexander, and others.

BLYTHE, CAL.—S. D. Kamar has applied for a certificate of public convenience and necessity to construct a telephone system in the section surrounding this town.

LAMBERTVILLE, N. J.—The Bell Telephone Company will make extensions in its system to Sergeantsville and vicinity, and will also build new lines in other sections of Hunterdon County. A.

ROCK ISLAND, ILL.—City Electrician Vincent Murphy has announced that he has about completed the plans for the new $10,000 police-alarm system which is to be installed early next spring.

MARIETTA, O.—The Washington Telephone Company has been incorporated with a capital stock of $300,000 by F. L. Alexander, B. L. Bullman, G. J. Lund, H. H. Miller and W. S. Plummer.

BRYANT, IND.—People's Telephone Company has been incorporated with a capital stock of $8,000 to operate a telephone exchange. The directors are W. H. Elberson, James Rupel and Peter L. Treece.

MOWEAQUA, ILL.—The Moweaqua Telephone Company has been incorporated with a capital stock of $20,000 to operate and maintain telephone lines. The incorporators are P. L. Drew, S. S. Clapper and R. E. Clapper. Z.

WENATCHEE, WASH.—George A. Pitcher and others have filed a petition with the commissioners of Chelan County, asking for a franchise to construct a telephone and telegraph line along certain roads of the county.

WILSALL, MONT.—A stock company has purchased the local telephone system from the Bell Company, and a switchboard will be installed here and also a telephone exchange. A copper toll-circuit will be built at Livingston.

FISHER, ILL.—The newly incorporated Fisher Telephone Company will install a new switchboard and build a system in the village. Charles Fairfield, I. J. Knupp, Chris. Summers, Isaac Hiser and G. C. Williams are the directors. Z.

SPRINGFIELD, MASS.—The New England Telephone & Telegraph Company is planning an addition to its building on Worthington street and Henry S. Hyde, vice-president of the company, said that the addition would be built during the coming year.

DEMING, N. M.—The Mountain States Telephone Company is rapidly extending its telephone system in Southwestern New Mexico, having just completed a line between Deming and Rincon. Work will be started soon on a line from Deming to Columbus. D.

COLUMBUS, O.—The State Public Utilities Commission has authorized the Central District Telephone Company, a subsidiary company to the Bell system, with lines between Steubenville and Youngstown, to issue $2,000,000 capital stock. About $400,000 of the proceeds from the sale will be spent on improvements in Ohio.

LEXINGTON, MO.—E. D. Graham, a former mayor of Mexico and owner of the telephone plant at Lexington, announces that he intends to build a new telephone exchange here. Work on the new plant will begin at once. Mr. Graham says he will install the latest type, multiple common battery, selective switchboard.

NEW ORLEANS, LA.—The Cumberland Telephone & Telegraph Company is making preparations for an extensive increase in business that will follow the establishment of new firms and agencies upon the completion and operation of the Panama Canal. The company will expend nearly $2,000,000 on its New Orleans plant in the next three years.

ALLENTOWN, PA.—Reorganization of the Consolidated Telephone Companies has been effected by Colonel Harry C. Trexler, of Allentown; Alvan Markle, of Hazleton; W. B. Given, of New York, formerly of Columbia, Pa.; Murray Gibson, of Philadelphia, and John Graham, of Newville. Two million dollars has been raised for a general rehabilitation of the system.

SAN ANTONIO, TEX.—The Austin Road Telephone Company has been organized by the residents of the Austin and Terrell roads east of San Antonio to build a rural telephone line in that section. The company will run its lines a distance of ten miles and will extend a mile north of Fratt. The officers are P. J. Reininger, president; Gus Neuse, secretary, and C. W. Ackerman, treasurer.

SAN FRANCISCO, CAL.—Announcement has just been made that the Pacific Telephone & Telegraph Company has approved estimates amounting to $453,850 for the construction of a toll line across California and Nevada, to be made part of a transcontinental line. The new line is to extend from this city to Calvada on the California-Nevada boundary line and thence to Wendover, Nev., near the Nevada-Utah boundary line, where it will connect with the Mountain States Telephone & Telegraph Company.

ELECTRIC RAILWAYS.

(Special Correspondence.)

VISALIA, CAL.—The Big Four Electric Railway Company has been granted a 50-year franchise in this city.

NELSONVILLE, O.—James Sharp, postmaster, is promoting an electric line from Lancaster to Nelsonville.

OSWEGO, ORE.—The City Council has granted a franchise to the Portland, Eugene & Eastern Railway for its electric wires and trains. Electrifying West Side lines of the Southern Pacific will now be rushed.

CHICAGO, ILL.—The Evanston Railway Company filed for record an open mortgage, under which it will issue bonds for the rehabilitation of its lines and to provide money for other corporate purposes.

MORRISTOWN, N. J.—The Morris County Traction Company, of New Jersey, is contemplating the erection of a power plant at that place to cost about $250,000. Address O. G. Schultz, Morristown, N. J.

IDAHO FALLS, IDAHO.—The citizens of this place have taken up with the Public Utilities Commission the question of granting the application for construction of a street railway and power plant in this city.

NEW ORLEANS, LA.—It is rumored that the New Orleans, Southern & Grand Isle Railroad is to be fitted up as an electric line, and a big hotel, an ideal summer and winter resort erected at Bay Adam.

NASHVILLE, TENN.—The Nashville Railway & Light Company has changed its charter so as to be allowed to construct lines on a large number of streets where it has not operated heretofore. Percy Warner is president. G.

NEW BERN, N. C.—This city is soon to have a new car line, one which will go out to the Eastern Carolina Fair grounds and to Glenburnie Park, the city's newest pleasure resort, and which will be opened up during the summer months.

COLUMBIA, S. C.—The Northwestern Electric Railway Company has been incorporated in South Carolina. The company proposes to build an electric railway from Easley, S. C., to Augusta, Ga. The company proposes to do a general passenger and freight business.

WILMINGTON, DEL.—Goldsboro Street Railway Company has been incorporated with a capital stock of $50,000 to purchase, acquire, construct and operate railways, street cars, etc. The incorporators are Herbert E. Latter, W. J. Mahoney, Oscar J. Reichard, all of Wilmington, Del.

PITTSBURGH, PA.—A state charter has been granted to the Western Traction Company to operate lines in Allegheny, Fayette and Washington Counties. The capital is $5,000 and the incorporators are B. C. Hovis, Crafton; F. J. Taylor, Munhall; W. H. Lardner, Wilkinsburg; W. B. Curry and A. L. Davies, Pittsburgh. S.

SEATTLE, WASH.—Construction of 38.4 miles of double track or 84.25 miles of single track as an addition to the municipal street car line now consisting of a line four miles long to Salmon Bat, at a cost of $1,218,220, with $787,000 added for equipment, making a total of $2,005,220, is the plan of Councilman Oliver T. Erickson.

HARRISBURG, PA.—The Beaver Valley & Ohio Railway Company has been granted a charter to build a line from a point in Beaver County to the Ohio state line. The road will be 12 miles long and is capitalized at $120,000. The incorporators are W. A. Goehring, M. G. Hibbs, W. A. Goehring, Jr., F. R. Latshaw and F. B. Hall. R.

CLOUDCROFT, N. M.—The Cloudcroft Commercial Club has reopened negotiations with a party of Illinois and Kansas City capitalists for the construction of an interurban line from this place to Hope and Artesia. The proposed line will be about 90 miles long and will pass through a wonderful scenic region. Scott Williams is secretary of the Commercial Club. D.

GALESBURG, ILL.—The Peoria, Galesburg & Western Railroad Company has filed with the recorder of Knox County a mortgage for $1,500,000 in favor of the Fort Dearborn Trust and Savings Bank of Chicago to secure a bond issue of like amount for the acquisition of franchises and the construction of an interurban railway from Peoria to Galesburg. Z.

TAYLORVILLE, ILL.—The Springfield, Rochester & Hillsboro Railroad Company has filed articles of incorporation. The company, which has a capital stock of $100,000, will build an interurban railway from Springfield to Hillsboro, with a branch through Rochester to Taylorville. The incorporators are Frank M. McGowan, Nathaniel J. Hamilton, A. Barker, M. D. Barker and Jesse H. Thomas, all of Springfield. Z.

LANCASTER, O.—Plans for building an electric railroad from Lancaster to Nelsonville, a distance of 33 miles, and thereby linking Athens and the Hocking valley district with Columbus by traction lines, may be realized if a company composed of Hocking Valley citizens succeeds in leasing the old canal property between the two cities from the state. James M. Dollison, of Lancaster, and James Sharp, postmaster of Nelsonville, are chief promoters of the enterprise.

AUGUSTA, ME.—Construction of the 100-mile electric railroad through Aroostook County forest wilderness from Washburn westward, for which permission to build has just been granted by the Railroad Commissioners of Maine, is of great importance to Maine, not only because it is part of a great transcontinental system, and will create new business in that way, but also because, via the Bangor & Aroostook Railroad, it will furnish an all-rail outlet for the richest lumber tract in New England, will transport supplies and products to and from a region that is fabulously rich in water-power and fertile farm lands. The road will pass almost wholly through a wilderness. After leaving Washburn, it passes through Wade and Portage Lake, and does not strike another settlement until it reaches the Province of Quebec.

PROPOSALS.

SWITCHBOARDS.—Sealed proposals will be received by the War Department, Office of the Chief Signal Officer, Washington, D. C., until January 10, for furnishing five switchboards, power and distributing frames for fire-control switchboard room, under proposal No. 687.

FLAME-ARC LAMPS.—Bids will be received until January 15 for furnishing flame-arc lamps at the office of the Sanitary District, Room 700 Michigan Avenue, Chicago, Ill. The flame-arc lamps for which tenders are invited are series alternating-current inclosed flame and arc lamps. Address John McMillen, clerk.

ELECTRIC LIGHT AND POWER SYSTEM.—Sealed bids will be received by the Town Council of Farnhamville, Iowa, until January 19, for furnishing material and constructing an electric light and power system. Work must commence on said improvement on or before March 1 and be completed on or before June 1. Plans are on file in the office of J. W. Hartinger, clerk, Farnhamville.

SIGNAL CABLE AND CABLE END BELLS.—Sealed proposals will be received at the office of the General Purchasing Officers, Isthmian Canal Commission, Washington, D. C., until January 21 for furnishing signal cable and cable end bells, as per Canal Circular 818. Blanks and general information may be obtained from any of the Assistant Purchasing Officers, who are located in all of the large cities of the United States.

MISCELLANEOUS ELECTRICAL APPARATUS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until January 13 for furnishing electric cable, conduit and fittings, electric detonators and miscellaneous electrical apparatus, as per Canal Circular 817. Blanks and general information may be obtained from any of the Assistant Purchasing Officers, who are located in all of the large cities of the United States.

ELECTRICAL CABLE.—Proposals in duplicate will be received by the trustees for the Water Works and Improvement bonds of the City of Jacksonville until January 15, for furnishing and delivering in good order f. o. b. cars Jacksonville, Fla., certain items of lead-covered underground electrical cables in accordance with plans and specifications on file in the office of the Chief of the Fire Department, Jacksonville. Each bid must be accompanied by a certified check payable to Frank Richardson, Chairman, without endorsement or condition of any kind, in the sum of $500 as a guarantee that the bidder will, if awarded the contract, promptly enter into an agreement for furnishing the cable and furnish a surety bond in the sum of $1,000 acceptable to the Board. Bids must be addressed to the Chairman of the Board and be marked "Bid for Underground Cables for Fire Alarm."

MISCELLANEOUS ELECTRICAL APPARATUS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until January 20 for furnishing one 25-kilowatt turbo-driven generator, to be delivered at the Navy Yard, Portsmouth, N. H., as per Schedule 6223; eight electric air heaters for ships and 1,600 feet of single-conductor navy standard armored wire, both to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 6222; miscellaneous spares for electric ranges, to be delivered at the Navy Yard, Brooklyn, N. Y., as per Schedule 6221, renewing storage batteries for motor trucks, Navy Yard, Boston, Mass., as per Schedule 6204; until January 27 for 600 pounds of electrolyte acid in carboys, to be delivered at the Navy Yard, Mare Island, Cal., as per Schedule 6201; until February 3 for one electric spot light as per Schedule 6193; and until February 10 for two five-kilowatt radio sets for ship installation, as per Schedule 6196, to be delivered at the Navy Yard, Brooklyn, N. Y.

NEW INCORPORATIONS.

BANGS, TEX.—Bangs Fuel & Light Company has been incorporated with a capital stock of $10,000 by James W. Wayman, Charles Hart and R. F. Hart.

GREEN BAY, WIS.—Minahan Electric Company has been incorporated with a capital stock of $5,000 by John E. Minahan, Eben R. Minahan and Victor I. Minahan.

CINCINNATI, O.—The Gem Electric Company has been incorporated with a capital stock of $1,000 by A. L. Wolf, T. L. Bratten, C. Spengel, A. St. C. Bevis and George E. Bailey.

MINNEAPOLIS, MINN.—Edwards Electric Company has been incorporated with a capitalization of $10,000 by J. O. Edwards, C. P. Edwards and Fred Dexter, all of this city.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed here for the Reliable Electric Company with a capital stock of $50,000, by A. E. Cerf, J. B. Shlare and Bernard Zellensky.

PHILADELPHIA, PA.—The Electrical Development & Machine Company has been incorporated with a capital stock of $20,000. S. C. Seymour, of Camden, N. J., is named as the principal owner.

GREENVILLE, S. C.—Victor Motor Car Company has been incorporated with a capital stock of $100,000 to manufacture automobiles and will build an electrically operated plant to have an annual capacity of 2,000.

LOS ANGELES, CAL.—Olston Electric Stove Company has been incorporated with a capital stock of $200,000. The directors are W. L. Rosa, C. E. Stoner, M. B. Lewis, G. J. Rowley and J. Gardner.

ALBANY, N. Y.—Elgas Fixture Company, Incorporated, has been granted articles of incorporation, capitalized at $1,500. The incorporators are Edward A. Conroy, Hugh J. Collins and John J. Cregan, of Albany, N. Y.

LOS ANGELES, CAL.—Articles of incorporation have been filed here for the Magnetic Trolley Retriever Company, with a capital stock of $500,000, by J. W. Kays, F. L. Gilman, Louis J. Hembree, Fred L. Dorman and Verna T. Dorman.

CHICAGO, ILL.—The Klingelsmith Electric Truck Company has been incorporated with a capital stock of $350,000 to do an electric-vehicle business. The incorporators are Joseph M. Klingelsmith, Michael F. Cure and Earle F. Tilley. Z.

SKOWHEGAN, ME.—The Skowhegan Electric Company has been organized and the certificate of organization filed. The object of the company is to acquire and hold real estate and to lease and sell and generate electric current. The capital stock is $200,000 and the officers are Herbert L. Swett, president; F. W. Briggs, secretary and treasurer.

DAWSON SPRINGS, KY.—The Dawson Light & Power Company has been organized and will take over the electric light plant heretofore operated by the Dawson Milling Company. E. A. Stevens, head of the milling company, will be manager of the lighting company, the new company being incorporated because of a growth in the business to an extent which has made separation of the two enterprises desirable. It is planned to increase the capacity to 100 kilowatts and to manufacture alternating instead of direct current. G.

FINANCIAL NOTES.

Westinghouse Electric has during the last four weeks felt a decided slump in new orders booked. Strangely enough orders held up right through November, the sales for that month being only $150,000 less than incoming business in October, a difference of under five per cent. But December sales will record a material decline and this slump may likely enough last over into 1914, although the Westinghouse management is not nearly so pessimistic as some other corporation leaders and feels that the depression will be of comparatively short duration. However, the Westinghouse people have no cause for anxiety, says the *Wall Street Journal*. The fiscal year ends March 31 and in the eight months to November 30 we understand that net profits after payment of all interest charges were $3,140,000. The company's dividend requirements for full twelve months amount to 7 per cent on the small issue of $4,000,000 preferred, or $280,000, and 4 per cent on the $35,194,837 common stock, or say, approximately, $1,408,000. The total of these two dividend requirements for a year is, therefore, $1,688,000, against which the company has already earned net of $3,140,000, or $1,452,000 more than the dividends for the full year to March 31 next. In other words, the company is on easy street so far as net for the current fiscal period is concerned. Even if December and the ensuing three months produce no net whatever, the dividend can be continued and nearly $1,500,000 turned back into plant or used for additional working capital. In eight months the company earned a balance of eight per cent for the common stock, or at the rate of 12 per cent per annum. It is unreasonable to expect that for the full year the earnings for the junior issue will go below 10 per cent. As business has fallen away in last month, the company has reduced its working forces at East Pittsburgh works. Already a cut of between 2,500 and 3,000 has been made and more help will have to go if business continues to decline or does not rally. As is usual, however, with declining business, the cash balance is growing and the company is in the most comfortable financial position of its long career.

The National Gas, Electric Light & Power Company, which was organized in 1904, has increased its authorized capital stock from $2,000,000 common and $2,000,000 six-per-cent preferred to $5,000,000 common and $5,000,000 preferred, respectively. The company controls a number of gas and electric light and power properties and is now said to be considering the acquisition of additional properties.

The Martinsburg (W. Va.) Power Company has filed a mortgage to secure $5,000,000 of bonds with the Safe Deposit & Trust Company, of Baltimore, as trustee. The bonds will be issued from time to time as required by the corporation. The company plans an enlargement of its central generating station to be in position to furnish current for the new electric railway at Martinsburg, and also for other corporations.

Stone & Webster are offering $250,000 of the six per cent preferred stock of the Keokuk Electric Company which has been organized under the laws of Illinois. The company does the electric light, street railway, power and gas business in Keokuk, serving a population of 20,000. Stone & Webster are also offering in blocks of 10 shares, seven preferred and three common, $750,000 of preferred and $225,000 of the common stock of the Central Mississippi Valley Electric Properties at $900 a block.

The largest trust deed ever filed for record in Saline County Ill., was filed in the recorder's office by the Southern Illinois & St. Louis Railway Company. The document amount involved is $2,500,000. The deed is made in favor of the Fort Dearborn Trust & Savings Bank of Chicago, as trustee, and it relates to the Western extension of the Southern Illinois Railway & Power Company, which will be constructed from Harrisburg, Ill., to Marion, Herrin, Johnston City, West Frankfort and Benton.

According to official estimates, gross earnings for 1913 of the Edison Electric Illuminating Company of Brooklyn and Kings County Electric Light & Power Company, the holding organization, will amount to over $5,600,000, an increase of nearly $500,000 over 1912. On December 1, the 55th consecutive quarterly dividend was paid, which for ten years has been at the rate of eight per cent per annum. On January 1, total stock outstanding was $12,942,900, against $10,000,000 a year ago.

Of the $458,000 three-year five-per-cent convertible notes of the United Railways & Electric Company, of Baltimore, outstanding, but about $50,000 additional was converted previous to the expiration of the conversion privilege, leaving about $400,000 which will be retired in cash on maturity July 15, 1914. Originally there were $3,125,000 of these notes outstanding, but the amount has been reduced to approximately $400,000 through conversion at par for the notes and 25 for the common stock of the company, which is $55 a share par value.

The Dayton Power & Light Company has been authorized by the Ohio Public Utilities Commission to issue $125,000 five-per-cent bonds and $50,000 six-per-cent preferred stock to purchase the Wilmington Water & Light Company. This is one of a number of companies not distant from Dayton which the Dayton Power & Light Company is anxious to acquire. The Dayton company has a generating plant in Dayton of sufficient capacity to supply the smaller towns bordering that city.

The Public Utility Commission of New Jersey has granted permission to the Public Service Electric Company to issue $3,000,000 of its capital stock at par, the proceeds to be used for extension and improvements. The original application was for $4,000,000. The Public Service Corporation has filed a certificate with the Secretary of State showing that it has issued $2,000,000 five-per-cent general-mortgage, sinking-fund gold bonds.

The Brooks & Company interests, of Scranton, Pa., which also control the United Service Company, have completed arrangements for the consolidation of the Twin Cities Traction Company, the Midland Power & Traction Company, the Coshocton Light & Heat Company, the Newcomerstown Electric Heat & Power Company, and the Lafayette Light & Power Company under the name of the Ohio Service Company. Application has been made to the Ohio Public Utilities Commission for approval of the consolidation. The consideration to be paid for the properties is given as $923,631 and the property value as $941,248. It is understood that the new company will work in close connection with the United Service Company.

Reorganization of the official staff of the Reading Transit & Light Company, a subsidiary of the Eastern Power & Light Company, has been completed and the new officers of the Reading Transit Company and its constituent corporations are now in charge. W. S. Barstow, who has been president, has been succeeded by Norman McD. Crawford, formerly president of the Mahoning & Shenango Railway & Light Company. J. B. Taylor and F. V. Henshaw are vice-presidents. W. S. Barstow remains as president of the Metropolitan Electric Company with Mr. Crawford as vice-president and general manager. Mr. Barstow and Mr. Crawford hold similar positions with Neversink Mountain Railway and the Oley Valley Railway, two of the subsidiaries of the Reading Company.

Dividends.

Bay State Street Railway; semi-annual of $3 on the first-preferred stock, payable February 2 to stock of record January 17.

Bell Telephone Company of Pennsylvania; the regular quarterly dividend of 1.5 per cent, payable January 15, to stock of record January 5.

Cincinnati, Newport & Covington Light & Traction Company; a quarterly dividend of 1.125 per cent on the preferred stock, and a quarterly dividend of 1.5 per cent on the common stock, payable January 15 to stock of record of December 31.

Electric Light & Power Company of Abington and Rockland; the usual semi-annual dividend of $4 a share on its capital stock, payable January 1 to stock of record of December 29.

Edison Company of Boston; the regular quarterly dividend of $3, payable February 2, to stock of record January 15.

Metropolitan West Side Elevated Railway Company; regular quarterly of 1.25 per cent on the preferred and 1.20 per cent on the common stock, both payable December 30 to stock of record December 27.

Metropolitan South Side Elevated Railway Company; regular quarterly of 1.75 per cent, payable December 30 to stock of record December 27.

Pennsylvania Lighting Company; the regular quarterly dividend of 1.25 per cent on the preferred stock, payable January 15, to stock of record January 3.

Public Service Company of Northern Illinois; quarterly of $1.25 on the common stock, payable February 2 to stock of record January 19.

Stark Electric Company; quarterly dividend of 0.75 per cent, payable January 1 to stock of record December 26.

Standard Underground Cable Company; regular quarterly dividend of three per cent, and an extra dividend of three per cent, payable January 10 to stock of record January 5.

Report of Earnings.

AMERICAN LIGHT & TRACTION.

	1913	1912
November gross	$ 424,945	404,581
Net after expenses	414,323	395,143
11 months gross	3,954,604	3,775,329
Net after expenses	3,841,309	3,667,722

MONTANA POWER COMPANY.

(Including Great Falls Power Co.)

	1913	1912
Nine months gross	$2,564,907	$2,147,922
Net after taxes	1,778,243	1,451,106
Balance after charges	1,127,923	535,834

PHILADELPHIA RAPID TRANSIT.

	1913	1912
November gross	$2,018,496	$2,008,400
Net	844,516	812,141
Surplus after charges	52,265	50,303
Five months gross	10,098,015	9,860,293
Net	4,210,841	3,995,049
Surplus after charges	223,343	196,768

BRAZILIAN TRACTION, LIGHT & POWER.

	1913	1912
November gross	$ 1,959,267	$ 1,773,623
Net after taxes	1,103,108	1,006,231
Ten months gross	21,537,429	18,728,477
Net after taxes	11,675,186	10,193,146

PACIFIC LIGHT & POWER.

	1913	1912
October gross	$ 258,518	$ 230,108
Net after taxes	112,546	97,270
Surplus after charges	75,804	58,663
12 months gross	2,843,223	2,480,400
Net after tax	1,266,260	1,076,161
Surplus after charges	795,222	581,154

UTAH POWER & LIGHT.

	1913	1912
November gross	$ 162,653	$ 120,388
Net after taxes	95,566	66,066
Six months gross	892,663	720,219
Net after taxes	536,873	377,075
12 months gross	1,706,481	1,473,072
Net after taxes	1,006,515	802,597

MT. WHITNEY POWER & ELECTRIC.

	1913	1912
November gross	$ 49,913	$ 38,751
Net after taxes	31,113	21,839
Surplus after charges	20,838	13,964
12 months gross	554,432	443,626
Net after taxes	304,158	229,673
Surplus after charges	180,858	135,173

MONONGAHELA VALLEY TRACTION.

	1913.	1912.
November gross	$ 83,639	$ 70,714
Net after taxes	51,344	44,719
Surplus after charges	25,562	19,951
11 months' gross	872,470	776,164
Net after taxes	560,027	469,830
Surplus after charges	288,150	233,506

OTTUMWA RAILWAY & LIGHT.

The Ottumwa Railway & Light Company reports for the twelve months ended November 30 as follows:

	1913.	1912.
Gross earnings	$319,286	$297,993
Net after taxes	144,834	130,594
Surplus after charges	77,798	63,529
Balance after preferred dividends	46,305	32,036

MUSKOGEE GAS & ELECTRIC.

The Muskogee Gas & Electric Company reports for the twelve months ended November 30 as follows:

	1913.	1912.
Gross earnings	$523,745	$534,059
Net after taxes	224,003	214,248
Surplus after charges	152,965	141,592
Balance after preferred dividends	52,634	41,387

KINGS COUNTY ELECTRIC LIGHT & POWER.

	1913	1912
November gross	$528,634	$470,452
Net after taxes and depreciation	215,631	161,729
Other income	5,410	3,826
Total income	221,040	165,555
Surplus after charges	149,470	87,165
Eleven months gross	5,091,630	4,664,983
Net after taxes and depreciation	1,894,338	1,602,654
Other income	59,662	51,270
Total income	1,954,000	1,653,924
Surplus after charges	1,150,243	836,217

SOUTHWESTERN POWER & LIGHT.

(Subsidiary Companies.)

	1913	1912
November gross	$ 232,802	$190,400
Net after taxes	102,251	87,293
Six months gross	1,177,230	1,009,355
Net after taxes	541,547	438,169
Twelve months' gross	2,257,568	1,923,080
Net after taxes	1,020,146	851,718

MASSACHUSETTS LIGHTING COMPANIES.

The several gas and electric properties of the Massachusetts Lighting Companies report as follows:

	1913	1912
November net sales	$ 97,514	$ 95,167
Five months' net sales	442,104	419,291

DETROIT EDISON.

	1913	1912
November gross	$ 529,288	$438,099
Net after taxes	242,256	199,216
Surplus after charges.	181,332	138,226
Depreciation	55,200	46,000
Balance	126,132	92,226
11 months' gross	4,963,413	3,906,315
Net after taxes	2,049,264	1,628,077
Surplus after charges.	1,416,993	978,026
Depreciation	476,726	411,240
Balance	940,267	566,786

VIRGINIA RAILWAY AND POWER.

	1913	1912
November gross	$ 429,332	$406,832
Net	214,920	212,712
Surplus after charges	88,031	97,898
Five months' gross	2,168,630	2,026,193
Net	1,072,132	1,014,538
Surplus after charges	444,990	433,738

TEXAS POWER & LIGHT.

	1913	1912
November gross	$ 134,081	$100,092
Net after taxes	47,236	43,249
Surplus after charges	23,601	31,210
12 months' gross	1,162,745	984,636
Net after taxes	436,019	407,513
Surplus after charges	239,815	300,803
Balance after preferred dividends	129,565	256,440

KANSAS POWER & LIGHT.

	1913	1912
November gross	$ 102,735	$ 80,196
Net after taxes	41,310	32,698
Balance after charges	26,213	20,163
Twelve months' gross	1,018,755	998,855
Net after taxes	361,311	348,157
Balance after charges	185,752	195,164
Balance after preferred dividends	80,752	90,164

FORT WORTH POWER & LIGHT.

	1913	1912
November gross	$ 66,798	$ 49,458
Net after taxes	36,373	25,283
Surplus after charges	29,460	19,692
12 months' gross	648,970	504,050
Net after taxes	378,715	246,123
Surplus after charges	298,088	185,727
Balance after preferred dividends	246,180	142,327

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER.

	1913	1912
November gross	$ 110,092	$100,787
Net after taxes	50,214	46,292
Surplus after charges	29,983	26,582
12 months' gross	1,245,949	1,170,366
Net after taxes	536,698	502,750
Surplus after charges	295,817	266,692
*Balance after preferred dividends	217,817	188,692

*Equivalent to 6.2 per cent on common stock.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 5	Dec. 29
American Tel. & Tel. (New York)	118½	123
Commonwealth Edison (Chicago)	133	127
Edison Electric Illuminating (Boston)	245	241
Electric Storage Battery common (Philadelphia)	47	46¾
Electric Storage Battery preferred (Philadelphia)	47	46¾
General Electric (New York)	140⅜	140
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅛	1¼
Massachusetts Electric common (Boston)	12	13
Massachusetts Electric preferred (Boston)	63½	63¼
National Carbon common (Chicago)	132	132
National Carbon preferred (Chicago)	115	113
New England Telephone (Boston)	133	132
Philadelphia Electric (Philadelphia)	26	25⅞
Postal Telegraph and Cables common (New York)	75	76
Postal Telegraph and Cables preferred (New York)	65	65
Western Union (New York)	59¾	57¾
Westinghouse common (New York)	64½	66
Westinghouse preferred (New York)	114½	112

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*Last price quoted.

PERSONAL MENTION.

MR. THOMAS HOWE has severed his connection with Edwards, Sager & Wooster, and will continue his practice in relation to patents, copyrights and trade marks at 2 Rector Street, New York City.

MR. HENRY HEICK has resigned as vice-president of Albrecht & Heick, a leading electrical contracting house and dealer of Louisville, Ky., after having been connected with the company for 27 years. The concern will be operated by Gustave Albrecht, Sr., president; Gustave, Jr., secretary, and Clarence Albrecht. Mr. Heick will probably enter the hardware business.

MR. W. A. ALLEN, formerly with the Carnegie Steel Company, has been employed as commercial engineer for the R. D. Nuttall Company, Pittsburgh, Pa. Mr. Allen's experience in the manufacture, selection and treatment of materials, well fits him for this important position. Mr. Allen's duties are such that he will eventually come in touch with practically every electric railway company in the country.

MR. EDWARD W. STEVENSON, for many years chief engineer of the Hazard Manufacturing Company, Wilkes Barre, Pa., was tendered a testimonial banquet on Tuesday evening, December 30, at the Hotel Redington, Wilkes Barre, upon the occasion of his resignation from the company Mr. Stevenson will act as sales agent for Smith & Nichols, dealers in waxes, saturations and other insulating material used in wires and cables for electrical purposes.

MR. H. A. HAMPTON resigned from the position of chief engineer of the Tampa Water Works Company, Tampa, Fla., on January 1, in order to devote his entire time to the engineering firm of Hampton & Buerke, whose work consists principally in installing and supervising the operation of power plants in Florida. Mr. Hampton was for 12 years in charge of the power department of the Tampa Electric Company, and during the last five years has been chief engineer of the Tampa Water Works Company.

MR. JOHN F. WESSELL, general manager of the Mahoning & Shenango Railway & Light Company, a subsidiary of the Republic Railway & Light Company, will return to New York to assume duties with that corporation. The office of general manager has been abolished. MR. RANDALL MONTGOMERY, assistant to the president, has been appointed vice-president; G. J. A. PAUL, general superintendent, has been made manager of railways and MR. HOWARD V. MANINGTON, of Columbus, has been appointed assistant to the president.

DR. LEE de FOREST, the inventor of many wireless telephone and telegraph devices, who was tried in the United States courts at New York along with officials of the Radio Wireless Company, on the alleged misuse of the United States mail, was acquitted on three counts, the jury disagreeing on the fourth. In this case the jury returned a verdict of guilty on two counts of the indictment against MR. JAMES DUNLOP, president and MR. ELMER E. BURLINGAME, agent of a subsidiary company. MR. S. DARBY was also acquitted.

MR. GEORGE B. JOHNSON, manager of the Commonwealth Edison Company's Electric Shop, Chicago, was awarded the first prize ($25) for the best suggestion for a slogan in the *Chicago Tribune's* campaign to develop courtesy toward women, especially in the way of providing them with seats on railways and public conveyances. Mr. Johnson's suggestion was "Seats for Women." Since Mr. Johnson has been regarded as a confirmed bachelor by his many friends the award of this prize comes as a pleasant surprise in showing his keen regard for the ladies.

MR. SLAUGHTER F. HUFF, president of the Coney Island & Brooklyn Railway Company, has been elected vice-president of the Brooklyn Rapid Transit Company, to succeed MR. GEORGE F. CALDERWOOD, whose resignation was announced last week. Mr. Huff's present duties as head of the Coney Island & Brooklyn system will automatically cease in a short time, owing to a recent merger of that system with the Brooklyn Rapid Transit Company. It is understood that Mr. Huff will not perform the functions of general manager, as this position was abolished with Mr. Calderwood's resignation.

MR. JAMES CLARK, Jr., president of the James Clark Jr., Electric Company, of Louisville, leading manufacturers of electrical equipment, had what is regarded as a miraculous escape from death recently, when he missed being crushed to death in an elevator accident only by inches. Mr. Clark was attempting to bring the service elevator used in the company's Main street store to the first floor. It came from below, instead of above, as he thought, and struck him under the chin, carrying him up, while the safety gate descended from above, catching him between the edge of the car and the gate. It happened that one of the palings on the gate was loose, and this gave under the pressure of Mr. Clark's body, permitting him to slip through. He fell through the shaft into the basement of the building, receiving a dislocated wrist, numerous cuts and bruises and a general jarring up. Though he has been in bed as a result of the accident, his recovery is assured.

OBITUARY.

MR. CHARLES W. CORNELL, secretary and treasurer of the Gamewell Fire Alarm Telegraph Company, died suddenly at his home in Brooklyn, N. Y., on January 1. He was 69 years of age.

MR. SAMUEL A. COLEMAN, a well known old-time telegrapher, died at his home in Brookyln, N. Y., at noon, Monday, December 29. Mr. Coleman had several official positions with the Postal Telegraph Company and was employed there at the time of his death.

MR. CHARLES E. WAYS, assistant general traffic manager of the Baltimore & Ohio Railroad, died at Baltimore, on January 2. He was 70 years of age. Mr. Ways was employed as a telegrapher at Harper's Ferry, W. Va., at the time of the John Brown raid in 1859, and, it is said, sent the telegram that announced Brown's attack on the United States Arsenal there.

MR. FRANCIS R. FROST, electrical engineer of the Atchison, Topeka & Sante Fe Railway, died at Las Vegas, N. M., on December 29. Mr. Frost went to New Mexico only recently in the hope that his health would be improved by the change of climate. This expectation was not borne out and the engineer sank steadily. Mr. Frost was conspicuous in electric car-lighting circles of the United States, devoting his time almost exclusively to this feature. Practically all of the passenger coaches of the Sante Fe system were equipped with electric lamps under his supervision. Mr. Frost was attacked by tuberculosis about eight months ago. He had headquarters at Topeka, Kans., and interment was in that city.

NEW PUBLICATIONS.

CANADIAN COAL PRODUCTION.—The Canadian Department of Mines has published bulletin No. 258 dealing with the production of coal and coke in Canada in 1912, by John McLeish.

SWISS POWER HOUSES.—The Schweizerischer Elektrotechnischer Verein, Zurich, Switzerland, has issued a volume giving statistics of the electric power houses in Switzerland for the year 1911. It is published in both German and French and is a supplement to the *Bulletin* of the Society.

NEW YORK CITY SUPPLIES.—A report by E. C. Church, chief of the Bureau of Supplies of New York City, dealing with supplies of the Department of Water, Gas and Electricity, has been published. Its different chapters are concerned with the following subjects: plan and scope, organization and administration, purchasing, inspection, storage and issue, records and accounts. The report is well illustrated and nicely gotten up.

PHILADELPHIA TRANSIT REPORT.—The report of the Transit Commissioner, A. Merritt Taylor, to the Mayor and City Councils of Philadelphia has been published in two volumes. It consists of a comprehensive study of Rapid Transit needs in that city and contains recommendations for the construction of definite subway and elevated lines. It is recommended that the subway be financed by the city, but be operated by the present street railway company. The technical work, upon which the report is based, was conducted under the supervision of Ford, Bacon & Davis, consulting engineers.

DATES AHEAD.

National Independent Telephone Association. Annual convention, Chicago, Ill., January 13-15.

South Dakota Independent Telephone Association. Sioux Falls, S. D., January 14-15.

Wisconsin Electrical Association. Annual convention, Milwaukee, Wis., January 15-16.

Electrical Contractors' Association of the State of Illinois. Annual meeting. Springfield, Ill., January 16-17.

Efficiency Society. Annual convention. New York, N. Y., January 26-27.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27-30.

Northwestern Cedarmen's Association. Annual convention, Escanaba, Mich., January 27-28

American Electric Railway Association. Mid-year meeting, Engineering Societies Building, New York, N. Y., January 29-31.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27.

State Independent Telephone Association. Des Moines, Iowa. March 10-12.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11.

American Railway Engineering Association. Annual convention. Chicago, Ill., March 17-20.

American Electrochemical Society. New York, N. Y., April 16-18.

With the Electrical Manufacturers

Three States Cedar Company, Minneapolis, Minn., producer of cedar poles, is sending out one of the most handsome calendars of the year.

Greenwich Sales Company, New York City, has opened offices at 257 Broadway and will represent manufacturers of electrical specialties in New York City and vicinity.

Wagner Electric Manufacturing Company, St. Louis, Mo., announces the removal of its Boston office to 77 Franklin Street. This office will continue in charge of Mr. Brooks Faxon.

Belden Manufacturing Company, Twenty-third Street and Western Avenue, Chicago, Ill., has issued its discount and price list No. 127. This applies to Belden catalog No. 5 and includes some special revised discounts on Beldenite rubber-covered Code wire.

R. D. Nuttall Company, Pittsburgh, Pa., informs us that a prominent road operating in the hills of western Pennsylvania has in service a gear that has made 583,000 miles. This is an untreated normal cast-steel Nuttall gear. It is believed to be good for at least 100,000 miles more. In addition to this phenomenal record, this same road has 50 other gears in the same service that have equally good records.

Simplex Wire & Cable Company, Boston, Mass., has on the press a 92-page manual which just fits the pocket as well as the need of every electrical man who has anything to do with wiring problems. It is full of tables and other information of all sorts about insulated conductors and other matters electrical, and is equipped with an unusually complete index. Printed on a fine thin paper, and bound with stiff covers, the book is to be distributed gratis to those who ask for it.

Geoge C. Richards Company, 629 West Jackson Boulevard, Chicago, has taken over the house electrical goods and alarm systems manufactured by Edwards & Company, New York, for a large central western territory. This energetic manufacturing agency is growing rapidly and represents a number of leading manufacturers of electrical material. Mr. Charles J. French has resigned from the contract department of the Commonwealth Edison Company to handle the Edwads line in Chicago and vicinity for Mr. Richards.

Hamilton-Beach Manufacturing Company, Racine, Wis., the well known manufacturer of fan motors, vibrators, and other current-consuming devices, has met with most gratifying results in the extension of its business during the past year. Mr. F. J. Ossius, president of the company, reports that the company's business in 1913 was far in excess of that of any previous year. Hamilton-Beach products are used all over the United States and seem to be meeting with popular favor. The contractors and dealers who are pushing H-B goods are increasing their list of customers thereby.

Dubilier Electric Company, Incorporated, 63 Fifth Avenue, New York City, has added several new bulletins to its electric catalog. Of these, one describes electric radiators of 550 and 1,100-watt size; these radiators embody the Dubilier resistance-wire units which are said to be more serviceable than lamps for this purpose. Several other bulletins are devoted to illustrated descriptions of some of the resistance units. The design of these units and their mounting is described for various kinds of service. Among the types referred to are units for heating apparatus, controllers, plain rheostats and motor starters, also resistance bands and cord resistances.

American District Steam Company, North Tonawanda, N. Y., is sending out to patrons and friends a beautiful, large calendar for 1914. Its outside dimensions are 21.5 by 46 inches. On it is reproduced the famous painting by DeLand depicting with historical fidelity and great beauty of color the first inauguration of George Washington as President of the United States, which took place on the portico of Federal Hall in New York City, April 30, 1789. The reproduction is 16 by 20 inches in size, surrounded by an attractive border bearing the legend of the American District Steam Company, which has been in the business of engineering, manufacturing and installing central steam heating equipment continually since 1877.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued bulletin No. 476 describing its unit type Wheatstone bridges and resistance boxes. These are of the dial decade type arranged for very convenient control. In the bridge sets one dial is used for controlling both of the bridge ratio arms; thus when making a resistance measurement the rheostat value is multiplied by the setting of the ratio dial. These ratio multipliers are 0.001 to 1,000, each varying by the factor 10. The coils are wound on metal spools and the entire equipment is made to afford maximum protection and serviceability for sets of this kind.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has added a number of new pamphlets to its publications. "Westinghouse Portable Meters" is the title of circular No. 1104, a rather elaborate publication describing the company's complete line of portable instruments. A number of detail and complete photographs are shown together with various diagrams. "Motor-Driven Refrigerating and Ice-Making Machinery" (section No. 3133) describes the process employed in this class of work and illustrates the application of motors thereto. A number of interesting installations are shown and a curve is given from which the horsepower required for machines of different tons capacity can be determined. There is also included a table showing the type, capacity and speed of motors required for the different machines in a refrigerating plant, together with the kilowatt-hours consumption. "Baldwin-Westinghouse Electric Mine Locomotives" is the title of a pamphlet which describes and illustrates very fully the construction of the modern electric locomotive. A large number of views are given, showing construction details, particularly of the new bar-steel frame locomotive whose advantages are pointed out. The various accessories, such as controllers, circuit-breakers, trolley and gathering reels, are also described.

Record of Electrical Patents.

Issued by the United States Patent Office, December 30, 1913.

1,082,484. Lamp Socket. W. F. Anklam, assignor, to C. M. Hall Lamp Co., Detroit, Mich. For use with automobile reflector headlights.

1,082,494. Coil Forming Apparatus. J. A. Burns, assignor to Westinghouse Electric & Mfg. Co. A coil-forming mold has a laterally movable block adjacent to a shoulder, and worm and screw mechanicism for moving the block.

1,082,511. Alternating-Current Motor. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. A single-phase railway motor with armature and field in parallel circuits, the relative current in which is controlled by a regulating transformer.

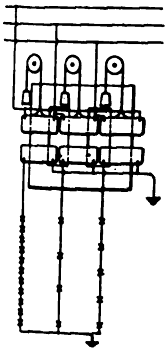
1,082,529. Apparatus for Forming Oxides of Nitrogen. J. S. Island, Toronto, Ont. Includes a hollow electrode of circular form and having openings adapted to project an annular sheet of gas, and an electrode in the plane of the projected gas and adapted to form a ring of electric flame.

1,082,532. Dynamo-Electric Machine. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. A damper for synchronous machines, has polar projections on the field that comprise groups of independent closed-circuit interpolar coils.

1,082,561. System of Distribution. E. H. Schwarz, assignor to Westinghouse Electric & Mfg. Co. A lighting system with a three-phase constant-current and regulator having independently movable coils for its respective phases, and a three-phase Y-connected and grounded-neutral lighting circuit with series lamps connected to the regulator. (See cut.)

1,082,563. Coil for Electrical Apparatus. H. B. Smith, assignor to Westinghouse Electric & Mfg. Co. Comprises a spiral of small cotton-covered wire, the successive turns of the covering being sewed to each other by zigzag stitches forming the spiral.

1,082,566. Thermostatic Device for Varying Magnetic Field. J. K. Stewart, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. For a magnetic speedometer.



1,082,561.—Three-Phase Series Lighting System.

1,082,571. Commutator Brush. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. An adjustable strap brush for engaging the side of a commutator for a measuring instrument.

1,082,577. Railway Signal-Lantern. A. A. Ziegler, Boston, Mass. Has two incandescent lamps arranged on an electromagnetically slidable base plate so as to be moved into the focus of the lens.

1,082,579. Dynamo-Electrical Machine. D. H. Andrews, Newton, and E. C. Ketchum, Boston, Mass. The field has alined pole pieces with parallel faces, through the center of which the armature shaft passes.

1,082,587. Metal-Filament Incandescent Lamp. M. D. Greengard, New York, N. Y. The filament is arranged in two parallel longitudinal planes joined by a transverse plane.

1,082,603. Alternating-Current Induction Motor. B. McCollum, Washington, D. C. Between the bars of a squirrel-cage rotor and one of the alternate end rings is a nickel connection to limit the starting current.

1,082,604. Shade-Holder. H. J. Morey, assignor to Pass & Seymour, Solvay, N. Y. Includes a contractible spring.

1,082,606. Supervisor Alarm System. J. G. Nolen, assignor to Fire Protection Development Co., New York, N. Y. Has duplicate conductors for each side of the system.

1,082,615. Electric Switching Device. R. Wikander, assignor to Westinghouse Electric & Mfg. Co. Automatic control switches for gradually short-circuiting the secondary resistance of a polyphase induction motor.

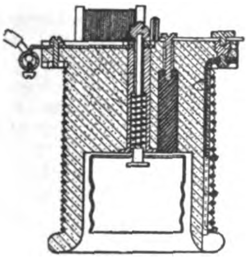
1,082,652. Lathe. C. F. Roth, Pilot Grove, Mo. Has electromechanical means for moving the tool carriage in and out.

1,082,653. Induction Wattmeter. G. A. Scheeffer, assignor to Roller Smith Co., New York, N. Y. The upper end of the meter shaft has a magnetic bearing and coil adapted to prevent axial play.

1,082,654. Electric Meter. G. A. Scheeffer, assignor to Roller Smith Co. Has special means for lifting and locking the spindle from the lower bearing during transport.

1,082,667. Automatic Resetting Alarm Cutout for Electric Burglar-Alarm Systems. J. P. Williams and H. Huhn, New York, N. Y., assignors to Electric Bank Protection Co. The cutout means are operated by a motor.

1,082,683. Automatic Cut Out and Compensating Socket. G. T. Dunklin, South Bend, Ind. Has a resistance wound around the socket that is automatically introduced into the circuit when the lamp circuit is broken. (See cut.)



1,082,683.—Series Lamp Cutout and Compensator.

1,082,694. Electric Switch. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Includes a number of vertically movable switch plugs inclosed in a casing.

1,082,703. Supervisory Alarm System. J. G. Nolen, assignor to Fire Protection Development Co., New York, N. Y. Includes a number of alarm-circuit-closers actuated on increase of pressure in an air tube.

1,082,721. Liquid Resistance. A. Aichele, Baden, Switzerland. Comprises a fixed upper box provided with electrodes and a vertically adjustable lower vessel containing the resistance liquid.

1,082,731. Combination-Lock and Circuit Breaker. G. J. Buckeye, Kansas City, Mo., assignor to Automatic Combination Lock & Circuit Breaker Co. Tumblers for the permutation lock co-operate to control the pivoted arm.

1,082,753. Artificial Light Diffusing Apparatus. N. Losey, Indianapolis, Ind. A foldable umbrella-like diffuser and reflector, through whose stem the circuit wires pass, is placed over an inverted lamp with a concentrating reflector.

1,082,759. Panel Board Switch. J. A. Obermiller and P. Eickenberg, Chicago, Ill. A push-button switch for connecting to the branch bars.

1,082,767. Riveted Metal-Work. A. F. Rietzel, assignor to Universal Electric Welding Co., New York, N. Y. A combination riveting and electric spot-welding process.

1,082,772. Conductor-Post for Electrical Distribution. C. Schuster, Bellevue, and C. N. Bergmann, Pittsburgh, Pa. A spacing frame for busbars.

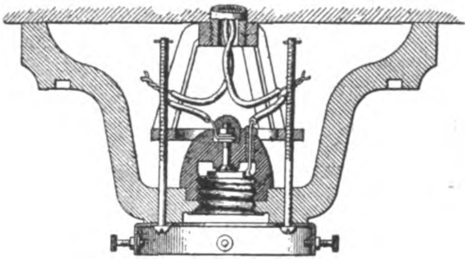
1,082,799. Car Trolley. F. E. Covey, Oakland, Cal., assignor of one-half to C. W. Yolland. A carrier for a telescopic trolley pole is arranged so it can turn on either side of a vertical axis.

1,082,810. Electric Device. A. A. Kent, Philadelphia, Pa. A contact device controlled by a double-notched rotary cam.

1,082,811. Device for Uniting Insulated Conductors of Electricity. A. A. Kent, Philadelphia, Pa. A plug type coupling.

1,082,824. Railway-Cab Signal. H. G. Sedgwick, Mill Valley, Cal., assignor to National Safety Appliance Co. A pair of contact arms for an electric signal is placed in a channel shoe on the locomotive.

1,082,830. Electric Heated Steering Wheel. R. S. Smith, Marshall, Tex. Electromagnetic control for the air brake.



1,083,218.—Combined Shade and Hood-Holder.

1,082,826. Insulating Means for Railway Ties and Chairs. G. H. Shane, assignor to Steel Railway Tie & Appliance Co. A rail, chair and channel tie are all insulated from each other.

1,082,825. Automatic Train-Stop. H. G. Sedgwick, assignor to National Safety Appliance Co. The heating unit is secured to the closure for a recess in the wheel.

1,082,840. Automatic System of Block Signaling for Electric Railways. S. M. Young, New York, N. Y. An alternating-current system with impedances and track relays connected across the rails.

1,082,856. Attachment for Controlling Telephone Switch-Hooks. J. Frith, Bridgeport, Conn. For desk sets with special bracket to hold the receiver to the ear.

1,082,869. Storage Battery. A. S. Hubbard, assignor to Gould Storage Battery Co. A vent system for a sealed battery connected to each cell in the battery tray.

1,082,887. Contact Device for Hand Lamps. L. Maisel, Madison, Wis., assignor to Northern Chemical Engineering Laboratories. Operated by a sliding motion.

1,082,920. Damper-Regulating Ap-

paratus. H. B. Weir and J. L. Fyke, Milwaukee, Wis. Electromagnetically actuated.

1,082,933. Tungsten and Method of Making the Same for Use as Filaments of Incandescent Electric Lamps and for Other Purposes. W. D. Coolidge, assignor to General Electric Co. The process of producing ductile tungsten wire consists in forming a sintered body of the metal hot-swaging this repeatedly until it becomes fibrous in structure, and then reducing it by hot drawing.

1,082,947 and 1,082,948. Process for Improving the Magnetic Qualities of a Magnetic Body. R. A. Hadfield, Sheffield, Eng. Silicon steel is made by first heating the alloy to a temperature between 700 and 800 degrees C., cooling slowly, then reheating to a temperature between 900 and 1,000 degrees, and finally allowing the alloy to cool rapidly. The second patent interchanges the temperature limits of the two heatings.

1,082,950. Arc-Light Electrode. J. L. R. Hayden, assignor to General Electric Co. Is formed of a metal tube with a cast filling of a homogenous mass containing two or more metallic compounds welded to the tube.

1,082,951. Combined Conductor's Valve and Emergency Switch. F. Hedley, Yonkers, and J. S. Doyle, Mount Vernon, N. Y. A lever operates the air-brake valve and simultaneously opens the power circuit.

1,082,956. Automatic Control System for Electric Railways. B. F. Hutchens, Jr., Allendale, N. J. For a sectionalized single-track railway.

1,082,962. System of Distribution. H. A. Laycock, assignor to General Electric Co. A balancer set for a three-wire system has a resistance in the field circuit of each machine and a relay-controlled shunt for each resistance.

1,082,967. Weighing and Recording Mechanism. G. Moore, Weston County, Wyo. Includes an electrical recording system.

1,082,978. Arc-Lamp Electrode. C. P. Steinmetz, assignor to General Electric Co. A white-arc electrode composed of carbon associated with titanium carbide or equivalent.

1,082,982. Rheostat. R. L. Watkins, New York, N. Y. A folding rheostat consists of a number of resistance leaves, each provided with a collar and lug adapted to be alined for connection by a pin when the leaves are spread apart.

1,083,017. Trolley. P. Johnson, Heaton, N. Mex. Parallel guard plates are pivoted on each side of the wheel.

1,083,020. Lighting Attachment for Sewing and Other Machines. J. W. Love and C. Webster, Warren, O. A bendable conduit with reflector socket and lamp to concentrate light on the work.

1,083,047. Trolley. M. Adamski Stoneboro, Pa. Spring-pressed bow trolley.

1,083,049. Convertible Trolley. A. L. Behner and J. Scott, Cleveland, O. Has two wheels in tandem, the front one of standard construction and acting as a pilot and the rear one of barrel shape.

1,083,070. Compound Metal. B. E. Eldred, New York, N. Y. For leading in wires sealed into glass; consists of a nickel-steel core, a layer of copper and an outer sheath of platinum.

1,083,073. Revolver Attachment. M. Ferguson and J. O. Fitzgerald, Jr., Richmond, Va. Includes an electric flashlight.

1,083,085. Loose-Coupled Tuning-Coil. A. C. Gowing and M. C. Spencer, Worcester, Mass. Consists of a number of concentric rings carrying primary and secondary windings, one of the rings being fixed to a diametrical rod passing through all the rings, and the remaining rings being adjustable.

1,083,109. Magnetic Wedge for Dynamo-Electric Machines. B. F. Lee, Schoolfield, Va. A laminated-iron wedge in each slot to hold the coil in place.

1,083,132. Electrode for Preventing Cathodic Reduction. A. Pietzsch and G. Adolph, Munich, Germany. The cathode is closely wound around with an asbestos string.

1,083,175. Commutator Slotter. F. R. Alley, Seattle, Wash. Includes two guideways, a screw and a cutter.

1,083,181. Insulating Rail-Fastener. A. J. Bates, Chicago, Ill. An electrically insulated seat for the rail and a heavily enameled anchor for holding the rail to the seat.

1,083,187. Electric Arc Lamp. F. Buchanan, Dayton, O. A feeding clutch controlled by an electromagnetic pawl and ratchet.

1,083,191. Thermo Electric Generator. J. J. Cook, Jersey City, N. J. A thermopile with the terminal portions of the elements provided with passages for a temperature-controlling fluid.

1,083,200. Electric Well-Drill. H. E. Diehl, Lawton, Okla. Includes a solenoid - reciprocated bit - carrying plunger.

1,083,210. Arc Lamp. C. A. B. Halvorson, Jr., assignor to General Electric Co. A special cutout for a magnetite lamp is closed when the arcing face of the copper electrode is advanced before the normal position of the arcing face of the magnetic electrode.

1,083,218. Adjustable Combined Shade and Hood-Holder.. C. G. Rush, Chicago, Ill. A pottery canopy or hood and a shade-holder are secured to a supporting ring attached to the fixture stud. (See cut, page 113.)

1,083,221. Starter for Internal-Combustion Engines. F. R. Simms, assignor to Simms Magneto Co., New York, N. Y. A special ignition system includes a magneto with induction coil and an auxiliary source which is connected to the induction coil through a trembler coil.

1,083,222. Electric Ignition Apparatus. F. R. Simms, assignor to Simms Magneto Co. A modification of the foregoing.

1,083,255. Electric Transmission of Intelligence. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. A telegraph transmission line is provided with means to impress on the line a potential independent of the potentials or impulses impressed during the transmission of the messages through a double condenser.

1,083,256. Telephony. I. Kitsee, assignor to American Telephone & Telegraph Co. Party line stations are provided with single-stroke bells connected in series to the line and operated by telegraphic keys in the line.

1,083,257. Telegraph System. I. Kitsee, assignor to American Telephone & Telegraph Co. A duplex system having a main line and an artificial line connected by the primary of a transformer, with a signal instrument controlled by the transformer secondary.

1,083,258. Electric Transmission of Intelligence. I. Kitsee, assignor to American Telephone & Telegraph Co. A cable has a series of lines each comprising three conductors, two composed of insulated wires and the third in the form of a metallic braiding surrounding the two wires, and a lead sheath outside the cable.

1,083,259. Cable Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co. The method of operating sensitive relays connected in the line consists in causing two movements in the relay for each letter through line impulses, and causing the time unit of each movement to be lengthened through localized impulses.

1,083,260. Electric Motor. R. E. Noble, assignor to Morgan-Gardner Electric Co., Chicago, Ill. A vertical motor with a barrel-wound armature and a commutator with interior bearing surface extending within the end turns of the armature.

1,083,266. Trolley Pole. A. R. Christian, Christchurch, New Zealand. A special spring construction at the base to keep the hole elevated.

Patents Expired.

The following United States electrical patents expired January 5, 1914:

574,370. Manufacture of Incandescent Electric Lamps. T. B. Atterbury, Pittsburgh, Pa.

574,377. Electric Railway Trolley. E. M. Bentley, New York, N. Y.

574,388. Electric Propulsion of Vehicles. W. A. Butler, New York, N. Y.

574,417. Secondary Battery and Process of Forming Same. G. W. Harris and R. J. Holland, New York, N. Y.

574,536. Electrically Heated Sad-iron. W. S. Hadaway, Jr., New York, N. Y.

574,537. Automatically Controlled Electric Oven. W. S. Hadaway, Jr.

574,565. Electric Meter for Alternating Currents. G. F. Packard, Fort Wayne, Ind.

574,579. Circuit for Annunciators of Telephone Lines. C. E. Scribner, Chicago, and F. R. McBerty, Downer's Grove, Ill.

574,632. Electric Railway. W. M. Schlesinger, Philadelphia, Pa.

574,642. Telephone Switchboard. H. J. Swarts, Knoxville, Tenn.

574,654. Telephone Receiver. R. S. Barnum, Chicago, Ill.

574,669. Electric Clock. C. M. Crook, Chicago, Ill.

574,707. Automatic Telephone-Exchange System. I. C. Bowman, New York, N. Y.

574,739. Electric Measuring and Indicating Apparatus. J. F. Kelly, Pittsfield, Mass.

574,745. Electric Heater. J. R. Meek, New York, N. Y.

574,761. Agitator for Telephone Transmitters. S. B. Rawson, Elvria, O.

574,826. Secondary Battery Support or Gird. J. J. Rooney, Brooklyn, N. Y.

574,828. Insulator. B. D. B. Smock, Wickatunk, N. J.

574,843. Method of Electrolytically Uniting Glass Articles into a Body. W. H. Winslow, Chicago, Ill.

574,856. Electric Alarm Device. G. V. Trott, Chicago, Ill.

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SELLING ELECTRIC SIGNS.

Regardless of what the individual sales records of sign manufacture might indicate, it is certainly apparent that the electric-sign industry has reached a gratifying position in this country. Merchants in the smallest as well as the largest towns have realized that electric advertising is not alone the most effective form of advertising commercially, but it is the highest class of advertising procurable. While vulgar, garish and ill-designed signs are to be seen in some cities, this is not the fault of electric advertising, but rather it is the fault of those directly concerned with the individual signs which offend. If the man who buys the sign will permit himself to be guided within reason by the man who sells, and if the salesman will counsel the buyer to erect the best and most fitting for the especial purpose in hand, electric advertising becomes at once the cheapest advertising, the most up-to-date, the most artistic and the most dignified.

Merchants realize to a greater extent than ever before the value of electric advertising, as evidenced by the large and increasing number of signs in use, and yet there has hardly been any comprehensive attempt made to improve the relationship between sign manufacturer, central-station company and user. In view of the progress which has been made without this co-operation, it seems that there are unlimited possibilities for improving conditions in this field.

Electric signs are about the easiest commodity on the market to sell, provided the salesman is equipped with definite data of a character that will interest the prospective user. The market for electric signs is almost without limit and the demand is ever increasing. In spite of this, however, the complaint is heard on many sides, particularly from central stations, that the lack of definite information, with which it is possible to equip central-station salesmen in their fight for this class of business, has been the cause of somewhat retarding sign development..

It is with the hope of relieving to some extent these conditions that we are inaugurating in another department of this journal a sign section, in which will be published each week a sketch or photograph of some original or noteworthy sign that may be used by central-station or sign salesmen in interesting prospects in similar lines. Data will be given regarding the equipment of the sign, color and flashing effects, approximate cost, wattage, and such other information as could well be used in interesting prospective purchasers. These data are being published in standard size, so that they can be cut from the page and made the basis of a sign-data book, which seems to be much desired in this industry.

TRAVELING ELECTRIC SIGNS.

Too little use is being made of traveling electric signs, considering their commanding interest to the general public. For many years advertisements have been carried about the streets of our cities and towns during the daylight hours on teams, automobiles and even the backs of patient burden-bearers decorated with clothing and other adornments. But only a beginning has been made in this sort or publicity. There is little question that such applications of electric signs will pay handsomely in the present undeveloped state of the business, for the improved electric lighting of streets and display windows has changed the habits of the people in thousands of communities, and has led to an increased amount of visiting of business districts after working hours but little anticipated in years past.

The good points of the fixed or flashing electric sign apply with even greater force to the moving display. Thanks to recent storage-battery development, such signs can be turned to account on almost any vehicle and at a cost which is certainly small in proportion to the interest aroused. It is especially easy with electric vehicles. There is no reason why the striking effect secured by electrically lighted outdoor displays in parades should be confined to these rare occasions, and the merchant and the central station who take up this matter in earnest, co-operating with the sign manufacturer when untried paths are to be followed, will reap a well deserved reward for their enterprise.

THE ILLUMINATION OF PICTURES.

Attention was called in these columns in the issue of December 13, 1913, to the frequent lack of proper illumination of paintings in art galleries. An instance was pointed out in which this condition had been avoided. This instance was a large art exhibition in the city of Cleveland. The fact that a study of scientific principles was made in connection with that installation may be credited to a prominent member of the Illuminating Engineering Society.

Some years ago Mr. Bassett Jones, Jr., called the attention of the Society to the effect of the color and direction of light upon the appearance of works of art and how greatly the meaning could be emphasized or obscured by correct or faulty lighting. Last winter Mr. M. Luckiesh devoted considerable attention to this subject and made addresses in a number of our large cities. In his home city, Cleveland, a direct result of this was apparent, and when preparations were made for the exhibition above referred to, scientific principles were applied through his direct co-operation and that of the Engineering Department of the National Lamp Works. A description of the Cleveland installation was given in the issue above mentioned.

Meanwhile experiments along a somewhat different line were being made in Chicago. One of the rooms of the Artists' Guild in that city was fitted with an installation of indirect lighting which utilized a combination of mercury-vapor and tungsten lamps. A brief description of this installation will be found elsewhere in this issue. Attention may be called here merely to the fact that this installation has been very satisfactory from the standpoint of color values, and many artists have expressed their appreciation of the fact that this installation brings out the entire range of colors much better than is usually achieved under artificial illumination. This is especially true of paintings in which greens and blues have a prominent part. This installation is somewhat handicapped by an inadequate power supply. Electric current is furnished from a plant in a neighboring building and a limited capacity of the mains, resulting in a fluctuating voltage, makes it difficult to realize the most perfect results. As an experiment, however, it amply demonstrates the advantages of proper color values and elimination of glare in lighting pictures.

A NOTABLE EDUCATIONAL AGREEMENT.

In an agreement signed last week between Harvard University and the Massachusetts Institute of Technology one of the most important co-operative steps in the history of American education is evidenced and engineering instruction and research were thereby placed upon a plane which should yield results of great public benefit in the years to come. By the terms of this intellectual treaty the mechanical, electrical, civil, sanitary and mining engineering faculties of the two institutions are to be centralized so that a professor, assistant or associate professor in either institution becomes *ex officio* a member of the staff of the other; the laboratories and equipment of the Institute will be used by engineering students at Harvard as well as by Technology men; and the funds of the University will be applied in large degree to the maintenance of these facilities. All this is to be accomplished without the sacrifice of individuality on the part of either institution; each will continue to have jurisdiction over its courses and students upon an independent basis, and yet there will be avoided that duplication of equipment and consequent waste in investment which in the last analysis would be economically unjustified in two institutions of similar aims located in the same neighborhood.

With the completion of the new buildings of the Massachusetts Institute of Technology at Cambridge in the next two or three years and the coordination of resources promised by the agreement, a far reaching stimulus to engineering education and research should be felt not only within but well beyond the present spheres of influence of these noted institutions. It is appropriate that engineering institutions should furnish such an example of efficiency in utilizing resources.

STATE COMMISSIONS AND LOCAL FRANCHISES.

In 1819 the Supreme Court of the United States handed down a decision in the celebrated Dartmouth College case, which established priority of the rights conferred through a charter granted in Colonial times over those conferred by an act of the State Legislature of New Hampshire. It has often been maintained in consequence of this decision that no state legislature can annul a charter whose provisions do not specifically provide for such control, but recent developments have shown this point of view to be untenable. It may be mentioned here, in passing, that the case referred to was decided by a divided court and one which was influenced more largely by reasons advanced outside of the court than during its sessions, and that partizan political considerations were largely involved in the dispute.

There is little reason why our Supreme Court should in a later generation be influenced by this precedent, and recent decisions would indicate that the precedent no longer is controlling. It has recently decided that the provisions of a charter granted to the Louisville & Nashville Railroad in 1850 specifying maximum freight rates do not act to prevent control of rates by the State Railroad Commission. In the deciding opinion in that case, rendered by Justice Hughes, it is stated that notwithstanding the contention of the irrevocability of a charter, the repealability of charters has been frequently asserted and sustained by the Supreme Court. It is definitely stated in this opinion that "a statute permitting the State Railroad Commission to fix rates potentially repealed that part of the charter which named rates."

In the Kansas Gas case, recently decided, the Supreme Court holds that the Public Utilities Commission of Kansas may revise existing rates of the utility corporation regardless of previous contracts with the municipality contained in its franchise. Whether a similar ruling would be made in other cases depends largely upon the constitution and statutory laws of the particular state in which such a case arises. In Wisconsin the legislature has repealed local franchises which conflict with control by the state commission. In Ohio the United States Supreme Court sustained legislation which was in conflict with a franchise previously given by the city of Hamilton. This is in conformity with the Ohio constitution.

In other states it is probable that such rights of the state legislature would not be sustained. In Michigan, for instance, the state has conferred upon municipalities the right to confer franchises by popular referendum, and it is thought by many that the state has no power to interfere with the terms of such franchises. A similar doubt exists in Illinois and certain other states.

It is thus evident that every case of this kind must be considered upon its own merits and with reference to the provisions of local laws and state constitutions and the interpretation which has been put upon these by the courts. In this connection, as in many others, uniformity will not be found throughout the country, since the question involves principles in regard to which different state constitutions have different provisions.

MOTION PICTURES FOR EDUCATING SOLICITORS.

New applications of the motion picture come to light weekly, and one of the latest examples of the commercial utilization of the cinematograph was given a few days ago in New York in connection with the training of bond salesmen employed in the work of raising funds for the development of the Montana Power & Light Company. About one hundred salesmen were thus given a first-hand idea of the properties covered by the bond issue and were prepared to talk more intelligently upon their prominent features to prospective purchasers. Pictures were shown of the hydraulic conditions on the Snake and Great Rivers, and the president of the company discussed in detail the present state of the properties and their possibilities under further development There is no question that latent possibilities of this sort also exist in connection with the training of central-station employees in commercial and technical tasks. The right and wrong ways to approach a prospective customer, the steps required in canvassing for electric service, house-wiring methods. and plant-operation details can all be shown in motion-picture form to the lasting benefit of the employees no less than the general public. There is a feeling among many central-station executives that more intensive training of employees especially charged with meeting the public is needed, and we believe that the motion-picture machine is destined to be turned to much more general account in this direction in the near future. As a matter of fact. several large merchants and industrial corporations are highly pleased with the results already achieved in thus securing an educated enthusiasm on the part of their representatives.

STANDARD METAL FINISHES.

It will be a great convenience to the electrical contractor and to many other persons as well if the finishes given to the metals used in electrical work, such as fittings and fixtures, could be standardized The number of finishes now on the market is legion and the electroplaters and others are turning out new ones every week. By establishing a definite line of a few dozen types of finish which would be everywhere recognized by a code designation and which could be furnished by regular supply men and platers, simplicity in ordering would be very much furthered on the part of the contractor and facility in filling orders increased for the metal finisher.

The National Electrical Contractors' Association has a committee working on this subject and this committee is in a position to greatly help the industry if it has the support of individual contractors over the country. It is now making a proposal to the membership along the lines above indicated.

Lynn Section Meeting.

On January 7, E. E. F. Creighton, professor in Union College, delivered a lecture on "High-Frequency Phenomena," before the Lynn Section of the American Institute of Electrical Engineers. The lecturer discussed electrical waves and surges, and stated that the action of an electrical wave is now well understood, being mathematically simple as compared with the action of a water or ocean wave. By means of charts and special apparatus, Professor Creighton illustrated electrical-wave effects in a number of different ways, and his personal research work in connection with the protection of electrical apparatus served as the basis for a well-delivered and illuminating address.

The question of lightning arresters was dealt with, and some practical experiments were made to illustrate how within but a few years continuity of service has been secured even in contention with the most violent atmospheric disturbances. For many years the largest electrical manufacturers were much baffled in the matter ot lightning arresters, and experimented in every direction, but at length by the use of suitable shunted assistance almost absolute protection may be obtained.

Professor Creighton was assisted in his demonstrations by Mr. Frank, of Schenectady. The attendance at the lecture was very large. Chairman E. R. Berry announced that the annual banquet will be held on January 24, in the new dining room of the American House, Boston. The statement was also made that the membership of the section is now 600.

Program of Meeting of Western Inspectors.

The ninth annual meeting of the Western Association of Electrical Inspectors will be held at the new Hotel Gibson, Cincinnati, O., on January 27, 28 and 29.

Sessions will begin each day at 10 a. m. At the opening session on Tuesday morning, there will be an address of welcome by the mayor, F. S. Spiegel, to which H. B. Long will reply. The presidential address will then be delivered by Ben W. Clark. Reports will be made by William S. Boyd for the Executive Committee, the secretary and the treasurer. Reports of committees to be presented at this session include the following: "National Electrical Code," by F. D. Varnam; "Outside Wiring," by M. E. Cheney; "Theater Wiring," by F. L. Lucas; "Show-Window and Display Lighting," by E. P. McGough. In the evening there will be a smoker.

At the session on Wednesday morning Frank R. Daniels will present the report of the Committee on Electric Traction Systems. C. H. Anderson will present a paper on "Practical Car Wiring," and R. W. Shenton will speak on "The Incandescent Lamp and Its Circuit." This will be followed by a general discussion of electrical-inspection problems. In the evening there will be a banquet, L. T. Milnor acting as toastmaster.

At the session on Thursday morning there will be committee reports as follows: "Installation and Operation of Induction Motors," by K. W. Adkins; "Architects' Specifications," by F. H. Moore; "Signal Systems," by Frank S. Anderson; "Rubber-Covered Wire," by V. H. Tousley. In the afternoon there will be a tour of inspection, which will include the pumping stations and filtration plants of the new Cincinnati water works.

A special car will leave Chicago at 11:45 p. m., on January 26, on the Pennsylvania Railroad, for the convenience of those going to the convention from or by way of Chicago. Reservations in this car can be secured by applying to Secretary William S. Boyd, 76 West Monroe Street, Chicago. On Monday afternoon arrangements have been made for a series of tests at the Underwriters' Laboratories, in Chicago, and a theater party has been proposed for that evening.

New York Automobile Show.

The annual Automobile Show was held in the Grand Central Palace, New York City, January 3 to 10. A number of electric vehicles were exhibited at the show, including the following: Anderson Electric Car Company, Detroit, Mich.; Baker Motor Vehicle Company, Cleveland, O.; Ohio Electric Car Company, Toledo, O.; Rauch & Lang Carriage Company Cleveland, O.; Ward Motor Vehicle Company, New York, N. Y.; Waverley Company, Indianapolis, Ind.

Among the exhibitors of accessories were the following: Apple Electric Company, Dayton, O.; Dean Electric Company, Elyria, O.; Detroit Electric Appliance Company, Detroit, Mich.; Joseph Dixon Crucible Company, Jersey City, N. J.; Edison Storage Battery Company, West Orange, N. J.; Electric Storage Battery Company, Philadelphia, Pa.; Holtzer-Cabot Electric Company, Brookline, Mass.; International Acheson Graphite Company, Niagara Falls, N. Y.; H. W. Johns-Manville Company, New York, N. Y.; Jones Electric Starter Company, Chicago, Ill.; Ward Leonard Electric Company, Bronxville, N. Y.; National Metal Molding Company, Pittsburgh, Pa.; North East Electric Company, Rochester, N. Y.; Pyrene Manufacturing Company, New York, N. Y.; Rushmore Dynamo Works, Plainfield, N. J.; Splitdorf Electrical Company, Newark, N. J.; United States Light & Heating Company, New York, N. Y.; Western Electric Company, New York, N. Y.; Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Westinghouse Air Spring Company, New York, N. Y.; Westinghouse Machine Company, Pittsburgh, Pa.; Willard Storage Battery Company, Cleveland, O.; Vesta Accumulator Company, Chicago, Ill.

Among the accessories exhibited was the Hartford electric brake, applicable to all types of cars. One great advantage of this brake is that it can easily be placed on an automobile, the preferred location being under the rear seat, bolted to the rear of the frame or under the hood. Cables are led to the brake-band operating levers on the car, but from which have been disconnected the ordinary rod or rods that attach to the emergency brake lever. The electric brake is designed as an emergency brake that will act quickly and with certainty.

The electric vehicles exhibited were very attractive and seemed to be built along more graceful lines than ever before.

Another British Railway to Electrify.

The Tilbury Line in England, which was recently acquired by the Midland Railway, the most extensive steam railroad in England, is to be electrified. This was decided by the directors of the Midland system after receiving the report of Sir William G. Granet and other officials of the road, after their recent trip to the United States to inspect electrification projects here.

Chicago Jovian Meeting.

Edward N. Lake, with the Stone & Webster Engineering Corporation, Chicago, delivered a highly interesting stereopticon lecture before the Chicago Jovian League on January 12. Views of the Keokuk hydroelectric development were shown principally, although construction views of several other important projects engineered by Stone & Webster were shown. The Chicago degree team volunteered to assist the Milwaukee Jovians at their rejuvenation on January 16.

Joint Meeting in New York.

There will be a joint meeting of the New York Electrical Society and the New York Companies Section of the National Electric Light Association at the Edison Auditorium on the evening of Monday, January 19.

Elihu Thomson will lecture on "The Wireless Transmission of Energy."

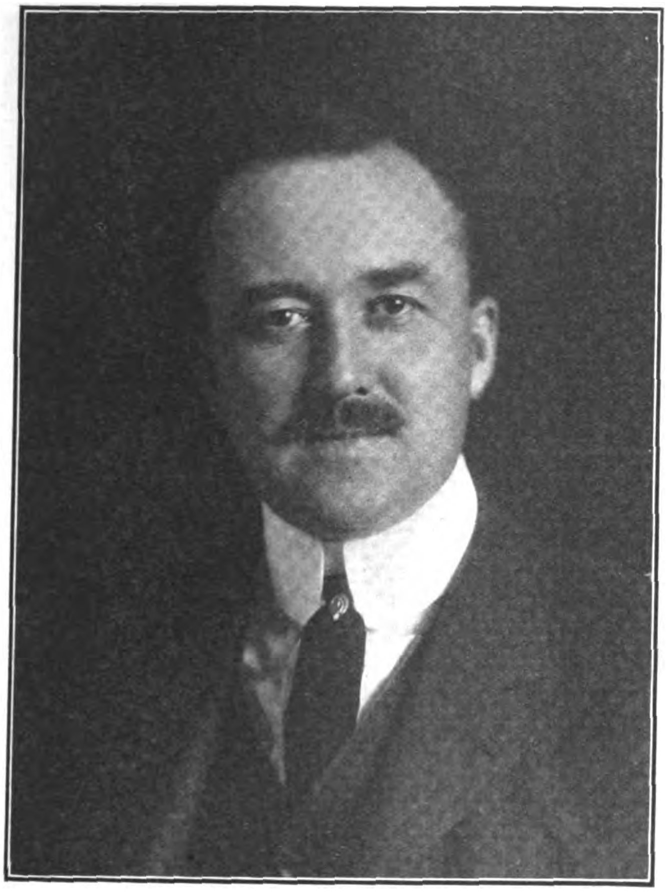
William H. Merrill.

The wide extent and excellence of the work of the Underwriters' Laboratories, Incorporated, in eliminating the fire hazard, are known to the readers of this publication. From a very meager beginning a comparatively few years ago, the laboratories have been developed into a fine organization housed in a substantial fireproof building covering a great area and devoted to the testing of materials of a fire-resisting, fire-preventing and mechanical and electrical nature of every description. While a great many articles and materials other than those connected directly with the electrical industry are now tested at the laboratories, its inception was wholly with respect to reducing the electrical fire hazard.

The genius of the enterprise known as the Underwriters' Laboratories, Incorporated, is William H. Merrill, founder of the institution and manager since its inception. Mr. Merrill was born in New York in December, 1868. He graduated in 1889 from the Massachusetts Institute of Technology. Shortly thereafter he was employed by the Boston Board of Fire Underwriters in the capacity of chief electrical inspector. He came to Chicago in 1893, taking the post of electrician with the Chicago Underwriters' Association. While still serving in this capacity he became associated with the Western Insurance Union in 1894, and organized the Underwriters' Bureau of Fire Protection Engineering.

Mr. Merrill has always been an eager and active exponent of fire-protection engineering. He assisted in the organization of the Electrical Committee of the Underwriters' National Electric Association and participated in the conference which resulted in the National Electrical Code. He has been secretary, treasurer and president of the National Fire Protection Association. In every activity with which he has been connected he has shown great executive ability and remarkable talent for organization. His correspondence sparkles with wit and humor, he is a brilliant conversationalist and an interesting and entertaining public speaker. He is possessed of the faculty of being able to understand and estimate the qualities of the men upon whom he must depend for the carrying out of many details of his work, and his wisdom in this direction has enabled him to surround himself with a fine organization of the best fire-protection men available in the country today.

When he began his work in Chicago there were many problems confronting the fire-insurance interests. Standards for wiring were in a bad condition, and one of the first steps made in the right direction was in securing the co-operation of the municipal department of Chicago in establishing a safe standard for electrical wiring and electrical apparatus. The opposition upon the part of electricians, manufacturers, insurance agents and owners which was manifested in the early days, seems almost incredible at the present time. Mr. Merrill secured the co-operation also of the Chicago Underwriters' Association whose regular building inspectors were detailed to assist him in his inspection work, these men receiving their entire electrical education from him. This educational work included lectures and practical demonstrations covering the detection of dangerous wiring and apparatus, with suggestions regarding the application of the proper safeguards.



William H. Merrill,
Manager of the Underwriters' Laboratories.

In was in 1894, when this work was going along so merrily, even if it was the subject of considerable opposition, that Mr. Merrill organized a laboratory under the joint auspices of the Western Insurance Union and the Chicago Underwriters' Association. A success from the beginning, the importance of the work was speedily recognized and so rapidly did the opportunities for service develop that both buildings and equipment have grown continuously and are still in a period and process of expansion.

Manhattan Electrical Supply Company of St. Louis Sales Force Attend Franklin Dinner.

The sales force of the Manhattan Electrical Supply Company, of St. Louis, Mo., were tendered a dinner at the Missouri Athletic Club on Friday, January 2, by Charles W. Brainerd, St. Louis manager of the Franklin Electric Manufacturing Company, of Hartford, Conn. The object of the dinner was to get in touch with the salesmen and give them an opportunity for thoroughly understanding the methods of manufacture and the operating characteristics and efficiency of Franklin Mazda lamps. The methods of creating new business and handling contracts were discussed from every angle. The meeting was a success in every sense and developed an intelligent and enthusiastic appreciation of the handling of Franklin Mazda lamps, which are made at the company's own factories at Hartford and Middletown, Conn. Covers were laid for 25. Those attending the dinner were the host and C. R. Baldwin, O. W. Stone, John H. Surman, C. W. Farnan, V. E. Mesplay, W. A. Ward, C. A. Smith, G. L. Thiemeyer, H. F. Wilker, W. Auld, J. A. Riddick, R. P. Lehnherr, W. C. Becker, William Kuhn, John Tracka, W. W. Dancy, John E. Leahy, Fred Hauck, J. A. Grace, H. B. Hewitt, G. W. Underhill, E. H. Peebles, H. H. Snyder, Albert Uhl, J. L. McCarron. G. H. Herbert, Earl Brunk, Harry E. Hawkins, William Ziegelmeyer, R. L. Sparks.

Wireless Club In Louisville.

The Falls City Amateur Wireless Club has been organized in Louisville, Ky., with Wallace W. Smith, 190 Pennsylvania Avenue, as secretary. The object of the club, as announced, is to bring together wireless experimenters in and near Louisville. The club expects to enroll everybody interested in this phase of electrical work within a radius of 150 miles of Louisville. A club room will be fitted up, and in connection with it a high-power long-distance outfit will be installed.

Annual Meeting and Dinner of the Western Society of Engineers.

The forty-fourth annual meeting and dinner of the Western Society of Engineers was held on the evening of January 7 at the Hotel LaSalle, Chicago. This meeting was one of the best attended annual gatherings ever held by the Society, 265 members and a few guests sitting down to the dinner.

Directly after the banquet Retiring-president Reichmann called upon Secretary J. H. Warder to present a summary of his annual report. Mr. Warder briefly referred to the strong position of the Society both in membership and in finances, and briefly touched on some of its more important activities during the past year.

Mr. Reichmann then made his retiring address as president. He announced the award of the Octave Chanute medals for the best papers presented before the Society in the year 1912 as follows: Mechanical and electrical engineering, to W. L. Abbott, for the paper entitled "The Northwest Station of the Commonwealth Edison Company"; general engineering, Onward Bates, for the paper entitled "Arbitration"; civil engineering, D. W. Mead, for the paper entitled "Cause of Floods and Factors That Influence Their Intensity."

Mr. Reichmann reviewed some of the work carried on by the Society during the past year. As a result of the effort made by the Society's officers, a 100-foot standard of length has been placed in the City Hall for reference. An effort is being made to secure new and larger quarters for the Society. Mr. Reichmann spoke of the advanced recognition being accorded to engineers and urged bringing all engineers in Chicago and contiguous territory into affiliation with the Western Society of Engineers.

He then announced the results of the letter ballot on election of officers as follows: E. H. Lee, president; B. E. Grant, first vice-president; Ernest McCullough, second vice-president; G. F. Gebhardt, third vice-president; C. R. Dart, treasurer; H. S. Baker, trustee for three years.

President-elect Lee assumed the chair at this point and made a gracious address, expressing his pleasure that his election had not been without contest. He believed that a contest for the presidency showed virility in an organization. Referring to engineering in general, he said that to the engineer is due in probably greater measure than to any other the foundation of our present progress. He compared engineering with other professions and claimed that credit must be given to engineers for paving the way for civilization. Engineering being based on solid unassuming work, it has suffered because too little time has been available for giving it proper publicity.

E. H. Lewis, dean of Lewis Institute, Chicago, was then called upon to act as toastmaster. This Dr. Lewis did with his usual humorous and cordial manner.

Dean Mortimer E. Cooley, of the University of Michigan, then presented the chief address of the evening entitled "Factors Determining a Reasonable Charge for Public Service." Dr. Cooley said he spoke on the subject from his experience of 15 years with the valuation of public utility properties. The fact that there is any question in regard to the determination of reasonable charges is due to the ignorance of the public on the many factors that must enter into the problem. The education to bring about a better public feeling is simple; the public is always ready to act in a fair and reasonable manner if it understands the problem properly. Officers of utility corporations now realize that the former unfriendly attitude of these corporations is largely responsible for the present hostile public opinion toward them. Dr. Cooley dwelt briefly on the advantages to the public in any community of having a single utility in each class to serve it at reasonable charges.

The question of what is a reasonable charge is not always the same, since it depends greatly on local conditions. Primarily a reasonable charge depends upon the service rendered. It must provide for (1) return on the capital investment; (2) operating expenses; (3) depreciation, and (4) a sinking fund. Dr. Cooley took up each of these items in considerable detail. He said that capital must be induced to invest by the definite assurance of fair return on the investment. He described at length the many features of a utility's organization due directly to capital. One of the principal causes of failure of the public to understand the utility side of the question is because it does not understand the elements that enter into the cost of the utility. Many of these are entirely unknown to the public; for example, the preliminary investigation of the feasibility of undertaking the project, financing of the project if it has been found feasible, the engineering work, both design and supervision. The actual construction work is about the only thing that the public actually sees and appreciates. Dr. Cooley thought that the newspapers should be called upon to educate the public on these matters because they are themselves public utilities. Among other factors that enter into the cost, which are self-evident if properly analyzed but usually are overlooked, are profits to the general contractor or constructing engineer, insurance during construction, taxes during construction, interest on the capital required during construction, and ample working capital.

Aside from meeting operating expenses, which is readily comprehended, there is an element of cost which is not usually understood. During the early development of a utility as a going concern there are likely to be extra expenditures in getting business and probably also deficits. These factors are in the class of intangible values of a utility concern. Dr. Cooley referred briefly to the importance of depreciation, explaining the factors that influence it and showing how it differs from maintenance and ordinary repairs. If depreciation is not allowed for, a sinking fund must be provided. Another feature usually overlooked is that the financing of a utility through the ordinary banking interests almost invariably involves discounts on bonds. In conclusion, the speaker referred to the considerable overhead charges that are involved in the organization and construction of any utility which vary upwards of 20 per cent, in some cases even running as high as 60 per cent of the capital investment.

The closing address of the evening was of a very humorous nature and was presented by S. E. Kiser, of the *Chicago Record Herald*. It was entitled "Alternating Currents," which is the title of a department edited by Mr. Kiser.

Dinner to A. C. Terry.

The Commercial Efficiency Promoting Association of the Western Union Telegraph Company gave a banquet on January 1 at the Fort Pitt Hotel, Pittsburgh, Pa., in honor of A. C. Terry, district commercial superintendent. Thomas Gosden, president, acted as toastmaster. Addresses were made by E. A. Baird, vice-president; T. R. Jones, secretary; George S. Walters, Samuel Bell, George F. Sladtmiller, W. W. Kelser and L. L. Leith. The music was by the Western Union Commercial Orchestra.

Frisco Strike Settled.

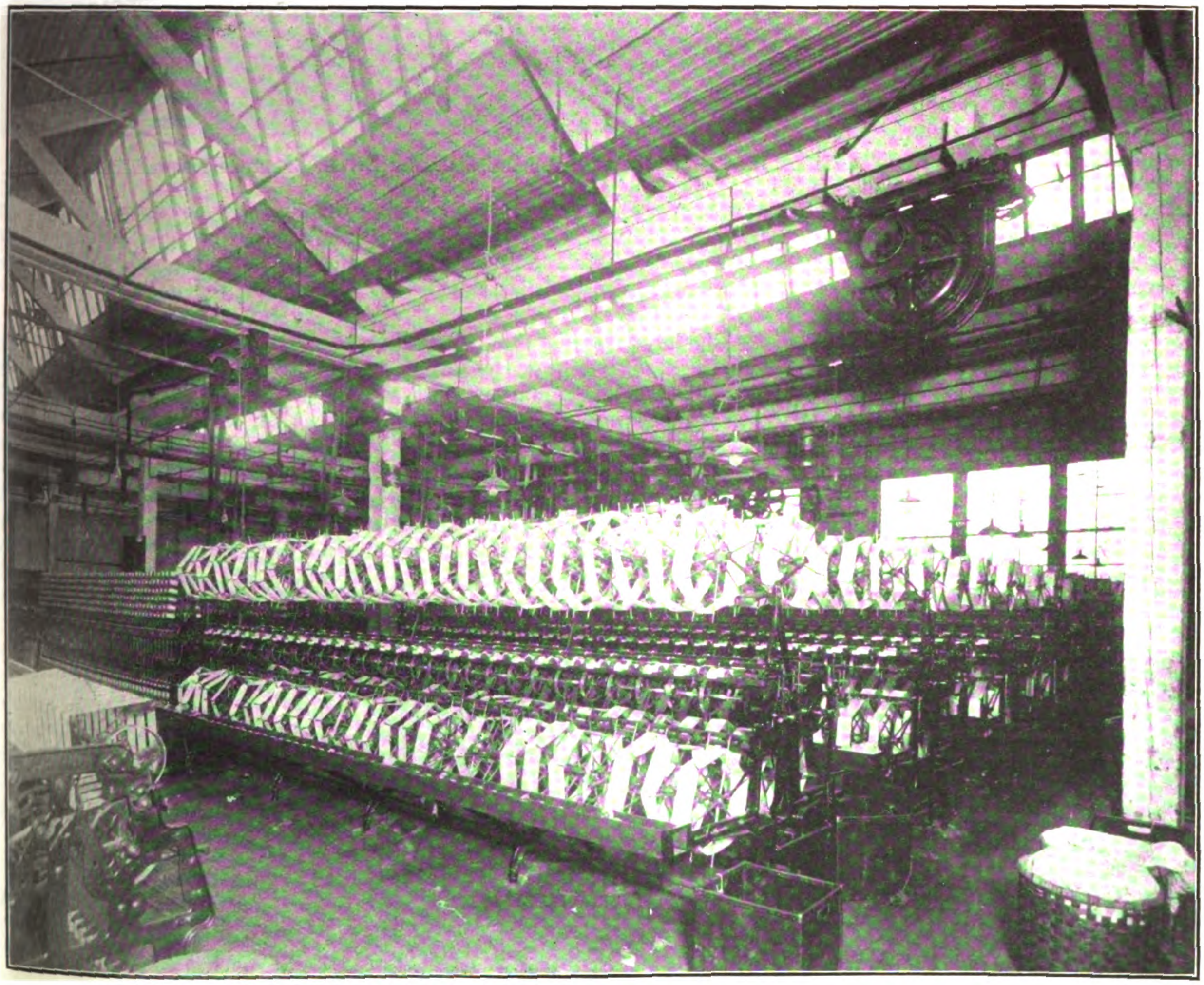
The trouble between the St. Louis & San Francisco Railroad and its telegraphers, mentioned in the issue of January 10, was finally settled by a grant of concessions by the company. The telegraphers will be given an increase of from 5 to 6.5 per cent in pay, a nine-hour working day, extra pay for overtime, and double pay for Sundays.

Boston Wireless Club Elects Officers.

The Wireless Club at Massachusetts Institute of Technology, Boston, has elected officers for the current year as follows: president, A. R. Morton; vice-president, D. R. Husted; secretary, R. E. Curtis; treasurer, H. W. Lamson. At a forthcoming joint meeting with the Wireless Clubs of Harvard and Tufts College, D. F. Comstock will make an address.

Electricity in Silk Mills.

When it is considered that only about one-tenth of the silk mills in this country are using electric service some idea of the opportunities offered for the introduction of electricity in this industry can be obtained. The accompaning article discusses the advantages of electric motor drive, both group and individual, and gives operating data on a number of mills purchasing power.



Double-Deck Winding Machines Driven by 25-Horsepower Motor.

Silk manufacturing is one of the oldest, most interesting and important branches of the textile art. Statistics show that in 1850 the value of the products of the American silk industry was $1,800,000, while in 1905 the value of finished silk goods in this country was $116,500,000; there were in service 49,000 power looms on broad weaving and 9,000 looms on narrow fabric work, 1,300,000 throwing spindles and 1,150,000 accessory spindles. About 23,000,000 pounds of raw silk were imported into the United States in the year ending June 30, 1910, and in 1913 it is estimated the import figure reached 50,000,000 pounds. This vast volume of raw material is handled by about 1,000 manufacturers, and when it is realized that but about 100 are as yet using motor drive, some conception of the opportunities offered for the introduction of electric service in this industry can be obtained.

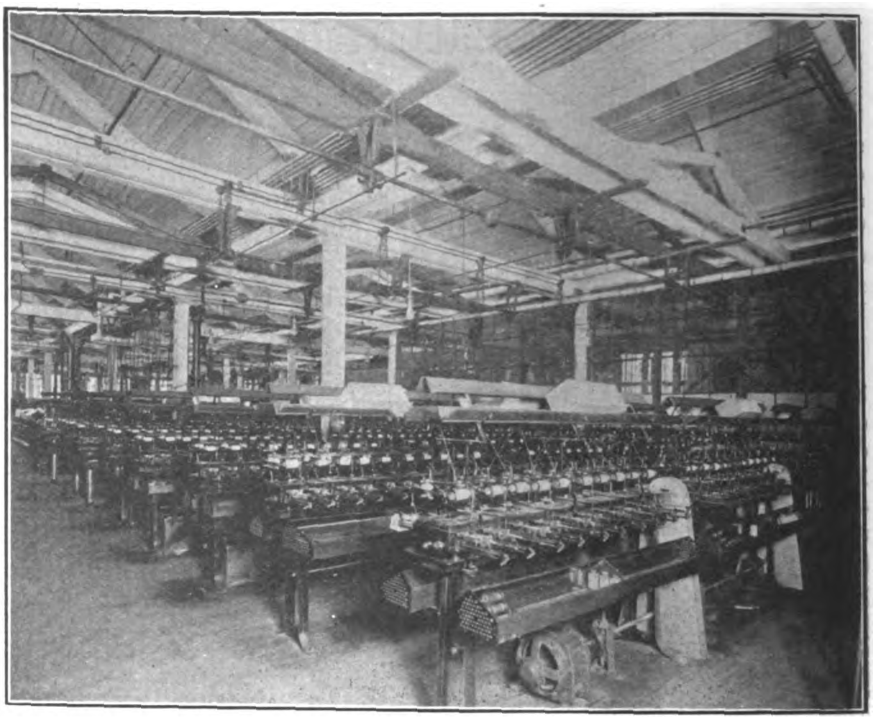
The progress of silk weaving became marked by the invention of the Jacquard loom in 1804. Before the arrival of Jacquard, figured silk weaving was a complicated labor, requiring almost infinite patience for its prosecution. Every loom required the services of at least two attendants. The advent of the Jacquard loom reduced the labor requirements by 50 per cent and the character of the work was made much easier. The next most important step in silk manufacturing was the advent of power-loom weaving which revolutionized most of the processes of silk manufacture. The changes wrought have brought silk fibres within the reach of a small purse, with the result that the demand on silk producing countries has been much increased. Lately the introduction of electric service has again revolutionized silk manufacturing, as shown by the testimony of mills using electricity. In the work of securing the utmost output of which a given plant is capable electricity stands in the front rank of auxiliary agencies. Wherever it has been introduced it has either increased or maintained the maximum rate of machine production better than was formerly possible with purely mechanical methods, provided the installation has been designed and placed in service under the supervision of an experienced engineer.

Cycle of Operations.

Silk is the product of the caterpillars of various species of moths, natives of India, China and Japan. This caterpillar, or silkworm, feeds on the leaves of the mulberry tree, and takes about 30 days to attain maturity, during which time the worm casts its silk several times, and after 30 days begins to spin its cocoon.

The extraction of the silk from the cocoon cannot be performed by machinery, and is confined almost entirely to the countries in which the silkworm is cultivated.

In the manufacture of silk products there are seven chief divisions of the work: throwing, dying in the skein, winding, weaving, dyeing in the piece, printing and finishing. Some few plants carry on all of these operations but they are exceptions, the usual operations being throwing, spinning and weaving. There are also a great many plants spinning and weaving only, purchasing the skein silk from plants devoted exclusively to throwing.

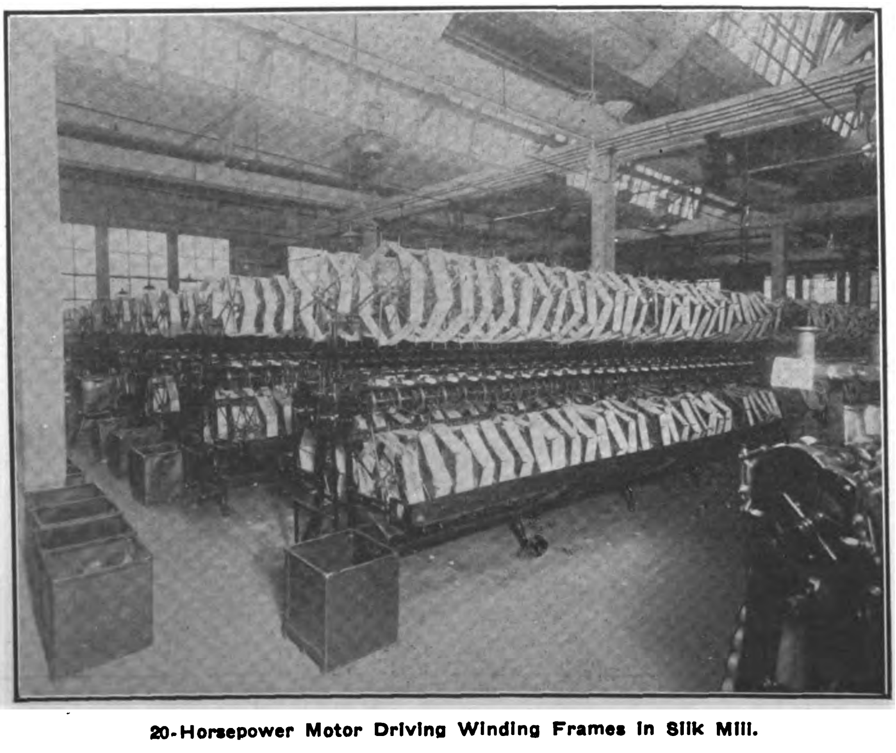

Group of Quilling Machines Driven by 10-Horsepower Motor.

The raw silk as it is imported from China or Japan is in a condition of great fineness and delicacy and it is therefore necessary to subject it to the series of operations called throwing before further working the material. Throwing includes winding, cleaning, doubling, twisting, rewinding and reeling the fibre into yarn of increasing substantiality. Single silk is produced by giving the single thread a twist to add strength and firmness to it. Tram silk consists of two or more threads thrown sufficiently together to hold by a twist of one or more turns per inch. The degree of twist varies according to the specific article produced. Organzine is formed of two or more singles, according to the thickness required twisted together usually in a direction contrary to that of the singles of which it is composed. Sewing silk and machine twist are manufactured from two and three strands respectively. The last process before reeling is stretching. The stretching machine evens up the thread and gives it firmness and uniformity in size. After stretching the silk is transferred to a reel and wound into skeins suitable for use of the dyer.

At the dye house, the skeins are boiled in soap and water to free them from any remaining gum and give the desired softness and luster. This takes from the silk 20 to 30 per cent of its original moisture. The silk is then placed in the dyeing vat, and the dyer may or may not, by the use of metallic substances in the dye, make the skein appear heavier and stronger than it otherwise would be. Following the dyeing comes the process of winding the silk on spools, requiring great care on account of the softness of the material. When dyed silk leaves the hands of the soft-silk winder it is ready for weaving.

There are three so-called foundation weaves: taffeta, serge and satin. The formation of the warp is an important piece of work. The winding of the filling is accomplished by winding from a spool or bobbin to a smaller spool called a quill, in a quilling frame. The quill fits into the shuttle which conveys the thread across the warp. A good weaver operating a power loom will weave from 10 to 20 yards of goods in a 10-hour day.

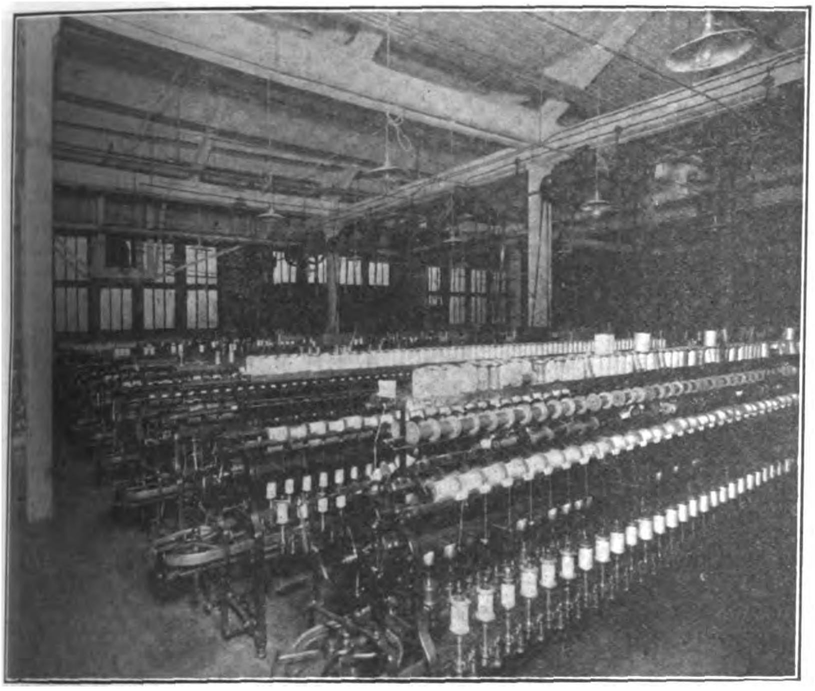
From the looms the silk is sent to the printing machines which have a roller for each color. The processes in this department are exactly the same as in cotton print works. In case the silk has not been dyed in the skein it is sent from the looms directly to the dye house.


20-Horsepower Motor Driving Winding Frames in Silk Mill.

Motor Drive.

In considering the application of electric motors to silk mill machinery, no hard and fast rules can be followed, as each installation presents conditions that must be studied and met for each individual case. Comparatively little specific data on motor drive for this industry are available, the most comprehensive yet made public being a general discussion of silk-mill drives by Andrew Kidd, Jr., a consulting engineer of New York, who has given considerable study to this work, published by the General Electric Company.

While the cost of power is a small part of the total cost of finished silk, yet, competition keen, the enterprising manufacturer will grasp every oppor-



Group of Spinning Machines in Silk Mill Driven by Two 10-Horsepower Motors.

tunity to reduce the cost per yard of his manufactured article, and the electric motor has assisted him materially in this respect.

The three methods of driving are: (1) mechanically, by line shafting, belts or ropes; (2) electrically, by grouping looms or preparatory machines under one motor; and (3) electrically, by an individual motor for each machine, particularly looms.

The old system of long line shaft drive, running the full length of the weaving room, and countershafts driven from this main line shaft is a very inefficient means of transmitting power. One striking example of the extravagance of this system was recently called to the writer's attention. In an old mill an engine of 100-horsepower capacity was delivering power to looms and necessary preparatory machines, when the machines themselves stopped, and it was found that 42 horsepower was lost in transmission. This represents what is ordinarily termed "friction load," and is the power required to drive simply the shafting, belting and loose pulleys on the machines, when the machines themselves are idle. It is the friction load under this condition, but under this condition only, for as soon as the belts are shifted to the tight pulleys and the machines are placed in operation, this friction load is undoubtedly greatly increased. No method has as yet been devised to determine accurately the extent of this increase in the friction, but the fact remains and should never be lost sight of that the friction load under operating conditions is greater than when the machinery is idle; and it is the power necessary to overcome this increased friction load that must be paid for by the manufacturer, and for which he receives no return. This loss gradually becomes worse as the belts stretch, shafts and pulleys become more and more out of alinement and the bearings wear.

In this system the maintenance items, such as cost of attendance, care and renewals of belts, oil, etc., are to be seriously considered. Then there is the liability of an accident to the shafting causing the whole or a part of the mill to go out of commission, and thus materially reducing the total output of finished product for the day or the week, depending upon the amount of repairs necessary.

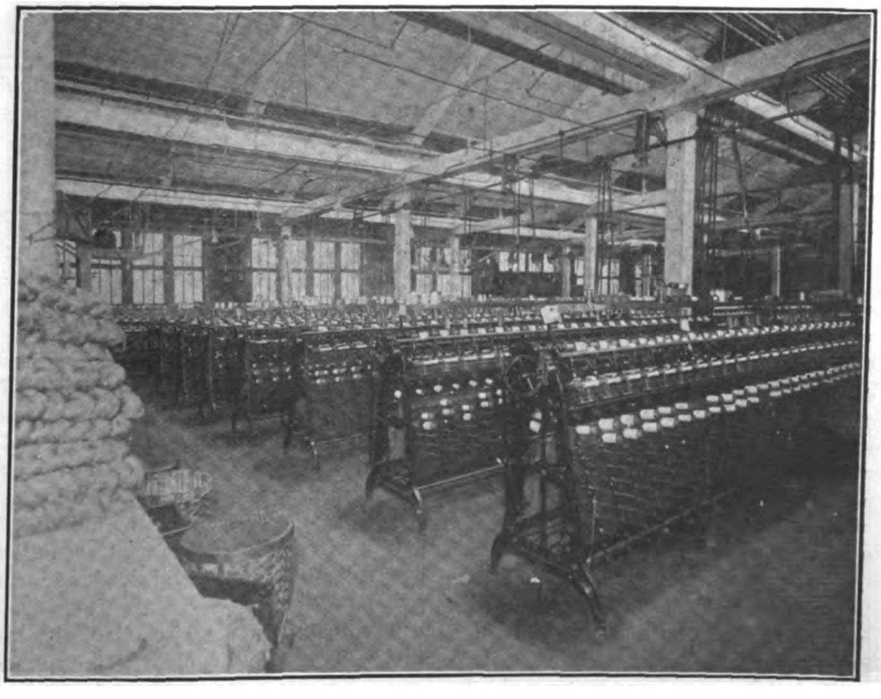
There is also the ever-present danger of dripping oil falling upon the raw material or the finished product.

In the motor-driven mill the first thing to be considered is whether the current is to be direct or alternating.

Under some conditions where the electric motor is used, a slight variation in speed is not objectionable; in fact, for machine tools, printing presses and railway service a decided variation in speed is required, and under this condition the direct-current motor is almost indispensable. However, inasmuch as the conditions in a silk mill demand constant speed, a little consideration will show that the alternating-current motor offers marked advantages.

If direct current is used, provision must be made to take care of the speed changes, which cannot be eliminated in the design of the motor. The reason for the variation in speed is that when the motor is started up, the field windings are cold and, consequently, their resistance is low, allowing an excess of current to flow through them. This excess of current tends to keep down the speed, and as the motor is being heated, say for three or four hours, the current slightly decreases, and the resistance and speed increase.

The speed of a 40-horsepower direct-current motor will vary seven per cent during the time the motor is heating up. A loom operating at 120 picks per minute would start off each morning at 111 picks per minute and gradually increase the number as the speed increased until the motor reached its



Group of Double-Deck Spinning Machines in Silk Mill.

normal temperature, when the looms would operate at 120 picks per minute for the balance of the day.

In order to compensate for these changes, a resistance box or rheostat must be inserted in the field circuit, and the strength of the field regulated frequently in such a manner as to keep the speed of the motor constant.

The speed of a direct-current motor will also vary if the voltage on the circuit changes, which change sometimes happens when a heavy load is thrown on or off the generator in the power house.

With alternating-current motors none of these difficulties are experienced. The speed of the motor does not vary when under constant load, but depends solely upon the speed of the engine which drives the generator. There are no brushes nor commutators, and no frictional parts, except the bearings; therefore, in comparing direct with alternating-current motors, the latter should decidedly be given the preference for silk mills.

The grouping of machines under one motor is looked upon favorably by many engineers and manufacturers, and very good results can be obtained from this system if particular attention is given to the arrangement of the shafting and the selection of the proper motor for the work to be performed. This system is used extensively where the machines being driven are run continuously, such as the preparatory machines used in a silk mill. The motor used should work up to its full capacity, in which case the highest economical efficiency is obtained.

A group of 48-inch looms, say 75 to 100 in number, can be driven by a 40 to 50-horsepower motor. As the torque required to start a loom is 100 per cent above normal running torque, this size motor would be ample for operating these machines successfully, since it is unlikely that a sufficient number of the looms would be started at the same moment to load the motor beyond its overload capacity.

As in the case of the mechanical drive, the group system drives the shafting and belting continuously, whether one or the total number of the machines are in operation. This group system has the advantage of greater flexibility than the mechanical system, due to the fact that any group may be run independently of another, and should a breakdown occur the particular group involved would be the only part of the mill affected.

The production of the looms is greatly increased, as the slipping of the belts is confined to one section, which gives a more constant speed. By reason of this more constant speed, the wear and breakage on the loom and the work of the loom "fixer" is greatly reduced. All heavy line shafting, hanger bearings and heavy belts are eliminated.

A direct-current motor is not to be recommended in silk mills for individual drive, as it is uneconomical and unsatisfactory for the conditions existing in silk-mill operation. Therefore, the following remarks apply to the alternating-current motor:

The method of installation is very simple, and js, in the majority of cases, entirely successful. In place of the belt pulleys used on mechanically-driven looms, and the friction clutch pulleys also used on such looms (and also advocated by some supporters of the individual electric drive), there is mounted a gear which meshes into the motor pinion. This gear is equipped with a special device, the duty of which is to protect the loom from excessive shock when the loom "bangs off," and which provides the same degree of elasticity as is obtained through the slipping of the belt and by the friction disk pulley ordinarily provided. A bracket bolted to the frame of the loom supports the motor. This bracket is so arranged that a vertical motion of the motor is allowed, as the different speeds of the loom are obtained by changing the motor pinion. The motor may also be supported from the jack shaft of the loom, in which case an eccentric bushing is provided which keeps the motor in perfect alinement and allows for the vertical movement necessary for changing the pinion. In all cases the motor is held to the loom in a very substantial and rigid manner.

It is generally preferable to stop the motor with the loom, thus saving all unnecessary losses and reducing the wear on the motor and its connections to the loom.

An oil switch is furnished with this equipment, and is held to the frame of the loom and connected to the shipper handle in such a manner that the weaver, to operate the loom, starts the motor instead of shifting the belt. The friction gear referred to in a preceding paragraph permits this to be done without damage to the machinery or to the fabric in the loom.

By any method of driving, either electrical or mechanical, that employs shafting and belting, certain losses appear at all times, due to friction and the slipping of belts, whether the looms are idle or in operation. These losses are eliminated entirely by the individual drive, as this arrangement requires energy only when actual production is being carried on.

The most beneficial result of the individual drive is the increased production. This is conservatively figured at 5 per cent, and is entirely due to the constant speed of the loom owing to the absence of all belts.

The maintenance item is reduced to a minimum, since there are no belts, line shafting or hanger bearings to be considered, the only frictional parts of the equipment being the motor bearings and gearing. The repairs on the loom are very much less for the group drive than for the mechanical system, and much less on the individual drive than on either. This installation is ideal, inasmuch as the looms may be placed to the best advantage for light, regardless of location to the generating plant. There is no dirt or oil overhead, and the pulleys and belts, which continually stir up dust through the atmosphere, are no longer required.

The first cost of installation for the individual drive is somewhat more than for the group drive, but when the increased production, decreased maintenance, unrestricted light, and the absence of all dirt and dust are taken into consideration, the manufacturer will agree that he will very soon be fully reimbursed for the extra expense incurred.

In the following two data sheets will be found detailed operating data relative to six typical silk mills purchasing power from central-station companies.

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Signal Batteries Supplied by Central Station.

A new interlocking signal tower, with 60 operating levers, has been put in operation by the Boston & Albany Railroad about a half-mile east of the station at Worcester, Mass. All the signals are electrically lighted, being operated by storage batteries in duplicate, to which current is supplied by the Worcester Electric Light Company. One battery is under charge while the other is operating. The tower and equipment cost about $63,000. Six men, working in three shifts of two men each, are required to operate the tower, which controls the main line and all tracks entering the freight yard from the east.

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Rates Reduced In Watertown.

The rates for electricity in Watertown, N. Y., as supplied by the Watertown Light & Power Company, were reduced on January 1. This company uses a graduated scale and the maximum rate has been reduced from 10 to 9 cents per kilowatt-hour, with the minimum rate still 4.3 cents.

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Enlargement of Trolhattan Plant.

The board in charge of the Swedish Government's famous Trolhattan hydroelectric power plant has sought a government appropriation of $804,000 for enlargement of the plant and the installation of three or four additional generating units.

Silk Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant manufacturing black taffeta silk exclusively, buying the silk in the form of skeins and weaving it into silk cloth for dress goods. There are 45 men and girls employed, working 60 hours per week. The weekly output of the plant is 4,000 to 5,000 yards.

Total connected horsepower, 20. Total number of motors installed, 4. Average kilowatt-hours per month, 2,050. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
November	2,666	March	2,167	July	1,118
December	2,939	April	1,914	August	2,125
January	1,938	May	1,929	September	2,016
February	1,895	June	1,775	October	2,180

Load-factor, 18 per cent; operating-time load-factor, 38 per cent.

The approximate electrical energy consumption per 100 yards manufactured is 10.5 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. The motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
3	5	1,700	Each belted to a six-foot shaft, two hangers, and 64 feet of countershafting, 10 hangers, driving 22 Crompton & Knowles 36-inch silk looms. Capacity per loom, 14 yards per day; driven pulley 14 inches by 2.5 inches.
1	5	1,700	Belted to a two-hanger shaft and 90 feet of shafting, 16 hangers, driving five Atherton Machine Company warping frames (432 spools), driven pulley 12 inches by 2.5 inches; three Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; two National Mill Supply Company winding frames (30 spools), 14-inch wheels; and eight Crompton & Knowles 36-inch silk looms; driven pulley 14 inches by 2.5 inches, 14 yards per day.

Silk plant located at Paterson, N. J., purchasing energy from the Public Service Electric Company. Plant operates 55 hours per week.

Total connected horsepower, 40. Total number of motors installed, 2. Average kilowatt-hours per month, 2,044. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
April	3,264	August	1,745	December	1,342
May	2,988	September	1,415	January	2,094
June	3,054	October	1,393	February	1,759
July	2,321	November	1,294	March	1,856

Load-factor, 9.4 per cent; operating-time load-factor, 19.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	1,200	Shunt-wound motor belted to line shafting driving 114 36-inch Benjamin Eastwood Company broad silk looms.
1	20	1,200	Shunt-wound motor belted to line shafting driving 26 Eastwood 36-inch broad silk looms; nine Eastwood double winders; and seven Eastwood warpers.

Silk mill, buying the silk in the form of skeins and weaving it into silk cloth for dress goods. Plant operates 60 hours per week.

Total connected horsepower, 40. Total number of motors installed, 4. Average kilowatt-hours per month, 1,574.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,883	May	1,757	September	1,076
February	1,578	June	1,970	October	1,211
March	2,111	July	1,324	November	1,330
April	1,875	August	1,380	December	1,390

Load-factor, 7 per cent; operating-time load-factor, 15.1 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to line and countershafting driving 45 Crompton & Knowles 36-inch silk looms. Capacity 14 yards per day.
1	5	1,200	Belted to a 10-foot line shaft, two hangers, and 50 feet of countershafting driving 20 Crompton & Knowles 36-inch silk looms. Capacity 14 yards per day.
1	20	900	Belted to line shafting driving five Benjamin Eastwood 40-spindle quilling machines, driven pulley 9 inches by 3 inches; nine National Mill Supply Company winding frames, 30 spools each, 14-inch wheels; seven Eastwood warping frames, 432 spools each; and three Crompton & Knowles 36-inch silk looms, capacity 14 yards per day.
1	5	1,200	Geared direct to freight elevator mechanism.

Silk Manufacturing Data—Sheet No. 2.

Silk mill, buying silk in skeins. There are 75 men and girls employed working 60 hours per week. The capacity of the mill is approximately 25,500 yards of silk per month.

Total connected horsepower, 50. Total number of motors installed, 6. Average kilowatt-hours per month, 3,220.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	3,292	May	1,801	September	4,480
February	3,279	June	1,855	October	5,510
March	3,355	July	4,480	November	4,865
April	1,639	August	5,510	December	2,122

Load-factor, 11.9 per cent; operating-time load-factor, 25 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,700	Belted to a 10-foot line shaft, three hangers, and 100 feet of countershafting, 18 hangers, driving 40 Crompton & Knowles 36-inch broad silk looms, driven pulley 14 inches by 2.5 inches. Capacity 14 yards per day.
1	5	1,700	Belted to an eight-foot line shaft, three hangers, and 45 feet of countershafting, seven hangers, driving 20 Benjamin Eastwood Company 36-inch broad silk looms; driven pulley 14 inches by 2.5 inches. Capacity 14 yards per day.
1	5	1,700	Belted to a two-hanger line shaft and 90 feet of countershafting, 16 hangers, driving three Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; five Atherton Machine Company warping frames, 432 spools each, driven pulley 12 inches by 2.5 inches; two National Mill Supply Company winding frames, 30 spools each, 14-inch wheels; and 10 Crompton & Knowles 36-inch broad silk looms, driven pulley 14 inches by 2.5 inches, capacity 14 yards per day.
1	20	1,200	Belted to line and countershafting driving 10 Benjamin Eastwood Company double winders; seven Benjamin Eastwood Company warping frames, 430 spindles each; six Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; and two Crompton & Knowles 36-inch looms.
1	5	1,700	Belted to line shafting driving machine-shop equipment consisting of one engine lathe; one turret lathe, two drill presses; one emery grinder; one shaper; and one grindstone.
1	5	1,200	Geared direct to mechanism of freight elevator serving two floors.

Small silk mill on the lines of the Public Service Electric Company of New Jersey, manufacturing silk cloth for dress goods. The running hours per week are 60.

Total connected horsepower, 15. Total number of motors installed, 3. Average kilowatt-hours per month, 689.

Kilowatt-hours per month for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	853	May	751	September	473
February	1.502	June	729	October	457
March	965	July	523	November	321
April	710	August	517	December	472

Load-factor, 8.4 per cent; operating-time load-factor, 18 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
2	5	1,200	Each belted to a line shaft driving 15 Benjamin Eastwood Company 36-inch broad silk looms. Capacity 14 yards per 10-hour day.
1	5	1,200	Belted to line and countershafting driving three warping frames, 400 spindles each; two 40-spindle quilling machines; and two 30-spool winding frames.

Silk mill, operating 10 hours per day.

Total connected horsepower, 45. Total number of motors installed, 3. Average kilowatt-hours per month, 2,824.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,711	May	2,761	September	2,716
February	2,974	June	2,424	October	3,165
March	2,814	July	2,630	November	3,081
April	3,227	August	2,669	December	2,715

Load-factor, 11.5 per cent; operating-time load-factor, 24.1 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	900	Belted to line shafting driving 26 Eastwood 36-inch broad silk looms, capacity 14 yards per 10-hour day; nine double winders; and seven 432-spool warping frames.
1	20	900	Belted to line shafting driving 110 Eastwood 36-inch broad silk looms, capacity 14 yards per day.
1	5	1,200	Driving freight elevator.

Commercial Practice
Management, Rates, New Business

COMPENSATION LAWS AND ELECTRIC POWER.

By G. D. Crain, Jr.

One of the most significant developments of the time is the almost universal recognition of the need for a change in the century-old method of disposing of the claims of those injured in industrial accidents. The common law is giving place to a law based on the belief that society at large, and not the individual, should bear the burden of these accidents.

The development of this sentiment has resulted in the enactment of compensation laws in 24 states, and in preparations being made looking to legislation along this line in many more. It is a conservative prediction that within another ten years practically every state in the Union will have such a law. The reason the prediction can be safely made is because manufacturers themselves are proposing these measures in many instances, anticipating both public sentiment and active agitation by workingmen. Their motive is one of policy as well as principle, since having a fixed schedule of compensation, which can be figured on in advance, is obviously better than a system which insures litigation of a most disagreeable kind, with relatively little relief for the victim of the accident, no matter what the outcome of the case.

The important point in this connection, from the standpoint of the operator of a central station, is the effect of the new conditions on the demand for his service. The enactment of compensation laws, as suggested, means that every accident in which a man is hurt must be met by a corresponding payment. Few exceptions are made—drunkenness and willful or malicious infliction of injury being among these—and the only thing to be determined is the question of fact. The extent of the injury and the length of time during which the victim was disabled are all that need to be determined. The amount of the award is fixed in advance by law.

The common-law defenses of fellow service, contributory negligence and voluntary assumption of risk are wiped off the slate, and the successful interposition of these defenses in probably a majority of accident cases under the common-law system is rendered impossible.

This situation is a definite encouragement of accident prevention. The careless manufacturer who, under the common law, decided that he could easily evade payment of damages, is brought face to face with the necessity of making his plant as safe as possible, because he knows that any and all accidents must be compensated for, without regard to the question of whether they were the fault of the operative. A premium is put on care.

In the same way, the insurance companies, which heretofore have charged a flat rate for liability insurance, fixing a rate based on the experience of all the companies in each class, have found that it is necessary to increase the charge for insurance when a definite schedule of payments required to be made is fixed. In view of this increased burden, and the necessity, as well as the desirability, of distributing it more equitably among the members of each class of industries, the companies have begun to substitute for the flat class rate an individual rate, based on an analytical study of each risk, from the standpoint of the hazard.

The plan, in general, is that used in fire-insurance rating. A standard risk is taken, and charges are made for defects, compared with the standard, and credits given for improvements, each plant thus being made to stand on its own bottom, and to be rated on its merits. The manufacturer who refused to spend money for safety devices, because their installation would not reduce the cost of his insurance, finds under the new system that there is a financial inducement for him to do so.

The application of all of this to the business of the central stations is simply this: The use of electrical power and especially of individual motors means the elimination of one of the most serious hazards involved in the operation of manufacturing establishments. With every inducement put forward to the manufacturer to get rid of the chances for accident, the probability of his taking up the use of electricity for power purposes is obviously greatly increased.

The transmission equipment of a manufacturing plant, where steam power is used, constitutes a serious menace. Even with belts guarded as carefully as possible and every reasonable precaution taken to reduce the hazard, there are certain great dangers which must continue to exist. The shifting of belts, the danger of cast-iron pulleys breaking, the decreased amount of natural light available on account of the belts and shafting being overhead—all of these features, and more, operate to make the use of an involved and complicated system of transmission, which is necessary under any scheme of mechanical power, dangerous. The danger may be reduced, and may be greater in some places than others; but it is there, all the time.

The use of electricity, enabling the manufacturer to drive his machines with individual motors, at once cuts down the accident hazard to a great extent. As far as the hazard involved in the transmission is concerned, it is almost eliminated. Even if the group system is used, and one motor serves a number of machines, the amount of overhead belting and shafting involved is so small, compared with the general lineshaft system of operation, that a tremendous improvement in working conditions is immediately brought about.

Many consumers of power have been considering the installation of electrical equipment and the use of electric drive in their plants. In innumerable cases the chief argument against the change is the investment already made in steam plant and transmission equipment. Even taking this into consideration, the manufacturer hesitates, and continues in the old way largely from force of inertia. But with the big desideratum here indicated presented to him—securing a greater education in accident hazard, which will be reflected in a reduced liability insurance rate and in a smaller number of accidents in his plant—an impulse will be given that will often lead to a decision to throw out the old transmission system and put in electrical equipment throughout the plant.

For a long time the accident-reduction feature has been used by manufacturers of electrical equipment as an incidental argument. Few central-station men have made use of it to any considerable extent. Comparisons of the cost of operation of the old plant and of electrical installations have been relied on to win the day, inasmuch as the dollars-and-cents feature of the situation has been the one stressed by the individual consumer. But the reduction of accident hazard can now be made one of the big features of selling talk both by the machinery men and the central stations, because, as explained, this has become not merely a more or less intangible advantage, but a definite proposition, the financial benefits of which can be measured.

The conditions which have been outlined, as existing in states where compensation laws have been put into effect, may be used by electrical interests in sections where such laws have not yet been adopted. It may be pointed out that such legislation is surely coming, and that it is far better to anticipate it than to wait until such changes are almost forced upon the manufacturer by the adoption of laws providing for specific compensation for injuries.

And in states where the insurance companies have not yet adopted the analytical system of rating, even though compensation laws have gone into effect, it may be stated by central-station men with confidence that the merit system is coming, and is a permanent condition that individual manufacturers must prepare to aline themselves with.

Taken all in all, the advent of compensation laws forms the best possible basis for predicting a great increase in the number of electrical installations in manufacturing plants.

New Business at Minneapolis.

The city council of Minneapolis has authorized execution of the street-lighting contract for 1914 with the Minneapolis General Electric Company, covering 2,800 arc lights and 900 "white-way" ornamental standards. This is an increase of 400 arc lights.

Among the power contracts closed by the company during the week, December 14-19, was one for 150 horsepower for the Gould Elevator Company. Another contract was for 55 horsepower for the operation of elevators in the Northwestern National Bank Building, displacing steam triplex pumps. A 40-horsepower contract was also secured from a warehouse company and 33 horsepower in miscellaneous small power business.

Special Heating Rate in Pittsfield.

The Pittsfield Electric Company, Pittsfield, Mass., has put in effect a special flat rate of four cents per kilowatt-hour for current supplied to heating devices. The company has installed an electric garage and has a competent man in charge to care for electric vehicles.

Commercial Inspection Bureau of the Boston Edison Company.

In a recent issue of *Edison Life*, the house organ of the Edison Electric Illuminating Company of Boston, Mass., R. S. Carpenter contributes an interesting article on the duties and scope of the new division of commercial inspection, which has lately been established.

In applying the title Commercial Inspection, says Mr. Carpenter, it is not our endeavor, as it might appear, to enhance the importance of the work of our division by the use of a more important designation than that under which it is commonly known, viz: the "Complaint Department." The fact is that the former expresses more clearly the scope of its work, while the latter is not sufficiently inclusive.

The analysis of the work of the commercial inspection division for the past year will bring out the fact that a large part of the letters which were written and the interviews which were held were for the purpose of giving information or adjusting conditions which might result in the furnishing of more satisfactory service. This information is of the most varied character, ranging from questions on the most simple and rudimentary principles of the business, to a request for answers to engineering problems which require the services of experts of the profession. Such questions as "How long does a watt last?" and "Would a 100-horsepower lamp light my bathroom?" are followed in rapid sequence with requests for cost of operating a shoe factory or of heating by electricity Boston's new Customs House. The former requires but the exercise of a little patience and kindness in dispensing common knowledge, but the latter are passed on to men who have spent their lives in the pursuit of such special problems.

The adjusting of conditions goes hand in hand with this information, one very frequently and logically leading to the other.

Our system of billing, embracing as it does the annual adjusting of accounts, causes to be corrected any gross misapplication of conditions; but it remains for the division under discussion to detect and foretell that such a rate, for example, or such a combination of load may work to the customer's disadvantage.

It is not to be intimated that care is not given to these essentials when a customer is taken upon our lines; but, as is known, conditions of any business are constantly changing, resulting in increases or reductions in the current consumption or load. Thus, although the rate originally applied may have been the best at the time, it might not best fit changed conditions of a later date. That such changes are being made continually is proved conclusively by the fact that the major part of the money refunded to the company's customers each month is for this reason.

In this respect the policy of the company is most liberal. We grant to the customer not only that which has been paid in excess of the maximum price of our commodity, but give the customer the benefit of a difference in his favor for the period of a few months prior to the change to a rate adapted to his particular conditions.

We go further than these mere bookkeeping problems, and if unable to help in the ways above mentioned, send a representative who visits the customer's premises and suggests such changes in installation, e. g., dividing of load to advantage, or combining of meters, as will tend to reduce consumption or increase efficiency. This class of work is of great value to our customers, and the demand for such assistance from us has materially grown.

We would not lead one to believe that we do not have complaints, and that they are not of primal importance in our business. Not only do we face the same questions and problems as above cited with our complaints, but we frequently have also to overcome prejudice possibly inherent and applying to all public-service corporations, and possibly acquired from a real or fancied injustice. Although this prejudice is common it can in a measure be reasoned away. Of greater weight than reasoning, however, is the practice of fairness and liberality which is the Boston Edison Company's policy, and following which none can justly retain such an opinion.

It is one of the essentials of success in this work to be able to consider the situation from both points of view, and while preserving the dignity of the company and conserving its interests, to be able to appreciate that the other man is a thinking, reasoning mortal and may be right. With this point of view we are at once on the proper basis for equitable settlement of any difficulty that would ordinarily arise.

We should in justice state, however, that the majority of our customers come to us with a fair-minded and reasonable proposition of what they believe is an error on our part. In most cases they are right and if not entirely so it is because they are not well informed as to our system. Needless to say, our energies are bent in making correction or in supplying the missing facts, and the satisfaction of dealing with these people is its own reward.

Reading Company Secures Ice-Making Load.

After investigating for a number of months and visiting the most modern ice plants in the country, among which were the Webster-Citizens Ice Company of Buffalo, N. Y., and the Knickerbocker Ice Company, of Chicago, Ill., the Reading Merchants Ice Company, of Reading, Pa., has decided to install electrically-driven machinery.

The York Manufacturing Company, of York, Pa., will furnish two vertical single acting 100-ton compressors. These will run at 68 revolutions per minute. The compressors are each capable of making 150 tons of ice if speeded up. The York Manufacturing Company is also furnishing a twelve-effect distill. This machine is capable of furnishing 65,000 gallons of pure water every 24 hours. The mixture used in this apparatus is one pound of steam to eight pounds of water. From the distill the water is run through cooling pipes and enters the freezing cans at 42 degrees Fahrenheit.

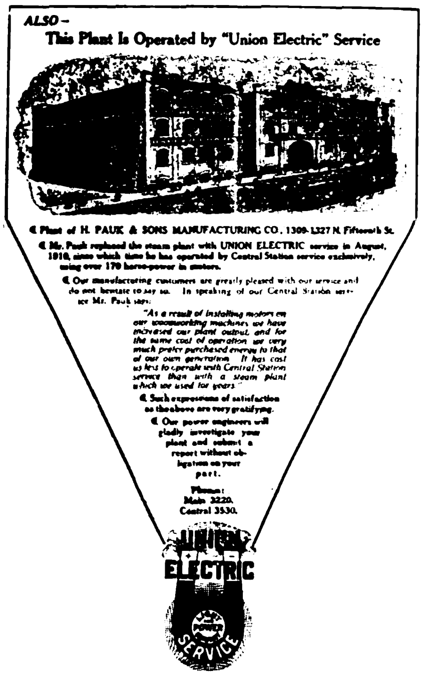
The We-Fu-Go & Scale Water Purifying Company will install its apparatus to soften and purify the condensing water in order that it will be in good shape to go to the distill. This machine has a capacity of 3,000 gallons per hour.

The ice making process is as follows: The ammonia gas is received in the compressor at 15 pounds back pressure. The gas is then compressed and goes to the condenser at 165 pounds head pressure. The warm gas then goes through the condenser and the condensing water at 54 degrees Fahrenheit liquifies it. The liquid ammonia then goes to an accumulator, from whence it is delivered to the expansion pipes. The expansion pipes are in a tank filled with brine. When the liquid ammonia expands in these pipes it draws heat from the brine. The brine is kept at a temperature generally of 10 degrees Fahrenheit. The cans filled with distilled water are immersed in the brine and frozen. The gas which has expanded to about 15 pounds pressure is drawn back to the compressor and starts over on its refrigerating cycle again.

The ice company has entered into a contract with the Metropolitan Electric Company for all electrical energy necessary for the operation of the plant. The electrical installation consists of: one 300-horsepower motor driving the ammonia compressor; four 2-horsepower vertical motors on the brine agitators; and one 20-horsepower motor driving the air compressor, water for the plant being taken from a well. A. L. Hart, of the power department, secured the contract for the Metropolitan Electric Company.

Advertising That Brings Power Business.

In its efforts to increase power business the Union Electric Light & Power Company, of St. Louis, Mo., has inaugurated a commendable advertising campaign which is meeting with much success. The accompanying illustration is a reproduction of a typical newspaper advertisement used in this connection. The feature of each ad is an illustration of the plant of some large customer with a statement of the customer's opinion of central-station service appended. In this case a large woodworking establishment, the H. Pauk & Sons Manufacturing Company, is used with a statement of Mr. Pauk reading, "As a result of installing motors on our woodworking machines we have increased our plant output, and for the same cost of operation we very much prefer purchased energy to that of our own generation. It has cost us less to operate with central-station service than with a steam plant which we used for years."


ALSO—

This Plant Is Operated by "Union Electric" Service

¶ Plant of H. PAUK & SONS MANUFACTURING CO. 1309-1327 N. Fifteenth St.

¶ Mr. Pauk replaced the steam plant with UNION ELECTRIC service in August, 1910, since which time he has operated by Central Station service exclusively, using over 170 horse-power in motors.

¶ Our manufacturing customers are greatly pleased with our service and do not hesitate to say so. In speaking of our Central Station service Mr. Pauk says:

"As a result of installing motors on our woodworking machines we have increased our plant output, and for the same cost of operation we very much prefer purchased energy to that of our own generation. It has cost us less to operate with Central Station service than with a steam plant which we used for years."

¶ Such expressions of satisfaction as the above are very gratifying.

¶ Our power engineers will gladly investigate your plant and submit a report without obligation on your part.

Phones:
Main 3220.
Central 3530.

Typical Advertisement of the Union Electric Light & Power Company Used in Power Campaign.

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Reduction in Rates at Morristown, Pa.

H. H. Ganser, manager of the Counties Gas and Electric Company, Morristown, Pa., furnishes the following data relative to the reduction in electricity rates recently effected.

Sliding scale rate for kilowatt-hours:

First	100	per month @	10c.
Next	100	per month @	7c.
Next	100	per month @	6c.
Next	100	per month @	5c.
Next	400	per month @	4c.
Next	500	per month @	3c.
Over	1300	per month @	2c.

Minimum charge; No bill submitted on this schedule less than $2.00. If the connected load of a consumer is more than two horsepower the minimum charge shall be $1.00 per horsepower for all connected load.

Discount: Bills to be rendered at one cent per kilowatt-hour above the foregoing rates and subject to a discount of one per cent per kilowatt-hour if paid at the office of the company within ten days after presentation.

When the current consumption for any month computed at the aforesaid rates exceeds $75, the consumer shall be entitled to a further discount of 10 per cent thereon, provided the amount of such further discount shall not reduce the amount due for such consumption to an amount less than $75.00.

Supplementary discounts: No. 1. Where the company supplies the consumer with electric energy at the primary voltage of its distribution line, and the consumer furnishes the necessary transformers, a further discount of 5 per cent will be allowed from the monthly bill, figured at the aforesaid rate.

No. 2. If the power-factor on the entire load, due to lagging current, is maintained at 95 per cent or better, a further discount of 5 per cent will be allowed on bills figured at the aforesaid rate.

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Commonwealth Edison Company Makes Big Increase in 1913.

Statistics have recently been made public showing that during the year 1913 the Commonwealth Edison Company, Chicago, increased its total connected load by the equivalent of about 2,400,000 50-watt units. Of this increase nearly 61,000 horsepower is due to increase in the railway load. The number of customers increased 31,098, or 17 per cent.

Remarkable gains were also made in commercial lighting and power, the output of energy for this service increasing 22 per cent over 1912. The total connected load of the company is now equivalent to more than 13,000,000 50-watt units. The total rating of generating stations is about 350,000 kilowatts.

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Life Insurance for Utility Employees.

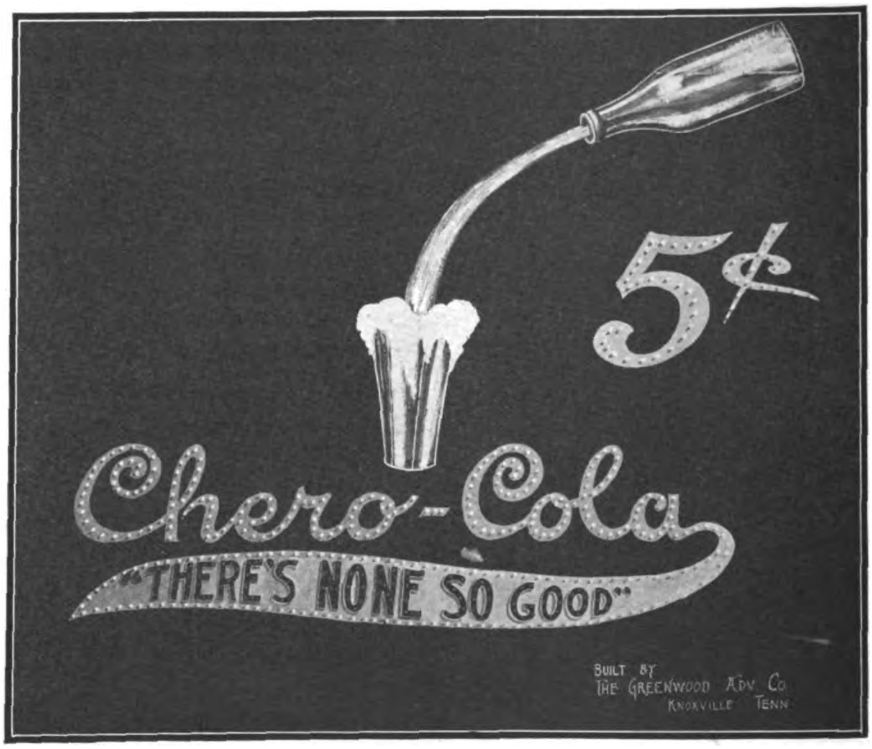
The United Railroads of San Francisco, which operates most of the street railways in that city, has adopted a policy of taking out life-insurance policies for its employees, and about $1,250,000 in policies were distributed to the men at the first of the year. Every man who has been in the company's employ for three years is insured for $250; for four years, $500; for five years or more, $1,000. Policies were issued to 1,587 men.

Electric Sign Data

Selling Electric Signs.

Electric signs are about the easiest commodity on the market to sell, providing the salesman is equipped with definite data of a character that will interest the prospect. The market for electric signs is almost without limit and the demand is ever increasing. In spite of this, however, the complaint is heard on many sides, particularly from central stations, that the lack of definite information with which it is possible to equip the central-station salesman in his fight for this class of business has been the cause of somewhat retarding sign development. One utility manager writes, "If an insurance man attempted to sell life insurance to a prospect and was not backed up with any more good, solid concrete facts and arguments than the central-station solicitor is backed up with in his efforts to obtain such business, I am of the opinion that the charitable institutions would be gorged and overflowing with widows left without a sustenance."

It is with the hope of relieving, to some extent, these conditions that we inaugurate this sign section, in which will be published, each week, a sketch or photograph of some original or noteworthy sign that may be used by central-station or sign salesmen in interesting prospects in a similar line. Data will be given regarding the equipment of the sign, color and flashing effects and approximate cost. Attention is called to the standard size of the data sheet, which can be cut from the page and made the basis of a "sign data book."



Electric sign being built for the Chero-Cola Company by the Greenwood Advertising Company, Knoxville, Tenn.

Dimensions of the sign are 40 feet high by 40 feet wide. 900 five-watt lamps are used.

Flasher effect comprises a bottle emptying into the glass which fills up and froths over in a realistic manner. Following this the words "Chero-Cola" and outline of tail light up on one switch; then the big figure "5" and cent mark and lastly. "There's None so Good" in red letters.

The color scheme is brought out in the bottle and glass with amber and red Betts & Betts color caps with opal caps of the same make used on the foam.

The approximate cost of the sign is $2,000 erected, complete.

In order to make this section entirely representative, we earnestly solicit the co-operation of sign manufacturers and salesmen. Central stations are also invited to send accounts of sign campaigns and to advise as to their methods of securing customers, etc.

The first suggestion offered is that of a Greenwood sign manufactured for the Chero-Cola Company of Columbus, Ga. The sign is very effective and is giving entire satisfaction to the purchasers. National and local advertisers dealing in beverages should be interested in this suggestion.

In connection with soliciting sign business too much emphasis cannot be placed upon the item of cost. The sign data book of the Commercial Section, N. E. L. A., states that "overloading the customer" is bad practice, whether in merchandise or advertising. It should be the salesman's policy to sell his customer a sign that fits both his business and pocket-book.

In estimating the costs and value of electric advertising three things must be considered—the size and first cost of the sign; the cost of current and maintenance; and the cost or value of the location. Against these items should be set down as credits, the advertising value of the sign and its efficiency as a sales influence.

It is obviously impossible to give any useful approximations of cost. The salesman should endeavor to persuade his customer to make an investment in proportion to the importance of the business—neither extravagant and wasteful, nor small and undignified. Especially should the customer be warned against trying to crowd over-much reading matter into the sign by using too small letters.

"Cut your cost to fit the cloth" is a mighty good motto to remember in this connection.

Also, the sign salesman should carefully study the location before recommending a sign. Such a study includes careful analysis of the number and class of passers-by, the distance from which the sign could be read, etc.

Electrical Construction

A METHOD OF CONDUIT CONSTRUCTION.

A Short Discussion of a Mode of Conduit Installation of Recent Success which Has Been Used On a Number of Street-Lighting Schemes.

By H. E. Weightman.

The writer had the pleasure of seeing the completion last year of two of a number of underground conduit jobs that are of general interest on account of the method of laying pursued.

The first job was of bituminized-fiber duct, of which about 27,600 feet was laid, with 38 manholes and 226 handholes. The conduit line was to supply 226 street lights of a series tungsten system.

A discussion of the lighting system will be in order as it will give the reader an idea of the layout of the work. The lamps were mounted on a twelve-foot ornamental iron pole with a sixteen-inch globe inclosing the lamp. The posts were set on concrete bases 2.5 feet square and 4.0 feet deep and securely anchored by means of four ⅞-inch bolts. Into this base was built a pipe bend of the same material as the conduit. At each lamp was built a handhole in the duct lines and branch duct or laterals were run from the handhole to the bend built in the lamp base. In each block were built two manholes. These manholes were of concrete, oval in plan, 6.0 feet long, 3.5 feet wide, and 4.0 feet deep, with cast-iron covers. The illustration shows the manhole, which was standard for both jobs.

The second job consisted of vitrified-clay duct, about 31,940 feet being laid. There were 232 electric light poles and handholes, with 55 manholes.

The duct, excepting under driveways, was laid on undisturbed earth, in true alinement, with closed joints, and over the joints was placed a three-inch-wide burlap, over which was troweled a reinforcement of cement mortar, two inches thick in the case of the vitrified-tile duct. In placing the bituminized-fiber duct no cement mortar was used, the lengths being joined only by the sleeves furnished by the manufacturer of the duct. The conduit of either type was reinforced by a four-inch bed of concrete on all sides where the duct ran across the streets or under driveways. All conduit was of three inches internal diameter and was laid 20 inches below the surface and back of the curb line.

The above method was used from motives of economy and has been used quite successfully in late years. Whether to use a concrete encasement or not seems to be chiefly a question of interest on the investment in the encasement versus the cost of repairing the conduit and inclosed cable where they are damaged by the predatory street paver, and each case must be decided on its own merits. In the cases mentioned, the conduit was placed back of the curb line so that there was very little likelihood of its being disturbed.

Whether to use bituminized-fiber or vitrified-clay conduit for this kind of work will depend upon more than duct cost and life. The conditions of soil it is to be laid in, such as drainage and the presence of foreign currents from power conductors, are some of the factors governing the case. Just how some of these affect the problem will be considered later.

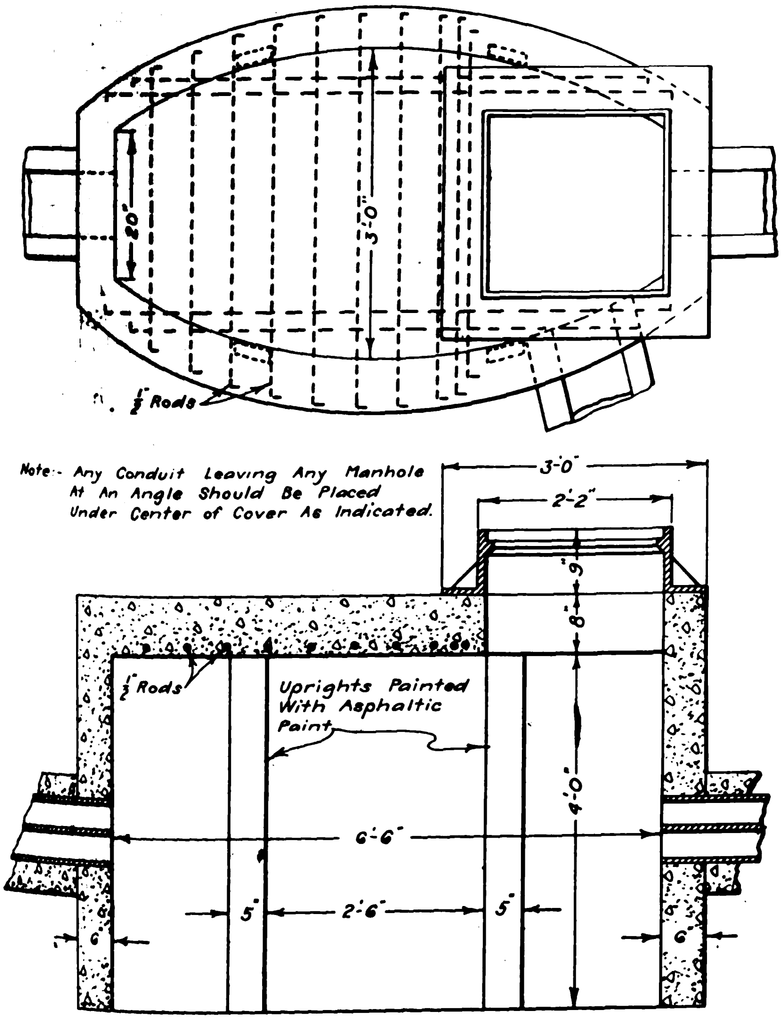
Among the advantages which bituminized fiber has over the vitrified-clay duct are: It is light, reducing freight and handling costs. More of this duct can be laid in a day's work, with less skilled laborers, than can be done with clay. It is possible to make it in longer lengths, which means fewer joints. The body is more waterproof than clay.

Some things that must be considered before omitting the concrete encasement on conduit systems are as follows:

(1) Mechanical injury.

(2) Chemical decomposition of the cable sheath.

(3) Electrolysis.


20"
3'-0"
½" Rods
Note:- Any Conduit Leaving Any Manhole At An Angle Should Be Placed Under Center of Cover As Indicated.
3'-0"
2'-2"
6"
8"
½" Rods
Uprights Painted With Asphaltic Paint
4'-0"
6'-6"
5"
2'-6"
5"
6"
6"

Details of Manhole.

Considering the first of the above factors, mechanical injury—with the conduit placed in the street it would be extremely liable to be damaged by excavators for plumbing, etc., and the conduit would be fortunate indeed if it were not completely knocked out of alinement when an attempt was made to roll the street previous to paving. Where the ground is very moist there is a greater tendency to settle and such conditions must be carefully considered. It would be hardly safe, if possible, to omit the concrete encasement on a line of more than one or two ducts. On the writer's jobs, as the conduit was placed back of the curb and in a firm, well drained sandy soil, it was advisable on the score of economy to omit the encasement.

I have separated chemical decomposition from electrolysis in my discussion because there are cases where chemical action, with no assistance from foreign electrical currents, has caused considerable damage to lead-covered cable. The usual question is, what is the cause of such deterioration? Poor drainage is the chief cause of such damage and with a water-holding soil adjacent to the conduit the action is much intensified. If the water were pure it would have no action on the lead sheath by itself, but in the presence of free oxygen in the air the lead is quickly attacked, with a formation of a hydrated oxide which is appreciably soluble in water and forms an alkaline liquid. When carbonic acid or nitrate of ammonia is present the action is intensified. In ducts which are not properly drained this is particularly noticeable. The water of course percolates from the surface of the street and in traversing the ground picks up the sulphur and nitrogen componds that are in the coal gas with which the earth is permeated. As a rule it, also, gathers some chlorine; then while working into the duct, through the ordinary poor cement joint, of which the newer method of conduit laying is a splendid example, it gathers up carbonates from the cement. The water also takes up in the street a certain amount of tannin from the leaves, grasses, twigs, etc., besides uric acid and other animal matter. Therefore, when the water finally reaches the inside of the duct, it is extremely well saturated with elements capable of attacking the lead sheath with great vigor.

To eliminate these effects, then, we must do three things:

(*a*) Build the conduit so that no water will ever lie in it, i. e., with a slope from the middle of the duct both ways toward the manholes.

(*b*) Try and make absolutely watertight joints.

(*c*) So plan the drainage that water will not stand around the conduit.

On the second job of our discussion the soil was sandy and well drained toward the lake so that the sand was always comparatively dry. The soil was so free from vegetable and other water-holding matter that it was necessary for the gardener to haul black earth to the job to plant his trees in. On the first job the soil was more moist and as better drainage could not be expected, bituminized-fiber duct was used. As mentioned before, the latter style of duct cuts the number of joints down remarkably and as the sleeves make a good tight joint and the duct is more waterproof than clay, it was easily the best to use. There was also more danger of soil settlement which again indicated the use of bituminized-fiber conduit.

Consider now how electrolysis would affect the problem. As stated before, the conduit is more liable to contain water of a destructive chemical nature where the concrete encasement is not used and the presence of increased quantities of acidulated or alkaline water will do a great deal toward furthering electrolytic action. There are a considerable number of good theories in regard to electrolysis, but the one I am about to write, seems to fit the present case nicely and is simple. White lead, used largely in the manufacture of paint, is made as follows. Hydrated oxide of lead, mixed with carbonate of lead in the proportion of 25 per cent of the former to 75 per cent of the latter, is cast into little disks not more than ⅛ inch thick. These disks are put into glazed earthen pots with a small quantity of acetic acid, then a number of pots are put in a bin and the whole covered with spent tanbark or other fermenting vegetable matter and left for three months. The temperature rises; complex chemical decomposition takes place, and the lead is converted into what we call white lead to the amount of about 65 per cent of the materials put in the pot. The residue is remelted and is again put through the same process until all is converted. Now, our cable in question, lies in a glazed-tile duct corresponding to the pot at the white-lead manufacturer's. Our chemicals are furnished as stated before under the chemical decomposition of lead sheaths. You will see that we now have all we need to start the making of white lead on a small scale. Now when stray currents from some power circuit traverse our cable we have a slight element of heat; slight, it is true, but, continued for any length of time, will do considerable damage.

In the jobs mentioned in this article the probability of damage from this source was slight enough to allow the concrete encasement to be left off without the expectation of great danger from this source. Then, too, the cost of replacing the cable will not be as great as the interest on the investment for the encasement.

As given above, there are numerous disadvantages to building conduit lines without the concrete encasement and the only possible advantage probably lies in first cost and interest on the investment, versus increased maintenance costs. Each case must be settled on its own merits. What would be economically possible in one case might not do at all in another, even in the same locality. This happens to be the case near the bituminized-fiber job mentioned above.

Another job in the same vicinity is nearing completion in which vitrified-tile duct is being used. On this job there will be approximately 45,700 feet of tile duct, 76 manholes, 367 handholes and electric light posts. On this job the drainage is considerably better and the profile such that it assists the sewers in draining the area.

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Standard Metal Finishes.

At the last annual convention of the National Electrical Contractors' Association, held at Chattanooga, Tenn., a committee was appointed on Standard Metal Finishes, of which Paul H. Jaehnig is chairman. The committee arranged sample cabinets containing specimens of the various styles of finish which they thought might be made standard. Each of these is designated by a letter and number. Thirty-four different samples are contained in this cabinet, which opens on a hinge and is dust tight. Final adoption of this collection of finishes as standard will depend upon the action of members of the Association in declaring their preference for the scheme. The committee has sent out circulars explaining the matter to the members of the Association and the proposal has met with enthusiastic response from a great many of the members.

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Fire Protection Meeting.

The Chicago Chapter of the National Fire Protection Association held a meeting on the evening of January 12 in the auditorium of the Chicago Board of Underwriters. The speaker of the evening was R. D. Kohn, of New York City, who is president of the National Fire Protection Association. Short addresses were made also by Mr. Miller, superintendent of buildings in New York City, who is president of the New York Chapter, and by F. J. Stewart, superintendent of the New York Board of Underwriters.

The Chicago Chapter was organized at a meeting held on December 15, 1913, and it is planned to hold monthly meetings of the local members and to cooperate with all local civic bodies in an endeavor to reduce excessive fire waste. The president of the Chicago Chapter is Frank D. Chase, and the secretary is William S. Boyd.

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A Reel For BX Conductor.

Perhaps one of the worst articles to handle around a contractor's shop is a loose coil of BX conductor. In order to keep it in good condition and have the coil in neat shape we made a reel which is illustrated in the accompanying figure. First a cross-piece is made by building up seven-eighth-inch pieces to double thickness, as shown in Fig. 1. This acts as a carrier and upon it is mounted a wooden candy pail, which was readily obtained. This is toe-nailed to the cross-piece and a piece of conduit of any convenient size is run through for a spindle and is provided with large washers and locknuts at the ends to hold it in place. Below the carrier arms are mounted four ordinary furniture casters. These permit the reel to turn freely. The reel is mounted on any convenient box and the coil of BX is simply dropped over the candy pail. The coils are all of nearly the same size, so that they fit on the same reel well enough. This arrangement saves much time in handling, as well as space.

E. M. Raetz.

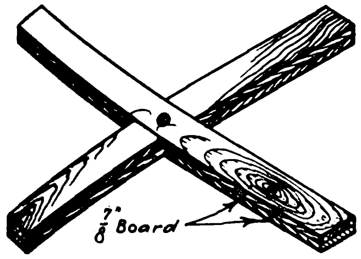


Fig. 1.—Cross-Piece.

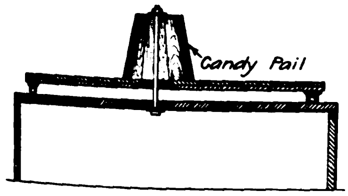


Fig. 2.—Complete Reel.

◆

Signaling in New York Police Department.

A scheme for signaling to policemen on their beats was installed last month in New York City, as a trial installation. On top of each street post bearing a telephone box there is mounted a green lamp. When the lieutenant at the station desk presses a button, lamps are lighted on five of these posts, which are, of course, on five different beats. The lights remain on until some one of the five men answers by telephone. This installation is being tried in the West Thirtieth Street Station District.

◆

Among the Contractors.

The Electric Construction Company, of Salt Lake City, Utah, has taken over the business and stock of the Inland Electric Company and the Gunn Electric Company.

The W. H. Smith Electrical Engineering Company, of Portland, Ore., has secured the contract for the electrical work in the Pittock Building.

The contract for the electrical work on the new county buildings being erected by Cook County, Ill., at Oak Forest, has been awarded to W. F. Cummings, of Chicago.

H. A. Haynes, of Chester, Pa., has secured the contract for the electrical installation of the Texas Oil Company at its Delaware River terminal.

The Jamestown Electric Company, Jamestown, N. Y., has secured the contract for the electrical installation in a large printing establishment in that city.

Hoben and Marry have recently established an electrical contracting business at 124 East Simmons Street in Galesburg, Ill., where each has had an extended practical experience. The company is specializing particularly in the installation of farm lighting systems for which it has an agency in that locality.

Spence & Finn, Altoona, Pa., have the contract for the $10,000 residence being erected at Altoona by W. Frank Vaughn.

The Keele Electric Company has recently started a general electrical contracting and repair business at 706 Jackson Street, Topeka, Kans. B. Keele, who is manager of the company, has a wide acquaintance in Topeka, where he has had an extended practical experience in the electrical business.

The Machinists' Electric Company, of Topeka, Kans., is wiring the new state printing plant at Topeka, which is expected to be ready for occupancy by March 1.

The Tucker Electric Company, of Topeka, Kans., has just completed the installation of the "White Way" in North Topeka. The cost of the installation was $16,000.

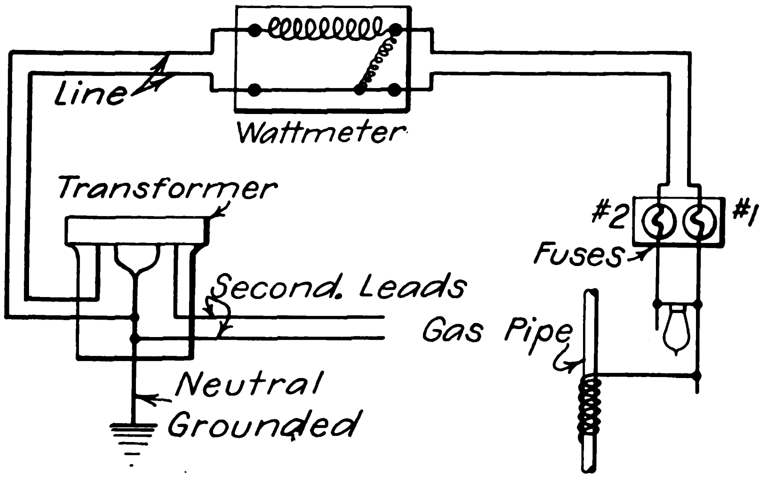
◆

Detecting a Theft of Current.

On lines where the transformers have the neutral grounded it is often sought by current thieves to transpose the line wires so that it is the neutral instead of the outside wire which is connected to the current coil of the meter. Beyond the meter this circuit goes through a fuse and beyond the fuse the neutral side is bonded to a gas pipe or other ground connection. The meter will probably operate until the fuse on the grounded line is unscrewed, after which no more current will be registered. These connections are shown in the accompanying diagram.

The inspector can detect this condition by seeing whether the lights on the circuit go out when each fuse is unscrewed individually. If the lights continue burning after fuse No. 1 is unscrewed, it indicates that something is wrong. I have found, as inspector, a number of cases in which this scheme had been used to steal current.

E. V. Smith.



Wattmeter Connected in Grounded Line.

◆

Flux for Aluminum Solder.

A flux for aluminum solder has been invented and patented by Hugo Hammar, of Delhi, N. Y. It consists of soft soap and beeswax, in the proportion of one part of the former to four parts of the latter.

The Electrical Contractors' Association of Wisconsin.

The eleventh annual meeting of the Electrical Contractors' Association of Wisconsin was held at the Hotel Wisconsin, January 12, 13 and 14. Monday morning, January 12, was devoted principally to registration and in the afternoon there was a business session. In the evening the Association went in a party to the Majestic Theater.

A business session was held on Tuesday morning when a discussion of the Lien Law was participated in.

On Tuesday afternoon there was an open session at which addresses were made as follows: Ernest Freeman, president of the National Electrical Contractors' Association, "The National Electrical Contractors' Association"; W. W. Low, "'The Relation of the Jobber to the Contractor"; F. F. Skeel, "The Relation of the Manufacturer to the Contractor"; F. A. Vaughn, "The Relation of the Consulting Engineer to the Contractor"; A. C. Langstadt, "The Relation of the Contractor to His Business Relatives."

Mr. Freeman spoke at some length regarding the history and development of the National Electrical Contractors' Association. He recited the growth from its beginning in 1902 with 31 members to its present position in the field with 1,250 members representing every principal city in the country. Some of the work that Mr. Freeman spoke of particularly related to the activity of the Association with respect to establishing uniformity in the interpretation of the National Electrical Code, the preparaton of a set of symbols for electrical installation details which have become practically standard and universal, the preparation of charts establishing the proper conduit sizes for circuits of various dimensions, the standardization of screws and screw parts, fixtures and the finish of plates. The work of the legislative committee, especially with reference to a uniform license law, was referred to.

Mr. Low called attention to the low average charge usual with the contractors' orders upon the supply dealer. Looking into the business of one large supply house it is discovered that 66.6 per cent of the entire volume of the business is for orders of less than $10. The average is about $2.19. Something like 60 per cent of orders from contractors are handled at a loss. Notwithstanding this the sliding scale of prices which the jobbers have effected in practically all cases protects the contractor against the small user of electrical supplies who would prefer to buy from the jobber in order to get a little better price than could be given him by the local dealer. However, in spite of the protective feature of the sliding-scale arrangement a great many contractors have persistently tried to break down this arrangement and to Mr. Low's mind this was a very grave mistake. Incidentally the contractor invariably prefers to deal direct with the manufacturer when large orders for material are involved. This is anything but a recognition of the supply man's position with relation to the contractor, and ignores the fact that the supply man establishes a warehouse whereby the contractor can get material from fresh stocks at any time, order material in any emergency and have practically immediate deliveries.

Mr. Skeel made an eloquent plea for competition upward. It was his opinion that the contractor could be a very elemental force in bringing about a recognition of quality of materials for electrical installations. It has been observed that the contractors as a rule could not be depended upon to recognize superior qualities in materials of construction, and rather than run the chance of losing a contract they would make their bids for the work based upon the use of the cheapest material.

Mr. Vaughn's paper was presented by A. J. Sweet. A consulting engineer usually establishes a code of ethics which builds for him a reputation. It is a matter of pride with the consulting engineer to work toward quality and invariably he specifies goods which have passed tests for superiority. With the consulting engineer in charge of the specification all contractors are placed on a parity and there is no tendency to use poor material or to work against the best interests of the client through skimping the job. The contractor can co-operate with the consulting engineer by giving him the benefit of his experience and by making a conscientious effort to work with the engineer so that the client will get a good job. Mr. Vaughn is of the opinion that the architect should devote all of his energies to following the study of architecture and that the properly equipped architect is not in a position to be familiar with the many details and the rapid advances made with respect to engineering requirements. The consulting engineer is by training and constant study equipped to handle the engineering problems and a ready co-operation upon the part of the contractor will rapidly establish an improved position for contracting generally.

Mr. Langstadt spoke in a happy and optimistic mood respecting the possible relations, of the contractor with the electrical supply jobber and the manufacturer. It was his opinion that most of the difficulties that beset each of them was due to a lack of proper getting together. There was too much of a tendency of each trying to be first and ignoring the rights of the other. The ideal situation would be reached when the manufacturer upheld the jobber and the jobber upheld the manufacturer and the contractor upheld both. The jobber as a rule was disposed to be fair and the contractor could not expect to go to the jobber and get something for nothing. There must be reciprocation and harmonious effort upon the part of each.

The session was enlivened by a spirited discussion of the jobber-contractor situation. On the one hand it was held that the contractor was suffering grievously from labor troubles in one direction and through the pernicious efforts of certain jobbers who were sending their salesmen throughout the country and peddling electrical supplies of every description in small lots, giving the consumer as good a price as the contractor was getting. The idea was advanced that the contractor was in business as a permanent institution and that he created a special trade entity which should have the full recognition of the supply man and manufacturer, and that where the consumer was not in this class that he should be penalized because of the temporary character of his demand. On the other hand, the proposition was advanced with equal vigor that the jobber, through the arrangement of a sliding-scale of prices, was treating the contractor as a trade ally, and that there was ample compensation and opportunity for profit in the difference between the price made to the contractor as a trade entity and the price to occasional consumers.

At the close of the formal session A. A. Gray, of Chicago, delivered an address explaining the plans and policies of the Society for Electrical Development, Incorporated, on behalf of J. M. Wakeman, general manager, who was not able to be present. Mr. Gray stated that latest advices from the general office in New York indicated that there were 1,181 members subscribing to the Society, comprising 157 electrical manufacturers, 249 central stations, 245 jobbers, 514 electrical contractors and 16 miscellaneous affiliations.

In the evening the annual banquet of the Association was held at the Hotel Wisconsin, L. W. Burch, of Madison, Wis., acting as toastmaster.

At the business session on Wednesday morning officers were elected for the year as follows:

President, W. R. Johnson; vice-president, L. W. Burch; treasurer, George Knoerr; secretary, Albert Petermann.

The summer meeting will be held at Detroit at the same time as the meeting of the National Electrical Contractors' Association.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Reinforcing a Hickey.

To keep the thread of a hickey from breaking, force a piece of three-quarter-inch conduit about 12 inches long into the lower end of the hickey, keeping it flush with the threaded end, as shown in the figure. This will tend to keep the thread from breaking and will insure a solid hickey. I have used mine for two years and have never had any trouble with it yet. E. Gelbgesser.

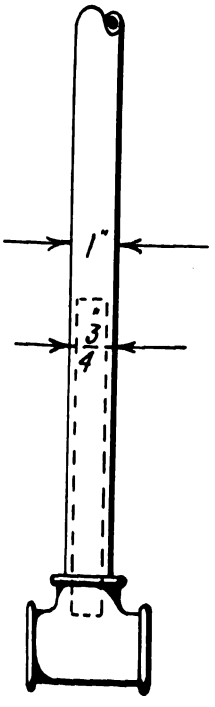


Fig. 1.—Reinforced Hickey.

Replacing Lamp Retainer of a Film Socket.

The following method was devised for changing the lamp retainer of film sockets on a series street lighting circuit without the necessity of carrying a ladder. For removing and replacing the lamps the men were using Mathews lamp changers on the ends of long poles. I suggested fastening an old lamp base on the other end of the pole. This can be screwed into the socket and the lamp holder then pulled out and replaced. This also does away with any possibility of danger from handling the lamp or socket when the current is on. J. G. Wetmore.

Tracing Connections.

I was recently called upon to number the meter loops to correspond with the numbers of the suites in an apartment house. The wiring had been completed but no meters had been installed. Not wanting to take the fixtures down and cut in at the wires, I used the following scheme. I took a piece of cord with an extension plug on one end and a battery connected to the other. I screwed the plug into the socket of a fixture and then went down to the meter closet and found the corresponding pair of wires by means of a bell. In this way I was able to quickly pick out the pair of wires coming from each flat. A. B. Whiteman.

Stripping Insulation.

Fig. 2 shows a little tool which I use for skinning lamp cord, fixture wire, etc. It is made from a strip of strap steel an inch wide. The edges at *A* and *B* are filed sharp enough to cut the insulation. It is then bent into the form shown. When the lamp cord is slipped between these jaws and given a slight twist the insulation will slip off readily without breaking any of the small strands of wire. F. H. M. Riley.

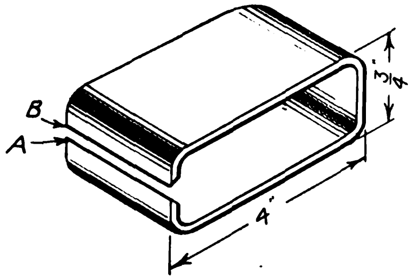


Fig. 2.—Tool for Skinning Cord.

Drilling Marble or Slate.

A method for making it easy to drill marble or slate has already been given, but I have learned of a much better method which I used recently in a plant where a lot of switches and cutouts were to be installed upon iron columns, which necessitated considerable drilling of the slabs for mounting. By using a little ammonia as a wash, flushing the drill and hole with it while boring, the job becomes like cutting butter with a hot knife. R. H. Eddy.

Operating a Bell on a Closed Circuit.

The ordinary stock type of vibrating bell cannot be operated from closed-circuit batteries such as are frequently found in alarm installations. It is common practice to install a relay and supplementary battery. This can be obviated by making a very slight change in the bell connections so that no extra relay and battery are necessary. The connections are shown in the accompanying figure. The battery is connected to the two usual terminals, but the contact of the vibrating tongue is connected to the proper binding post through a push button, which is arranged to be ordinarily closed. Upon operation of this push button, this circuit is opened and the bell will ring. Ben R. Browne.

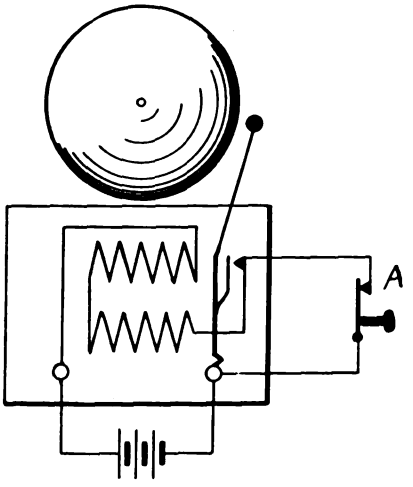


Fig. 3.—Operating Bell on Closed-Circuit Battery.

Getting the Conduit Plumb.

I recently had a job where I had to run quite a lot of piping on side walls to switches and the owner was very particular to have all the piping plumb. I cut a V-shaped notch in the end of a board about three inches wide, which was long enough to reach from the floor to the ceiling. In the notch I fastened a cord with a plumb bob. All I had to do then was to stand the board against the elbow at the ceiling in order to plumb the pipe, as shown in the accompanying figure.

E. Ammann.

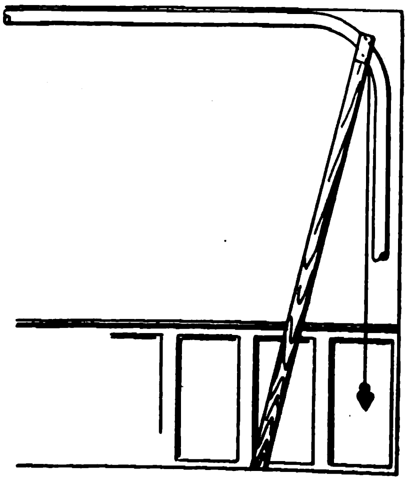


Fig. 4.—Plumbing Conduit.

Public Service Commissions

CALIFORNIA.

The Railroad Commission has rendered a decision denying the application of the Coast Counties Gas & Electric Company for authority to issue 2,000 shares of its six-per-cent preferred stock.

The Midland Counties Public Service Corporation was granted authority to issue $79,000 of bonds for the purpose of paying off indebtedness incurred in construction of new lines.

Authority was granted to the Tulare County Power Company to issue $80,000 in stock for enlargements to its steam plant and for the construction of new lines and distribution systems.

A decision was rendered granting authority to the Northern California Power Company, Consolidated, to issue $12,000 of promissory notes.

KANSAS.

The United States Supreme Court in a recent decision upheld the power of the Public Utilities Commission to revise existing rates regardless of a contract between a city and the utility company fixing the rates for gas, which exists in the company's franchise. This is in conformity with another recent decision upholding the power of the State Railroad Commission of Kentucky to control the rates of the Louisville & Nashville Railroad, regardless of the fact that the maximum freight rates were fixed in its original charter granted in 1850.

MASSACHUSETTS.

In his inaugural address January 7, Governor David I. Walsh made important recommendations to the Legislature of Massachusetts on matters affecting electric lighting and power companies. Chief among them was the recommendation that the supervision and regulation of water power and electric power companies be given at once to the Gas and Electric Light Commission. There is at present no regulation of these companies by a public service commission. Governor Walsh says they should be subjected to the same supervision as to capital and rates as railroad, telephone, telegraph, gas and electric light companies.

The Governor advises the doing away with a present obstruction to the municipal ownership of lighting utilities, by which no town or city in the state can now undertake either electric or gas lighting without purchasing both the gas and electric lighting plant privately owned, if there is such a company in the community. The law now is, that the private company can at its option compel the city to buy its property, or it may refuse to sell and continue in the business as a competitor of the municipality, but the law gives no option on this matter to the municipality itself. In other states either no restriction is imposed on the entrance of the municipality into the business, or it is only required to obtain from the state board supervising the industry a certificate of public convenience and necessity. It is recommended that the Gas and Electric Light Commission be given authority to exempt municipalities from the compulsion to purchase existing plants, after a public hearing and upon petition by the local authorities. The Governor further recommends that the supervision and regulation of telephone and telegraph companies be transferred from the Public Service Commission to the Gas and Electric Light Commission, and that all public utility companies regulated by public commissions should reimburse the state for the expense of such regulation. This rule now applies to gas and electric light companies, but the companies supervised by the Public Service Commission have been exempt, though formerly railroad and railway companies reimbursed the state for the costs of the Railroad Commission.

The full bench of the Supreme Court of Massachusetts has annulled the order by which the Public Service Commission last August authorized the New York, New Haven & Hartford Railroad Company to issue convertible bonds to the amount of $67,552,000.

The Public Service Commission has approved the giving of free transportation to district nurses by the Connecticut Valley Street Railway Association, with the understanding that this action shall not be construed as establishing a precedent for similar action in the future.

The Gas and Electric Light Commissioners of Massachusetts have submitted recommendations to the Legislature looking to a clearer defining of their powers in cases of stock issues. During the past year the Supreme Court of the state has issued an important decision, in which the Commission's authority in the case of the Fall River Gas Company's request for the approval of an issue of securities, which was dismissed by the Commission, was overruled and the right to issue approved. The court's action calls in question the fundamental principles of state regulation of stock issues. The laws have aimed at limiting the issue of securities by public service corporations to their actual needs and to prohibit the representation in additional securities of surplus earnings invested in plant. The theory has been that the volume of securities outstanding has a strong effect on rates and quality of service. The Commission says that the court's decision was couched in such language as to be made the basis of a claim that the only function of the Board is to determine whether the amount of money to be raised is necessary for the particular work done or to be done. It is also asserted by some that all expenditures for new property must, if the company requests, be represented in new securities, regardless of the fact that no obligations may be then outstanding on account of such expenditures, or of the company's condition at the time the Board's approval is sought. The Board holds that these constructions are erroneous and that the Court did not intend to thus weaken existing law. The Board asks that future disputes be obviated by a definite legislative enactment.

The Gas and Electric Light Commission has approved the issue, by the Attleborough Steam and Electric Company, of 400 shares of new capital stock, at $150 per share, the proceeds to be applied to the payment of obligations incurred after June 30, 1913, in the enlargement of its generating station and equipment.

The Commission has authorized the Lawrence Gas Company to enter the town of Boxford for the supply of electricity for light, heat and power. Boxford has now no facilities for electric lighting.

MISSOURI.

The Supreme Court of the state has held that the Public Service Commission Act of 1913 repeals an ordinance of the city of St. Louis, passed in

February, 1911, for the purpose of regulating electric light companies. In 1907 the legislature authorized cities to appoint utility commissions and to regulate their own public utilities. An ordinance passed by the city of St. Louis required the Union Electric Light & Power Company to supply free meters and lamp renewals and to charge not more than 9.5 cents per kilowatt-hour for electric energy. The company carried the matter into court on the ground that this provision was confiscatory and that the act of the legislature upon which it was based had been repealed by the Public Service Commission Act. Both the lower court and the Supreme Court upheld the latter contention.

NEW JERSEY.

The Board of Public Utility Commissioners has submitted its annual report, covering the year 1913, to the governor. The Board sets forth that it has in this period approved of issues of stocks and securities to the total of $89,000,000, and has given approval to 84 ordinances and resolutions of municipal bodies granting privileges to public-utility companies. Suggestion is made for the prompt enactment of laws that will give the Board additional authority to control the issuance of utility corporation securities as follows:

(1) Specifically empowering the Commission to require proof when their approval to proposed security issues is asked, that there has been an adequate attempt on the part of the petitioner to ascertain and to obtain the highest price at which such securities may be sold; and in default of satisfactory proof, to impose as a condition of granting such approval, the advertising for sealed competitive bids for such securities, accompanied by certified checks guaranteeing the responsibility of the bidders.

(2) Amending the present law under which the Board's approval of the purpose of proposed security issues is made prerequisite to such approval, whereby such clause shall be defined by a prescribed rule indicating in general terms in what respect the purpose of the issue may be scrutinized by the Board with a view to approval or disapproval thereof.

(3) Making void all security issues by public utilities whether put out by way of sale or by way of pledge or hypothecation, and making such unauthorized issue a misdemeanor, unless the prior approval of the Board has been granted.

OHIO.

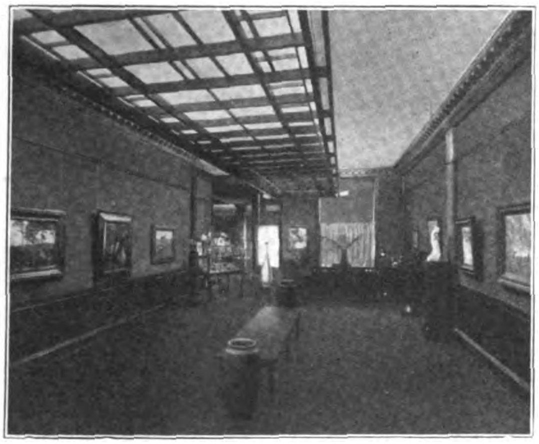
The Trumbull Public Service Company has been authorized by the Public Utilities Commission to issue its first-mortgage six-per-cent gold bonds to the face value of $148,000 to be sold for not less than 92 per cent of par. The proceeds are to be used for the reimbursement of income used for extensions and improvements.

The New Concord Water & Electric Company has been authorized to issue its 20-year, six-per-cent bonds to the amount of $17,000 to be sold for not less than 90 per cent of par. The proceeds are to be used for the payment of outstanding indebtedness incurred in construction, and for additional new construction.

The Lighting of Pictures.

The Artists Guild maintains in its rooms in the Fine Arts Building, Chicago, an exhibition of paintings and other objects of art and has recently experimented along the line of illuminating its exhibition rooms with a combination of mercury-vapor and tungsten lamps, with very satisfactory results.

The room in which this installation has been made is shown in the accompanying illustration, and has a floor area of 18 by 38 feet, with a ceiling height of 12 feet. The lamps are mounted above the large horizontal screen, which is seen in this picture, suspended three feet from the ceiling by chains. Hence nearly all of the light reaches the canvases indirectly, by reflection from the ceiling. The screen is 5 feet wide and 25 feet long. The lamps are divided into two groups and are mounted near the center line of the room, one group in each half of the room. Each group consists of a mercury-vapor lamp with a porcelain reflector mounted below, and four tungsten lamps surrounding it, provided with the No. 700 reflector manufactured by the National X-Ray Reflector Company. The tungsten lamps are each rated at 100 watts. The mercury-vapor lamps take 3.5 amperes and two are connected in series on a 110-volt circuit. Each lamp thus consumes about 190 watts, of which about one-third is dissipated in the series resistance which is necessary for regulation. These lamps when mounted in the usual way with a reflector above give a mean hemispherical candlepower of 300.



Exhibition Room A of the Artists Guild.

Artists have expressed great satisfaction with the effect obtained in this room and the way in which certain color tones of the pictures are brought out, especially those which appear dull when illuminated by incandescent lamps alone. Those in which blue and green tones predominate have their color values brought out more nearly in conformity with daylight effects. This installation was designed by George C. Keech, Chicago representative of the Cooper Hewitt Electric Company.

Harvard and Technology to Co-operate.

The Board of Overseers of Harvard University and the Corporation of the Massachusetts Institute of Technology have entered into a co-operation in educational work which has in view solely the best interests of those who are seeking the education. The two great institutions have before co-operated in the School for Health Officers, in its initial year already eminently successful, and in a far more important way they have agreed to join forces in a much broader field of scientific training, in which the prospects for success are even greater. It is neither more nor less than a co-operation in the conduct of the four courses leading to degrees in mechanical, electrical, civil and sanitary engineering, and mining engineering and metallurgy, and in the promotion of research in those branches of applied science. This agreement is bound to mark an era in the history of American education.

The movement is so novel and its consequences so far-reaching that a misunderstanding of the splendid character of the undertaking is possible, and yet, as is so often the case with great schemes the plan adopted is essentially simple. This plan is set forth in the agreement that has been entered into between the two institutions. The first principle and foundation stone of the whole matter is that the University and the Institute are to remain absolutely unaffected in name, organization, title to and rights over property or in any other way not specifically mentioned in the agreement. Each is to retain complete control of its own financial resources. Each is to be free to lay down such regulations as it likes with regard to the courses leading to its own degrees.

The co-operation is definitely limited to the great fields of engineering, all of which involve great expense in the maintenance of extensive and costly laboratories. In the interests of efficiency and convenience, for the concentration of effort and the elimination of waste and lost motion, it is agreed that all the work of education and research in these important branches of applied science shall be carried on within the buildings of the Institute, to be erected on its new site in Cambridge, bordering on Massachusetts Avenue and the Charles River Embankment. These buildings are being erected, arranged and equipped with a full knowledge of the best already existing in the world and with means and intention to surpass all others in fitness for their purpose.

For the maintenance and equipment of these laboratories and the payment of salaries, the University agrees to set aside practically all the money that it would otherwise be free to devote to education of this type. Technology, on its part, agrees to devote to the same general purpose all the funds or the income of funds that it now holds for carrying on work in the departments of engineering that have been named, and both institutions agree that their respective measures of support may be increased from time to time if disposable funds are available.

The faculty of Technology shall be enlarged by the addition to it of the associate professors of the four departments in the Harvard Schools of Applied Science, who, retaining their titles and privileges in Harvard University, will acquire the corresponding titles and privileges in the Institute. Similarly, the officers of corresponding rank in the four departments in the Institute will acquire the same titles and privileges in the University. The work of instruction and the laying down of courses leading to degrees is entrusted to the enlarged faculty of the Institute. Outside the departments of engineering that have been made, the faculty of the Institute will be appointed as at present—solely by the Corporation of the Institute. However, within the departments of mechanical, electrical, civil and mining engineering, both corporations will be concerned with the appointments of the instructing staff, but neither corporation will be called upon to make any payment of salary to a professor whose appointment has not been formally approved by it. The enlarged faculty will lay out courses of instruction for the students of both institutions.

The agreement is now complete, since it has been formally adopted and approved by the properly constituted authorities in both institutions.

THE ELECTROLYTIC DEPOSITION OF METALS.

Joint Meeting of Engineering Societies in New York City.

The 290th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on the evening of January 9, as a joint meeting with the New York Sections of the American Electrochemical Society and the American Society of Mechanical Engineers. President C. O. Mailloux called the meeting to order at 8:25 p. m. The first paper to be presented was by Lawrence Addicks, of the American Electrochemical Society, and was entitled "The Power Problem in the Electrolytic Deposition of Metals."

The Power Problem in the Electrolytic Deposition of Metals.

The whole question is narrowed down to a copper-refining plant as typical of this general class of electrolytic processes. Here the following power limitations are imposed by present practice: (*a*) direct current; (*b*) say 8,000 to 15,000 amperes; (*c*) say 100 to 200 volts per circuit; (*d*) resulting in 800 to 3,000 kilowatt units—1,000 to 1,500 in present installations; (*e*) circuits electrically independent, to avoid cross leakage; (*f*) constant current; somewhat variable voltage—say ± 20 per cent; (*g*) steady current load night and day; (*h*) steam needed for heating electrolyte; (*i*) plants of from 3,000 to 9,000 kilowatts should be considered.

Amperage.—This is fixed by the current density and the electrode surface per tank. The current density is fixed by a balance between the interest on copper tied up, the cost of power and the difficulties in practical handling of rough deposits. Fig. 1 shows the approximate relation between cost of power and current density in American practice; the high densities, of course, call for cheap water power. Twenty amperes per square foot of active cathode surface may be taken as representing practice in the vicinity of New York, with an ampere efficiency of 90 per cent and an average consumption of about 1 kilowatt-hour at the switchboard per 6 pounds of copper. Electrode surface per tank has been steadily increased until 30 pairs of electrodes, three feet square, are used in one case. This calls for a current of $30 \times 3 \times 3 \times 2 \times 20 =$ 10,800 amperes.

Voltage.—As we have to deal with a highly conducting electrolyte, containing 10 to 13 per cent of free sulphuric acid, which must be continually circulated to avoid stratification in the tanks, carefully studied construction is necessary to avoid serious trouble from leakage currents. These not only represent wasted energy, as shown by the so-called current efficiency, but wherever current jumps from the electrolyte to a lead pipe or other metallic conductor, a rigidly equivalent quantity of copper is deposited thereon and when traversing acid-soaked wood of relatively high resistance, a quantity of heat sufficient to cause a fire risk may be generated. It must be remembered that nearly the entire electrical energy produced at the generators appears as heat in the tanks. It can be readily appreciated that high voltages greatly aggravate these difficulties. While I have suggested 100 to 200 volts as the range per circuit, I favor the lower limit and do not believe voltages higher than 150 to be good practice.

Circuits.—The statements already made regarding current leakage indicate the undesirability of any electrical connection between generators, and I believe it would be necessary to use motor-generators instead of rotary converters in any scheme for distributing power from a large unit over several circuits.

Uniformity.—The first principle to be observed in the operation of an electrolytic refinery is uniformity of conditions. The process is very delicate and, while simple in theory, economy depends upon the successful balancing of many conditions to obtain the best results. In consequence, the current should be held at a fixed value, following variation in the resistance of a circuit with the voltage. Hand control of the field of shunt-wound generators is adequate, as the changes in resistance are very gradual. An exception to this statement is the case of cutting out sections of tanks for several hours when drawing copper. It is also necessary to carry up to 2 per cent insoluble-anode tanks, to correct the gradual accumulation of copper in the electrolyte, and as these require about six times the normal voltage for operation, they cause an appreciable variation in the total resistance of the tank house when they are added or withdrawn. To cover this range a field control of our typical generator from 120 to 180 volts at 10,000 amperes will be required.

Load-factor.—The operating conditions as described amount to practically 100-per-cent load-factor for both momentary and 24-hour loads.

Warming Electrolyte. — Electrolytes have a high positive temperature co-efficient of conductivity. As this amounts to about 0.5 per cent per degree Fahrenheit, and as the electrolyte represents about half the resistance of the circuit, it is evident that its temperature must be considered. In general, the electric energy dissipated in the tanks will maintain a temperature of 90 to 100 degrees and it has been found economical to add sufficient steam in closed-coil heating tanks to keep the circulating electrolyte at an average temperature of about 130 degrees. Exhaust steam can be used, and roughly an amount equivalent to one-fourth of the steam supplied to the engines is required. Additional steam is required for light and power, compressed air, pumping and the manifold requirements of a refining process of which electrolysis is but one step, so that figuring for the moment on the use of live steam for heating the electrolyte, only about one-half the total boiler capacity is used for electrolytic power generation. On the other hand, waste-heat boilers attached to the reverberatory furnaces which form a necessary part of every refinery will generate more than enough steam for heating the electrolyte and any other uses where steam, as such, is essential.

Size of Plants.—American copper refineries vary from 4,000,000 to 35,000,000 pounds monthly capacity. At 6 pounds per kilowatt-hour a 1,500-kilowatt generator would take care of 6,500,000 pounds per month. Eliminating the smaller plants and allowing for some future extension of the larger ones, we should consider from 2 to 6 circuits of 1,500 kilowatts each, equivalent to from

13,000,000 to 39,000,000 pounds of copper per month. Turning to present practice in the vicinity of New York, we find a very cheap source of fuel in No. 3 anthracite buckwheat at $1.75 per long ton delivered. Using this fuel, steam can be produced for about 15 cents per 1,000 pounds, including all operating expenses, but excluding administration, taxes, depreciation and interest charges. With this base price for steam, a kilowatt-hour can be safely figured at 0.4 cent on a similar basis, allowing for auxiliaries and a reasonable departure from ideal conditions in everyday operating. In fact 0.3 cent can be approached with first-class conditions. Present practice is to use moderate superheating and vacuum, with the highest grade of reciprocating engines. At the Raritan Copper Works four-cylinder Nordberg triple-expansion engines have recently been installed, while at the Chrome plant of the United States Metals Refining Company a triple-expansion unit using a compound Hamilton-Corliss engine with a Rateau turbine for the third expansion is being tried out. Previous installations have been chiefly confined to compound condensing units. Final figures for these recent installations are not yet available, but Fig. 2 shows about what can be expected from a 1,200-kilowatt unit of each type, excluding steam for operating condenser. The Chrome installation is of particular interest on account of the successful commutation of 6,000 amperes (the engine generator and turbogenerator running in parallel) at 1,500 revolutions per minute by a Rateau-Smoot generator. The installation cost of such power plants may be roughly taken at $100 a kilowatt.

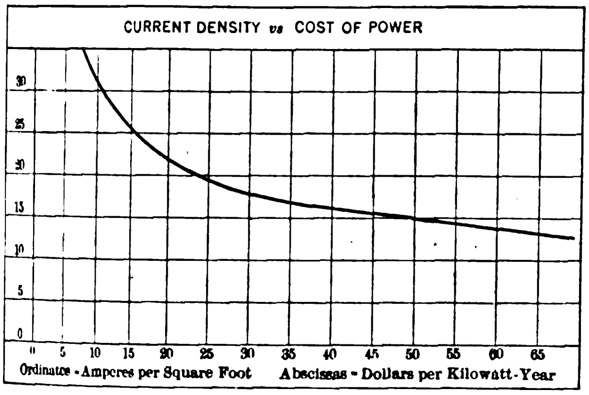


Fig. 1.—Relation Between Cost of Power and Current Density.

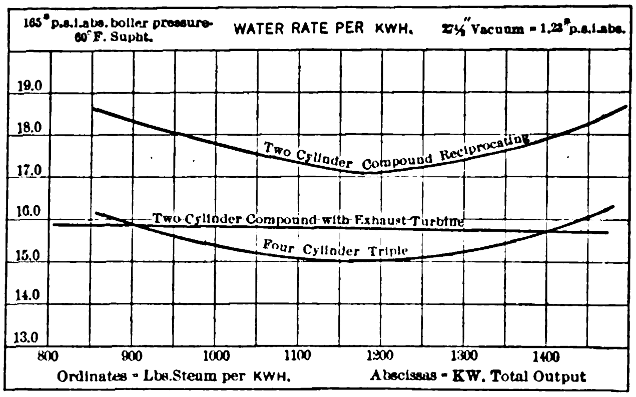


Fig. 2.—Water Rate per Kilowatt-Hour.

The plant of the future may consist of gas-driven units of large capacity, alternating-current turbogenerators driving motor-generators of smaller size, of compound reciprocating engines exhausting into a trunk main from which exhaust-steam turbines are fed, of multiple-expansion reciprocating engines, of turbine-driven unipolar generators, or of some combination of these. Spare units must be provided in sufficient proportion to give absolute reliability of service.

The next paper was by H. E. Longwell, of the American Society of Mechanical Engineers, and dealt with the mechanical side of the problem. An abstract of this paper follows.

The Power Problem.

Mr. Longwell treated the power problem in a very general way, pointing out the necessity for not only good design in detail but a common-sense comprehensive view of the entire problem. He pointed out that fixed charges on the investment are quite as important as operating costs and frequently outweigh such considerations as economy in steam consumption. He compared a high-grade steam-turbine plant with a gas engine and producer plant, the units having a capacity of 1,500 kilowatts in each case. Assuming a high grade of fuel costing $3.00 per ton, the saving with the gas engine would amount to $6.00 per kilowatt per year; whereas, the increased first cost would be about $50 per kilowatt. Allowing six per cent for interest, one per cent for taxes, one per cent for insurance, two per cent for maintenance and eight per cent for amortization, he did not consider the extra outlay for the more efficient plant to be a good investment. Gas-engine eqipment should, therefore, not be considered for a plant to refine copper electrolytically, especially as such a plant would be located where there is abundant water supply for condensing purposes and where the cost of fuel is reasonable. Under such conditions a steam plant displays its best ecenomy. Another reason for choosing a steam plant is that waste-heat boilers can be used in connection with the reverberatory furnaces used in such a plant. He then considered the combination of compound reciprocating engines with low-pressure turbines and condensers. The reciprocating engine is usually more efficient than that portion of a turbine utilizing the same range of pressure, but this gain in fuel economy is more than counterbalanced by the additional first cost and costs for installation, attendance and maintenance. This combination is sometimes justified for the purpose of utilizing a reciprocating engine already installed, but not otherwise. He considered the turbine superior to the reciprocating engine as a prime mover, especially with modern condensing apparatus and a plentiful supply of cooling water. He realized, however, that steam turbines are less efficient than some multiple-expansion reciprocating engines. Formerly the turbine was at a disadvantage in generating direct current on account of its high rotative speed. This difficulty has been removed by the development of reliable transmission gear having an efficiency of over 98 per cent and allowing any reasonable speed ratio. Illustrations were given of a number of such geared generating sets. The turbine not only has an advantage in first cost over the reciprocating engine as a prime mover but its advantage is more marked when freight and installation costs are considered. For units from 6,000 to 9,000 kilowatts an average cost may be taken as $75 per kilowatt. Electric energy at 100-per-cent load-factor, such as exists in electrolytic copper plants, should cost at the switchboard about 4.3 mills per kilowatt-hour, where good coal can be obtained for $3.00 per ton and the investment charges are not over 10.5 per cent per annum.

The final paper of the evening was by F. D. Newbury, of the American Institute of Electrical Engineers, and was entitled "Sources of Direct Current for Electrochemical Processes."

Sources of Direct Current.

Mr. Newbury first outlined the problem involved in providing direct current for electrochemical processes. The usual conditions require a large current at comparatively low voltage. The problem involves the available prime movers and their advantageous operating speeds. He considered reciprocating steam engines, steam turbines and water wheels. He left gas and oil engines out of consideration. Commutation is the great problem with direct-current generators and converters handling heavy currents. The possibilities of supplying current at different speeds was discussed and a table given showing the outputs possible at different speeds with different numbers of poles. The distribution problem depends upon local conditions and where transmission for 1,000 feet or more is required, high voltage should be adopted for this purpose, with alternating-current generators and synchronous converters. Provision must be made for variation in voltage. Continuity of service is important and a design must be adopted which will insure this. Four types of steam-turbine-driven units were then considered: (*a*) direct-connected commutator-type direct-current generators; (*b*) direct-connected unipolar-type direct-current generators; (*c*) gear-connected commutator-type direct-current generators; (*d*) direct-connected alternating-current generator with synchronous converter. Class (*a*) is limited to relatively small current ratings on account of the high speed necessary. Machines of class (*b*) have been successfully constructed and have relatively high efficiency. The first cost and maintenance, however, are also high. This type is not favored. Class (*c*) is now a satisfactory type. Class (*d*) has been used in copper-refining plants and possesses obvious advantages. When the distances are great the generator can be wound for high voltage and step-down transformers installed at the converter.

It is also useful where different circuits must be electrically separated. The use of the induction-type generator was considered in this connection. A table is given showing the efficiencies for the various classes. Under water-wheel-driven units a plant having a capacity of 120,000 horsepower was considered and a comparison made between direct-current generation and alternating-current generation with converters. The efficiency of the latter is 10 per cent higher and the first cost only 81 per cent of the former. With the smaller plant this comparison would not be so favorable to it. A 60-cycle system is preferred to 25 cycles. Reciprocating engines have the advantage of lower speed and with them direct-connected direct-current generators should be used.

The discussion was opened by H. B. Coho, secretary of the New York Section of the American Electrochemical Society, who explained the absence of the president of that society, E. F. Roeber, as due to illness.

G. A. Roush pointed out that the size of plant discussed by Mr. Newbury was far larger than that generally used in electrochemical work and especially in copper refining. A comparison of cost on the basis of 120,000 horsepower would not apply to present individual plants, as such a capacity would probably be sufficient to serve all the electrochemical installations in the neighborhood of New York City.

F. A. Lidbury made a similar criticism of the paper by Mr. Newbury, as there is only one line of electrolytic industry, viz., the production of aluminum, which would require power upon such a scale. If this industry is excluded, most electrolytic plants will be found to have a power consumption from 1,000 to 10,000 horsepower, and single units of 5,000 kilowatts are not found, but the largest are more likely to be about 1,000 kilowatts. A comparison on this basis would have given results much different and would have been of more value to electrochemists. In most cases he considered it feasible to have water-wheel generators located close enough to the electrochemical plant to justify the generation of direct current. Coming to this basis of capacity, Mr. Newbury's table shows that direct-current generators of 1,000 kilowatts can be direct-connected to water wheels at speeds as high as 600 revolutions per minute for 250 volts, or at 300 revolutions per minute for 125 volts. As there are no speed difficulties, this puts a different aspect upon the comparative efficiency of direct-current and alternating-current generation. In addition to considerations of efficiency, first cost and reliability in operation, which enter into the above considerations by Mr. Newbury, it is necessary to give attention to other important considerations in making a choice of installation for the supply of power. One of these is maintenance and attendance costs, and the other is depreciation, which is low for copper conductors and high for rotary converters and the accompanying equipment. Moreover, the electrochemical engineer usually favors simplicity and is willing to pay extra for it. A good reason for this is a decrease in operating troubles. Reliability and smoothness of operation are not enhanced by multiplying the electrical links in the chain of power machinery.

F. L. Antisell, of the Raritan Copper Company, mentioned the importance of considering efficiency under partial load. The reciprocating engine maintains its efficiency better under low loads than does the turbine.

J. B. F. Herreschoff told of his experiences in an electrolytic copper refinery in New York City. In the early days when small units were used they were driven by triple-expansion engines operating at 350 revolutions per minute. These units were of about 400 kilowatts. Later direct-current turbogenerators running at 5,000 to 6,000 revolutions per minute were installed. The commutators of these, although very long, gave trouble. The machines generated also an enormous amount of heat, which indicated low efficiency, not over 70 per cent, although they were supposed to give 95 per cent. These were replaced with alternating-current turbogenerators running at high speed and low voltage and connected to a rotary converter.

J. B. Herreschoff, who is connected with the same plant, pointed out that by doubling the current the copper is deposited in half the time, but the voltage must be double, so that four times as much power is consumed. This has the advantage of keeping up the temperature of the electrolyte, as is done at Great Falls, Mont., where a current density of 40 amperes per square foot is used and the temperature of the electrolyte kept up to 150 degrees Fahrenheit. In the East, temperatures are usually from 130 to 135 degrees. In doubling the current density the cost of power per pound of copper is also doubled and the deposits are likely to be less smooth and more brittle. He referred to the control of voltage where rotary converters are used. With a single converter on one generator, voltage can be controlled through the generator field. With two rotaries on one alternator, differences of voltage can be obtained by weakening the field of one rotary and strengthening the field of the other. The effect of this upon the power-factor is to cause excessive heating in some of the parts.

C. O. Mailloux pointed out that while the kind of deposit depends upon the current density, good deposits can be obtained at high densities if conditions are properly controlled. He once used as high as 1,000 amperes per square foot, and a rate of 500 amperes is not uncommon where speed is an object, as in some forms of electrotyping. Ordinary electrotyping is done at a rate of 5 to 20 amperes per square foot, but good deposits can be obtained at higher rates by controlling the temperature, acidity and specific resistance of the electrolyte, and stirring it so as to bring fresh copper in contact with the cathode. Since there is almost no counter electromotive force in an electrolytic copper cell, the cost of power can be reduced to an almost negligible quantity by properly choosing the conditions, but such conditions do not represent the best for commercial operation. He considered that in many cases the most economical current density was higher than that actually used.

Lawrence Addicks pointed out that with high current density the circulation of the electrolyte must be increased. In silver and gold processes this cannot be done on account of the insoluble anode slime which is formed and which must be allowed to settle.

C. H. VomBaur pointed out the advantages of the oil engine, since crude oil is now available in New York City at less than three cents a gallon and a kilowatt-hour could be supplied for 0.45 cent, including all fixed charges and allowing 10 per cent for interest and depreciation. Engines of this type have been made in sizes as large as 2,000 horsepower per cylinder, which is large enough for such electrolytic work.

The authors of the papers then closed the discussion. Mr. Addicks considered the principal objection to gas and oil engines was unreliability. Mr. Longwell pointed out that his arguments applied only to the application of power under consideration and that other types of prime mover had their advantages under certain conditions of use. Mr. Newbury stated that the large size of water-wheel plant was considered with special reference to the aluminum industry and that for electrolytic plants near New York a steam unit was the only thing to be considered. With units of 1,000 or 2,000 kilowatts he agreed that a direct-connected direct-current generator was preferable to an alternator and rotary converter, if the plant can be located near the point of utilization. The efficiencies given in his paper were conservative and represented what would be actually obtained in practice. He pointed out that rotary converters give little trouble and should not be regarded as interfering with the simplicity of an installation. He agreed with Mr. Herreschoff regarding voltage control by a rotary converter. He pointed out that on account of the lowering of the power-factor it might result in excessive heating at the tap coils, unless the machine were especially designed for such use.

Mining Plants in Europe.

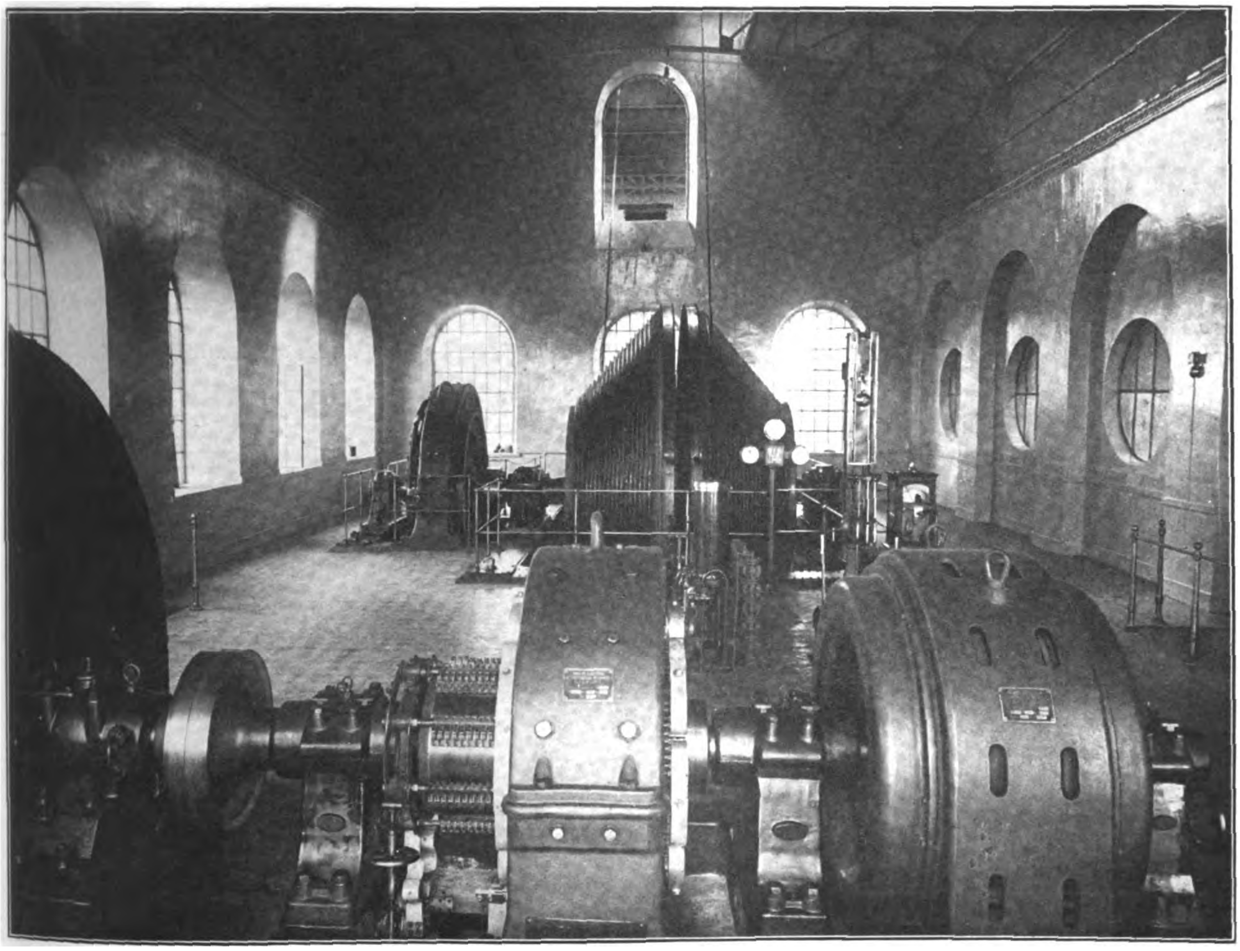


Fig. 1.—Hoisting Motor at Landres Iron Mines, with Motor-Generator Set in Foreground.

In France, as well as in other countries of Europe, the question of installing cable machines for use in mining plants is one which is receiving much attention on the part of electrical engineers. A typical installation, which is described below, is that at the Landres iron mines in France, which are operated by the Micheville Steel Company.

The regulations in force in France require all mining plants to have two distinct shafts to the surface. One of these shafts usually serves for taking out the material and for entry of air to the mine, and the second shaft is used for return of air to the surface and for secondary services such as circulation of men and material, etc. In the Landres mine it was desired to make use of this second shaft so as not only to take care of the secondary work but also to handle part of the material extracted from the mine, thus giving an additional output and at the same time affording a standby in case of accident to the principal shaft. Fig. 1 shows a view of the cable hoist which is now installed at shaft No. 2, it being driven by a direct-current electric motor. Besides the usual advantages afforded by the use of electric drive for the cable drum, local circumstances led to preferring this method over steam-engine drive, for it was intended to put in electric pumps of large output in the mine installation on account of the large amount of water to be pumped out, and a part of the pumping capacity was also needed in connection with water supply for a proposed increase in the electric station existing at the mines.

For the use of the mine water pumping it was required to install an alternating-current group on the three-phase system which should run without stopping, as the water pumping needed to be continuous. A machine of 1,500 kilowatts was needed for present and future service, and this power represents four times what the cable-drum motor will take. Owing to the proposed use of the alternator for pumping work, it became a matter of much less cost than usual to provide at the same time for the cable hoist, so that there was only the slight expense of choosing an alternator of somewhat larger size than what the pump work required, and the cost of the present outfit was practically limited to the cable plant proper. On the other hand there was quite an advantage in operating the cable drum on the present system from the fact that the alternator always works under a good load and thus there is less disturbance felt from the current variation occurring in the cable system.

The cable-drum outfit installed at the Landres mines is designed for the following conditions:

Standard lift; height	760 feet
Net load, iron ore	3 tons
Elevator (for one car), weight	3.7 tons
Weight of empty car	0.9 ton
Steel cable, round, diameter	1.5 inch
Steel cable, weight per foot	3.6 pounds
Number of trips per hour	90
Total time of lift, actual	30 seconds
Total time of lift, including maneuvers	40 seconds

It was quite a difficult matter to carry out the program for working the lift, on account of the great number of trips per hour, and this could only be realized by a very easy-working machine and one which was capable of very exact control. For this reason it was not found advisable to use a three-phase motor, for the small depth of the mine and the frequency of starting made this solution an uneconomical one, and it was decided to use for the cable drum a direct-current motor supplied by a motor-generator set consisting of a generator coupled to a three-phase motor, working on the Ward Leonard system, the whole of the present outfit being built at the Belfort works of the Société Alsacienne de Constructions Mécaniques. The cable-drum motor thus has independent and constant excitation of its field, and is supplied with variable current from the generator of the rotary set. Variation of the motor voltage serves to give the start, speed changes, braking and reverse drive as is usual upon this system, and the variable voltage is secured by varying the exciting current of the generator. Thus a simple field rheostat with reversing switch worked by a lever supplies for all the maneuvers of the cable hoist. As is well known, when slowing up or upon the descent of loads, the cable-drum motor works as a generator and restores energy to the system, and electric braking is obtained in this way to the best advantage. As the central station would run at a disadvantage under the frequent starts and stops of the cable system, the amount of power taken from the main alternator is made more uniform by the use of a flywheel of considerable weight mounted on the shaft of the motor-generator, and this flywheel acts to store up energy during the stop periods and to restore it during the working periods, and thus the rotary group with its flywheel serves as a buffer between the central station and the cable-drum system. The rotary set is seen in the foreground of Fig. 1.

It was not found advisable to use the Koepe type of drum, such as is in favor in mines on the Continent, for, although it is a very practical type in numerous cases, it is not suited to this mine on account of the small depth of the shaft. On the other hand, a cylindrical drum has the drawback of giving a variable load, on account of the difference in weight of the rolled and unrolled cables. For these reasons it was decided to employ drums of conical shape, as seen in Fig. 1, and they make it possible to keep the load due to the cables and accordingly the current in motor and generator practically constant and the present method gave the best solution of the problem under the above conditions. Such drums have end diameters of about 10 and 20 feet.

A few features of the cable machine and its brakes and other safety devices will be of interest. One of the drums can be made loose on the shaft for the adjustment of cables and it is stopped by a brake worked by a handwheel, this brake acting on a suitable rim. The two drums can be fastened in fixed position by a screw system which gives a very close final adjustment of the cables. Access to the inside of the drums is easy and allows of operations of attaching the cables, these being brought to the shaft for anchoring. The shaft is of Siemens-Martin steel and at the motor side it carries a forged flange for coupling on to the electric motor. Self-oiling bearings are employed.

The brakes consist of a double-jaw system working upon drums which are solid with the cable drums, the jaws working upon lower joints, these latter being well mounted in the foundation. Brakes are operated by compressed air, and are thrown either by the cylinder of the working brake or by the safety-brake cylinder. The former is a horizontal cylinder with direct action and the latter is mounted vertically and uses a counterweight device. The brake works in the first place as a working brake to stop the machine by its own effect or to block the load which is already stopped. Such operation is carried out by a lever which acts on the three-way cock of the compressed-air supply, and the brake is thrown by the horizontal piston, this action being gradual and easily adjusted. Secondly, the brake acts as a safety brake, and for this purpose the brake is connected to a counterweight which is normally kept lifted by the presence of the compressed air on the piston of the vertical cylinder. When the counterweight falls it throws on the brake.

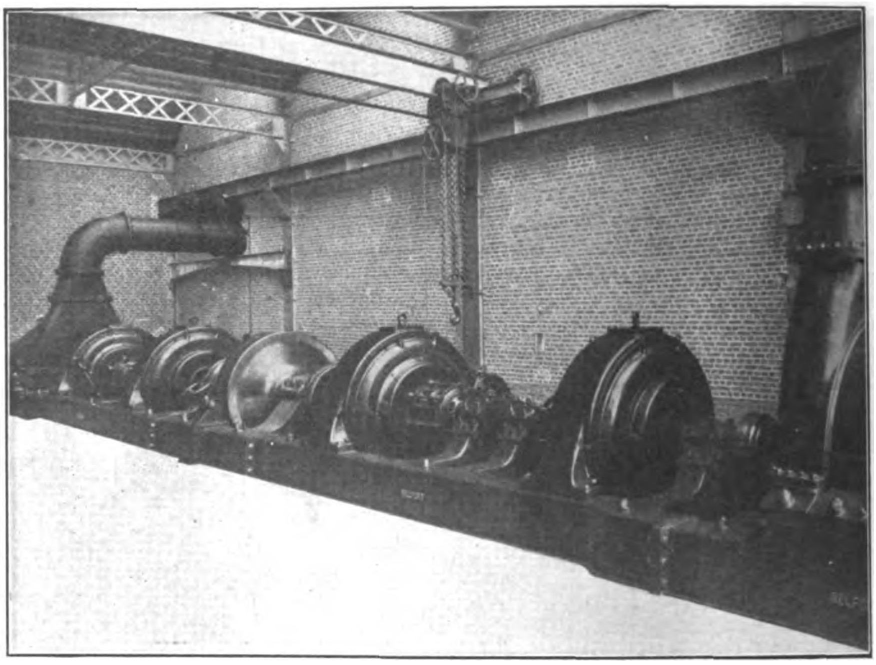


Fig. 2.—Direct-Current Turbogenerators in Courrières Coal Mines.

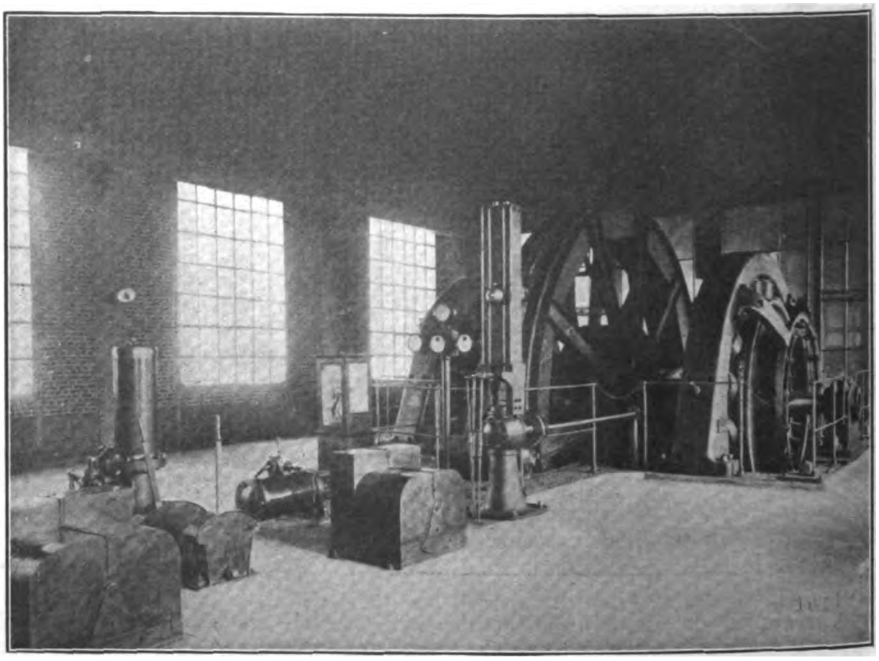


Fig. 3.—1,500-Horsepower Hoisting Motors at Courrières Mines.

The safety-brake system is one which is carefully worked out, and it is thrown in the following cases: (1) When the compressed-air supply fails. (2) Should the lift rise above the level of the shaft mouth beyond a standard amount. In this case the index of the mine-level indicator in the machine room operates to throw the brake by a rod-and-lever device. (3) The brake can be worked by hand by the use of a suitable lever in case the regular brake should fail to work.

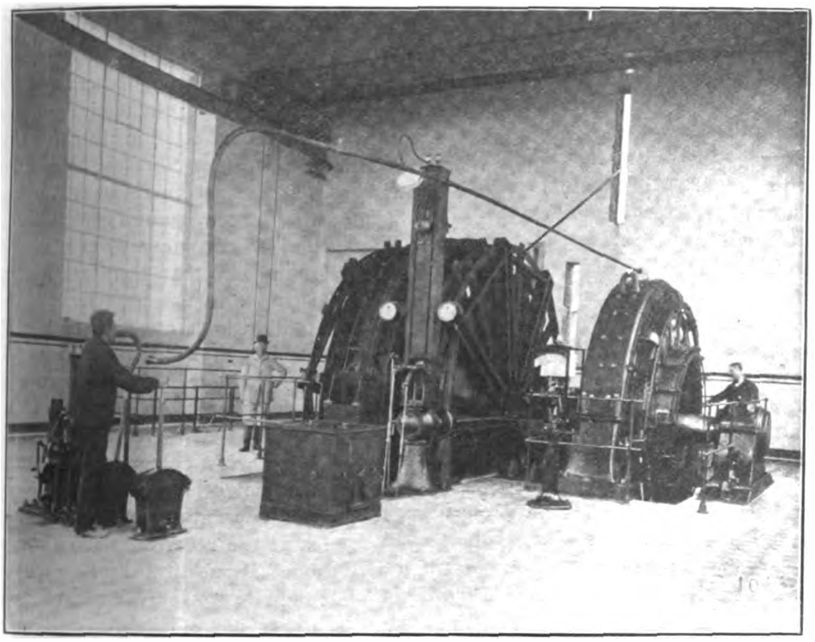


Fig. 4.—Hoisting Motor at St. Thérèse Potash Mines.

(4) It can also be thrown by an electric method by the use of a solenoid. The core of the solenoid is normally held up by the existing current taken from the 500-volt busbars of the central station. If this current is broken, the core falls and by a suitable device it causes the counterweight of the safety brake to drop.

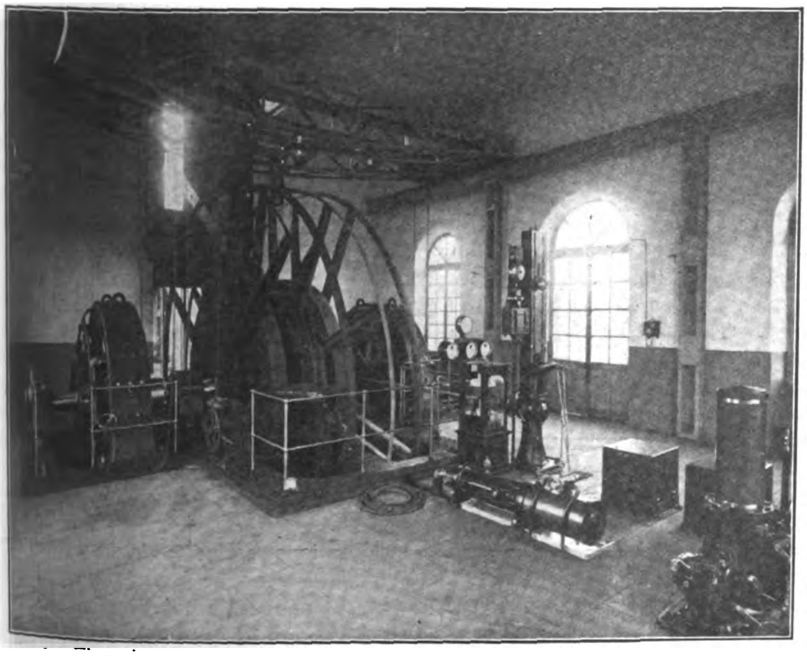


Fig. 5.—Hoisting Motors at Carmaux Coal Mines.

The electric braking method is a useful addition to the system, and it is used in the following cases: (1) When the current of the station 500-volt circuit fails, this current serving to feed the field circuits of generators and motors; (2) upon the working of the automatic circuit-breaker of the main motor circuit; to this end the circuit-breaker is provided with an extra break which opens the circuit of the above mentioned solenoid; (3) when the lift runs at too high speed in the shaft; the Karlick recording speed indicator is provided with an extra contact device which puts current on a relay so as to break the current of the solenoid, and this happens when the speed rises above a standard rate; (4) should the lift rise above the upper level, a switch placed above the shaft mouth and a second contact device mounted on the machine room level-indicator, serve to break the current in the solenoid.

The fall of the counterweight of the safety brake has also the effect of cutting off the field current of the generator by a suitable contact device, and in this way the cable motor no longer receives current when the brakes are thrown. The compressed air used for the system is supplied by a small motor-driven compressor with automatic action, the three-phase motor being provided with a ball-governor contact. When the air pressure falls below five atmospheres, an air relay closes the motor circuit and the motor starts, being again thrown off when seven atmospheres is reached.

Two separate hand-lever stands are mounted in the machine room, and one of these has the lever for working the above mentioned field rheostats. The second lever serves to operate the brakes. The mine-level indicator shows the position of the lifts within the shafts, being made up of two indicating pieces guided in mounting and descent by two endless screws, these latter being worked from the cable machine shaft by countershaft and gearing. Such indicator is fitted with a device which causes an automatic slow-up of the machine in case of inattention on the operator's part, and to carry this out the indicator corresponding to the rising elevator in the shaft is made to bear upon a pedal at the proper time. By means of a rod-and-lever device, this pedal acts on the working lever and brings it to a point near the stop position. Should the operator then have failed to carry out the full stop by this lever when the elevator comes to the shaft mouth, the indicator piece acts upon a second pedal which throws the safety brake.

Turning to the electric motor, this is mounted on the cable machine shaft between the main bearing and an outer bearing. By the use of coupling disks, the motor can be readily dismounted. The motor is supplied at a voltage varying from 0 to ± 500 volts, and its speed varies from zero to + 41 revolutions per minute, with power varying up to 1,000 horsepower. It has commutating poles which give sparkless working at all loads and speeds, and both directions of drive. Fields are excited from the station 500-volt busbars, the field current being constant during the whole of the working period. However, at the stops, an extra resistance mounted on the steering apparatus is automatically thrown into the circuit of the fields, and their loss is thus reduced considerably.

The rotary group comprises a three-phase motor, generator and flywheel. Commutating poles and compensating winding are used in the generator. The motor furnishes up to 450 horsepower at a speed of 485 revolutions per minute. A semi-elastic coupling connects the flywheel on the shaft, this being of cast steel in one piece and weighing 15 tons. It has a peripheral speed of 300 feet per second. According to its design, when its speed falls from 485 to 410 revolutions per minute, the flywheel furnishes the extra energy which the main plant would otherwise need to supply from the moment when the power taken by the cable machine exceeds the mean power till the moment when it falls below that value. Conversely, the flywheel absorbs during the stopping periods the energy set free at the previous period, and its speed rises to 485 revolutions per minute. In this way the power used by the three-phase motor remains about constant. To obtain the speed variations which allow of using the energy of the flywheel, a rheostat is operated automatically in the circuit of the rotor of the three-phase motor, and the same rheostat serves for starting the motor. As the air friction losses in the flywheel are far from being negligible at the speeds employed here, the wheel is inclosed in a sheet-metal case. Flywheel bearings are fitted with water cooling, and a hand pump sends oil under pressure into the bearings before starting up. A handwheel brake is used for stopping the rotary group.

An interesting point about the Landres plant is the method by which the cable motor can be run directly upon current from one of the generators in the central station if need be. In case of accident to the motor-generator set or upon failure of three-phase current, the cable machine can be operated temporarily in the following way: The main plant contains two similar groups made up of a compound engine running at 110 revolutions per minute coupled to a direct-current generator with auxiliary poles, designed for 600 kilowatts at 500 volts. A special switch allows of sending the current from either of these generators into the cable motor. In order to run the motor on variable voltage, field current for the generators comes off the 500-volt busbars, through a rheostat similar to that used on the generator of the motor-generator. This rheostat is worked by the same lever by using a device for connecting either of the rheostats on to the lever as desired.

The installation at the Landres mines is a most successful one as regards good operation, the running of the machine being easy and regular, while the manipulation is both rapid and sure. All the slowing down and stopping movements can be carried out normally by the use of the single working lever, without needing to call upon the brake lever. Duration of the lift is from 28 to 32 seconds and the maneuvers average 8 to 12 seconds, giving an average value of 40 seconds for the trip. In average service 95 trips an hour are realized, and this figure alone is enough to show the great precision of the working and control of the present machine.

Several other mining-plant outfits are shown in the other illustrations. The plant at the Courriéres coal mines, France, is of interest from the use of exhaust steam coming from various steam engines, and the electric motors of the rotary groups are here replaced by low-pressure steam turbines, as shown in Fig. 2. Each group comprises one turbine and two dynamos with separately excited fields. Between the two groups is a flywheel which can be coupled on to either group. With this plant, the group used with the flywheel serves to send current into the cable-drum motor and the group runs at 1,500 revolutions per minute standard, allowing a 25-per-cent fall of speed so as to utilize the energy stored up in the flywheel. The second group is independent of the first and works at constant speed of 1,500 revolutions per minute, supplying direct current at 500 volts for various motors throughout the plant. Proper switch devices allow of throwing either of the groups on to the cable motor, and in such case both groups work under like conditions. Should the second group be used, the electric motors in the works which it fed are replaced by old steam engines. Turbines are of the Zoelly type, working at 1,500 revolutions per minute on constant speed or at 1,500 to 1,125 revolutions per minute on variable speed. The generators are connected in series for supplying the cable motor and have commutating poles. The flywheel is of forged nickel-steel, weighing 9.4 tons, and it reaches a peripheral speed of 430 feet per second. A Koepe drum of 21 feet diameter is employed here, and the machine can take out 200 tons of coal per hour from 1,300 feet depth in 48 trips. At each side of the Koepe drum is mounted a direct-current motor of 750 horsepower running on voltage variable from 0 to ± 500 volts, operating at 35 revolutions per minute, maximum speed.

Fig. 4 shows one of the cable machines mounted in the potash mines known as Kali-Sainte-Thérèse, Alsace, Germany. Four machines of this kind are in operation. They use a 16-foot Koepe drum working at 42 revolutions per minute. The motors of these machines are run from rotary groups on the Ward-Leonard system without flywheel, this being a very economical method wherever, as here, the variations of load are not objectionable.

Fig. 5 shows the machinery in the coal mines of Carmaux, France. Each machine is required to take out 130 tons of coal per hour from 1,450 feet depth in 43 trips, net load being 3 tons. These machines use flat cable of aloes fiber wound upon narrow drums. At each side is an electric motor (1,250 horsepower combined), working with current supplied by a rotary group, this latter being made up of two 500-volt direct-current generators and a 480-horsepower 5,000-volt three-phase motor working at 585 revolutions per minute.

Multiplex Radiotelegraphy.

Ricardo Moretti has recently patented a system of multiplex radiotelegraphy depending on selective resonance. A number of transmitters are arranged at the sending station so that variations of definite frequencies can be set up in the high-frequency current supplied to an oscillating circuit coupled directly or inductively to a single aerial. At the receiving station, there are connected in the circuit of a single wave detector, telephone receivers, each of which responds only to a tone of predetermined pitch. Transmission proceeds exactly as in wireless telephony, in that there are radiated from the antenna high-frequency oscillations which are changed in pitch by a microphone or other means. In one arrangement, Moretti uses a number (say three) of sound pipes each emitting a characteristic note when supplied with compressed air (under the control of switch keys). To permit of separation of the individual tones at the receiving station, a "monophone" is substituted for the ordinary telephone receiver. A monophone is, as it its name indicates, a telephone receiver, the diaphragm of which is set in vibration only by a certain definite frequency of stimuli. Each monophone at the receiving station reproduces only the signals sent out at corresponding frequency from the transmitting station, and thus as many messages can be sent simultaneously from, and received simultaneously, by a single aerial, as there are sound pipes and monophones.

In an alternative arrangement, Moretti replaces the sound pipe by electromagnetically operated tuning forks which, under the control of the several sending keys, set up intermittent currents of definite frequencies in the windings of a single iron core which actuates the diaphragm of a microphone in the antenna circuit. This arrangement is essentially that of a telephone relay, except that a number of relay windings are employed instead of a single winding. At the receiving station, the antenna is coupled inductively to a resonant circuit containing a thermo-electric detector, across which are shunted the three monophones. The latter analyze the complex oscillations received as in the previous case. Either of the systems described above is applicable to the simultaneous reception in one station of signals emitted by a number of stations.—*Electrical Review* (London).

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A recent development in electrical auxiliaries to automobiles is an electrically heated glove for the chauffeur which is connected to the six-volt electric system of the car through contact plates on the steering wheel and glove.

Convention of the Independent Telephone Association of America.

The first annual convention of the Independent Telephone Association of America was concluded on Thursday, January 8, after a three days' session at the Hotel La Salle, Chicago. A report of the first three sessions of this meeting was given in our issue of last week. The total registration for the convention, including both members and guests, was about 375. All of the members and officers of the Association that attended the convention felt gratified at its success, which was phenomenal for an association organized but three months.

On Wednesday afternoon the session opened with an address by J. C. McCabe, Bay City, Mich., who spoke on "Publicity." He said that he had been a newspaper man for 25 years and a telephone man for but two years. In these last years he had put into practice many publicity ideas which had been of great value to his telephone company, particularly in enabling it to get a new franchise from the municipality on very favorable terms, because the publicity had paved the way for good will toward the company. He said that publicity is essential to every utility company and peculiarly to a telephone company. Publicity is of two kinds, deserved and undeserved. Unless the utility takes the public into its confidence it is liable to get considerable undeserved publicity, which will bring the ill will instead of the good will of the public. A good publicity department should be organized in any utility. It must have a most capable man at its head who should have charge of all advertising, give advice to the new-business department and cultivate friendly relations with all publicity mediums in the community. He must keep in close touch with the customers. Advertising is now to be regarded as an absolute necessity and really is an investment. Mr. McCabe quoted extensively from the writings of Elbert Hubbard to bear out his views. He strongly commended newspaper advertising as being most effective for utility companies. Such companies should be steady advertisers instead of doing a little work in this line now and then. Free publicity can readily be obtained in newspapers if items of general interest are supplied at the same time and if advertising is also carried in the papers. He cited the very effective publicity work of some large utility corporations. He advised against nonproductive advertising, which is a needless expense; among items of this kind he placed blotters, pictures and many novelties that carry little meaning with them.

The meeting then resolved itself into an experience session, presided over by D. M. Neill. Mr. Binkly, Hamilton, O., narrated the experience of his company in attempts to secure toll connections over the Bell lines to Cincinnati. The Public Service Commission of Ohio declared it had no jurisdiction to compel the giving of such service. The matter was then brought to the courts and has not yet been finally decided. He, therefore, introduced a resolution to instruct the officers of the Association to give assistance to companies having similar difficulties. This was referred to the Resolutions Committee.

W. F. Goodrich, La Crosse, Wis., told how physical connection had been working out in Wisconsin. The utility commission had found it lacked authority to compel this and therefore at a meeting of the Wisconsin State Telephone Association it was decided to urge the legislature to grant the needed authority to the Commission. This was done by unanimous vote of the legislature, since both the Bell and independent telephone interests had sought such legislation. However, subsequently a case brought before the commission in which it was sought to compel physical connection had been carried by the Bell interests to the courts, where final decision has not yet been rendered.

Improvement of Long-Distance Transmission.

H. T. Currier, of the Kellogg Switchboard & Supply Company, made an address on "The Little Big Things of Transmission." He said that although the great bulk of the telephone traffic is of local character, being confined within 100 miles of the exchange, he was convinced that all telephone companies will be called on in the future to carry more and more long-distance traffic beyond these limits. To enable a company to handle long-distance service it must have not only good line equipment but must have facilities to supply sufficient energy to overcome the losses on long lines. Each substation should be supplied with a minimum of 0.2 ampere. He told in a striking manner how iron line wire and poor station equipment cuts down the transmission very greatly; he emphasized this by citing many examples with figures of losses incurred due to improperly designed or defectively maintained equipment. Connecting cords are the very frequent cause of trouble in this regard; while these may not affect local traffic to a great extent, yet anything but the most perfect cords will seriously cut down transmission on long-distance lines. Therefore, for all toll circuits, it is necessary to use connecting cords that produce the minimum dissipation of energy. For such circuits No. 22 gauge cable is not desirable, as it produces a loss twice that of standard No. 19 gauge cable. The smaller telephone companies must standardize their equipment to produce better and more economical toll connection. It is possible to fix up switchboards for toll service quite easily at less expense than to rebuild the entire outside plant. For toll service 48-volt supply must be used in place of 24 volts. In order to insure that the proper cords will be used in putting up toll connections it is well to have jacks of different sizes for toll and local circuits.

Bernard C. Groh, of the Automatic Electric Company, also spoke along the same line, emphasizing the importance of getting the most perfect transmission possible. He defined what is meant by standard cable and other terms used in transmission discussions. He agreed with Mr. Currier's remarks. Both local and exchange batteries must be kept up if good results are to be obtained. Frequently the equipment may apparently give quite satisfactory local service but be entirely inadequate for toll service. In order to make sure that batteries and other parts of the equipment are not deteriorating so as to prevent good toll transmission, it is necessary to keep a close check on the lines and equipment by testing over an artificial line which can be easily constructed by the wire chief of the exchange. Another thing that compels more attention to improvements in transmission is the increasing use of repeating coils, because of the greater use of phantom circuits and the simplexing of circuits.

On Thursday morning the session opened with an address by Arthur Bessey Smith, of the Automatic Electric Company. He illustrated and described the elements of the automatic telephone system, particularly the calling device, the line, selector, side, connector and monitor automatic switches. He briefly referred to the advantage of an automatic traffic distributor and to the very effective way in which monitoring can be done by automatic equipment.

Telephone Service Standards.

J. C. Crowley, Jr., Superior, Wis., spoke of the action taken by the Wisconsin Railroad Commission on the standardization of operating rules and practice. The Wisconsin Commission had called a conference of all telephone companies in the state, which was held last September, about 70 out of 600 telephone companies being represented. There was a general discussion of the question of standards of service, as a result of which a preliminary code has been drawn up. While this has not been finally approved, being subject to another hearing on the question, it will in all likelihood be adopted with possible slight revision. Wisconsin is the first state to adopt such service standards for telephone service. The Commission will enforce these regulations liberally so as not to impose hardship on any company, and if conditions warrant the standards would doubtless be revised. He recommended that the Association adopt these standards to be promulgated by its Service Department.

J. N. Cadby, of the engineering staff of the Wisconsin Commission, then spoke of the work done along this line. He said the final draft of the rules has not yet been prepared, since another hearing on the subject will be held on February 11 or 12. The effort of the Commission is to have rules that are fair and reasonable and particular care was exercised in drawing them up, since they probably will be a guide for other state commissions. The rules apply to both large and small companies, but are modified in the case of the latter, where conditions seem to warrant more liberal regulation. The preliminary draft of the rules was then presented by Mr. Cadby with an explanation of what was intended by each. A brief summary of these rules is as follows:

(1) All telephone companies must give good transmission, avoid cross talk, outside noise on the lines, etc.

(2) Not over 12 subscribers must be connected on any one line of ten miles or less in length.

(3) At least one trunk line must be provided for through traffic between communities.

(4) Frequent tests and inspection of the lines and equipment must be made to insure good service and maintenance.

(5) Exchanges must have sufficient equipment and of such kind as to provide for all traffic and also for reasonable extensions; traffic studies must be frequently made so that increase in traffic may be anticipated.

(6) Facilities must be at hand for emergencies; such as to have an extra operator ready to be called in exchanges where but a single operator handles the business.

(7) In exchanges having more than 500 lines at least 94 per cent of all calls must be answered by the operator within 10 seconds.

(8) Each company must adopt definite rules for the phraseology to be used by operators and a definite plan of operation must be put into practice; courtesy must be insisted upon on the part of all employees.

(9) Information must be readily and freely supplied to subscribers; telephone directories must be revised semi-annually in exchanges having more than 1,500 lines.

(10) The telephone directory must include instructions for subscribers as how to get the best results from the service.

(11) The rules and charges for toll service must be made public.

(12) A detailed and complete record of complaints and interruptions of service must be kept and all complaints must be investigated as soon as possible.

(13) Each telephone company must file with the Commission the name of the head of its complaint department.

(14) Toll service must be carefully checked up, properly timed, inspected and maintained.

W. N. Matthews, reigning Jupiter of the Jovian Order, then addressed the Association on the organization and work of the Order and on the value of being associated with it. In connection with the latter he cited a specific case wherein through the efforts of the Commercial Division of the Jovian Order the bad condition of the wiring in some 600 buildings in New York City was exposed. Although both the city's and the insurance inspectors were aware of this condition nothing had been done, and through the Jovian Order a co-operative plan was worked out whereby it was expected to compel the remodeling of the wiring in these buildings. Mr. Matthews referred to this as merely one instance of the broad co-operative work undertaken by the Order throughout every branch of the electrical industry, and urged the telephone men to join in with this work.

E. C. Lewis, of the Telephone Improvement Company, then explained with the aid of numerous illustrations the advantages of the Automanual telephone system and showed numerous exchanges in which it was employed. By showing a view of the operating room of the exchange when the old manual system was still in use and then later one after the Automanual equipment had been installed, he demonstrated very strikingly the saving in labor costs through the change.

H. N. Tolles, of the Sheldon School of Salesmanship, then made an illustrated address entitled "Business Building." He made a very clever and energetic demonstration of the value of studying salesmanship in all business getting. He mentioned the many factors that are involved in successful work of this kind, among which he pointed out particularly a study of applied psychology, the study of human nature, careful training, etc.

The final session of the convention opened on Thursday afternoon with an illustrated talk by Mr. Ferris, of the Kellogg Switchboard & Supply Company, who showed many views in the manufacturing plants of this company.

W. F. Goodrich, La Crosse, Wis., then presented a paper entitled "How to Make a Market for Home Securities." He said that a utility should encourage home investment in its securities, particularly among its own customers, as this is a most valuable influence in developing good will toward the company. The financial manager of the organization is a most important official. He should be well known in the community and if possible should be a director. As to the types of stock issues that are to be preferred for local investment, common shares of the par value of $100 and preferred seven-per-cent shares of a par value of $50 will probably find the best market in the community. The company should approach as far as possible the idea of a mutual organization as its ideal. If investment is to be encouraged, regularity of dividends is necessary and under no circumstances should extensions be made from earnings before the dividends have been provided for. The financial department of a utility should encourage any legitimate publicity of the affairs of the company. Frequently sales of securities can be made to local investors through clubs, building and loan associations, friendly bankers, etc., but this does not mean that personal solicitation in this work can be dispensed with.

Resolutions.

The report of the Committee on Resolutions was then presented. The first resolution recommended was an affirmation of three resolutions that had been adopted by the Board of Directors on December 17, 1913, and which had been submitted to the Attorney General of the United States and were believed to be the basis of the offer made by the American Telephone & Telegraph Company; therefore, the officers of the Association were called upon to insist on the strict carrying out of these ideas and to aid in the enactment of legislation, if this should be necessary to put these ideas into effect. B. G. Hubbell explained this resolution by saying that the Association officials had been called upon to suggest how the difficulties of independent telephony could be overcome and the resolutions of December 17 were the result. He was asked some things in connection with the offer of the American Telephone & Telegraph Company, and explained what he understood to be the interpretation thereof. The resolution was then adopted unanimously.

Another resolution similarly adopted called upon the directors of the Association to secure such regulation of the telephone business as will insure freedom of development of telephone properties and will prevent absorption of local properties with the aim of a huge monopoly. The third resolution reaffirmed the belief of the Association in the value and importance of maintaining local telephone properties independent and urged support by the public of such utilities.

The fourth resolution urged the directors of the Association to try to insure competition in the invention, manufacture and sale of telephone equipment, so that all telephone companies may be at liberty to buy in the open market. Mr. Randall explained the meaning of this resolution to be an attempt to separate the American Telephone & Telegraph Company and the Western Electric

Company, and to thwart efforts to monopolize telephone manufacture. He explained further that it was hoped to bring about a condition such that independent manufacturers might be free to sell to Bell operating companies and thus keep the Western Electric Company from exacting exorbitant prices from the Bell companies so as to enable it to undersell independent manufacturers in the sale of material to independent operating companies and thereby decrease the market of independent manufacturers.

Another resolution directed the officers of the Association to help any independent telephone company to secure long-distance connection over interstate long-distance telephone lines. Other resolutions were also unanimously adopted thanking the officers and directors of the Association, the manufacturers who had made such a splendid exhibit, the Chicago press, the telephone journals, the Hotel La Salle and others who had contributed to the success of the convention.

John H. Wright spoke of the effort of the Finance Committee to raise funds that would insure the carrying on of the work of the Association. The dues of the Association are merely nominal and therefore it is necessary to depend upon companies to pledge something per month above their actul dues. Very valuable financial aid had been secured in this way from many companies and further efforts in this line were necessary in order that the Association may carry out all its plans. At the conclusion of Mr. Wright's appeal, a member called attention to the extremely valuable work that Mr. Wright had done at his own expense to help the Federal investigation of the telephone industry and to further the work of the Association in every way. On his motion, therefore, a special resolution thanking Mr. Wright for his service was passed.

The convention closed with a brief address by President Fisher, who cited the attendance, keen interest and excellent program of the convention, and the large amount of work accomplished by the Association as ample justification of its organization. He felt that it had brought new life and energy into independent telephony and therefore deserved the credit of the industry for these efforts.

Election of Officers.

Shortly before the close of the convention balloting for the election of officers took place but the count of the ballots was not complete at the time the convention adjourned. The election resulted as follows:

President: B. J. Hubbell, Buffalo, N. Y.

First Vice-President: E. B. Fisher, Grand Rapids, Mich.

Second Vice-President: E. D. Schade, Johnstown, Pa.

Treasurer: Richard Valentine, Janesville, Wis.

Directors for two years: R. Valentine, W. J. Uhl, G. W. Robinson, J. C. Casler, J. H. Wright, Samuel Hill.

Directors for one year: H. L. Beyer, T. J. Shefflin, L. A. Herrick, H. L. Reber, E. M. Cooke, D. M. Neill.

Directly after the announcement of the election, Mr. Hubbell, president-elect, modestly declined to serve, pointing out that Mr. Fisher had presided in such an able manner that to him should be given the honor of directing the efforts of the Association for another year. This Mr. Fisher has consented to do. At the annual meeting of the Association, which is to be held in Chicago on February 10, this election will be ratified.

An interesting feature of the convention was the promptness with which the sessions were called and adjourned. In order to get members into the meeting room at the time that the session was to begin stereopticon or moving-picture views were thrown on the screen, which quickly caused the gathering of the assembly. The chief entertainment feature of the convention was a sumptuous banquet given in the main banquet hall of the hotel on Wednesday evening. This was enlivened by a most entertaining program of music, song and nonsense by various speakers and entertainers.

Exhibits.

A very extensive exhibit of telephones and telephonic equipment was made on the seventeenth floor of the hotel, almost all of this floor being devoted to this purpose. Among the exhibitors were the following:

American Electric Company, American Steel & Wire Company, American Telephone Fire Alarm Company, Julius Andrae & Sons Company, Automatic Electric Company, L. S. Brach Supply Company, Century Telephone Construction Company, Coffey Audit & System Company, Frank B. Cook, Cracraft-Leich Electric Company, Dean Electric Company, Delta Electric Company, Electrical Contract Company, Ericsson Telephone Manufacturing Company, Hawker Brothers & Haviland, Kellogg Switchboard & Supply Company, Leeds & Northrup Company, Mathias Klein & Sons, Manhattan Electric Company, W. N. Matthews & Brother, Monarch Telephone Manufacturing Company, National Carbon Company, Naugle Pole & Tie Company, Northum Toll Register Company, Nungesser Battery & Carbon Company, Reliable Electric Company, John A. Roebling's Sons Company, Specialty Device Company, Standard Underground Cable Company, Stewart Brothers, Stromberg-Carlson Telephone Manufacturing Company, Swedish-American Telephone Manufacturing Company, Telephone Improvement Company, Utilities Service Company.

National Independent Telephone Association Convention.

The seventeenth annual convention of the National Independent Telephone Association was held at the Hotel La Salle, Chicago, on January 13, 14 and 15. The meetings were well attended and keen interest was displayed in all the proceedings. Practically all of the exhibitors that had made displays at the convention of the Independent Telephone Association of America during the preceding week again made substantially the same exhibits of telephone apparatus and supplies.

President Savage presided at all the sessions. The first session on Tuesday afternoon was devoted to a characteristically humorous and optimistic address by J. Adam Bede, of Minnesota. At the Wednesday morning session Richard Yates, member of the Illinois Public Utilities Commission, made an address on the work of that new regulatory body. William Fortune, of Indianapolis, then talked of the new federal income tax and efforts being made to improve its method of collection.

The chief feature of the Wednesday afternoon session was President Savage's annual address and a free discussion thereof, and of the independent telephone industry as a whole.

On Thursday morning there was held an important general conference on toll connections between independent and Bell telephone companies and on the recent agreement between the federal authorities and the American Telephone & Telegraph Company.

A detailed report of the convention sessions will be given in our next issue.

The Engineer's Part in the Regulation of Public Utilities.

During a reunion of the alumni of Stevens Institute of Technology, a meeting was held for the discussion of the engineer's part in the regulation of public utilities in the auditorium of the Institute, Hoboken, N. J., on the afternoon of January 9. The speakers included Alexander C. Humphreys, president of the Stevens Institute of Technology; Newcomb Carlton, vice-president of the Western Union Telegraph Company; John W. Lieb, Jr., vice-president of the New York Edison Company, and James E. Sague, of the Public Service Commission of New York for the Second District.

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It is expected that the 60,000-horsepower Tata hydroelectric project in the Bombay Presidency, India, will be completed in February, 1914. The power will be transmitted to the city of Bombay where 31 cotton mills and three flour mills have already contracted to take energy.

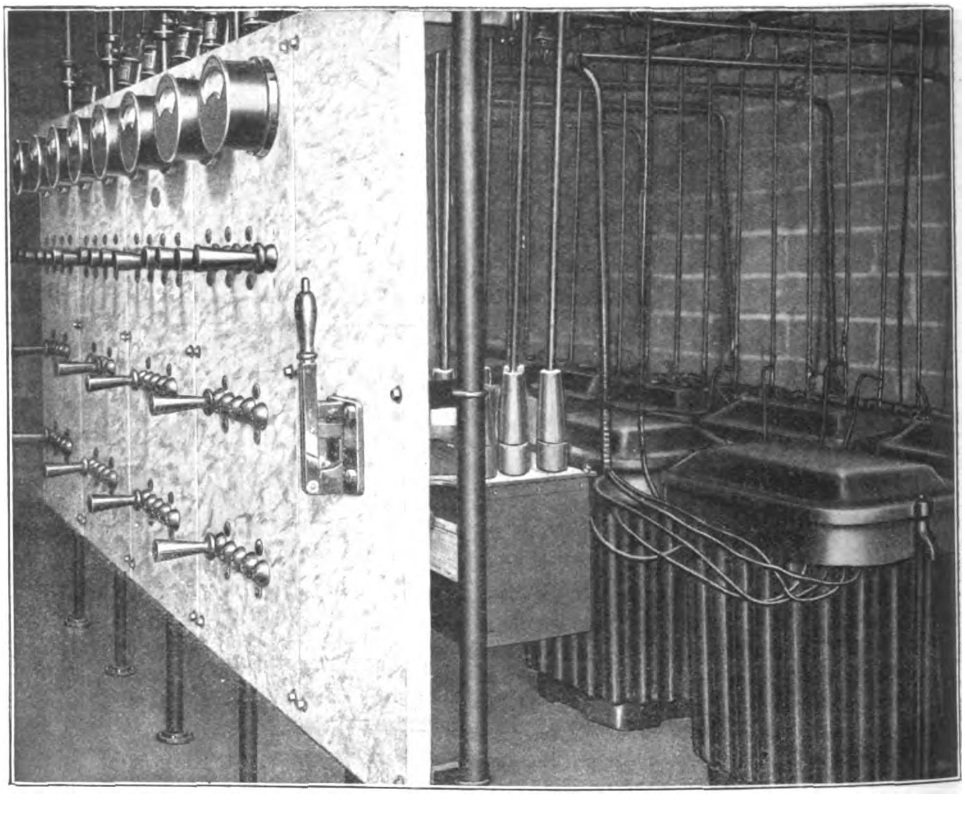
New Electrical and Mechanical Appliances

Regulator for Series Tungsten Lighting Circuits.

A great increase in the use of tungsten lamps for series street lighting has attracted attention to automatic regulators for such systems. In general these are of two types, one employing so-called shunt-box or adjuster sockets in connection with each of the lamps, and the other employing film cutouts at each socket and one adjusting or regulating device at the substation or generating plant. For the latter type of apparatus a standard type of constant-current transformer or regulator used so extensively in series arc lighting has been used, but the sluggish movement of the regulator has given rather poor regulation on many circuits with resultant decrease in the life of the lamps.

In order to provide a more sensitive and simpler control, specially suitable for series tungsten lamps, a regulating apparatus known as the "A-W" regulator has been meeting with considerable success. This equipment permits running series tungsten circuits from constant alternating - current supply mains, but unlike the arc-lamp regulator it provides almost instantaneous regulation without any moving parts whatever.

The A-W outfit, in the station type, comprises three parts. The first of these is the regulator, which is a transformer designed especially for close regulation. It is of the oil-filled, self-cooling type, mounted in an enameled cast-iron case. The transformer is equipped with a number of percentage taps which enable the circuit to be started with 50 per cent of the rated capacity of the regulator and adjusted to full-load conditions of power-factor and efficiency. At any adjustment of the load the power-factor remains about 80 per cent and the efficiency, even on small units, is about 96 per cent. Another use of the percentage taps referred to is for changing the current adjustment; thus in some installations 6.6 amperes is carried on the circuit until midnight and after that the current is reduced to 4.5 amperes. This practice results in considerable economy in energy and also lengthens the life of the lamps; this plan has been found better than cutting out a part of the lamps, since it requires no complications in the wiring of the conduit. The regulating transformer has distinct primary and secondary windings thoroughly insulated from each other to prevent any accidental ground on the primary circuit from being communicated to the series lamps.



Station Type Regulator for Series Tungsten Circuits.

The second part of this regulating outfit is known as the adjuster coil. This is an automatic inductive coil which provides the refinement in current adjustment in an electrical manner with the same effect as the mechanical adjustment in the ordinary series arc-lamp regulators. The coil is mounted in an iron case filled with an insulating compound. The third part of the equipment is the station panel which is of blue Vermont marble mounted on enameled iron pipe frame with wall braces and floor flanges. The size of the panel is 18 by 48 inches. Mounted thereon are two primary stab switches with receptacles, a five-gang circuit-adjusting switch and an ammeter for which there is an instrument thransformer on the back of the board. If desired, a watt-hour meter can be installed on the panel, room being left for this purpose. The primary switches have porcelain-tube receptacles with internal spring contact clips. An inclosed fuse is placed on each side of the primary line adjacent to the switch. The five-gang switch consists of five porcelain-tube receptacles of similar construction to those for the primary switches. These connect with the percentage taps and the transformer secondary.

The illustration shown herewith is of the control panels of what is said to be the largest installation of series tungsten street lighting in this country. Eight A-W regulators are used. The transformers of these are shown adjacent to the wall at the right.

The A-W regulator is manufactured by the Electric Appliance Company, of Chicago. A pole-type regulator similar to the station type described herein is also made by the same company.

Jewell Electric Elevator Controllers.

Among the automatic controlling devices for electric motors manufactured by the Jewell Electric Company, Mansay Building, Baltimore, Md., the new direct-current and alternating-current reversing elevator controllers are meeting with particular favor.

Fig. 1 shows the former of these which is known as the type LN elevator controller. Since experience has shown that failure of elevator controllers is usually due to the many small parts contained therein, the design of the Jewell elevator controllers has purposely been made as simple as possible so as to have the fewest number of parts. Thus, any of these parts that is liable to wear can be quickly detected and replaced without disturbing any of the electrical connections of the device.

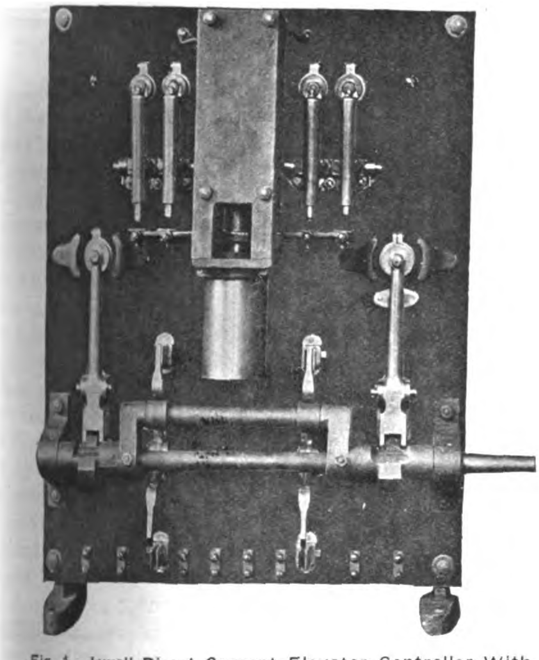


Fig. 1.—Jewell Direct-Current Elevator Controller With Reversing Switch.

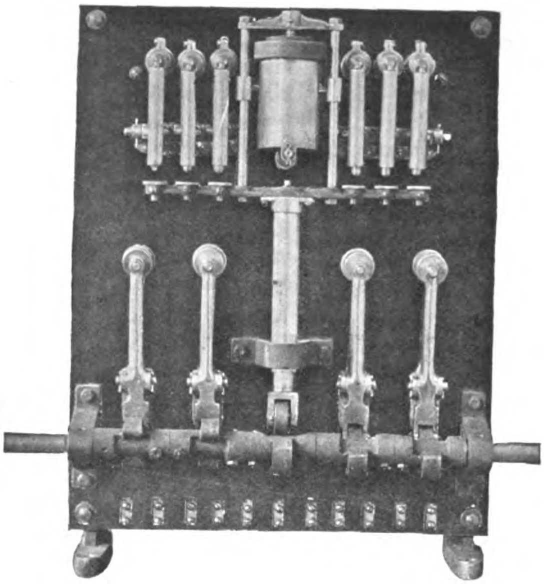


Fig. 2.—Jewell Alternating-Current Reversing Elevator Controller.

One of the valuable features of the type LN controller is the vertical button contact design. Through this construction no floating particle or dust can lodge where they might interfere with proper operation of the controller. The contacts are all under spring pressure, so as to be free from jarring loose from vibration. Both sides of the line circuit are simultaneously opened by the main line switch, this reduces arcing to a minimum and insures long life to the contacts. Powerful magnetic blow-out coils are provided; these coils are mounted on the back of the slate panel to protect them from any possible injury.

The controller actuates an electric brake and also cuts out the series fields of the motor when full speed has been attained. The controller is designed to operate on a throw of 90 degrees of the controller shaft for an up motion of the elevator and similarly for the down motion. A sprocket of 22 teeth for No. 32 chain is furnished, but being made removable, can be replaced by a gear, where a direct connection to the shipper shaft is desired. The controller lends itself particularly well to ceiling installations, the iron frame being made reversible.

In Fig. 2 is shown the alternating-current type of elevator controller, which as to its reversing switch and contacts is similar to the direct-current controller. A distinctive feature of the alternating-current type is its freedom from magnets which have been found to lack the reliability of action so essential on elevator appliances. In this controller, alternating-current magnets have been replaced by positive mechanical means, thus permitting application of the controller o a wide range of voltages. In all the controllers the main line and reversing switches are placed on the face of the panel where their operation can be readily observed.

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A New Carbon Battery.

The fascinating problem of producing electrical, direct from thermal energy continues to attract the attention of numerous investigators, and Baur and Ehrenberg (of Zürich) have succeeded in developing a carbon battery which, though of no industrial importance, is the only battery of this type which has yet yielded a reasonable electrical output. Hitherto iron and carbon cells of this type have employed an electrolyte of melted soda and have polarized rapidly when supplying current, owing to oxygen from the air being unable to reach the iron electrode with sufficient ease and rapidity. To overcome this difficulty, advantage is taken in the new cell of the fact that molten silver will dissolve large qnantities of oxygen. About two pounds of silver is melted in a thick-walled crucible (about four inches in diameter), and covered by a layer of molten electrolyte (say potassium silicate with 10 per cent of silicon fluoride). Pencils of carbon are plunged into the molten salts. Into the silver are plunged a nickel rod (insulated from the molten alkali by a porcelain tube) and a second porcelain tube for the oxygen supply. To prevent disintegration, the carbon rods are incased in porous shells of magnesia. With an effective carbon area of 17 square inches, such a battery will yield about 0.1 amperes for five hours, the internal resistance of the cell being 0.46 ohm and the temperature 1,000 degrees Centigrade. About one-eighth cubic foot of oxygen is required during this time. On open circuit, the battery electromotive force is 1 volt, but when delivering 1.2 ampere and 1.0 ampere respectively, the terminal potential difference falls to 0.9 and 0.54 volts.

◆

Two New Applications of Magnetic Separators.

Removing iron particles from ground scrap rubber in the reclamation plant of a rubber mill and extracting the metallic iron from crushed slag in the steel plant are two new applications of magnetic separators that have recently been made. The separating is effected by simply passing the ground or crushed material on a belt over the magnetized pulley which picks out the metallic particles only.

The magnetic separators used were of Cutler-Hammer manufacture.

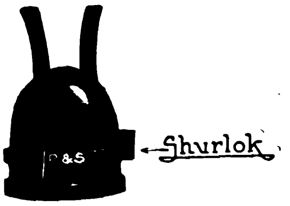
Electric Block-System Crossing Signal.

An ingenious type of highway-crossing signal is being used by the Lehigh Valley Railroad. This is an electric block-signal system used at crossings and of the same general design as that which is used along its entire line to control train movements, but it has in addition not only a visual signal, but also a powerful bell which rings loudly as trains approach. The signal is of the familiar banjo form. As the train approaches, a red disk appears and the bell rings continuously for several minutes before the actual arrival of the train, which may be more than a mile away when the warning signal is energized. The bell can be heard distinctly for a distance of some 500 yards. When no train is approaching the crossing, a white disk is displayed in the signal casing. At night time the signal is illuminated by a bright lamp shining continuously through either the red or white disk.

The signal is electrically operated. An approaching train automatically makes track connections which cause the red disk to swing into place and the gong to ring. As soon as the train has passed the crossing this conection is broken, the white disk replaces the red one and the bell stops ringing. The railroad officials say they are convinced that it is practically impossible for these signals to become deranged by anything short of actual demolition. If a circuit wire should become broken, either accidently or through tampering, the danger signal is immediately displayed.

Weatherproof Locked Socket.

The lamp lock known by the trade name "Shurlok" that was put on the market some time ago by Pass & Seymour, Incorporated, Solvay, N. Y., has met with exceptionally popular favor and has aroused a large and urgent demand for its application to weatherproof sockets. To meet this demand the firm has developed a line of weatherproof Shurlok devices, of which the one shown herewith is the first one to be regularly listed; it is known as P. & S. No. 43,310. Although no publicity has as yet been given the new device, the company has already received orders for over 10,000 of the sockets from a few concerns that knew thereof.



Weatherproof Locked Socket.

In packing houses, damp basements, subways, tunnels, underground stations, etc., the new weatherproof socket with its unobtrusive, but effective, Shurlok is particularly suitable. The socket is of mica compound and this makes it not only moistureproof, but also rugged and strong, so as to be particularly adaptable in places subject to severe service.

Reflector Envelope Unit for Railway Car Lighting.

A railway coach is an expensive piece of equipment in which even the most costly lighting units form but a small part of the total expenditure. Yet none of the conveniences with which railway cars are now equipped give more travel-comfort or are more necessary than light units correctly designed to meet the particular service requirements of railway work.

Reflector Envelope Unit for Car Lighting.

The new reflector envelope unit which has been developed by the Holophane Works of General Electric Company is a particularly interesting piece of lighting equipment, for it illustrates the care which railway men use in their lighting problems as contrasted to the careless ways of commercial lighting.

This reflector envelope unit is made up of a Holophane prismatic flanged reflector, and especially designed for car lighting from the center deck. A Druid glass envelope rests on the reflector flange and breaks up the high lights in the prisms, diffusing the light uniformly. A threaded metal fitter is spun on the Holophane reflector, a rubber gasket on the flange seals the envelope and reflector together at the bottom, and a metal collar, threaded over the fitter at the top, clamps the envelope and reflector together. The complete unit is sound mechanically, effective in light distribution, and beautiful in appearance.

Copper Production in Arizona.

With a mine producion of about 414,593,000 pounds of copper in 1913, Arizona led all other copper-producing states. The output in 1913 shows an increase of more than 49,000,000 pounds, or about 12 per cent over that of 1912, which was 365,038,649 pounds. As the price of copper was slightly lower in 1913, the value of the metal increased only about $3,500,000. There were 11 active copper smelting plants in the state, and ore and concentrate were also sent to 6 copper and lead plants in other states. Of the former, the greatest increases in output were made at the Hayden, Calumet & Arizona, Copper Queen, Old Dominion, Consolidated Arizona, and Swansea plants. At the United Verde and Detroit plants there was little change from the figures of 1912. Those making less copper were the Shannon, Arizona Copper, and Pioneer plants. New plants were completed by the Arizona Copper and Calumet & Arizona companies, and another was in course of construction for United Verde ores.

Simplex Foot-Warming Rug.

A convenient appliance to aid in carrying out the old suggestion "Keep your head cool and your feet warm" has been placed on the market by the Simplex Electric Heating Company, Cambridge, Mass. While intended originally to add to the comfort of winter riding in an electric automobile, it has also been found of great value in residences, offices, sanatoria, etc.

As shown in the illustration herewith, the Simplex rug is made as a Wilton carpet rug 15 by 27 inches in size. It is neatly bound and substantially made in every way. The heating unit is especially rugged and will outlast the carpet covering; the rug may be walked on indefinitely without injury. The design is such that the rug does not produce danger from fire or overheating. It is ready for immediate use by merely plugging into the circuit. The rugs are made for various voltages, although 110 is standard for house service and 75 for an 80-volt electric car. The power consumption is 100 watts.

For the electric automobile the Simplex rugs are a great convenience at relatively low energy cost. Particularly is this true when the passengers are going to a dance or other social function for which heavy footgear would be out of place. The new rug dispenses with the various troublesome expedients formerly used as foot warmers for carriage and vehicle use. The rugs are made in various colors, but unless otherwise specified gray is supplied.

Simplex Foot-Warmer Rug.

Electrose Arcover Line and Strain Insulators.

Louis Steinberger, an inventor well known in the insulator art, has succeeded (after a vast amount of labor and costly experimenting, having had to overcome seemingly insurmountable difficulties) in producing on a commercial scale what are believed to be absolutely reliable suspension line and strain insulators for every voltage. These "Arcover" insulators are said to meet every requirement in a highly satisfactory degree. Their very remarkable efficiency will doubtless at once receive due recognition from leading engineers and electrical manufacturing and constructing companies in all parts of the world.

These Arcover insulators are the only insulators with imbedded interlinked strain or suspension members that are made up of a single, integral and uniformly solid mass of insulating material without joints. Even though the insulating material should become totally destroyed, the line cannot possibly fall to the ground.

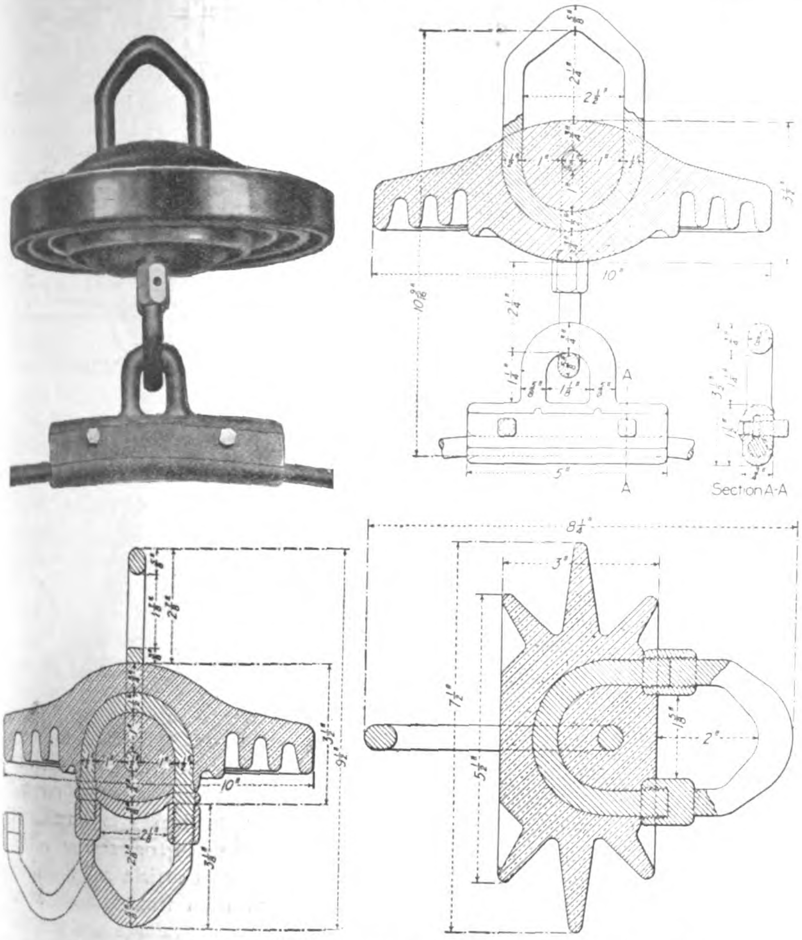
The electrical and mechanical values of these insulators have been worked out to a degree of perfection never before attained in this class of devices and are far in excess of ordinary requirements. Therefore they are especially well adapted for applications where unusually severe conditions prevail. These Arcover insulators possess a number of original and desirable features. Two or more units may be connected or disconnected in a fraction of a minute, no special tool being required; a plain wrench, a nail or even a piece of wire is all that is needed. No extra connecting member is required and there are no loose parts to be lost. The spacing of the units in their relation to each other has been worked out on scientific lines, to the best possible advantage.

The novel form of line clamp shown in connection with the Arcover insulators is also an invention of Mr. Steinberger, and possesses many admirable features; it has a smooth bore for gripping the wire or cable, thereby preventing crystallization and the possible breaking of the conductor at or near the clamp. It is designed so as to grip conductors of various diameters. It is light in weight, but sufficiently strong to break the conductor before slippage occurs. The metal parts employed in all these insulators are made of galvanized drop-forged steel.

In the table below are given the remarkable electrical and mechanical values of the 10-inch Arcover disk suspension and strain insulators, also of the 7.5-inch Arcover disk strain insulators:

	7.5-Inch Disk Strain Insulator	10-Inch Disk Strain and Suspension Insulator
Puncture value, in oil	120,000 volts	150,000 volts
Tested to dry arc value	74,000 volts	100,000 volts
Rain arc value...	55,000 volts	55,000 volts
Line voltage	25,000 volts	25,000 volts
Mechanical value.	20,000 lbs.	20,000 lbs.
Tested to	10,000 lbs.	10,000 lbs.

Arcover disk strain insulators are made in the following diameters: 5.5, 7.5, 10.5, 12.5 and 14.5 inches. Arcover disk strain and suspension insulators are made in the following diameters: 8, 10, 12, 14 and 16 inches. These insulators are made by the Electrose Manufacturing Company, 60 Washington Street, Brooklyn, N. Y., of which Mr. Steinberger is president.



View and Sections of Electrose Arcover Line and Strain Insulator.

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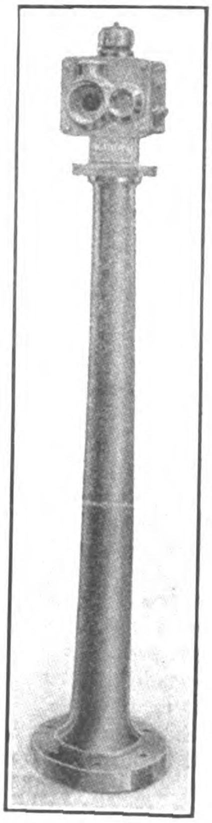
A Combined Telephone and Megaphone.

For marine work the use of the telephone is already well recognized and there are numerous types of loud-speaking telephones now in operation on board ship. Reference may, however, be made to the "Telemeg," which is made by Kelvin, Bottomley & Baird, Limited, of Glasgow, Scotland, inasmuch as this differs somewhat from the types of instruments usually made. The ordinary loud-speaking telephone is simply a heavily constructed telephone with excessive battery power behind it. In such instru-



Combined Telephone and Megaphone for Shipboard Use.

ments the loudness of speech is obtained because of the exceptionally heavy currents which pass through the speaking circuit. The Telemeg, which is a shortening of "telemegaphone," combines the principles of the telephone and megaphone. Speech is transmitted electrically from the sending station, which may be the bridge of a ship, to the receiving station, say the forecastle, and is there emitted in extremely loud tones from a specially formed trumpet-orifice or megaphone. Only a minute current passes through the speaking circuits of the instrument, the loudness of speech being obtained by the combination of a specially constructed microphone with the megaphone orifice. The value of this will be seen when it is remembered that heavy currents passing through the speaking circuit of any telephone system are destructive as they cause undue heating and burning of the carbon granules which transmit the current in the microphone. So much is this the case that some telephones are provided with devices for frequently shaking up the carbon granules so as to bring new surfaces into contact as the older ones become deteriorated by overheating. With the Telemeg the maximum speaking current is being passed continuously for days and weeks without any deteriorating effect at all, and hence there is no occasion to provide a device for periodically rattling the microphone so as to rearrange the carbon granules in the manner described above.

Another frequent source of trouble common to telephones is dampness. Any moisture around the carbon granules entirely destroys the speaking qualities of the apparatus. Hence marine telephones are usually inclosed in water-tight casings. In the Telemeg, on the other hand, while the outer casing is quite water-tight, the microphone itself is contained in a sealed metallic capsule and is thus absolutely water-tight. It may, for example, be taken out of the outer casing, immersed in water and replaced, when the speaking qualities of the apparatus will be found to be quite unimpaired. The gear which is shown in the illustration has been subjected to exhaustive tests for a period of several years and can be said to replace the old fashioned form of telegraph operated by chains between one station and another. These telegraphs could only be used to signal about half a dozen phrases and usually work out at a considerably higher price than the electrical apparatus above described. It therefore warrants the attention of all up-to-date shipbuilders and owners.

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Copper Exports.

Exports of copper for the week ending January 8 totaled 12,689 tons; same period last year, 6,147 tons.

A New Forged-Steel High-Tension Insulator Pin.

Hubbard & Company, Pittsburgh, Pa., announce the addition of the Hubbard forged-steel high-tension pin to the well known Hubbard array of pole-line hardware. This pin was developed to overcome the inherent defects of the old types of malleable and cast-iron supports for high-tension insulators, and is said to be by far the lightest, strongest and cheapest pin of the center-bolt separable-thimble type on the market. The strength of all other separable thimble pins is limited to the bending strength of the center bolt at the point of contact between the thimble and the main casting, and the diameter of this bolt is in turn limited to three-fourths inch by the fact that the bolt must be small enough to screw into a cast thimble of not over 1.125 inches, outside diameter, in order to permit cementing into a 1.375-inch pin hole.

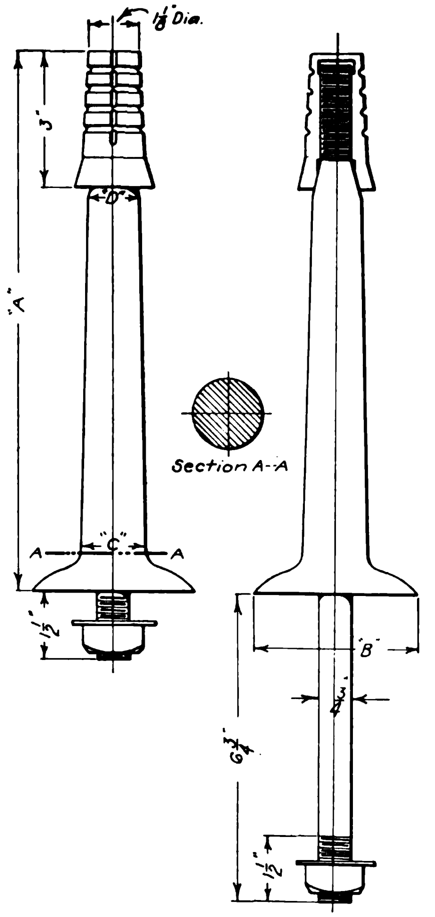

Fig. 1.—Two Styles of Hubbard Forged-Steel Pin.

In the Hubbard forged-steel pin the tapered collar of the thimble, which is of malleable iron, greatly reinforces the pin at its smallest diameter, thus allowing the use of the standard type of thimble without any reduction in the strength of the pin. When a stress is applied to a pin having a long center bolt, the bolt will stretch considerably, allowing a deflection, which in one case amounted to 5.5 inches under a horizontal pull of 1,750 pounds, while a forged-steel pin subjected to an equal stress deflected only one-fourth inch.

The Hubbard forged-steel pin is made in two styles, shown in Fig. 1, the long-shank pin for use with wood or channel steel arms, and a short-shank type for use on arms of angle section, including the Hubbard "Bo-Arrow" arm and high-tension extension. Fig. 2 shows a Bo-Arrow arm equipped with the new pins.

There are no welded joints in this pin, as it is forged from a solid bar of open-hearth steel, thus insuring freedom from flaws. It can be furnished plain or galvanized to meet the National Electric Light Association test in seven sizes, ranging from 6 to 16 inches in length. It can be furnished on shorter notice than can a cast article, and if desired in any variation from standard sizes.

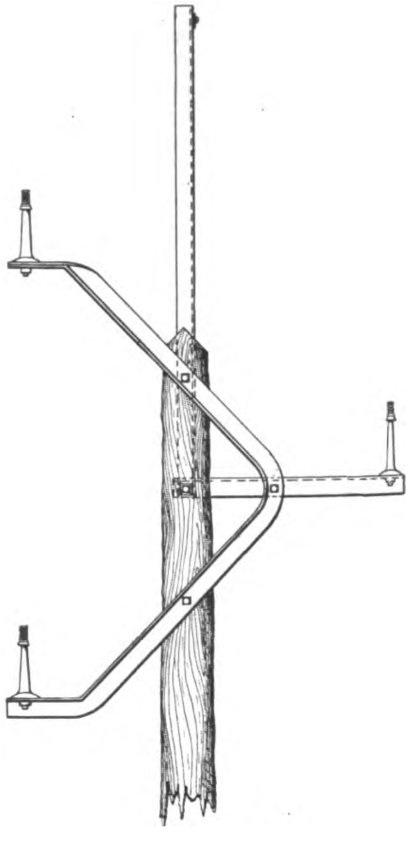

Fig. 2.—Bo-Arrow Arm Equipped with the New Steel Pins.

The malleable thimble used with the forged-steel pin is also used with the high-tension channel steel clamp pin for wooden and angle steel arms and with the various types of pole-top pins manufactured by Hubbard & Company. All of these pins, together with the Peirce cône type sheet-steel pin, are described in the Hubbard "Reference Book of Transmission Line Construction," which is at last ready for distribution, having been held up from time to time for the inclusion of new data.

Johnson Wire Puller.

A very convenient and extremely valuable tool has been invented by M. E. Johnson, 5514 Lowe Avenue, Chicago. Mr. Johnson has patented this device and is its sole manufacturer. In the accompanying illustration (Fig. 1) is shown a view of one of these tools that has been in service for many months. It is a modified form of pliers in which one jaw is provided with a cam extension. The method of using the tool is shown in Fig. 2. The tool is well adapted for all exposed wiring and also is a great aid in knob-and-tube wiring. It is particularly designed to tighten each stretch of wire with the utmost speed and convenience, and its use insures extremely neat and rapid work.

The insulator or cleat is set in place, the screw or nail holding it partly driven, and the wire slack is pulled up by hand in the usual manner. In order to tighten the wire the Johnson wire puller is applied at either the right or left side; it is necessary merely to give it a turn whereby it rolls on the cam-shaped pulling block until the required tension is obtained. Holding the tool in this position with one hand, the screw or nail is then driven home. On releasing the wire puller, the cleat or knob is not pulled back by the wire because any slack in the setting of the insulator has already been pushed back to the limit by bracing the wire puller against it. This eliminates the sagging back of insulators commonly noticed in work of this kind and which gives the wires the appearance of being loose.

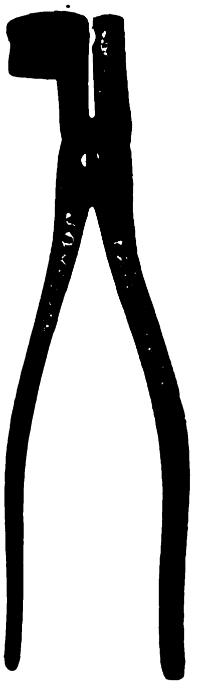
Fig. 1.—Johnson Wire Puller.

The new tool can be used in many places where ordinary methods of tightening the wire are impossible. For example, it is very serviceable where an obstruction prevents access for gripping the wire with any other device but the new wire puller. It is also very convenient in working between joists or beams. Its use does not mar finished ceilings or wires, and does not injure the insulator. It makes an extremely neat job and results in such saving of time that, according to the manufacturer, its low cost is very soon paid for.

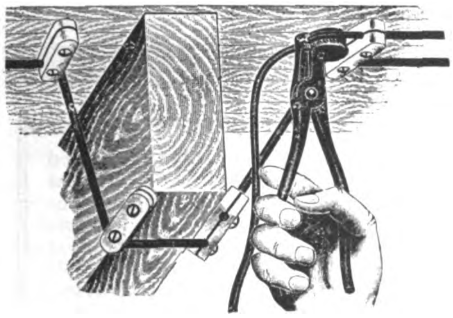
Fig. 2.—Method of Using Puller.

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Orr & Lockett Drilhammer.

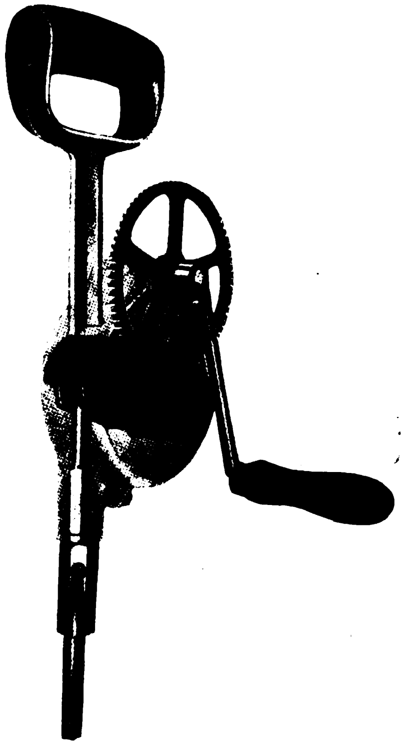
For drilling holes in any material except wood and metal, a new tool has been placed on the market called the Drilhammer. This is of unique construction in that it is a very compact and powerful tool which the manufacturers say is extremely effective on account of the principle used in its operation. By means of centrifugal force two hammer elements are revolved so as to deliver upwards of 975 blows per minute upon the drill.

The tool has a one-piece malleable handle, giving a strong and steady grip. A crank is mounted on a steel cut spur gear which meshes with a small pinion on the main shaft of the tool. This carries a steel spider, at each end of which is pivoted a hardened tool-steel hammer element. Since these hammer elements are free to swing upon the spider, on revolution of the latter they are thrown out by centrifugal force and revolve in their extended position with the spider. As each element reaches the point at right angles to the axis of the drill it strikes the end of the drill with full force. Since it is pivoted on the spider it swings away from the end of the drill so as to pass the latter on continued revolution. The other hammer piece likewise strikes a vigorous blow when it swings around to the end of the drill.

Thus, for every revolution of the spider two blows are given to the drill. The gear ratio of the drill is 1 to 6.25, and, therefore, by every turn of the crank practically 13 blows are given to the drill. On a small machine an operator can easily make 75 turns of the crank per minute. Consequently, he can deliver from 975 to 1,000 blows per minute. In a smaller machine the diameter of the spider is four inches; consequently at a speed of 75 revolutions per minute the hammers travel at the rate of 468.75 feet per minute, which is such a high velocity as to deliver very powerful blows upon the drill end.

The manufacturers claim that this drill delivers more blows per minute than any other similar tool on the market. It is also claimed that the rapid crumbling strokes delivered make clean holes in the shortest possible time. The tool is made of very rugged construction so as to be substantially indestructible. Since it has no springs there is nothing to adjust or deteriorate. Its operation is extremely simple and it can be put to use without preliminary experience.

Two sizes of Drilhammer are made, the smaller size is used for holes ranging from one-fourth to five-eighths inch. The second size is used for drilling holes from one-half to one and one-quarter inch. The tools accommodate any style drill used in such work. An extension can readily be applied to brace the Drilhammer against the ceiling or in any other position where it cannot be readily held by the operator. This extension is particularly serviceable for electricians.


Orr & Lockett Drilhammer.

A view of one of these devices is shown in the illustration.

The Drilhammer is manufactured and sold by the Orr & Lockett Hardware Company, 14 West Randolph Street, Chicago.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—H. T. Paiste Company, Philadelphia.
Edison-base type, 660 watts, 250 volts, catalog No. 400.
Approved December 6, 1913.

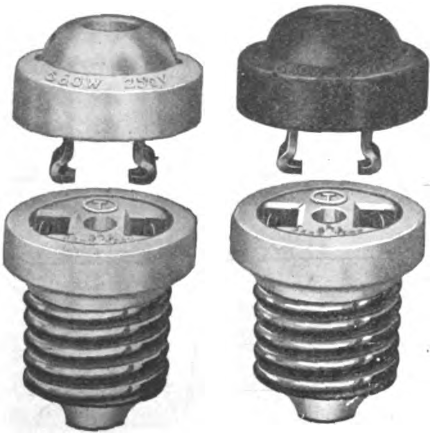
ATTACHMENT PLUGS, Fuseless.—The Trumbull Electric Manufacturing Company, Plainville, Conn.
"Trumbull" 660 watts, 250 volts.
Separable attachment plugs, catalog Nos. 785, 786.
Approved December 16, 1913.

CABINETS.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Steel cabinets, catalog Nos. 2-Std., 935 and 954, with sheet-metal meter adapters for inclosing the connections to meters, also four-inch to ten-inch sheet-metal connectors.

Must be installed with the surfaces beneath the meter adapters covered with sheet metal at least one-sixteenth inch thick.

Approved December 6, 1913.


Attachment Plugs.—Trumbull Electric Manufacturing Company.

CUTOUT BASES, Cartridge Fuse.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Porcelain base:

250 volts, 0-30 amperes, catalog Nos. 19 353, 21 353, 21 653, 21 993, 25 693, 25 873, 29 653, 80 423.

250 volts, 31-60 amperes, catalog Nos. 19 365, 21 365, 21 656, 21 996, 25 696, 25 876, 29 656, 80 426.

600 volts, 0-30 amperes, catalog No. 25 694.

600 volts, 31-60 amperes, catalog No. 25 697.

Slate base:

250 volts, all capacities, catalog Nos. 8000-05 inclusive, 8010-15 inclusive, 8019, 8021-25 inclusive, 8030-35 inclusive.

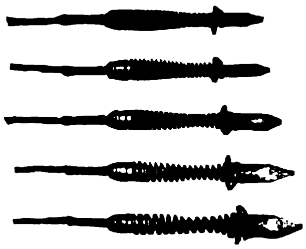
600 volts, all capacities, catalog Nos. 8050-54 inclusive, 8060-64 inclusive, 8070-74 inclusive, 8080-84 inclusive.

Approved December 6, 1913.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

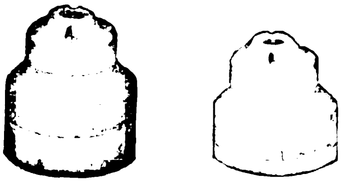
"G.E." soldering irons, types 1-8 to 1-12 inclusive, 75 to 275 watts, 95 to 250 volts.


Soldering Irons.—General Electric Company.

Portable electrical heating devices of this class present certain inherent hazards. The temperatures necessary for their normal use are high enough to cause fire if they are left in contact with combustible materials. As yet no adequate means have been brought forward for eliminating such hazards.

The general design and workmanship shown in the construction of these soldering irons are satisfactory.

Approved November 17, 1913.


Receptacles for Attachment Plugs.—National Metal Molding Company.

Pull Switch.—Bryant Electric Company.

RECEPTACLES, For Attachment Plugs.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.
"National" receptacles for attachment plugs, 660 watts, 250 volts.
Outlet box receptacles, catalog Nos. 390 and 390-A.
Molding receptacles, catalog Nos. 360 and 360-A.
Approved December 6, 1913.

RECEPTACLES, For Attachment Plugs.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
"C-H," 10 amperes, 250 volts.
Concealed, catalog Nos. 7,616, 7,617, 7,655.
Molding, catalog Nos. 7,621, 7,622.
Flush receptacle, catalog Nos. 7,611, 7,612.
Approved December 6, 1913.

SWITCHES, Combination Cutout.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

"Paiste" panel cutout and service entrance switches, second and third wire.

Receptacle for Attachment Plugs.—Cutler-Hammer Manufacturing Company.

Panel cutout, Edison plug fuse bases and knife switches, 30 amperes, 125 volts, catalog Nos. 4,012-16 inclusive, 4,025.

Approved December 5, 1913.

SWITCHES, Surface Snap.—The Trumbull Electric Manufacturing Company, Plainville, Conn.
Double-pole, 10 amperes, 250 volts, wing handle, catalog No. 7,456.
Approved December 10, 1913.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.
Chandelier switches:
"Wrinklet" pull switches, one ampere, 250 volts, three amperes, 125 volts, catalog No. 456.
Approved December 6, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

MARTINSBURG, W. VA.—The Martinsburg Power Company will enlarge its power plant.

SHERWOOD, N. D.—C. H. Budke will install an electric light plant here next summer. C.

MINDEN, IOWA.—A $7,000 municipal light plant will be established. Address the city clerk.

GALT, MO.—A municipal light plant will be established. Address the city clerk for particulars.

DeRIDDER, LA.—DeRidder Light & Power Company is planning to erect a $30,000 power plant here.

SIOUX CITY, IOWA.—Sioux City Gas & Electric Company will spend about $100,000 enlarging its plant next year.

DE GRAFF, MINN.—An electric light plant will be established here. Address C. D. Neenan, village recorder.

CALGARY, ALTA.—The Eau Claire Lumber Company is considering the erection of an electric power plant here.

DAYTON, WASH.—Jacob Weinhard is considering the installation of an electric light and heating plant in this city.

DENNISON, IOWA.—Bonds will be voted for the construction of an electric light plant here. Address the City Clerk for desired information.

SHEBOYGAN, WIS.—The city has asked permission to establish a municipal lighting plant here. Address the city clerk.

SHERIDAN, MONT.—The Chamber of Commerce has started a movement for ornamental lighting. Address the city clerk.

MUSCATINE, IOWA.—The Citizens Light & Power Company will make improvements. Address Frank T. Hulswit, president.

LANSFORD, N. D.—The Council is planning to construct an electric light plant here. Address the city clerk for particulars.

GLENDORA, CAL.—Bids will be received until February 12 for a franchise to operate an electric distribution system in this city.

ADRAIN, MINN.—Business men headed by M. E. Mehrten are raising funds for an ornamental street-lighting system. C.

TYLERTOWN, MISS.—The Tylertown Light & Power Company is planning to purchase and install a 60-horsepower engine.

SPENCER, S. D.—A movement has been started for a transmission line from Salem to this place, the estimated cost of which is $400. C.

GRIMMES, IOWA.—$4,000 in bonds will soon be voted for the construction of electric light plant here. Address A. E. Larson, town clerk.

DELL RAPIDS, S. D.—N. C. Draper has been granted a franchise for electric lighting and power. Address James Ridlington, city auditor.

SUMAS, WASH.—The Public Service Commission at Olympia has ordered improvements and alterations to be made in the electric system here. O.

MADISON, GA.—The Electric Light Commission is contemplating rebuilding half of its transmission line. Address G. W. Hubbard, superintendent.

MONROE, N. Y.—Permission has been granted to the Orange & Rockland Electric Company to erect poles, wires and other appliances in this town.

HERINGTON, KANS.—The Council is planning ways and means to secure $49,000 for improving the light and water plant. Address the city clerk.

GLYNDON, MINN.—The Glyndon Light & Power Company has been incorporated with a capital stock of $5,400 by A. J. Fitzsimmons and others.

SAN DIEGO, TEX.—The San Diego electric light plant has been sold by S. G. Smith to Arthur Blankenship, who will make improvements to the plant.

MT. CARMEL, PA.—The Edison Electric Light Company is thinking of an addition to its plant at this place. Address W. Keiser, superintendent.

EAST ORANGE, N. J.—The Real Estate Brokers' Association of East Orange has appointed a committee to arrange for improved lighting facilities on Park Avenue. A.

WORCESTER, MASS.—The Street Lighting Committee has recommended installing 389 additional electric street lamps. Address H. A. Kinglet, superintendent.

GALENA, KAN.—The Empire District Company has been granted permission by the Public Utilities Commission to issue $120,000 worth of bonds for improvements. M.

ANTIOCH, CAL.—The Great Western Power Company has been granted a permit to run a high-voltage power line from the eastern to the western town limits.

BELLINGHAM, WASH.—The Skagit Power Company has been granted a 50-year franchise and will construct power plants in the upper Skagit and Cascade River region.

ROBINSON, KANS.—C. I. Stocking, superintendent of the Northeast Kansas Telephone Company, is making preliminary plans for the installation of an electric light plant.

WASHINGTON, N. C.—Gilbert C. White, engineer of Charlotte, has prepared plans for an electric light and water works plant to be constructed here at a cost of $160,000.

WAYLAND, N. Y.—Wayland-Steuben Power Company, Incorporated, has been incorporated with a capital of $50,000 by V. M. Kimmel, J. Kimmel and O. F. Kiefer, Wayland.

SOUTH PASADENA, CAL.—The Los Angeles Gas & Electric Company has been granted a certificate of public necessity and convenience to operate under franchises in this city.

WASHINGTON, PA.—Robert P. Reed, of this city, has the plans for a building which will be erected by the Relief Electric Light & Power Company for the generation of electric power.

GOSHEN, IND.—After some experience with a private lighting corporation the city of Goshen has arranged for a $35,000 temporary loan to pay the expense of reconstructing the municipal lighting plant.

BOWLING GREEN, KY.—This city is contemplating enlarging its electric light plant so as to provide current for the operation of an ornamental lighting system which will be installed in the business section. G.

MANHATTAN, KANS.—The Rocky Ford Power Company is to build a line west to Riley and north to Leonardville, and will provide light and power for those towns. Dr. C. K. Raber is president of the company. M.

MT. CALVARY, WIS.—The management of the St. Lawrence College at Mt. Calvary is now making plans for the installation of a new lighting system at the college during the summer vacation. Address Rev. B. Schmitz.

LOUISVILLE, KY.—George E. Woodruff & Company, Louisville paint dealers, are planning the establishment of a paint factory, and in that event will require motors for the operating of grinding and mixing machinery. G.

SHASTINA, CAL.—The Railroad Commission has rendered a decision allowing the California-Oregon Power Company to serve electricity in the towns of Shastina and Edgewood under rates which it had previously put into effect.

SEDRO WOOLEY, WASH.—The City Council will install a $2,500 cluster-lighting system on Metcalf Street, from State Street to the Great Western crossing. The Northwest Traction Company will furnish the current.

MILFORD, PA.—The Shohola Falls Hydro-Electric Company is contemplating the erection of a hydroelectric plant on the Delaware River near Belvidere, N. J. The stock of this company was recently increased from $6,000 to $500,000. N.

COLUMBUS, O.—Representatives of North Side civic and commercial organizations are back of a movement to secure the extension of the High Street cluster-lighting system rom Fifth to Chittenden Avenues. Address the city electrician.

DEADWOOD, S. D.—The Homestake Mining Company, of which T. J. Grier is superintendent, will build this year a steam-electric generating plant of 3,200 horsepower to cost $45,000; a boiler plant at an estimated cost of $100,000 and a new hoist. C.

SIOUX CITY, IOWA.—Enlargements of the Sioux City Service Company's plant and equipment during 1913 cost approximately $191,000 and about the same amount will be expended for improvements this year. Address E. L. Kirk, general manager.

BARBOURVILLE, KY.—The Barbourville Electric Light & Power Company has plans for enlarging its electric light plant, a new franchise which it sought having been granted. New generating equipment, as well as transmission apparatus, will be required. G.

COLUMBUS JUNCTION, IOWA.—The citizens of this city decided to grant the Miller-Edwards Electric Light & Ice Company, of this city, a franchise to wire the town and establish electric lights. Work will probably begin at once and the service soon be established.

WILLIAMSBURG, IOWA.—Frank Gue of Keota has purchased part of the canning company's buildings and also the lighting franchise voted to the company by Williamsburg. He will install an electric-light system and hopes in the future to extend it to Conroy and Parnell.

TULARE, CAL.—A survey is now being made for a new transmission line for the Mt. Whitney Power & Electric Company from No. 3 plant to Lindsay. This will be a steel tower construction following the present line to Lemon Cove, thence in a straight line to Lindsay.

PATON, IOWA.—This city proposes to obtain electric power by building a transmission line to connect with the Central Iowa Power Company. W. H. Grover, of Ames, Iowa, has been authorized to prepare a preliminary report and if the project is feasible, plans and specifications.

GARDEN CITY, KANS.—A municipal electric light plant is to be built here, an injunction suit brought against the city to prevent a bond issue to cover the expense of erecting the municipal plant having been recently dismissed in the Federal courts. A "White Way" will be constructed. M.

LAKE VIEW, IOWA.—The town voted on January 14 upon an issue of bonds for the purpose of installing a transmission line to Sac City, a distance of 10 miles, and also a local distribution system. Plans and specifications will be prepared by W. H. Grover, of Ames, Iowa, who has been retained as engineer.

PHILADELPHIA, PA.—Preparatory to the installation of tungsten electric lighting as a substitute for gasoline and arc lamps Director of the Philadelphia Department of Public Works Cooke has made public some of the plans for a change in 4,000 gasoline lamps to electricity, and 700 arcs to incandescent globes. N.

WESTFIELD, MASS.—The Municipal Light Board will at once purchase a 300-horsepower boiler and a 500-kilowatt generator. The town has voted $25,000 for the purpose. Further increases in the plant are likely in the near future owing to the great growth in the business through the sale of power to numerous manufacturing plants in the territory. W.

LAPWAI, IDAHO.—It is expected that active measures will be taken soon for the construction of an electric lighting system in this city. A franchise has been asked of the Municipal Board by the Lewiston Electric Light & Power Company, which, if granted, will enable the company to extend its light and power lines from Lewiston to this city, within six months. O.

WEEDSPORT, N. Y.—A petition signed by 121 taxpayers has been submitted to the village clerk asking for a special election on a proposition to bond the village for $15,000 for the erecting of a municipal lighting plant. The taxpayers voted in favor of a municipal plant a year ago, but it was found that the system would cost more than the bond issue specified.

REDDING, CAL.—The Railroad Commission has granted a certificate of public necessity and convenience to the California Power & Manufacturing Company to sell power in the territory which can be served from the existing plant of Florin Brothers at Fall River Mills. The effect of the decision is to leave a large section of territory open to both the California company and the Pit River Power Company, which have applied simultaneously to serve the section.

PHILADELHPIA, PA.—Charters issued by the State Department December 31 for the incorporation of eleven electric companies to operate in Bucks County is declared to be the forerunner of an important plant which may eventually supply light, heat and power to Philadelphia. The incorporators of the new company are S. D. Warriner, Philadelphia; Rollin H. Wilbur, St. David's, and P. F. Baker, Germantown, leading officials in the Lehigh Coal & Navigation Company.

DES MOINES, IOWA.—The Des Moines Electric Company will begin construction of a high-tension power line from Des Moines to Oskaloosa next spring, to light the streets of Oskaloosa and operate the street railway and interurban. The Illinois Traction Company owns the franchise. This company also owns the Des Moines Electric Company, and it intends to make the Des Moines plant supply light and power in the half dozen Iowa cities in the center of the state in which it operates. High-tension lines will be extended from Des Moines to several other cities next spring.

OLYMPIA, WASH.—Acceptance of the 50-year franchise granted to the Washington Public Service Company by the County Commissioners to build and operate a system of electric light and power lines to parts of Thurston County has been made. Proposed lines will extend from this city, through Tenino, to Grand Mound, thence to Gate, the purpose being to furnish electric light or power to the small towns and farmers enroute. According to the terms of the franchise, construction must begin not later than December, 1914, and the system completed and in operation by January 1, 1916. The Washington Public Service Company has a franchise to establish an electric power plant and a central system in this city. It is understood that active operations will begin in the immediate future. O.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

TROY, N. Y.—The City will install a new fire-alarm, telegraph and police-signal system here. Address the city clerk.

EL CENTRO, CAL.—The Imperial Telephone Company is preparing to extend its service to the town of Bernice.

MONTEVIDEO, MINN.—Citizens Telephone Company has been granted a franchise here. A. M. Parks is city clerk. C.

VENTURA, CAL.—The Pacific Telephone & Telegraph Company has been granted a 30-year franchise to operate in San Buenventura.

EMAUS, PA.—The Council is considering the installation of a standard fire-alarm system.

CHICOPEE, MASS.—The Council may establish a police telephone system. Address Frank A. Rivers, mayor, in regard to the matter.

FAIRMONT, W. VA.—The City Council has granted a franchise to the Central District Telephone Company to lay an underground system.

KREM, N. D.—The Mercer County Telephone Company will build a line to Hazen, and in the spring a line will be built from Stanton to Hanover. C.

LOGANSPORT, LA.—R. W. Caraway, Thomas Russell, Sr., and others are planning to install a telephone exchange at this place in the near future.

DEER RIVER, MINN.—Northern Minnesota Telephone Company has organized with Frank Russell as president C.

TEMPLE, TEX.—The United Telephone Company is making improvements and enlarging its plant here at a cost of $3,000. The switchboard will be enlarged and new cable strung. D.

SILVER CITY, N. M.—The Mountain States Telephone Company is considering the installation of a telephone line to Mogollon, and the establishment of an exchange in that camp.

EAGLE ROCK, CAL.—The Pacific Telephone & Telegraph Company has been granted a certificate of public necessity and convenience to operate in this city.

SPIRITWOOD, N. D.—The Winfield Township Farmers Club has purchased a telephone line and has incorporated the Winfield Rural Telephone Company. Improvements will be made.

DODGE CITY, KANS.—The Arkansas Valley Telephone Company has received permission to construct a new exchange at Dodge City, and otherwise improve its plant until it has an aggregate value of $60,000. M.

DALLAS, TEX.—The Dallas Automatic Telephone Company has increased its capital stock from $900,000 to $1,000,000 and will make extensive improvements and addition to its present plant and system. D.

TRAVERSE CITY, MICH.—The citizens plan to establish a municipal telephone system. An executive committee was appointed to finance and solicit subscriptions for the municipal service. Address the city clerk for information.

STONE HILLS, N. Y.—The Stone Hills Telephone Company, Incorporated, has been incorporated to operate a telephone line. The capital stock is $3,000 and the incorporators are Charles Sourwine, Fred B. Mitchell and Albert G. Eiss, all of Lafargeville, N. Y.

RIO GRANDE CITY, TEX.—The Starr Telephone Company has been organized here for the purpose of establishing a line between Rio Grande City, Roma and Samfordyce. The capital stock is $5,000 and the incorporators, John Thaison, Dr. G. W. Edgerton and others.

BALLINGER, TEX.—The West Texas Telephone Company will soon begin work on extensive improvements and additions to its plant and system at Ballinger, costing about $20,000. Twelve thousand feet of new cable will be strong, a new switchboard installed and new automatic telephones put in. The work will be completed by March 1. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MILTON, FLA.—H. S. Laird and others are planning to build a street railway to connect Milton and Bagdad, Fla.

LOUISVILLE, KY.—Interurban Railroad Company is considering the construction of an underpass near Anchorage, Ky. T. J. Minary is president. G.

NELSON, B. C.—This city recently voted to purchase the Nelson Street Railway system for approximately $46,000. Extensive improvements are planned. O.

SACRAMENTO, CAL.—The Sacramento Electric Railroad Company has been authorized by the Railroad Commission to construct the first unit of its electric railway here. C. L. Donohoe is president.

ISMAY, MONT.—The Ismay, Ekalaka & Southern Electric Railway Company will commence work in the spring for the construction of an electric railway to connect Ismay and Ekalaka. George Burke is interested.

BILLINGS, MONT.—The Big Horn Canon Irrigation & Power Company has completed a survey for a railroad 68 miles long from the Canon to Custer. Power will be developed from a dam the company is expected to build in the Big Horn Canon. C.

SAN DIEGO, CAL.—The Railroad Commission has directed the La Jolla Railway Company to electrify its line and have electric cars running between San Diego and La Jolla within a year. The cost of the work is estimated at $200,000.

RED WING, MINN.—The Commercial Club has started a movement for a street car line. The first move will be to induce St. Paul and Southern Electric Railway to build its first line to this place and Lake City. R. H. Boxrud and E. H. Foot were appointed a committee to investigate the proposition. C.

CARLYLE, MONT.—J. A. Cox, representing eastern capital, addressed a farmers' meeting about a proposed electric road from Beach, N. D., to Baker, Mont. Farmers may decide to build the line themselves and a committee was appointed to look up the proposition. James Anderson, Carlyle, is chairman. C.

MADISONVILLE, KY.—The Madisonville & Nortonville Light, Power & Traction Company, which has been incorporated under the laws of Delaware, will in all probability build an interurban line from this city to Nortonville. The company has asked the city for a franchise which will permit of the selling of electricity for power, heating and manufacturing purposes.

UNION STAR, MO.—Farmers in the community seven miles southeast of here have started a movement for an electric line which is to run from Pattonsburg to St. Joseph, a distance of about 50 miles. This road is to run through rich farming communities now from five to ten miles from any railroad. The farmers believe that there is need for the road and that the people would support it.

NASHVILLE, TENN.—The Tennessee & Kentucky Railroad Company has filed amended articles of incorporation changing its name to the Tennessee & Kentucky Interurban Railroad Company, and increasing its capitalization from $10,000 to $15,000. The company will build an interurban line to Adairville from Nashville, and branch lines to Springfield and Franklin, Ky. J. P. Helms, J. L. Weakley and others are interested.

BREMERTON, WASH. — Gustav Rust, and associates of Seattle, on January 6, were granted a franchise by the City Council to construct and operate a street car line in this city. The promotors propose to connect Hood Canal points and this city by an electric line. The erection of a $350,000 power plant on the Hama Hama River, which will have a capacity of 10,000 horsepower, is also contemplated. O.

PRINEVILLE, ORE. — Prominent business men and farmers living in this vicinity, headed by T. M. Baldwin, a local banker, have subscribed $60,000, which will be used in constructing an electric railway between this city and Metolius. Practically all of the right of way has been secured. This is an entirely different proposition from the one being promoted by H. P. Scheel, of Tenino, recently mentioned in the columns of this journal.

NASHVILLE, TENN.—The Nashville & Detroit Construction Company, which will build the line of the new Nashville, Tenn., Traction Company, has increased its capital stock from $500,000 to $1,500,000, and will start work in the near future. It will build a power plant in Eastern Kentucky, build a transmission line 80 miles long to Nashville, and will construct the trackage and other facilities needed for the operation of the line.

SAN FRANCISCO, CAL.—A new electric railroad, to operate between this city, San Jose and Monterey by way of Watsonville, will soon be incorporated, according to Attorney Charles L. Brown, one of the directors. The concern is to be known as the San Francisco Peninsula Railway Company. It is stated that the new line will build 100 miles of track, part double-tracked, with shops and headquarters in this city. Eastern and foreign capital is behind it. Thirty miles of the right of way have already been deeded and survey for the whole is nearly complete; the San Jose franchise was obtained a year ago by private parties, and the Watsonville franchise also has been obtained.

PROPOSALS.

ELECTRIC ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until January 30 for the installation complete of an electric passenger elevator in the post office at Vicksburg, Miss.; also one in the post office at Minneapolis, Minn., in accordance with drawings and specifications, copies of which may be obtained from the office of the Supervising Architect.

NONINTERFERING LOCAL FIRE-ALARM SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 13 for a noninterfering local fire-alarm system in the Appraisers' Warehouse, New York City, in accordance with specifications, copies of which may be obtained from the Supervising Engineer, New York City, or the office of the Supervising Architect.

INTERIOR LIGHTING FIXTURES. —Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 11 for the interior lighting fixtures of the post office at Boonville, Mo.; and until February 20 for the same for the post office at Atlanta, Ga. Drawings and specifications may be obtained from the custodians of the sites or from the office of the Supervising Architect.

ELECTRICAL FITTINGS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until January 27 for 40-pair lead-sheathed telephone cable, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6236; until February 4 for two sets storage batteries for use in electric trucks, for delivery at the Navy Yard, Mare Island, Cal., and 8,200 dry cells, for delivery at various navy yards, as per Schedule 6228; until February 17 for furnishing three five-kilowatt radio sets for shore installation, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6246. The Bureau will also receive bids until February 10 for miscellaneous voltmeters, ammeters and wattmeters for delivery at the Navy Yard, Mare Island, Cal., as per Schedule 6258.

NEW PUBLICATIONS.

HIGH-FREQUENCY AMMETERS.—The Bureau of Standards, Washington, D. C., has published Technical Paper No. 206, entitled "High-Frequency Ammeters," by J. H. Dellinger. An abstract of this paper was given in our issue of October 18, 1913.

INDUSTRIAL RESEARCH. — The presidential address before the American Chemical Society at the 1913 convention by Arthur D. Little, entitled "Industrial Research in America," has been reprinted for distribution by Arthur D. Little, Incorporated, 93 Broad Street, Boston, Mass.

NEW YORK COMMISSION REPORT.—The New York Public Service Commission for the First District has published Vol. I of its annual report for 1912. This is concerned largely with transportation matters in New York City. The testing of gas and electric meters and other matters connected with the regulation of gas and electric corporations in the city are included.

ELECTROLYTIC CORROSION.—The Bureau of Standards, Washington, D. C., has published Technologic Paper No. 25, entitled "Electrolytic Corrosion of Iron in Soils," by Burton McCollum and K. H. Logan. This consists of a paper which was presented before the American Institute of Electrical Engineers at the last annual convention. An abstract of it will be found in our issue of July 5, 1913.

JOURNAL OF MECHANICAL ENGINEERS.—The American Society of Mechanical Engineers has, with the January issue, changed the form of its *Journal,* which will hereafter include the transactions, the separate publication of which is discontinued. The page size of the *Journal* will hereafter be 9 by 12 inches. Papers will not hereafter be published in the *Journal* in advance of meetings, but will be available in advance in pamphlet form.

PUBLIC SERVICE LIBRARY CATALOG.—A catalog of the Library of the Public Service Corporation of New Jersey, located in the Public Service Building, Newark, N. J., has been prepared by the librarian, Mrs. Helen I. Brewer, and printed. Books are listed according to author and title, alphabetically. The catalog comprises 152 pages and contains only the books to be found in the general library of the company and not the collections in the various departments. This list is to be followed by a classified catalog.

FINANCIAL NOTES

The Minnesota Gas & Electric Company has sold to Chicago bankers $325,000 of its first-mortgage six-per-cent bonds, which are being offered at par and accrued interest. The bonds are dated August 1, 1913, and due August 1, 1933.

The United Light & Railways Company has sold to the Continental & Commercial Savings Bank, N. W. Halsey & Company and Russell, Brewster & Company, all of Chicago, $500,000 of its first and refunding five-per-cent 20-year bonds, due June 1, 1932. Bonds are being offered at 86 to yield 6.25 per cent and are redeemable at 102.5 and interest on any interest date, on sixty days' notice.

Control of the Bristol & Plainville Tramway Company has formerly passed to Richter & Company, of Hartford, Conn., and Charles H. Tenney, of Springfield, has been elected chairman of the board; A. B. Tenney, president; D. Edgar Manson, of New Haven, vice-president, and Morris L. Tiffany, of Bristol, secretary and treasurer. Other directors are John T. Trumbull, Rollin J. Plumb, Robert F. Briggs, Nobel E. Pierce, W. H. Putnam, and Ferdinand Richter.

The Omaha & Council Bluffs Street Railway Company on May 1 will redeem the $1,846,000 outstanding bonds of the Omaha Street Railway Company by an issue of $2,000,000 first-consolidated 5s, due January 1, 1928. This new issue has been purchased by A. B. Leach & Company of New York City, and is being offered at 97 and interest. The holders of the Omaha Street Railway bonds have the option to exchange their holdings for the new Council Bluffs consolidated 5s.

The Michigan State Railroad Commission has granted permission to the Detroit Edison Company to increase its capital stock from $15,000,000 to $25,000,000 and to issue and sell $3,400,000 (par value) six-per-cent debenture bonds, against which will be held the remaining $1,350,000 of the present $15,000,000 authorized capital stock and $2,050,000 of the increase in capital stock. Alexander Dow, general manager of the Detroit Company, stated that at least $3,000,000 is to be spent in Detroit improvements.

From the revenue derived from the investment of the Montreal Telegraph Company's contingent fund the twelfth annual bonus amounting to $5,000 was declared at the sixty-seventh annual meeting. Quarterly dividends amounting to $160,000 were paid, this being at the rate of eight per cent. The report shows the property of the company valued at $2,151,823. It is operated and maintained by the Great Northwestern Telegraph Company of Canada, its operation and maintenance being also guaranteed by the Western Union Telegraph Company.

Directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, have formerly authorized an increase of $1,416,000 of the common stock of the company. When this stock is issued the common will total $9,216,000, which, with $6,360,000 preferred, will increase the stock outstanding to $15,576,086. The new stock will be first offered to present stockholders at par, and they will have the privilege of subscribing for one share for each ten they now hold. Stock not taken by present stockholders will be underwritten by a syndicate.

The Kuhn interests, of Pittsburgh, have consolidated 162 electrical companies in Western Pennsylvania into four companies. The new companies are the West Penn Light & Power Company, with a capital of $244,000, and composed of 39 companies; the West Penn Lighting Company, formed of 100 companies and with capital stock of $547,000; The West Penn Electric Company, made up of 16 companies, capital $901,000, and the Kittanning Electric Company, formed of seven companies with a capital of $51,000. The directors of each company are the same, as follows: W. S. Kuhn, J. B. Van Wagener, Byron Trimble, J. A. Lynch and C. W. Scheieck. Another consolidation was the combining of 26 companies chartered for the Ohio and the Beaver valleys into the Harmony Electric Company, with a combined capital of $130,000. The directors are William McBride, Sewickley; D. C. Wiseman, Bellevue; Harrison Bock, Sharpsburg; L. T. Bedell, McKeesport and C. H. Walsh, Pittsburgh.

Dividends.

American Light & Traction Company; regular quarterly of 1.5 per cent on preferred and 2.5 per cent in cash and 2½ per cent in common stock on common, both payable February 2.

Associated Gas Electric Corporation; regular quarterly of 1.5 per cent on preferred, payable January 15 to stock of record December 3.

Brooklyn City Railroad Company; regular quarterly of two per cent, payable January 15 to stock of record January 6.

Columbus Railway Company; the regular quarterly dividend of 1.25 per cent on the preferred stock, payable February 2 to stock of record January 15.

Kaministiquia Power Company, Limited; quarterly of 1.5 per cent, an increase of one-quarter of one per cent over previous declaration.

Manhattan Electric Supply Company; the regular semi-annual dividend of three per cent on the preferred and three per cent on the common stock, payable February 2 to stock of record January 18.

Montreal Tramways Company; quarterly of 2.5 per cent, payable February 2 to stock of record January 15.

New Hampshire Electric Railways; regular semi-annual of two per cent on preferred stock, payable January 31.

Public Service Investment Company; semi-annual of $1.50 on preferred stock and $2 on common, payable February 2 to stock of record January 15.

Railways Company, General; regular quarterly of one per cent, payable February 1.

Rio de Janeiro Tramway, Light & Power Company; quarterly of 0.25 per cent, payable February 2 to stock of record January 15.

United Traction Company, of Pittsburgh; semi-annual of 2.5 per cent on preferred stock, payable January 20 to stock of record January 10.

West Pennsylvania Traction Company; regular quarterly of 1.5 per cent on preferred, payable January 15 to stock of record January 13.

Reports of Earnings.

LONDON UNDERGROUND (METROPOLITAN DISTRICT):

	1913	1912
Week end. Dec. 20	£ 13,282	£ 13,167
Jan. 1-Dec. 20	663,042	644,657
London Underground (London Electric Railway):		
Week end. Dec. 20	£ 14,725	£ 14,975
Jan. 1-Dec. 20	697,815	697,165
London Underground (London General Bus):		
Week end. Dec. 20	£ 61,528	£ 60,393
Jan. 1-Dec. 20	3,150,312	2,636,800

UNITED LIGHT & RAILWAYS.

	1913	1912
Subsidiary companies:		
November gross	$ 527,130	$ 479,026
Net after taxes	204,736	204,975
Surplus after charges	100,151	109,479
Twelve months' gross	5,999,052	5,260,105
Net after taxes	2,421,941	2,161,941
Surplus after charges	1,216,257	1,050,262
Holding companies:		
November gross	131,217	108,764
Net after expenses and charges	91,178	73,948
Balance after preferred division	47,959	41,293
Twelve months' gross	1,136,511	....
Net after expenses and charges	989,233	....
Balance after preferred division	478,535	....

OMAHA & COUNCIL BLUFFS STREET RAILWAY.

The Omaha & Council Bluffs Street Railway reports for the year ended December 31, 1913, as follows:

	1913	1912
*Gross earnings	$2,955,727	$2,852,963
Operating expenses and taxes	1,564,542	1,479,686
Net earnings	1,431,185	1,373,277
Interest charges	601,755	591,940
Balance	829,430	781,337
Depreciation	240,000	240,000
Balance applicable for division	589,430	541,337

*December estimated.

NEW YORK RAILWAYS.

New York Railways Company reports earnings for the month of November and five months as follows:

	1913	1912
November gross	$ 1,138,477	$ 1,154,417
Net after taxes	328,077	342,659
Other income	36,628	44,924
Total income	364,706	387,583
Surplus after charges	87,544	108,668
Passengers carried	22,502,895	22,439,804
Five months' gross	5,977,220	5,897,085
Net after taxes	1,818,350	1,799,708
Other income	159,089	183,210
Total income	1,977,439	1,982,919
Surplus after charges	592,775	587,668

Operating expenses include reserves imposed upon the company by order of the Public Service Commission, now in litigation.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 12.	Jan. 5.
American Tel. & Tel. (New York)	119	118½
Commonwealth Edison (Chicago)	132	133
Edison Electric Illuminating (Boston)	247	245
Electric Storage Battery common (Philadelphia)	48¼	47
Electric Storage Battery preferred (Philadelphia)	48¼	47
General Electric (New York)	140½	140⅜
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅛	1⅛
Massachusetts Electric common (Boston)	12	12
Massachusetts Electric preferred (Boston)	63	63⅓
National Carbon common (Chicago)	135	132
National Carbon preferred (Chicago)	116	115
New England Telephone (Boston)	135½	133
Philadelphia Electric (Philadelphia)	26¾	26
Postal Telegraph and Cables common (New York)	76	75
Postal Telegraph and Cables preferred (New York)	65¼	65
Western Union (New York)	58½	59¾
Westinghouse common (New York)	66	64½
Westinghouse preferred (New York)	116	114½

ATLANTIC GAS & ELECTRIC.

Year ended Oct. 31:	1913	1912
Cons. inc. of sub properties	$1,128,132	$1,021,869
Net sur. from sub. prop. for Atlan. Gas & Electric	185,798	198,462
Other income	73,360	69,165
Gross income	259,158	267,627
Net income after expiration	248,846	239,181
Surplus after charges.	148,846	139,181
Balance after preferred dividends	43,846	34,181

TWIN CITY LINES.

	1913	1912
November gross	$ 751,113	$ 700,676
Net	376,166	352,791
Surplus after charges.	227,841	199,217
Eleven months gross	8,085,035	7,485,814
Net	3,998,715	3,689,157
Surplus after charges	2,378,951	2,107,791

BALTIMORE COUNTY WATER & ELECTRIC.

Baltimore County Water & Electric Company reports for the year ended October 31, 1913.

	1913	1912
Gross earnings	$266,623	$232,082
Net after taxes	126,676	100,094
Surplus after charges	79,026	....

LEHIGH VALLEY TRANSIT.

	1913	1912
November gross	$ 191,199	$ 184,851
Net	133,337	131,048
Surplus after charges.	62,598	85,766
Twelve months gross	1,764,997	1,526,776
Net	1,024,716	876,697
Surplus after charges.	446,572	374,442

AMERICAN GAS & ELECTRIC.

Six subsidiaries of the American Gas & Electric Company report for the twelve months ended November 30 as follows:

CANTON ELECTRIC.

	1913.	1912.
Gross earnings	$407,728	$344,115
Net after taxes	204,617	171,933
Surplus after charges	143,953	115,092

MARION LIGHT & HEATING.

Gross earnings	$252,196	$223,054
Net after taxes	116,208	87,320
Surplus after charges	70,696	48,513

MUNCIE ELECTRIC LIGHT.

Gross earnings	$452,325	$381,928
Net after taxes	188,774	165,035
Surplus after charges	101,305	86,812

ROCKFORD ELECTRIC.

Gross earnings	$457,796	$413,793
Net after taxes	239,046	199,906
Surplus after charges	142,973	105,662

SCRANTON ELECTRIC.

Gross earnings	$910,013	$798,172
Net after taxes	558,424	444,001
Surplus after charges	363,172	294,523

WHEELING ELECTRIC.

Gross earnings	$308,018	$256,528
Net after taxes	146,455	119,545
Surplus after charges	79,772	63,508

NORTHERN TEXAS ELECTRIC.

	1913	1912
November gross	$ 197,719	$ 169,150
Net after taxes	88,682	84,088
Surplus after charges.	64,630	59,426
Twelve months gross	2,118,257	1,762,985
Net after taxes	951,129	834,625
Surplus after charges.	663,602	572,888

PACIFIC LIGHT & POWER CORPORATION.

	1913	1912
November gross	$ 234,155	$ 224,140
Net	112,564	87,573
Surplus after charges	66,931	49,520
Twelve months' gross	2,853,239	2,509,239
Net	1,291,551	1,081,997
Surplus after charges	812,633	590,449

CHICAGO & MILWAUKEE ELECTRIC RAILWAY.

The receiver for the Chicago & Milwaukee Electric Railway Company for the 10 months ended October 31, 1913, reports as follows:

	1913	1912
Gross revenue	$802,472	$818,200
Gross income	310,631	333,429
Taxes	44,166	42,500
Inter on obligations of receiver	52,019	54,894
Total deductions	96,187	97,394
Net income	214,444	234,034

The net income for the year ending December 31, 1913, will be sufficient to pay the interest on the $1,080,000 first-mortgage bonds due January 14 and leave about two per cent on the $5,000,000 of Illinois division bonds.

REPUBLIC RAILWAY & LIGHT.

	1913	1912
November gross	$ 251,259	$ 233,970
Net after taxes	100,246	100,014
Surplus after charges.	56,728	56,352
12 months gross	2,979,608	2,638,427
Net after taxes	1,162,160	1,059,870

ILLINOIS TRACTION COMPANY.

	1913	1912
October gross	$ 729,532	$ 689,193
Net after taxes	325,791	315,962
Ten months gross	6,458,095	6,105,335
Net after taxes	2,621,554	2,438,283

YOUNGSTOWN & OHIO RIVER RAILROAD.

	1913	1912
November gross	$ 21,547	$ 20,039
Net after taxes	8,038	7,920
Surplus after charges	3,869	3,753
Five months gross	116,032	109,248
Net after taxes	44,725	43,272
Surplus after charges	23,892	22,439

PUGET SOUND TRACTION, LIGHT & POWER.

	1913	1912
October gross	$ 744,519	$715,378
Net after taxes	325,034	218,564
Surplus after charges	150,566	149,199
Twelve months gross	8,506,260	....
Net after taxes	3,553,612	....
Surplus after charges	1,497,166	....

SOUTHERN CALIFORNIA EDISON.

	1913	1912
November gross	$ 391,822	$ 366,602
Gross income	181,391	174,832
Surplus after charges.	106,162	113,676
Balance after depreciation	41,162	53,676
Eleven months gross	4,330,935	3,914,469
Gross income	2,161,646	1,810,161
Surplus after charges.	1,381,847	1,150,663
Balance after depreciation	746,847	605,663

GALVESTON-HOUSTON ELECTRIC.

	913	1912
November gross	$ 211,612	$ 181,074
Net after taxes	89,483	76,288
Surplus after charges.	52,918	42,566
Twelve months gross	2,352,895	1,981,369
Net after taxes	1,007,663	821,718
Surplus after charges.	589,276	429,707

DALLAS ELECTRIC.

	1913	1912
November gross	$ 198,259	$ 163,751
Net after taxes	82,224	72,534
Surplus after charges.	55,522	47,899
Twelve months gross	2,163,823	1,800,248
Net after taxes	903,224	710,779
Surplus after charges.	602,289	425,501

PERSONAL MENTION.

MR. F. X. CLEARY, district manager at New York for the George Cutter Company, has returned recently from a visit to the company's plant at South Bend, Ind.

MR. HARRY H. WELLS, district manager of the Public Service Electric Company at Orange, N. J., has been appointed divisional agent of Essex County for the company.

MR. D. WALKER WEAR, formerly purchaser of the Chicago Tunnel Company, has been elected vice-president and director of the Stow Manufacturing Company, with offices at 443 State Street, Binghamton, N. Y.

MR. ERNEST RITTER, formerly manager for the Bell Telephone Company at Allentown, Pa., has been appointed district manager for the company of all territory between Monongahelia, Pa., and Clarksburg, W. Va.

MR. H. B. STABLER, equipment engineer of the Chesapeake & Potomac Telephone Company, has an article in the monthly journal published by the Engineers' Club of Baltimore entitled "Some Notes on Telephone Engineering."

MR. W. J. RUSH has been appointed western sales representative of the Best Electric Company, Pittsburgh, Pa. Mr. Rush will be located in Chicago, and will look after the sales of the company for the western, northern and southern states.

MR. GEORGE F. MADDOCK has been appointed manager of the Examinations and Reports Department of H. M. Byllesby & Company. Mr. Maddock, who succeeds MR. HAROLD ALMERT, resigned, has been the representative of Byllesby & Company on the Pacific Coast for a number of years, residing at Berkeley, Cal.

MR. W. R. HAYNIE has been appointed United States representative of the Consolidated Diesel Engine Manufacturers, Limited, of Aldwych, London, England, with offices at 30 Church Street, New York. Mr. Haynie is also United States representative of the above company's associates, Messrs. Carels Freres & Diesel Engine Company, Limited, of Ghent, Belgium.

MR. W. J. MARLAND, Oakland, Cal., is making a trip throughout the country arranging for a collective exhibit of electrical and mechanical devices at the Panama-Pacific Exposition. It will be remembered that Mr. Marland conducted a collective exhibit of electrical specialties at the Pan-American Exposition at Buffalo in 1901. Mr. Marland states that he has arranged to represent a large number of leading electrical manufacturers. The plant is to show a working demonstration of various electrical and mechanical specialties grouped together in operating units. Expert demonstrators and linguists will be provided to answer all questions and establish complete representation for the manufacturers who participate in this enterprise.

MR. W. R. GARTON has resigned as vice-president and general manager of the Lord Manufacturing Company, Brooklyn. Mr. Garton is well known to the electrical industry, having been active in the field for many years. He was one of the pioneers in the construction of telephone, electric light and railway properties, and more recently has devoted a great deal of time to the supply and manufacturing business. He is an associate member of the American Institute of Electrical Engineers, and a member of the American Electrical Railway Association, the New York Railway Club, the Keystone Electric Railway Club, the New England Street Railway Club, and the New York Electric Railway Association. His temporary address will be 851 East Nineteenth Street, Brooklyn.

OBITUARY.

MR. GEORGE F. REED, general manager of the Springfield Street Railway, died of heart failure at his home in Springfield, Mass., on January 18. Mr. Reed was 47 years of age and had been in the employ of the company for 32 years.

MR. HERMAN CHARLES MEINHOLTZ, of the Heine Safety Boiler Company, St. Louis, Mo., died in that city December 24, 1913, at the age of 45. Mr. Meinholtz had been with the Heine Company since he was 19 years old and at the time of his death was in direct supervision of the company's factory. He was a member of the Engineers' Club of St. Louis and of the American Society of Mechanical Engineers. He is survived by his widow and five children.

NEW INCORPORATIONS.

MEADOWVIEW, VA.—Edmondson Electric Company has been incorporated with a capitalization of $5,000. D. H. Edmondson is president, and S. W. Edmondson, secretary.

PERTH AMBOY, N. J.—Guth Electrical Company has been incorporated with a capital stock of $50,000. The incorporators are M. J. Dahl, A. Guth, and D. Guth, all of this city.

NEW YORK, N. Y.—Manhattan Brass & Electrical Company, Incorporated, has been incorporated with a capital stock of $14,000 by Harry Hilfman, Samuel Denemark, New York City; and Henry Denemark, Brooklyn.

CHICAGO, ILL.—The Consumers' Light & Power Company has been incorporated with a capital stock of $10,000 to do a general electricity, power, steam, light and heat business. The incorporators are Charles Kiper, Jerome N. Frank and Harvey R. Willard, of Chicago. Z.

CHICAGO, ILL.—The Electric Construction Company has been incorporated with a capital stock of $10,000 to engage in electrical contracting and manufacturing. The incorporators are Christopher C. Buckles, George Homer Hightower and Ernst W. Cooley. Z.

SCRANTON, PA.—Charters have been issued to the Commercial Electric Company, of Olyphant, and the Republic Electric Company, of Blakely, each with a capital stock of $5,000 and offices in this city. The incorporators are C. H. Perrigo, J. A. Gibbons and J. B. Neville, all of Scranton.

DATES AHEAD.

Efficiency Society. Annual convention. New York, N. Y., January 26-27.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27-30.

Northwestern Cedarmen's Association. Annual convention, Escanaba, Mich., January 27-28.

American Electric Railway Association. Mid-year meeting. Engineering Societies Building, New York, N. Y., January 29-31.

Wisconsin State Telephone Association. Madison, Wis., February 11-12.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27.

State Independent Telephone Association. Des Moines, Iowa, March 10-12.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11.

Peoria Electric Show. Peoria, Ill., March 9-15.

Buffalo Electrical Show. Elmwood Music Hall, Buffalo, N. Y., March 9-16.

American Railway Engineering Association. Annual convention. Chicago, Ill., March 17-20.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18.

Electrical Contractors' Association of Texas. Annual convention, April 25, 1914.

With the Electrical Manufacturers

Charles Cooper & Company, 194 Worth Street, New York, N. Y., has sent out its usual monthly price list of chemicals which it has either imported or itself manufactured. This list is growing from month to month and contains many interesting prices of a great number of chemicals used in various arts.

The Samson Cordage Works, Boston, Mass., is distributing to the trade a handsome calendar and pad for either a roll-top or flat-top desk. This calendar is not only of a very practical size, but is a matter of considerable ornament. The pad is made up of a pebbled dark gray mat, embossed in white, showing the Samson medallion in relief.

Pawling & Harnischfeger Company, Milwaukee, Wis., has recently issued bulletin No. 401, which is devoted to its type H electric traveling cranes. This publication contains detailed descriptions of the principal parts of these cranes and has over 20 illustrations thereof. Either direct-current or alternating-current motors are provided and a variety of safety devices are included.

Bridgeport Brass Company, Bridgeport, Conn., is sending out circular letters to electric railway lines urging them to consider the merits of Phono-Electric trolley wire in making up this year's specifications for trolley wire. The manufacturers say that this wire gives from two to three times the life and service that hard-drawn copper wire does under similar working conditions.

Frank W. Morse, 516 Atlantic Avenue, Boston, Mass., in a recent price list, gives brief illustrated descriptions of a large assortment of automobile and motor-boat electric-lighting appliances. These are made in a variety of forms suitable for many standard and special services. Included in the assortment are search lamps, trouble lamps, boat and carriage lamps, dash lamps, lamp adapters, special sockets for vehicle and boat use, connectors of various types, combination sockets and connectors, switches, flexible connections, etc.

The Cutter Electrical & Manufacturing Company, Philadelphia, Pa., manufacturer of I-T-E circuit-breakers, announces the opening of a new branch office in Indianapolis, Ind., under the direction of Linn O. Morrow, whose territory will include southern Indiana and Illinois, Kentucky, Tennessee and Missouri. Mr. Morrow has been connected with the Cutter Company for over six years, having spent about four years in the engineering department. The Indianapolis office will be under the supervision of H. F. Darby, Jr., Chicago district manager.

General Insulate Company, 1008 to 1014 Atlantic Avenue, Brooklyn, N. Y., the well-known manufacturer of Insulate composition, reports that, despite the general quietness prevailing in nearly all trades during the latter part of 1913, the year, as a whole, has been the most successful one which the company has ever enjoyed, the business for the year showing an increase of nearly 40 per cent over that of any previous year. Mr. Steinberger, the genial president of General Insulate Company, reports that the indications for 1914 are most promising, business already contracted for being even in greater volume than in the early part of 1913.

American District Steam Company, North Tonawanda, N. Y., is sending out to patrons and friends a beautiful, large calendar for 1914. Its outside dimensions are 21.5 by 46 inches. On it is reproduced the famous painting by DeLand depicting with historical fidelity and great beauty of color the first inauguration of George Washington as President of the United States, which took place on the portico of Federal Hall in New York City, April 30, 1789. The reproduction is 16 by 20 inches in size, surrounded by an attractive border bearing the legend of the American District Steam Company, which has been in the business of engineering, manufacturing and installing central steam-heating equipment continually since 1877.

H. W. Johns-Manville Company, New York, N. Y., has issued an illustrated booklet describing in detail the working of the Audiffren-Singrun automatic refrigerating machine. This points out the many advantages of this ingenious aparatus, among which is the hygenic principle on which it operates so effectively. It also points out that with the constantly recurring shortage of natural ice, which this summer will be more noticed than ever before, there is need for a means of obtaining artificial refrigeration conveniently and effectively. The company reports that among the many orders received for these equipments is one for the complete equipment of the Bellevue Apartments at Madison, Wis. Installations are being made daily in residences, clubs, hotels, cafes, butcher shops, dairies, etc.

The National India Rubber Company, Bristol, R. I., has published a very handsome catalog illustrating and describing its complete line of rubber-covered insulated and lead-incased wires and cables. This is without doubt one of the handsomest catalogs that has been produced devoted to any material in some time. It contains 224 pages and is printed on beautiful coated paper. The text is printed in black and the illustrations are in silver, bronze and colors, showing the actual appearance of the lead sheath, the copper conductor and insulating cover. In addition to the information respecting the products manufactured by the company, a large portion of the catalog is devoted to a study of specifications for double-braided, weatherproof, hard-drawn copper wire; specifications for mineral matter, rubber compound insulated signal wire for 660 volts or less; specifications for aerial braided cable for 660 volts or less; specifications for rubber-insulated, armored submarine cable for 660 volts or less; specifications for armored submarine cables for 2,200 volts; specifications for lead-covered cable for 660 volts or less; specifications for lead-covered cables for 2,200 volts, specifications for underground braided cables for 660 volts or less; extracts from the rules and requirements of the National Board of Fire Underwriters with respect to insulated wires; copper wire tables, diameters of wires in strands, approximate equivalent cross sections of wires, weight per 2,000 feet of bare copper wire in pounds, carrying capacities of insulated wires and cables, definitions of electrical units, wiring formulas and other essential engineering data.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., advises us that during the past year it has undertaken a number of contracts for hydroelectric development in Alaska that will do much to improve mining conditions in that territory. The most important of these is the new generating unit for the Alaska Treadwell Gold Mining Company to be installed in the Hugget Creek development. This unit will consist of a 2,350-kilowatt water-wheel generator driven by a Pelton water wheel running at 300 revolutions per minute. A 50-kilowatt motor-generator exciter set, with special shaft so that the unit may be water-wheel driven when desired, is also included. A contract has been recently closed for a 300-kilowatt water-wheel generator to be installed by the Chichagoff Mining Company operating near Sitka. This will supplement the company's present installation of 127.5 kilowatts. With the generator there were also ordered the necessary transformers for transmitting the energy at high voltage from the power plant to the mines. During the summer the Kennecott Mines Company, operating one of the highest grade copper mines in the world, located in the Copper River district, purchased a 200-kilowatt water-wheel generator, together with all the necessary switchboard and accessories. This water-power plant will supplement a steam-driven power plant now being operated by the mining company and containing one 400 and one 50-kilowatt generator. A considerable number of electric motors for mining and milling operations were purchased with the above generators. In addition to the above, the Alaska Juneau Gold Mining Company of Juneau, Alaska, recently purchased from the Westinghouse company a 1,000-kilowatt water-wheel generator to be driven by a Pelton wheel, the energy from which will be used to supplement that of a 937-kilowatt steam turbine.

Record of Electrical Patents.

Issued by the United States Patent Office, January 6, 1914.

1,083,285. Electrical Ignition System for Internal-Combustion Engines. F. Kratz, assignor to firm of Robert Bosch, Stuttgart, Germany. A special arrangement for starting the ignition from a battery.

1,083,306. Electric Signaling System. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. The impedance of the track rails at the block ends is increased by laminated-iron plates adjacent to the web of the rails.

1,083,315 Automatic Stopping Device. W. H. Yetman, assignor to Samuel L. Moore & Sons Corporation, Elizabeth, N. J. Electromagnetically operated check-valve drain and engine stop, actuated when a tank has been pumped full.

1,083,317. Treatment of Peat and the Like. E. A. Buckle, assignor to International Nitrogen & Power Co., Ltd., London, England. Water is extracted by passing current through the peat heated to a temperature of over 100 degrees C. under pressure so that no steam is produced.

1,083,325 and 1,083,326. Incandescent Lamp. S. O. Hoffman, San Francisco, Cal. In combination with the filament is an arrangement of lenticular prisms to produce spectrum images of the source and means whereby the luminous radiation is allowed to radiate freely and the infra-red radiation is directed back to the source to be converted into light.

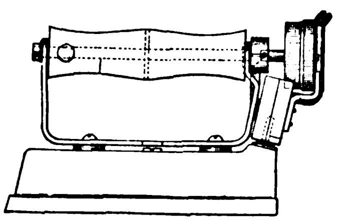
1,083,331. Incandescent Electric Lamp. T. W. Lowden, assignor to Acton Lamp Co., Ltd., London, England. Has a special support for the metal filament.

1,083,353. Production of Perforated Strips. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. A machine for continuously feeding a battery-element strip of perforated material past a grinder to reduce the burrs surrounding the perforations.

1,083,354. Insulating Compound. T. A. Edison, Orange, N. J. Contains tetracholoronaphthalene and asphalt.

1,083,355. Art of Forming Chemical Compounds. T. A. Edison. The process of forming nickel hydroxide for use in alkaline storage batteries consists in mixing a dry pulverized crystallized salt of nickel and an excess of dry soluble hydroxide, drying the mass, crushing and washing, and finally drying the residue.

1,083,356. Storage Battery. T. A. Edison, assignor to Edison Storage Battery Co. The active material for the positive electrodes of alkaline storage batteries consists of nickel hydroxide containing not more than 5 per cent cobalt hydroxide.



1,083,534.—Flatiron with Rotary-Handle Snap Switch.

1,083,370. Device for Maintaining the Equilibrium of a Pendulum. W. Luyken, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Includes two electrically controlled disk systems and two auxiliary pendulums mounted on the main pendulum.

1,083,375. Electrical Foot-Warmer. T. Plimley, Victoria, B. C., Can. Electrically heated boot-black stand.

1,083,386. Electrically Heated Instrument. J. A. Chapman, Fort Worth, Tex. One blade of a scissors has an exposed resistance wire.

1,083,406. Telephone Desk Set. H. L. Knight and B. W. Sweet, assignors to Century Telephone Construction Co., Buffalo, N. Y. Relates to details of the tubular standard and of the base.

1,083,412. Electric Hoist. H. B. Shreve, assignor to Weir & Craig Mfg. Co., Chicago, Ill. A portable hoist with the winch drum and motor inclosed in a common casing, and a double-pull-chain controller.

1,083,418. Contact-Holder. A. Sundh, assignor to Otis Elevator Co., Jersey City, N. J. An electric elevator switch has a spirally fluted contact block and a similar holder therefor.

1,083,431. Automatic Switch for Trolley Roads. .R. V. Cheatham, St. Matthews, Ky. A double solenoid controlled by the motor current of a car actuates the switch.

1,083,448. Fitting Submarine Signaling Apparatus in Vessels. S. Lake, assignor to Lake Torpedo Boat Co., Bridgeport, Conn. Has electrical means for operating a striker in a resonant compartment of a submarine boat.

1,083,456. Translating and Selecting System. E. C. Molina, assignor to American Telephone & Telegraph Co. For a selective telephone system.

1,083,486. Apparatus for Producing Electric Contacts at Adjustable Periodic Intervals. L. A. Granoux, Marseille, France. Electromagnets cause a change in the direction of movement of the contact lever and an index arm determines the length of the oscillating period.

1,083,498. Synchronizing Picture-Exhibiting and Sound-Record Machine. I. Kitsee, Philadelphia, Pa., assignor to Cort-Kitsee Co. The clutch between the picture machine and its motor is electromagnetically controlled by the phonograph.

1,083,520. Portable Electric Light. C. F. Burgess, Madison, Wis. A flashlight has an adjustable resistance wound around the casing to protect the lamp from the high initial voltage of the batteries and to compensate for deterioration in the batteries due to age.

1,083,525. Speed Control for Motor Cars. S. K. Evans, Elmsford, N. Y. A contact moving with the speedometer index is connected to the circuit-controlling device.

1,083,530. Electric Searchlamp for Automobiles. J. Gallay, Geneva, Switzerland. A plug at the rear holds the lamp, reflector and casing together.

1,083,534. Electrically Heated Flatiron. M. I. Grimes, Winthrop, Mass. Partial rotation of the handle operates a rotary snap switch. (See cut, page 161.)

1,083,541. Perforating Device. A. Kettnich, Denver, Colo. Has electromagnetic control for the punches.

1,083,542. Switching Socket or Connector. G. C. Knauff, Chicago, Ill. A double-ended socket for an automobile lamp, one end receiving the lamp and the other a connecting plug.

1,083,557. Electrically Heated Cooking Apparatus. J. W. Phelps, Detroit, Mich. A special armor for a heating unit of an electric "fireless" cooker.

1,083,566. Relay. S. R. Stone, New York, N. Y. Has an armature at each end of the electromagnet.

1,083,569. Protector for Telephone-Transmitters. H. van Hoevenberg, North Elba, N. Y., and R. W. Pope, Elizabeth, N. J., assignors of one-half to W. J. Spain. A cap can be locked over the mouthpiece.

1,083,580. Monitor. H. C. Zenke, Richmond Hill, N. Y. An electric recording system.

1,083,588. Train-Controlling Device. J. J. Brennan, Fort Wayne, Ind. Includes a clock, an electric bell, and electromagnetic air-brake control.

1,083,592. Electrical Drying-Oven. H. J. Cary-Curr, assignor to E. H. Sargent & Co., Chicago, Ill. Electrically heated and thermostatically controlled.

1,083,638. Shaft-Speed Indicator for Cream-Separators and the Like. J. K. Stewart, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. Of the magnetic type.

1,083,658. Electric Arc Lamp. H. H. Boney, Chicago, Ill. A special feed mechanism for a projecting lamp.

1,083,669. Electric Traffic-Controlling System. F. L. Dodgson, assignor to General Railway Signal Co., Gates, N. Y. Special relay arrangement for the track circuits.

1,083,671. Telephone Mouthpiece with Antiseptic Attachment. T. Duquette, Sr., North Grosvenor Dale, Conn. Has absorbent material in an annular flange.

1,083,677. Method of Producing High Vacuums in X-Ray Tubes and the Like. C. A. Friedrich, New York, N. Y. Consists in heating both the anode and the cathode to red heat by means of low-potential currents.

1,083,691. Process for Obtaining Aluminum. P. C. McIlhiney, Great Neck, N. Y. Consists in electrolyzing the bath with continued additions of aluminum fluoride and water to obtain metallic aluminum and hydrofluoric acid.

1,083,715. Trolley. E. Washington, Pittsburgh, Pa. Has a rearwardly extending guard trough.

1,083,717. Automatic Car-Arrester. R. A. Willson and A. L. Wright, Spokane, Wash. At each end of the car are automatic means for shutting off the control current and applying the air brakes.

1,083,726. Circuit-Breaker Connection for Electric Railway Systems. F. E. Case, assignor to General Electric Co. Connected between overlapping trolley sections having different voltages.

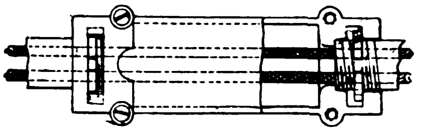
1,083,729. Dynamo-Electric Variable Gearing. F. Collischonn, assignor to General Electric Co. The engine and drive wheels of a car are connected through a generator-motor coupling, the members of which can also be mechanically connected.

1,083,730. Driving Mechanism for Motor Vehicles. F. Collischonn, assignor to General Electric Co. The engine is connected to a generator which supplies current to the driving motors; the engine can also be directly connected to the motors through differential gearing.

1,083,755. Insulating Material and Process of Making the Same. J. C. Peabody, assignor to Republic Mfg. Co., Boston, Mass. Consists of paper fiber and uncombined resin distributed uniformly over the surface of the fibers, the whole being rendered dense and homogeneous by heat and pressure.

1,083,756. Connector for Electric Conduit. J. C. Phelps, Springfield, Mass. The ends and cover of the connector box are recessed to receive the pipe ends and lock nuts for same. (See cut.)

1,083,785. Process for Precipitation of Zinc. F. L. Wilson and S. E. Bretherton, Berkeley, Cal. Consists in adding zinc carbonate, ammonia and carbon dixode to the electrolyte to maintain the ionic strength thereof constant and to make the precipitation of zinc on the cathodes more uniform.



1,083,756.—Conduit Connector.

1,083,788. Loud-Speaking Telephone Receiver. C. Adams-Randall, Boston, Mass. Includes a resonator and a diaphragm composed of iron wires having different periods of vibration.

1,083,801. Jacquard. T. A. B. Carver, Glasgow, Scotland, assignor to Textile Appliances, Ltd., Glasgow, Scotland. Includes an electric needle-control device.

1,083,810. Electrohydraulic Controller. C. Engberg, assignor to Engberg's Electric & Mechanical Works, St. Joseph, Mich. Includes an electromagnetic puppet valve.

1,083,817. Electric Hammer. J. O. Fields and R. L. Fields, Zanesville, O. Includes special control for the operating solenoid.

1,083,822. Space Block. H. Geisenhöner, assignor to General Electric Co. Is provided with a notch and clip engaging in the notch and attached to one of the iron laminations of the core.

1,083,827. Shuttle Motion. G. G. Grower, Ansonia, Conn. Includes electromagnets to repel the shuttle from one end of the shuttle race to the other.

1,083,837. Means for Operating Electric Switch-Buttons. A. Kaufman, Savannah, Ga. A turning head is secured to the socket key and connected by a cord to a spring operating drum.

1,083,839. Ticket-Sales Register. A. Kiparski, St. Petersburg, Russia. Automatic electrical apparatus for independently registering the number of tickets delivered from individual boxes.

1,083,840. Automatic Ticket Registering and Indicating Device. A. Kiparski, St. Petersburg, Russia. Covers details of the electromagnet control for the above.

Patents Expired.

The following United States electrical patents expired January 12, 1914.

574,885. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

574,889. Electric Cigar-Lighter. J. W. Dawson, Louisville, Ky.

574,901. Telephone. C. C. Gould, Philadelphia, Pa.

574,903. Electric Meter. J. Hessberger, Niedersedlitz, Germany.

574,905. Electric Arc Lamp. R. O. Hood, Danvers, Mass.

574,914. Means for Adjusting Compound-Wound Dynamos. B. G. Lamme, Pittsburgh, Pa.

574,922. Electric Calendar-Clock. G. W. MacKenzie, Beaver, Pa.

574,926. Overhead Electrical Knife-Switch. J. Menchen, Kansas City, Mo.

574,953. Electrical Signal System. R. Skeen, Madison, Ill.

574,954. Electric Signal. R. Skeen, Madison, Ill.

574,978. System of Lightning Protection for Electric Circuits. A. Wurts, Pittsburgh, Pa.

574,979. Device for Protecting Electric Circuits. A. J. Wurts.

574,994. Printing Telegraph. B. Hoffman, Paris, France.

575,002. Illuminant for Incandescent Lamps. A. De Lodyguine, Pittsburgh, Pa.

575,045. Electric Valve Apparatus. J. V. Stout, Easton, Pa.

575,047. Electric Quick-Break Switch A. H. Armen, Philadelphia, Pa.

575,053. Electric Railway. L. Dion Natick, Mass.

575,059. Bicycle Electric Bell. H. B. Ewbank, Jr., Baltimore, Md.

575,065. Railway Signaling System. N. Henquin, Schenectady, N. Y.

575,072. Electrically Operated Piano Attachment. E. J. Simpkins, Toledo, O.

575,080. Trolley-Head for Electric Cars. W. S. Troutwine, Indianapolis, Ind.

575,093. Automatic Electric Marine Sounding Apparatus. J. F. Babcock, Bangor, Me.

575,099. Trolley Stand. J. E. Bishop, Indianapolis, Ind.

575,116. Direct-Current Dynamo-Electric Machine. M. Hutin and M. Leblanc, Paris, France.

575,131. Signaling Appliance for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

575,156. Electric Bell. J. W. Holdsworth, St. Louis, Mo.

575,170. Electric Conductor. H. T. Richards, Brooklyn, N. Y.

575,176. Dynamometer. L. Schuler, Goppingen, Germany.

575,186. Telephone System. J. H. Weckel, Breakabeen, N. Y.

575,210. Dynamo-Electric Machine. G. L. Campbell, Kinsman, O.

575,231. Static Generator. A. J. Gawne, Sandusky, O.

575,235. Electric-Current Regulator. W. Hawker, Windsor Mills, Canada.

575,303. Electric Railwav. G. W. C. Lomb, Birmingham, Ala.

575,311. Device for Picking Up Live Wires. H. O. Rockwell, St. Louis, Mo.

575,314. Electric Locomotive W. L. Silvey, Dayton, O.

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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THE WISCONSIN CONVENTION.

On other pages of this issue we make rather extended mention of the successful convention which was held by the Wisconsin Electrical Association last week in Milwaukee. Not only was the registration in excess of any previous gathering of this organization, but the papers and discussions were of exceptional interest; in fact, there are two features of the technical program which alone would characterize the convention as the most successful yet held.

The paper by Hon. Halford Erickson, member of the Wisconsin Railroad Commission, entitled, "Some Problems of Public-Utility Accounting and Rate-Making," will without doubt be considered as one of the most comprehensive and valuable contributions to the voluminous literature already available on this subject. The complete paper will be published in a later issue.

The paper by Mr. S. E. Doane, chief engineer of the National Electric Lamp Association, on "High-Efficiency Incandescent Lamps and Their Central-Station Applications," was also particularly interesting, as it touched upon one of the vital present-day problems in central-station operation. It is pointed out that the field of the incandescent lamp is greatly extended by the advent of these high-efficiency lamps and further development in this direction can be expected. The prelude of this paper which comprises a résumé of Mr. Doane's observations of central-station conditions in Europe, is both interesting and important in that it shows the extreme measures which the foreign utilities are adopting to secure small customers and the excellent results which they are obtaining in this respect. Much of the work which is being carried on in Europe to secure the small customer could well be emulated by central stations in this country. The basic principles upon which the success of the foreign utilities is founded are flat rates with current-limiting devices; close co-operation with electrical contractors; and elimination of much of the red tape of billing, collecting, etc., which in this country makes it impossible to secure the very small customer.

Another of the important papers at the convention was that by Mr. C. M. Larson, chief engineer of the Railroad Commission, entitled, "Street-Railway Traffic Surveys in Relation to Railway Operation, Management and Regulation." This paper explained very clearly how the Commission undertakes the survey of a transportation system, pointing out that large savings can be effected in construction and operating costs by the adoption of proper routings and schedules. A significant statement was made by Mr. Larson to the effect that if such surveys were made by railways of their own volition, regulation by commission would be less necessary. This is also true of lighting and power companies and is indicative of the attitude of progressive regulatory bodies. If public utilities generally had taken the rights of the public into consideration and voluntarily made such surveys and investigations necessary to determine the quality of the service rendered and the equitableness of the rates charged, the need for utility commissions would have been materially reduced and the industry as a whole would have been greatly benefited.

Taken altogether, one of the most pleasing aspects of the convention was the spirit of co-operation that was seen to exist between the Wisconsin Commission and the public utilities of the state. Representatives of the former took active part in all discussions and by means of a comprehensive exhibit undertook to explain fully the various methods adopted by the Commission, and the principles which underlie its rulings.

WIRELESS FOR SAFETY AT SEA.

From the beginning of the conference of the Revision Committee of the International Commission on Safety at Sea, it was certain that in the conventions arrived at and adopted the use of wireless telegraphy would be one of the outstanding features. The conference has practically completed its sittings at London, and the president, Lord Mersey, in making the closing speech, referring in a general way to all the subjects which had been discussed and on which agreements had been reached by the delegates, spoke particularly of the use of wireless telegraphy.

The convention adopted by the conference provides that all merchant vessels when engaged in international or colonial voyages, whether steamers or sailing vessels, and whether carrying passengers or not, must be equipped with wireless telegraphy, if they have on board 50 persons or more, except where that number is increased owing to causes beyond the master's control. The contracting states, however, have the discretion to make suitable exceptions in certain cases, the most important of which are vessels which on their voyages do not go more than 150 miles from the nearest land. A continuous watch for wireless purposes must be kept on all vessels fitted with wireless telegraphy as soon as the Government to which the vessel belongs is satisfied that such a watch is useful for purposes of saving life at sea.

Wireless apparatus must have a range of at least 100 miles and an emergency apparatus placed in a safe place, unless the main installation is in the highest part of the ship in conditions of the greatest safety.

The master of a ship in distress is to have the right to call for assistance among vessels which have answered his appeal from those vessels which he thinks are best able to render him assistance. The other vessels may then proceed on their voyage.

It is true that the beneficent purposes of wireless as an agency of rescue for ships at sea has been impressed vividly upon the popular mind through the thrilling stories which have always accompanied its demonstrations for the last few years. However, the making mandatory upon the part of the states interested in the conference is a fine recognition of the spirit of co-operation that exists today not only among the people of a community, but among the nations of the earth.

THE PRESIDENT AND THE TRUSTS.

With very little delay after his return from a brief vacation, Mr. Woodrow Wilson, president of the United States, has delivered to Congress and the American people his views with respect to what is commonly called "big business." It is too early to make comment upon even the outstanding features of the President's message, and it is also too soon to record anything of moment with respect to the tenor of criticism or suggestion upon the part of business at large.

There is no possibility of doubt respecting the President's patriotism and intellectual ability. There is no possibility of doubt respecting the patriotism and intellectual ability of those with whom the President has advised. Men well informed with respect to both the viewpoint of the heads of big business organizations and the ideas of the Administration are apprehensive of the future, chiefly because of the lack of understanding of so many people otherwise well informed of the terrific importance and stupendous proportions of the problems now facing the Administration. It will take statesmanship of the highest order, intellectuality of the greatest degree to work out a solution. In the meantime it is necessary that citizens of the United States, in no matter what position they find themselves, give careful study to what the Administration is striving to accomplish, and realizing that this is for the common good, work toward that end and place as little obstruction in the way as possible. Where ignorance exists it should give way to enlightenment; where prejudice exists it should give way to justice; where indifference exists it should give way to a zeal for active co-operation.

Briefly, what the Administration, as expressed in Mr. Wilson's message, seeks to accomplish, is:

(1) Effectual prohibition of the interlocking of directorates of great corporations—banks, railroads, industrial, commercial, and public service bodies.

(2) A law to confer upon the Interstate Commerce Commission the power to superintend and reg-

ulate the financial operations by which railroads are to be supplied with the money they need for their proper development and improved transportation facilities.

(3) Definition of "the many hurtful restraints of trade" by explicit legislation supplementary to the Sherman law.

(4) The creation of a commission to aid the courts and to act as a clearing house of information in helping business to conform to the law.

(5) Provision of penalties and punishments on individuals responsible for unlawful business practices.

(6) Prohibition of holding companies and a suggestion that the voting power of individuals holding shares in numerous corporations might be restricted.

(7) Giving to private individuals the right to institute suits for redress on facts and judgments proved in government suits, and providing that statute of limitations should run only from the date of conclusion of the Government's action.

It would probably be agreed by all that surrounding the message in all its portent there breathes a spirit of amity and the desire that in securing relief from the ills which have attended the great energies which have become vitalized during the last 20 years, there shall be a harmonious and constructive recognition of the elements of progress. The intent to accomplish a great good for a great many should be accepted. The whole question and each phase of it should be debated earnestly and considerately. A mistake now in the adjustment of any one of these suggestions might easily prove disastrous. Only through intelligent discussion and a willingness to discover the real facts in the light of many viewpoints will progress be made.

CO-OPERATION IN THE TELEPHONE INDUSTRY.

For several years there has been slowly growing in various branches of the electrical industry a strong spirit of co-operation based on the conviction that co-ordinated efforts result in much greater and more permanent development than random efforts frequently directed at cross purposes. This co-operative movement has affected nearly every avenue of electrical activity with a few important exceptions, among which has been the telephone industry.

Following the expiration of the fundamental telephone patents there sprang up numerous factories for telephone equipment and almost countless independent telephone operating companies. The keen rivalry between the two camps soon degenerated into open hostility and reckless and destructive competition. The air became surcharged with cries of monopoly, discrimination, cut-throat tactics, etc., as the result of which drastic legislation was enacted in many states and the charges for telephone service were reduced to such a point that even great deterioration of quality of service could not prevent many companies from going into bankruptcy. The public enjoyed low rates, but had to put up with miserable service and was burdened with supporting duplicate telephone systems. The investor in telephone securities enjoyed nothing but the pleasure of a fight.

Such conditions could hardly endure. It is to the credit of a few state utility commissions that traffic-interchange agreements received approval. The interests of the stockholders and also of the public compelled many telephone company officials to make an increasing number of such contracts in the last few years, but at the risk, on the part of independent telephone men, of being called traitors to what were conceived to be the principles of independent telephony. Meanwhile, the idea of government regulation of utility corporations was gaining ground and regulatory commissions have been established in most of the states. The increasing powers of these commissions and the fair and reasonable exercise thereof in nearly all cases have checked any evils connected with the natural monopoly of utilities and permitted the achievement of the many advantages attendant thereon. Consequently the need for maintaining unlimited competition has vanished.

The most important step in removing the hostility between the two great telephone interests in this country was the now famous letter, published in our issue of December 27, in which the American Telephone & Telegraph Company offered to place its long-distance lines at the disposal of independent telephone companies. Another long step in this direction is the excellent presidential address of Mr. Manford Savage, retiring president of the National Independent Telephone Association, which was presented to the convention last week and received the unanimous approval of that association; an abstract of this sane and broad-gauge address is given on another page of this issue. Mr. Savage points out clearly that in order to conserve the interests of investors in telephone securities a conciliatory attitude must be taken.

Despite the fact that the independent telephone interests are now divided into two rival groups, one dogmatically adhering to the principles that were perhaps necessary in former days to give independent telephony a foothold, and the other group courageously facing the conditions as they exist today, it is inconcievable that the best interests of telephony in general can prevail unless the issues of the day are fairly met. The assurance that the Interstate Commerce Commission and the several state utility commissions will represent the interest of the public and safeguard the interests of the telephone companies should augur well for carrying out properly the details of the pending agreement for interchange of service. But of this there can be no doubt, that the public as well as the telephone industry at large will be better off by cordially putting into practice the spirit of the day—co-operation.

Buffalo Electric Show.

The Jovian League of Buffalo has incorporated The Buffalo Electric Show Company, which will conduct an electrical show in the Elmwood Music Hall in that city from March 9 to 14. Arrangements for the show have reached a point which assures success. Over 7,000 square feet of floor space have been subscribed for, and the 3,000 square feet yet available will no doubt be taken up before the time arrives. The exhibits will be of a varied nature, including the latest novelties for the application of light, heat and power. A complete electrical restaurant will be one of the features.

The chairman of the committee in charge of the show is E. D. McCarthy. The chairmen of other committees are as follows: Space and Exhibits, W. E. Robertson; Finance, W. R. Huntley; Concessions, G. H. Calkins; Advertising and Publicity, L. F. Philo; Program, H. I. Sackett; Decorations and Illumination, J. J. O'Leary; Service, F. A. Coupal; Attractions and Entertainment, C. W. Underwood; Tickets and Admissions, L. W. Wipperman. The general secretary is Harry S. Hilliker.

Central stations, jobbers contractors and manufacturers are all co-operating for the success of the show. The decorations will be the most lavish ever seen in Buffalo. Inside and out the hall will be brilliant with electric light. A large electric fountain will be the central feature. Special excursions will be run from neighboring towns and the show will be thoroughly advertised.

A large and handsomely printed program will be given away to each visitor at the show. It will contain the history of electrical development on the Niagara frontier and interesting articles on the latest electrical devices, as well as a description of each exhibit.

Sea Safety Meeting Defines Wireless Equipment Status.

The International Conference on Safety at Sea Revision Committee, which has been in session at London, England, for several weeks, practically concluded its labors at the British Foreign office this week. Incomplete dispatches indicate that the question of wireless-telegraph equipment was settled by exempting ships carrying less than 50 passengers and also vessels plying within 100 miles of the shore from carrying wireless apparatus. December 14, 1914, is the time limit set for the acceptance by the various countries concerned of the convention adopted by the revision committee.

Bion J. Arnold to Talk to Chicago Electrical Engineers on Subways and Railroad Terminals.

At the next joint meeting of the Electrical Section, Western Society of Engineers, and the Chicago Section, American Institute of Electrical Engineers, to be held in the Society's rooms, Monadnock Block, Chicago, on the evening of January 26, Bion J. Arnold, past-president of each of these organizations, will give an illustrated lecture on "City Transportation, Subways and Railroad Terminals."

Chicago Electric Club Meeting.

At the weekly meeting of the Electric Club of Chicago on January 15, John D. Shoop, first assistant superintendent of schools, delivered a very inspiring address on "Good Fellowship." Preceding the address, J. A. Harney, club member, read a poem composed by himself which was well received.

Charles W. Peters, chief deputy sheriff of Cook County, will speak before the Club on January 29, on the subject of "Society's Criminals and How They Are Made."

Baltimore Section Discusses Electrification.

The Baltimore Section of the American Institute of Electrical Engineers held a meeting on January 9 at Johns Hopkins University, the subject being "The Electrification of Railroads." This was a popular meeting to which business men of prominence and leaders of other organizations in Baltimore had been invited. The chief speakers were: W. S. Murray, formerly electrical engineer for the New York, New Haven & Hartford Railroad, and N. W. Storer, of the Westinghouse Electric & Manufacturing Company.

Changes in Electrical Testing Laboratories.

A number of changes have been made in the personnel of the executive staff of the Electrical Testing Laboratories, Incorporated, of New York City. The present officers are as follows: President, John W. Lieb, Jr.; vice-president, Clayton H. Sharp; secretary, Preston S. Millar; treasurer, Joseph Williams.

Preston S. Millar will hereafter act as general manager, and Clayton H. Sharp as technical director. The chief engineer is F. M. Farmer.

Pittsburgh Jovians Give Smoker.

The Jovian Electrical League of Pittsburgh, gave a smoker in honor of W. M. Matthews, head of the national organization, and Mercury Ell C. Bennett, on Saturday evening, January 17. The smoker was held at the Fort Pitt Hotel.

Electrical Exports for November.

The following data relating to the electrical exports from the United States for last November are taken from the monthly summary of imports and exports issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

There was a slight falling off in the November total of electrical shipments compared with the same month in 1912, but the general average of the monthly totals of 1913 is well maintained by the November figures. The number of articles exported during that month for the four classes for which numbers are reported were: electric fans, 784; arc lamps, 887; carbon-filament lamps, 62,628; metal-filament lamps, 72,256.

In the following table are given the classified figures for last November, and also for the corresponding month of the preceding year, as far as the detailed figures for the latter are available.

Articles.	Nov. 1913.	Nov. 1912.
Batteries	$ 105,175	....
Dynamos and generators	229,146	$ 192,424
Fans	11,049	11,730
Insulated wire and cables	181,436	....
Interior wiring supplies, etc. (including fixtures)	64,232	....
Lamps—		
Arc	14,197	12,199
Carbon-filament	8,614	20,188
Metal-filament	18,411	34,291
Motors	474,252	268,107
Static transformers	94,083	....
Telegraph instruments (including wireless apparatus)	9,283	8,944
Telephones	106,609	115,752
All other	926,973	1,606,918
Total	$2,243,460	$2,270,553

Conference of the American Electric Railway Association.

The mid-year conference of the American Electric Railway Association will be held in New York City on January 29, 30 and 31. The annual banquet will be held on the evening of January 29 at the Waldorf Astoria Hotel.

The conference proper will take place on January 30 at the Engineering Societies Building and the following subjects have been selected for discussion: "The Economic Aspects of Regulation Compared With Profit Sharing With Municipalities;" "The Effect of Rate of Fare on Riding Habit;" "Inherent Hazards of the Electric-Railway Industry;" "Present-Day Influence of Labor on Legislation." Among the speakers will be Halford Erickson, of the Wisconsin Railroad Commission, and F. W. Hild, of the Portland Railway Light & Power Company.

Meetings of many of the committees of the American Electric Railway Association and allied associations will be held during the three days of the conference.

W. D. Ray.

Many men in every walk of life have achieved distinct social success and among their fellowmen have proven to be examples of deserved popularity, but have achieved this success and popularity at a sacrifice along commercial and business lines. Some men have achieved great commercial success, but by reason of their concentration to business and the elimination from their minds of everything of a social or civic nature, have stood in an almost isolated position so far as their brotherhood or fraternity with their fellowmen might be concerned. Then there are others who have achieved both social and commercial success and who occupy a position of popularity among their business friends, their close social friends and among a wide range of acquaintances in their own communities.

Of the latter class is W. D. Ray. Long and favorably known to the electrical fraternity as a genial, whole-souled gentleman of great ability as an engineer and executive, he has another side which has made him a leader in every community to which he has been attached, and in the fraternal and social organizations with which he has been connected.

William Daniel Ray was born at Normal, Ill., 40 years ago, and has been some 25 years in business, having been located eight years at Chicago; three years at Everett, Wash.; six years at Detroit; four years in Cleveland, and four years at Hammond, Ind.

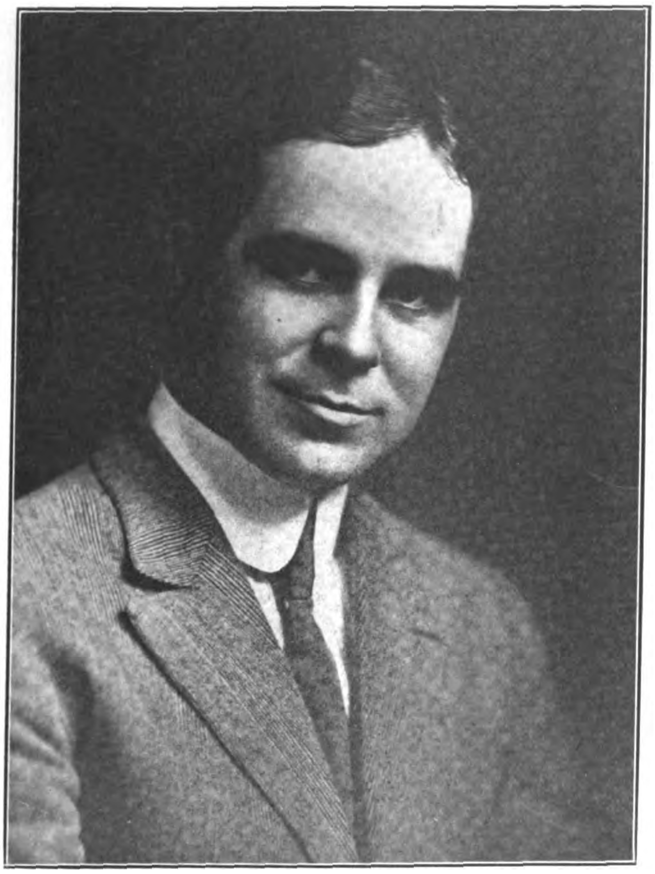
Mr. Ray's education was confined to the common and high school courses at Oak Park, Ill. His early years were spent at practical electrical work, as electrical engineer for the Chicago & Northwestern Railway and the Chicago & Northern Pacific Railroad. In this position he had full charge of the various lighting and power plants operated by these roads, including their steam plants, and with the latter road also their electric and pneumatic equipment of switches and block signals on their Chicago terminals.

Later he was with the Standard Electric Company, of Chicago, as assistant electrical engineer, designing direct and alternating-current dynamos, motors and arc lamps.

Wishing to profit by the electrical development and achievements exhibited at the Chicago World's Fair, Mr. Ray became attached to the electrical department, and the close of the exhibition found him assistant superintendent of operation of that department. It was while here and during the World's Fair year that Mr. Ray collaborated with C. K. MacFadden in the book entitled "The Practical Application of Dynamo-Electric Machinery."

In 1894 he went to Everett, Wash., as superintendent of the electric railway there and later was made general manager, which position he held three years. During his connections there he patented an electric arc lamp.

In 1897 he returned to Chicago, entering the Chicago office of the Lorain Steel Company, in the capacity of sales engineer for their electric railway motors and car trucks, traveling in Illinois, Wisconsin, and as far west as Omaha and north to Minneapolis, until the Lorain Steel Company finally gave up the manufacture of railway motors and car trucks, their motor interests being disposed of to the Westinghouse interests.



William D. Ray.
General Manager of the Northern Indiana Gas and Electric Company.

Mr. Ray was then engaged for several years to introduce and promote as sales engineer the sales and installation of air-brake equipment in the electric traction lines of the country, and there met with marked success.

The Detroit Construction Company engaged him as electrical engineer for their traction properties, where he had charge of important engineering work in connection with power houses, sub-stations and overhead transmission of two 75-mile roads—the Detroit, Lake Orion & Flint Railway and the Grand Rapids, Holland & Lake Michigan Railway. After finishing these roads, he superintended the construction of the Grand Rapids, New Haven & Muskegon Railway, a third-rail system for the Westinghouse interests.

From 1905 to 1909, Mr. Ray was contract agent of the Electrical Department of Chicago in the sale of electric power from the large hydroelectric plant developed in connection with Chicago's Drainage Canal.

In 1909, Mr. Ray became associated with Mr. Geist as manager of his gas and electric properties in the Calumet District at Hammond, East Chicago, Indiana Harbor and Whiting. In 1910, the United Gas Improvement Company became interested in Mr. Geist's properties in Northern Indiana, which includes Michigan City, South Bend, Mishawaka and Plymouth. This district has shown a remarkable industrial development in the past five years.

Mr. Ray is a member of the American Gas Institute, National Electric Light Association, National Commercial Gas Association, vice-president of the Indiana Electric Light Association, and now director of the Indiana Gas Association. He is a member of the Hamilton Club of Chicago, director of the Hammond Chamber of Commerce, director of the Manufacturers' Association, and director of the Hammond Country Club.

He is a thirty-second degree Mason, a Knight Templar, and in December last was elected Illustrious Potentate of Orak Temple of the Mystic Shrine. This is one of the most important posts in Masonry, covering one of the largest divisions of the Masonic Order, and one of the most famous Shrines in Masonic circles all over the United States.

◆

Colonel Bailey to Address Vehicle Association.

The January meeting of the Electric Vehicle Association of America will be held on January 28, at 8 p. m., in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City. Col. E. W. M. Bailey will give an illustrated description of his trip in an electric automobile from Boston to Chicago, by way of New York.

New England Vehicle Meeting.

The January meeting of the New England Section, Electric Vehicle Association of America, was held at Salem, Mass., January 15. In the afternoon a parade of about a score of electric pleasure cars, trucks and service wagons was held. A route covering about 11 miles, through Beverly, Peabody and Salem, was traversed, the line of vehicles bearing advertising placards attracting much attention from business men and residents along the route.

At 6 p. m. the visitors dined at the Salem Club, after which a public meeting was held at the Board of Trade rooms, at which leading merchants and manufacturers of the city were present. J. A. Hunnewell, chairman of the Section, presided. The Committee on Membership reported that twelve members have been added since the November meeting. J. C. Codman, for the Meetings Committee, stated that four more meetings will be held this season, one of them probably at Hartford, Conn. Secretary O. G. Draper reported for the Garage Committee that a half-dozen garages in Boston have adopted a uniform scale of charging rates, together with distinctive advertising insignia.

Mayor John F. Hurley, of Salem, welcomed the visiting delegation, and President Day Baker of the Electric Motor Car Club of Boston responded. H. T. Sands, of the Tenney public service companies, of which the Salem Electric Lighting Company is one, said that central stations welcomed the introduction of the electric frankly because of the income to be derived from the sale of current for them, and would not help to induce merchants and manufacturers to introduce them if they were not confident this type of transportation would prove the most efficient.

H. F. Thompson, of the research division of Massachusetts Institute of Technology, gave an address on "The Simplicity of the Electric." Realizing that his audience was composed mainly of non-technical men, Mr. Thompson clearly demonstrated that the storage-battery car is without a rival in the simplicity of its mechanism and the ease of operation. The care of batteries is not so onerous as that of horses, which are subject to ailments and epidemics. The speaker related an instance where a manufacturer delivered a car without instructions as to renewing the battery solution. The purchaser operated the car a year before he became aware that he should add water to the electrolyte. The public accepts the electric trolley car as an established agency of transportation, but views electric motor cars as more or less experimental. The prejudice against the latter on the score of limited speed and mileage is being dispelled by such trips as Colonel E. W. M. Bailey recently made from Boston to Chicago.

Records given of registered electrics in Massachusetts for the two years past were:

	December 31, 1912.	December 31, 1913.
Passenger	487	604
Commercial	262	409
	749	1,013

Gain in 1912, 17 per cent; gain in 1913, 35 per cent.

Mr. Thompson stated that the final report on the study that has been conducted by himself and others of the Institute of Technology will be available in about a month. The gist of the results is that in commercial work the electric car is cheaper than either the horse or gasoline wagons for a large portion of city deliveries and trucking services.

Frank J. Stone, of the Electric Storage Battery Company, gave a stereopticon lecture on the construction and application of storage batteries, showing pictures and describing their use in connection with car lighting, submarine propulsion, wireless operation, street-car service and as emergency equipment of city lighting companies. Slides showing detailed construction of batteries and also of the workings of the company's factory were exhibited.

George W. Holden, of the Edison Storage Battery Company, described the construction and uses of the batteries of that company's manufacture.

Chicago Jovians Discuss Electric Starters.

E. L. Jones, of the Jones Electric Starter Company, was the principal speaker at the regular meeting of the Jovian League of Chicago on January 19. "It is estimated by those in close touch with the situation that the value of the electric-starter business in 1914 will aggregate $25,000,000," said Mr. Jones, "and when it is considered that the industry has only been established a year or two the significance of these figures can be appreciated."

Speaking of the requirements of electric starters for gasoline automobiles, Mr. Jones said that the first requisite is the ability to spin the engine readily, and under adverse conditions, such as low gasoline supply, poor ignition, extreme temperatures, etc. Next, the starter must recharge the storage batteries at a normal rate, when running as a generator. A system for adequately regulating the charging current is a third requisite. In connection with the latter simplified wiring is much to be desired.

The starters at present available can be classed under two heads, those comprising a combination machine which acts as a motor when starting the engine and as a generator when the engine has attained sufficient speed; and those comprising two separate machines: a series motor for spinning the gasoline engine and a shunt generator for charging the batteries.

Mr. Jones said that there is a tendency on the part of some manufacturers to eliminate the magneto taking current for ignition directly from the battery when running. When running at low speed this system has many advantages because of the inability of the magneto to generate high voltage at slow speeds. At high speed, however, the magneto is to be preferred. Mr. Jones stated, in answer to questions that the horsepower required by the generator of a starting and lighting equipment averages 0.25 horsepower. The cost of gasoline for operating a starter for 10,000 miles was found on test to total only $7.50.

In the absence of Statesman Niesz, F. W. Harvey, Jr., alternate statesman, presided at the meeting.

Public Safety Discussed at Chicago Electric Vehicle Meeting.

Members of the Chicago Section, Electric Vehicle Association of America, were urged to extend their co-operation in the public-safety movement which is being undertaken by the Public Safety Commission of Cook County by Coronor Hoffman and G. H. Whittle, president of the Commission, in addresses delivered before the Section, on January 20. Mr. Whittle presented statistics on accidents in general and pointed out that their prevention can be brought about by education and legislation. The activities of the Public Safety Commission were outlined in detail.

Coronor Hoffman cited accidents that have come to his attention and stated that in almost every instance recommendations could be made which, if enforced, would prevent or reduce the number of similar ones. Mention was made of the increasing number of automobile accidents and it was pointed out that if drastic action is taken against habitual offenders the industry as a whole will benefit.

Telephone Employees Meet at Pittsburgh.

Representatives of Bell telephone companies held a two-day meeting in Pittsburgh, Pa., on January 9 and 10, with such success that it was decided to make the meeting an annual event.

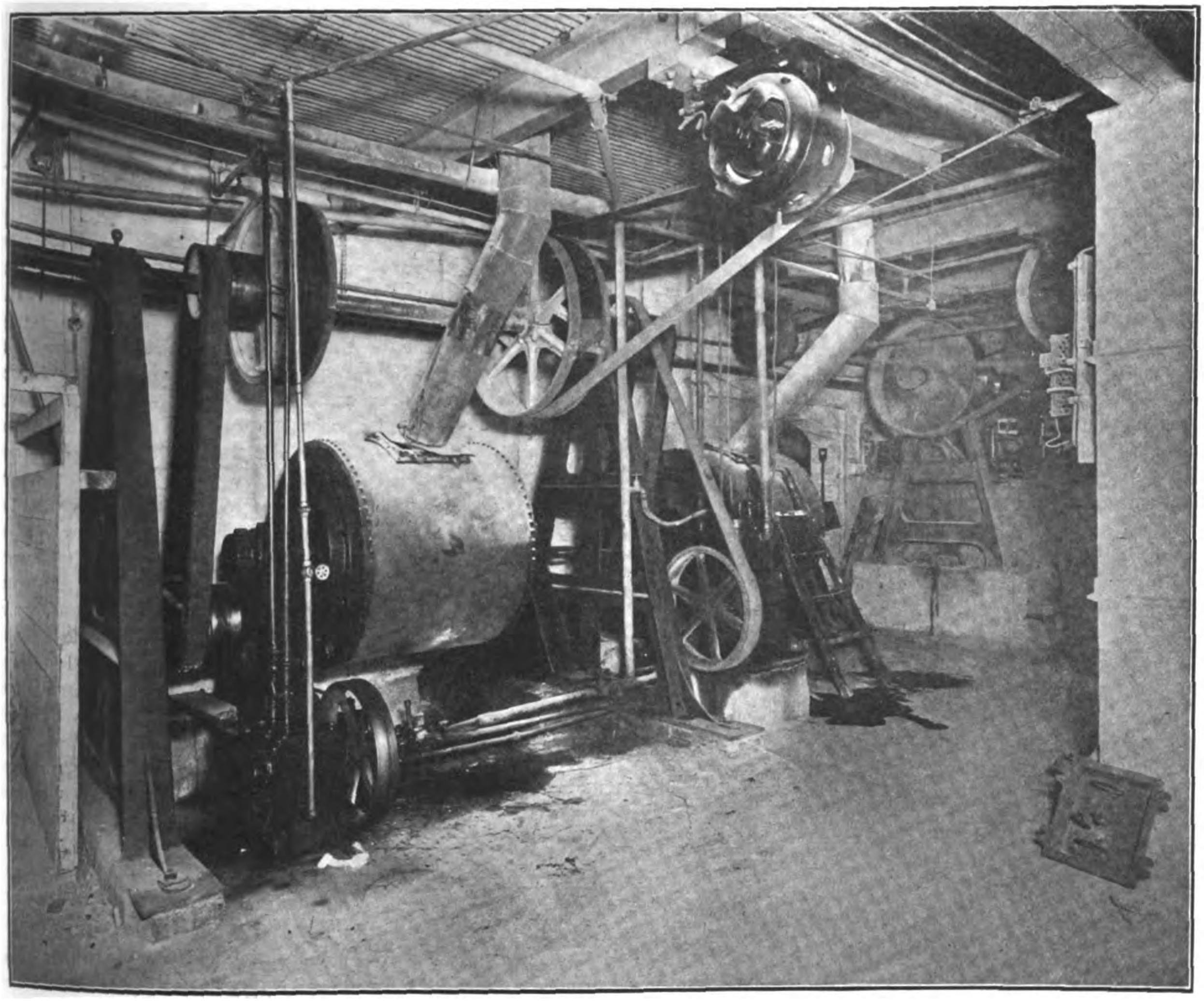
At the closing session W. W. Henderson, district commercial superintendent of Pittsburgh, spoke on "Results and Expectations." C. H. Lehman spoke on "Methods and Practice;" and W. B. Clarkson on "The Personal Equation in Our Dealings With the Public." This was in the nature of a state convention and most of the cities and towns in Pennsylvania were represented.

Electricity in Potteries.

The present-day processes in pottery manufacturing plants which require accuracy, rapidity, continuity and a well designed system for each department of the work as well as for the process as a whole, make the use of electric drive essential. Data are presented in this article showing that, in addition, actual economies in operating costs are effected by the use of motor drive and central-station service.

Natural development and increasing competition have produced many requirements in the operation of clay-working industries. In recent years the method of machine drive has become an important subject, and manufacturers of brick, tile, poreclain and pottery are recognizing the electric motor as an improved unit of driving power which is unsurpassed for convenience of application, satisfaction in use, and economy in the operation of clay-working machinery.

In the contemplation of the layout of a brick, tile, or pottery plant, the first point for consideration is the location. Railroad facilities, water, coal, location of raw material are very important factors. The use of electricity, especially when supplied by central stations, simplifies the problem, since the water and coal questions become of secondary importance. The various departments of the plant can then be located and arranged to the best advantage for operating without limitation of arrangements imposed by central engine drive, with belt connections to the various departments.



View of Motor-Driven Machines in Thomas Maddock Sons Pottery, Trenton, N. J.

When the various machines or departments are operated by means of individual motors, there is greater assurance of continuous operation compared with the central engine drive, in which case engine trouble means the shut-down of the entire plant. Motors maintain a practically constant speed throughout their operating range, which results in increased production as compared with the plant driven by single steam engine, where the speed varies not only with the boiler pressure, but also with the variation in load.

The manufacture of pottery and enameled decorative floor and mantel tile have, as a class, been slow to look into the question of motor drive for their apparatus, especially in connection with purchased power, as the use of exhaust steam in the dry rooms has been considered as outweighing all other considerations. The nature of the work is such, however, that individual motor drive offers many advantages, and such installations as have been made show decided savings, accompanied by an increase in output. The use of belts and line shafting in factories of this type is especially disadvantageous, on account of the fine clay powder which fills the air and collects on belts and pulleys, works into the hanger bearings, etc., producing excessive belt slippage and large friction losses. Considerable difficulty is often experienced in keeping the machinery at proper speed on full load, and the output of the plant is in many installations limited on account of the belt slippages. The introduction of individual motor drive will, in such cases, increase the output of the factory by ten to thirty per cent without any other increase in factory equipment, extra floor space or increased labor.

The cycle of operations in pottery manufacturing are well described in a recent issue of one of the leading clay journals, Brick and Clay Record.

In making tile, the dry process is used. That is, the material when pressed into the molds is a fine dry powder. In the wet process, used in the manufacture of pottery, the material is in the form of a wet clay when molded into its final shape. The initial preparation of the raw material, however, is identical in the two processes.

The material from which both tile and pottery are made consists of a mixture of flint, feldspar and clay. A charge of these substances, weighing 4,000 pounds, is thoroughly mixed with sufficient water to give it the consistency of heavy cream in a large tank called a "blunger mill." The mixing is done by means of paddles revolving on a vertical shaft, which is direct-connected to a horizontal driving shaft by means of a bevel gear. The charge is stirred from four to six hours until a uniform consistency is secured. The "slip," as the mixture of clay and water is called, then goes to a sifter, where a copper wire screen with a mesh of 100 per inch, oscillating at about 400 times per minute, removes all lumps, pebbles or foreign matter, but allows the slip to pass into a storage cistern called an "agitator," where it is kept until ready for use, usually only a few hours. As the flint and feldspar are insoluble, and would soon settle to the bottom if left standing, a paddle is rotated in the cistern at a rate sufficient to keep the mixture in constant motion.

10-Horsepower Motor Driving Pumps in Pottery.

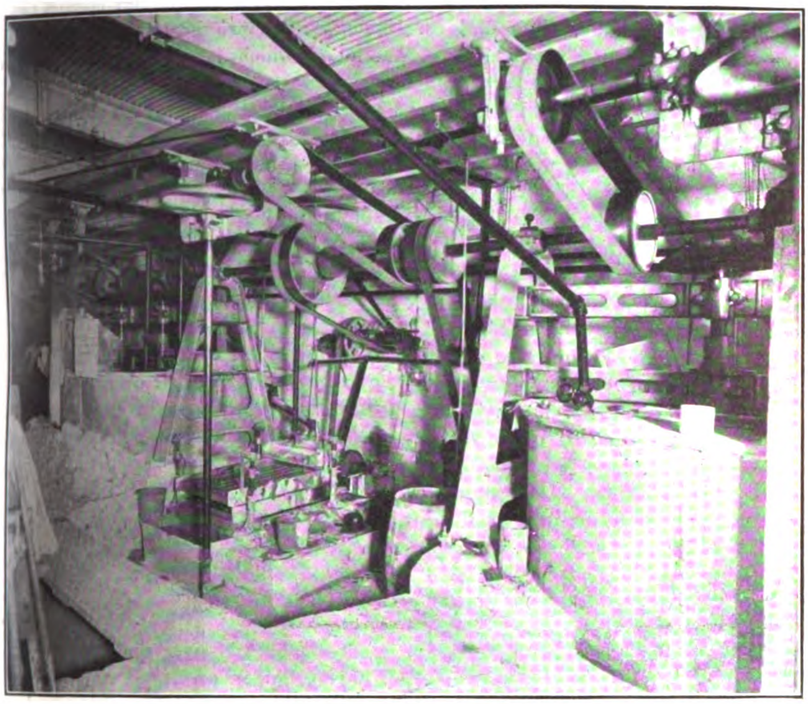
The blungers, sifters and agitators are mounted in close proximity to eliminate pumping, and are ordinarily driven by belts from a line shaft. These belts are very much in the way, and, when a heavy charge is put in the blungers, the slippage is quite large, causing a decided reduction in the capacity of the mills. Direct motor drive has increased the output by 15 per cent over that secured by the use of belts from the same machines in plants where installed.

Motor-Driven Pug Mills in Maddock Pottery.

From the agitator, the slip is pumped into the slip press, a rack containing a number of iron plates, between which are canvas sacks. The pressure from the pumps is sufficient to press the greater part of the water out through the canvas, and leave layers of the clay deposited between the plates. These pumps which lift the slip to the presses operate against very little pressure as they start pumping into the empty presses. As the press gradually fills, the pressure increases until by the time its capacity is reached the pumps are operating at a pressure of from 100 to 110 pounds. With belt drive very large heavy belts are used at excessive tension, the slippage increases very rapidly with the pressure, increasing the amount of power and the time required to pump a charge. With pumps driven by belts, 45 to 50 minutes are required to pump a charge of one ton. With a motor geared to the pumps, the same work is done in 15 minutes.

The clay at this stage is moist and sticky, and is, by reason of the treatment it has passed through, uniform in composition and free from lumps, pebbles or foreign material.

The processes in the manufacture of tile and pottery are identical until the wet clay is removed from the slip presses. From this stage the processes are different. To secure the dry material for the making of tile, the wet clay from the slip is placed on racks in a heated drying room, where all the moisture is evaporated. The hard clay is then passed through a crusher, which breaks it up into small pieces, after which it is ground into a fine powder in the dust mills. These mills are usually 36 to 48 inches in diameter, and are provided with paddles.



Pottery Machinery Driven by 25-Horsepower Motor.

or fans, which revolve at about 1,200 revolutions per minute inside a cast-iron case.

On account of the high speed, necessitating large pulleys on the driving shaft and small ones on the mills, and on account of the dust which continually accumulates on the belts, forming a glazed surface, the driving of a dust mill by means of a belt offers many annoying features. The heavy tension to reduce slippage produces large friction losses, while considerable trouble is frequently experienced from belts breaking, or jumping off the pulleys. With line-shaft drive it is necessary, in such cases, to slow down or stop the engines to replace one belt, thus delaying the work in the entire plant. Even when no such trouble is experienced the slippage is usually large enough to appreciably decrease the output. Thus, in one plant, the dust mill ground only four tons of clay per hour when driven by belt without interruptions, while when direct-connected to a motor, the output was increased to five tons per hour, and, owing to the more uniform speed, a finer quality of dust is secured than was possible before.

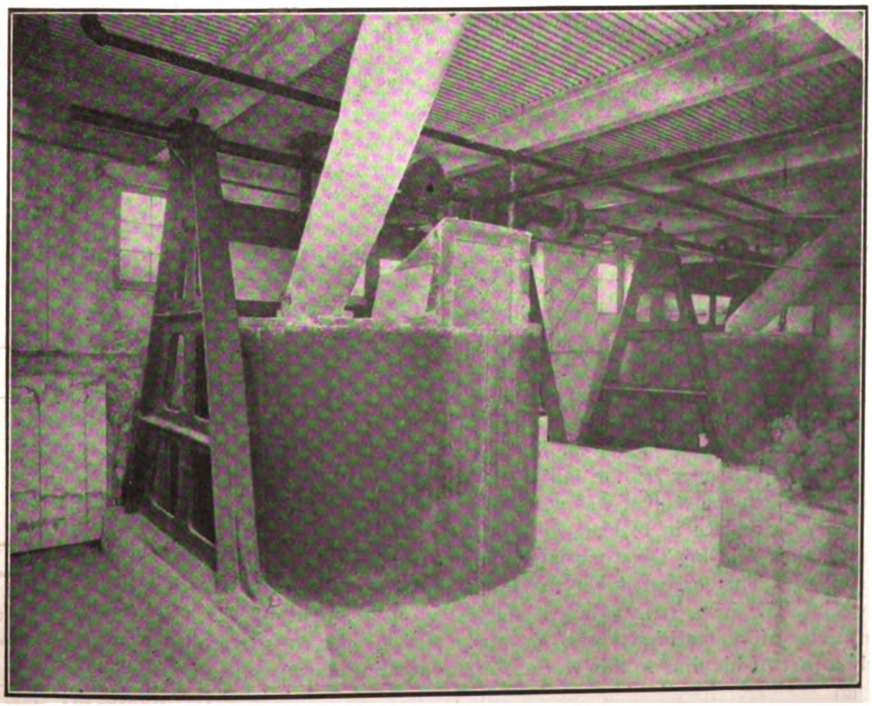
The fine, dry powder produced by the dust mills is molded into forms by hand presses, after which it is ready for the initial firing.

Pottery ware, as previously stated, is molded from the moist clay. The clay from the slip presses is of the right consistency, but is liable to have the moisture unevenly distributed throughout the cakes. These are, therefore, passed through a pug mill, to insure uniformity of the materials. This mill is a round tank, open at the top and having a vertical shaft with a number of paddles, which when revolving mix the clay and at the same time push it to the end of the tank where it is pressed through a die about eight inches in diameter located near the base. The clay from the pug mills, is then molded into the finished ware on machines called "jiggers" or "jollies." This green ware is soft and full of moisture and is accordingly thoroughly dried in a heated drying room called the "green" room.

The firing of the ware is practically the same for both tile and pottery work. The dry ware is exceedingly brittle and easily damaged, and is protected from injury in the kilns by being inclosed in fireproof clay receptacles, called "saggers." The temperature depends on the quality and thickness of the material to be burned. In order to determine the temperature of the ware during the firing, several pointed cones, built up of flint and clay, are placed in the kiln where they can be observed through a peephole. The cones are numbered, according to the amount of heat they will stand, the melting point being determined by the percentage of flint. When the sharp points of the cones bend from the heat, the potter knows by experience the temperature he is getting.

After the initial firing, the ware is decorated, refired and glazed. The raw material from which the glazing is made resembles glass very closely. It is ground up in the glaze mills, which are similar to the tube mills used in cement works and mines. They consist of steel cylinders lined with porcelain brick and containing several hundred pounds of small cobble stones, the "frit," as it is called, being ground up between the sides of the rotating cylinder and the pebbles. When ground into a fine dust, the frit is mixed with water and is ready for use. Pottery ware is dipped entirely into the glazing. Tile is glazed on one side only. The ware is again fired, and is then ready for the market.

Both tile and pottery ware are placed in sagars for each firing. This constant handling breaks a large number of the sagars so that it is always necessary to have a sagar department in order to keep up the stock. The broken sagars are crushed in a "grog" pan of the type shown. This consists of a pan five to seven feet in diameter, the bottom of which is made of cast-iron plates full of fine slots. Suspended in the pan are



Motor-Driven Glaze Pans.

two heavy steel rolls, each weighing from 600 to 700 pounds. Material thrown into the revolving pan is crushed under the rolls and sifted through the slots in the bottom of the pan into a bin. This material, known as "grog," is mixed with clay, passed through a pug mill and formed into new sagars, which are fired, and are then ready for use.

In the sagar department there is usually a "wad" mill, similar in construction to a pug mill, except for the die at the bottom of the mill. In the wad mill this die has a large number of holes through which the material is pressed, forming strings of clay, which are placed between the sagars when they are stacked up in the kiln, to keep them from burning together.

The wad mill, grog-pan, sagar, pug mill and sagar press can all be driven with advantage by individual motors, with a considerable saving of both power and labor. In fact, one of the notable features of the change from belt to motor drive is the increased output per man which is thereby effected. On the other hand, the glaze mills are usually driven in a group, as a nearly uniform load can thus be secured on the motor, and the friction losses are usually not excessive.

In one Ohio pottery investigated, an 80-horsepower Corliss engine was formerly used driving a long line shaft in the preparation room, operating the blunger mills, sifters, agitators, slip pumps, crushers, dust mills, and dust-mill conveyors and sifters. The company also had an 80-horsepower gas engine driving a generator which furnished power for motors operating group drives in the machine shop, ball mills, sagar and glaze departments, and also the necessary current for the lighting system. With this equipment, the power costs per month were as follows:

Engineer's salary	$ 65.00
Coal and gas	180.00
Up-keep of belts	25.00
Loss due to shut-downs on account of belt troubles	25.00
Oil and waste	20.00
Gas engineer	6.25
Gas engine maintenance and repair	25.00
Five per cent loss in time due to gas engine shutdowns	60.00
Incidentals	8.25
Total	$414.50

The belt troubles mentioned were largely at the dust mills where considerable difficulty was experienced on account of belts breaking and also jumping off, due to the high speed and the necessity of using such large pulleys on the line shaft and small ones on the mills. Every time a belt came off it was necessary, in order to replace it, to slow down the engine, thus delaying the work in the entire plant. This occurred several times a week. The item, gas engineer, covers the time of a machinist who devoted only a part of his time to this work. The steam engineer, in addition to the care of the steam engine, also took care of all belt repairs and the oiling and care of the shafting.

The demand for power at this plant finally became greater than its capacity, and the company disposed of its engine equipment and installed motors, buying power from the Ohio Electric Railway Company, of Zanesville, Ohio. The belts were eliminated entirely in the preparation room, and, in fact, there are but six driving belts left through the entire factory, with 35 motors installed.

As a result of the change, the capacity of the entire plant was increased fully 20 per cent over the old method, while at the same time the cost of power, including repairs, does not exceed $150 per month. This affords a clear saving of over $250 per month in spite of the increased output. In addition an appreciable saving in labor was effected. In the sagar department, for instance, eight men were formerly required to keep up the stock of 85,000 to 90,000 sagars required. Motors geared direct to the grog pan, pug mill and sagar press have so increased their capacity that six men are now able to keep up this stock.

Motor-Driven Chasers in Pottery.

One serious difficulty confronting the management at the time of the proposed change was the heating of the dry room, which had been heated by the exhaust steam from the engines. At present the company is utilizing the waste heat from the kilns. When a kiln is drawn, after the material has been burned, the fire is shut off and the kiln and its contents allowed to cool slowly. This heat is now drawn by a fan and blown through the dry rooms, and, as there are always several kilns being drawn at one time, there is more than enough heat.

In the plant of the Canonsburg Pottery Company, Canonsburg, Pa., where operating expenses are an important consideration, electric drive offers decided advantages. This company operates two plants of approximately the same size, one of which is equipped with electric drive; the other is driven by a 75-horsepower steam engine and has approximately 250 feet of shafting. The electrically-driven plant burns coal under 100-horsepower boilers, 40-pounds pressure supplying steam for heating and drying, while the engine plant burns gas under a 100-horsepower boiler at 80 pounds. For supplying steam for heating and drying and for the engines.

A fair idea of the comparative sizes of these plants may be obtained from the following equipment of producing machinery, the sizes being about equivalent for the same size of machines in the different plants.

Electrically Driven Plant.

3—Single blungers
2—Agitators
1—Sifter
1—Double blunger slip pump
3—Cylinder presses
1—Pug mill
10—Kilns
100 men employed.

Electrically Driven Plant.

1—Single and 2 double blungers
2—Agitators
1—Sifter
1—Double blunger slip pump
2—Cylinder presses
1—Pug mill
7—Kilns
70 men employed.

The main output of these plants consists of porcelain, dinner and china ware.

The monthly operating costs of each plant compare as follows:

Engine-Driven Plant.

Gas bill for heating and power	$286.00
One engineer	65.00
	$351.00

Electrically Driven Plant.

Power bill	$ 69.68
Coal bill	61.00
One engineer	65.00
	$185.68

Difference in favor of the electric drive, $165.32.

It might be mentioned that gas is more expensive for the amount of heat produced than the coal at the prevailing prices, but the saving in labor makes part if not complete compensation. In this case, the saving in power by electric drive amounts to about 90 per cent interest on the cost of the motor installation.

Increased facilities in handling the products is an important feature in this comparison, since the glaze mills in the engine-driven plant, which are at present located in the sifting room could be placed in or near the glaze room, as they are in electric plants, where they are much more convenient.

Pottery Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Pottery plant operates a seven-furnace high-voltage porcelain insulator works. The output is approximately 30,000 insulators per day. There are 110 men and 70 girls employed working 10 hours per day.

Total connected horsepower, 71. Total number of motors installed, 13. Average kilowatt-hours per month, 12,074. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	12,830	May	11,760	September	10,730
February	13,770	June	14,049	October	11,230
March	12,370	July	12,580	November	11,430
April	13,070	August	10,760	December	10,310

Load-factor, 31 per cent; operating-time load-factor, 63 per cent.

The approximate electrical energy consumption per 1,000 insulators manufactured is 14.7 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M.	Type	Application.
1	2	1700	Squirrel Cage	Belted through two countershafts to a 6-inch molding machine.
2	1	1700	Squirrel Cage	Each belted through a countershaft to a three-inch molding machine.
1	5	1700	Squirrel Cage	Belted to a 24-inch exhaust fan.
1	15	1120	Slip Ring	Belted to a 65-foot shaft (13 hangers) and 77 feet of countershafting (16 hangers) driving three 5-foot by 5-foot pug mills; one Patterson 4-inch by 12-inch, two-cylinder pump; one 4-foot by 4-foot vibrating table 2-inch stroke; one 10-foot by 14-foot mixing tank; one 10-foot by 2-foot agitator; seven 6-inch insulator templates.
1	3	1700	Squirrel Cage	Belted to a 30-foot shaft (six hangers), and an 8-foot countershaft (four hangers), driving one 30-inch threading die; one 16-inch by 6-foot engine lathe; one double emery wheel (8-inch and 12-inch wheels).
1	15	1120	Slip Ring	Belted to an eight-foot shaft (four hangers) and a four-foot countershaft (two hangers), driving two 36-inch by 24-inch pug mills (three 3-inch nozzles on each mill).
1	15	1120	Slip Ring	Belted to a 52-foot shaft (14 hangers) and an eight-foot countershaft (four hangers), driving one 4-foot by 3-foot color mill; two 5-inch by 30-inch color mills; two 20-inch by 30-inch pug mills, (three 3-inch nozzles on each mill); one 48-inch roll pulverizer.
1	1	1700	Squirrel Cage	Belted to a 20-foot shaft (four hangers), driving one 6-inch molding machine; three smoothing lathes.
1	3	1700	Squirrel Cage	Belted to a 4-foot shaft (two hangers) and a 4-foot countershaft (two hangers) driving one six-inch molding machine.
1	3	1700	Squirrel Cage	Belted to a 4-foot shaft (two hangers) and a 12-foot countershaft (six hangers) driving three three-inch molding machines.
1	5	1700	Squirrel Cage	Belted to a 30-foot shaft (nine hangers), driving eight three-inch jiggers; one double six-inch emery wheel.
1	2	1700	Squirrel Cage	Belted to a 40-foot shaft (10 hangers) and a 4-foot countershaft (two hangers), driving five five-inch smoothing lathes; three two-inch smoothing lathes; one three-inch insulator press.

Pottery plant making glass-furnace linings and crucibles.

Total connected horsepower, 75. Total number of motors installed, 1. Average kilowatt-hours per month, 3,510. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	3,100	May	3,700	September	4,300
February	2,700	June	3,100	October	4,100
March	2,700	July	3,300	November	3,600
April	3,200	August	4,500	December.	3,900

Load-factor, 8.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M	Application.
1	75	690	Belted to a 15-foot shaft (5 hangers), driving one C. &. A. Potts No. 3-P four-roll cylinder crusher, upper cylinder runs at about 1,200 revolutions per minute; one American Clay Machinery Company 10-foot pug mill; and one American Clay Machinery Company 8-foot pug mill. A small steam engine is also employed in this plant.

Pottery Manufacturing Data—Sheet No. 2.

Plant manufacturing a line of semi-porcelain dinner and toilet ware using the wet process exclusively. There are four glass kilns and three biscuit kilns the output being 12 kilns of finished ware per month. All heating is done by steam from a 100-horsepower coal-fired boiler at 40 pounds pressure. About one ton of coal is used per day in summer and a maximum of five tons per day in the coldest weather. An average of 7.5 tons of dry clay is used per day. 8,000,000 cubic feet of natural gas is required per month for burning the ware. There are 70 men employed working nine hours per day six days per week.

Total connected horsepower, 64. Total number of motors installed, 9. Average kilowatt-hours per month, 2,980. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,000	May	3,320	September	2,760
February.	2,900	June	3,550	October.	3,460
March	2,980	July	1,870	November	2,940
April	2,400	August	3,200	December	2,740

Load-factor, 8.5 per cent; operating-time load-factor, 21 per cent.

MOTOR INSTALLATION.

The supply source is three-phase, 60 cycles, 220 volts

No.	Horse-Power.	Speed R. P. M.	Application.
1	5	850	Back-geared and geared to a Patterson Foundry & Machine Company 4-inch by 12-inch double-plunger slip pump, making 22 strokes per minute.
1	15	850	Back-geared and geared to a 25-foot four-bearing shaft on blungers, and a 10-foot, three-hanger countershaft, driving three blunger mills geared to main shaft, each making 34 revolutions per minute; one single mill 5 feet 5 inches diameter by 4 feet 4 inches high and two double mills each 5 feet by 5 inches wide, 9 feet 10 inches long and 4 feet 4 inches high; one Patterson Foundry & Machine Company rough agitator 9 feet diameter by 3½ feet deep, 20 revolutions per minute; one Patterson Foundry & Machine Company smooth agitator 9 feet diameter, 10 feet deep, 20 revolutions per minute; one Patterson Foundry & Machine Company rocking motion sifter 4 feet by 2.5 feet screen, 150 strokes per minute.
1	5	850	Back-geared and geared to a Patterson Foundry & Machine Company 4-foot by 5-foot color grinding cylinder, 28 revolutions per minute.
1	7.5	690	Back-geared and geared to a Crossley taper barrel-body pug mill 20 inches maximum diameter by 40 inches high, 5.5 revolutions per minute.
1	2	1120	Belted through a short countershaft to a 15-foot clay elevator, 14-inch by 16-inch flat buckets, 15 feet per minute.
1	5	690	Belted to a 110-foot shaft (11 hangers) 175 revolutions per minute, driving seven Patterson Foundry & Machine Company small friction jollies for making cups, saucers, plates, etc.; two Patterson Foundry & Machine Company jumbo friction jollies.
1	15	850	Back-geared and geared to an 8-foot, two-hanger shaft, driving one Patterson Foundry & Machine Company vertical wad mill, 24 inches diameter by 36 inches high, 13 revolutions per minute; one Patterson Foundry & Machine Company 5-foot grog pan, 34 revolutions per minute, rolls 36 inches by 5 inches; one Patterson Foundry & Machine Company taper body sagger pug mill, 24 inches maximum diameter by 36 inches high, 11 revolutions per minute; one grog elevator, 10-foot lift, 4-inch by 6-inch buckets.
1	10	690	Back-geared and geared to a 30-foot, four-hanger shaft, 70 revolutions per minute, driving three Patterson Foundry & Machine Company 4-foot glaze grinding cylinders; one Patterson 1.5-inch by 6-inch single-plunger glaze pump, 17 strokes per minute; one Patterson small glaze sifter, 10-inch by 24-inch screen; and one Patterson glaze agitator, 5 feet diameter by 6 feet high.
1	0.5	1120	Belted to 9-inch emery wheel.

Plant manufacturing structural concrete tile by the new wet process. Approximately 3,000 tile of various sizes and sections are turned out per day. The maximum capacity is 10,000 tile. Fifteen men are employed, working nine hours per day.

Total connected horsepower, 17.5. Total number of motors installed, 2. Average kilowatt-hours per month, 689. Average kilowatt-hours per month for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	853	May	751	September	473
February	1,502	June.	729	October	457
March	965	July	523	November	321
April	710	August	517	December	472

Load-factor, 7.2 per cent; operating-time load-factor, 17 per cent.

The approximate electrical energy consumed per 1,000 tile is 10.7 kilowatt-hours.

MOTOR INSTALLATION.

The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M.	Application.
1	10	850	Belted to a 35-foot shaft, 372 revolutions per minute (six hangers) and a two-hanger countershaft driving one agitator, 15 feet long by 24 inches wide, 36 strokes per minute of paddle.
1	7.5	1120	Belted to a 15-foot shaft, 280 revolutions per minute (three hangers) and one two-hanger countershaft driving one Broughton mixer; and one drum hoist to draw a load of 950 pounds up a 30-degree incline in approximately 15 seconds.

Commercial Practice
Management, Rates, New Business

CENTRAL-STATION POWER FOR A WASHING-MACHINE FACTORY.

By **F. S. Dewey.**[1]

The Voss Brothers Manufacturing Company, located in Davenport, Iowa, is one of the largest washing-machine manufacturers in the United States if not in the world. No line of improvement in the manufacture of machines in this establishment has contributed more to the securing of low cost of production and high grade of output than the adoption of the electric motor drive.

General View of Assembling Floor, Voss Brothers Washing-Machine Factory.

In the manufacture of washing machines the adoption of the proper woodworking machines was an important factor and the placing of these machines was another important factor. With the old line-shaft drive the machines were located so that they might obtain their power from the line shafting and countershafting. They were not so located that the material on its way through the factory would follow from one machine to another in the proper sequence. One of the reasons that electric motor drive was decided upon was because with this drive the machines could be located anywhere, irrespective of a line shaft. As a result of this the factory is much better lighted and the danger of an accident to an employee is reduced to a minimum.

Woodworking forms the larger part of washing-machine manufacture, and the many advantages of motor drive in this industry are well known. With the electric drive each machine can be stopped and started as the nature of the work demands.

The factory building of the Voss company is a new one with two floors and basement. In the basement is installed the heating system and the machines used in the manufacture of the metal parts of the washing machines. The first floor contains all of the woodworking machines and on the second floor final assembling is done.

Before electric drive was installed careful consideration was given the subject of purchasing power. Central-station power in this case was adopted only after all phases of the situation had been thoroughly considered. The washing-machine manufacturer as well as woodworking factories in general must of necessity look to the present off fall as a greater source of revenue in the future, as the by-products that can be obtained from the wood waste far exceeds the fuel value of the wood.

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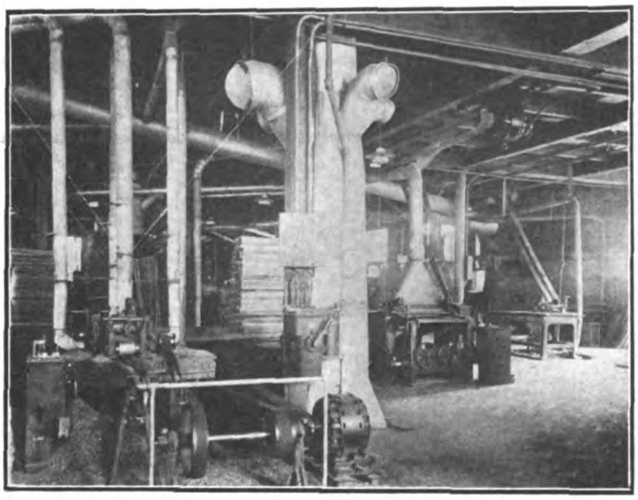
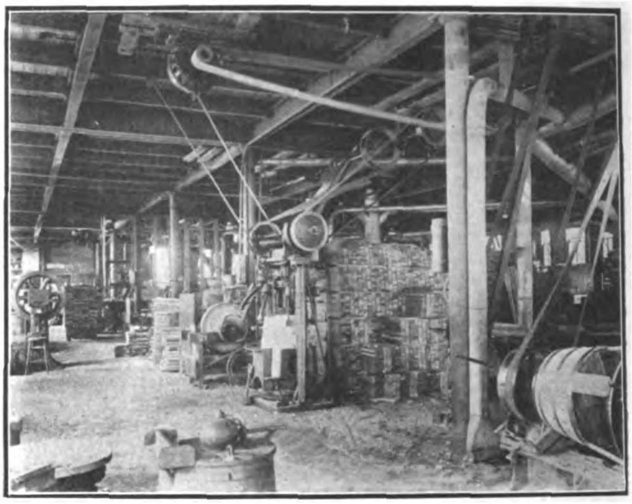
[1] Assistant superintendent, People's Light Company, Davenport, Iowa.



First Floor Showing Stave Machines.



Tub Machines on First Floor.

The manufacturer who depends upon the utilization of wood in turning out his product must of a necessity in the future look to the saving in the cost of production as a part of his net earnings. In order to make this saving he must cut down his operating expenses. The electric motor drive lends itself in making these needed reductions. By the eliminating of a large amount of line shafting and belting the power consumption may be reduced 25 per cent to 75 per cent. The quality of the product will be improved because with the electric motor a more constant speed may be maintained. With the elimination of line shafting and unnecessary belting a better system of illumination can be secured which all makes for improved product.

The ability to operate any machine independently of all others in the factory or the ability to operate any desired department or group of machines at one time, are some of the big advantages of electric drive. Another decided advantage, if the proper motor to meet the operating conditions of the machine is selected, is that the electric motor may be overloaded 50 per cent for 30 minutes without endangering the motor.

The installation of electric motors in any position enables the manufacturer to so arrange the different machines in the factory so that the work may be carried through the factory in the proper sequence, no unnecessary handling of material being necessary. This item, alone, is of greatest importance.

No.	Horse-power	Speed R.P.M.	Application.
1	7.5	1,120	Belted to a 60-foot shaft and 15 feet of counter-shafting driving. one 3-spindle shaper; three Barnes 20-inch drill press; one New Yankee drill grinder; one emery wheel; two 24-inch drill presses, and one blower for grindstones.
1	10	1,120	Belted to one 30-inch single surfacer, self feed.
1	5	1,120	Belted to 12-inch rip saw. Self feed.
1	10	850	Belted to one National Blower Works 60-inch exhaust fan.
1	3	1,700	Belted to 16-inch R. & H. jointer.
1	7.5	1,700	Belted to Collady 7-inch head sticker.
1	3	1,700	Belted to 16-inch swing cut-off saw.
1	7.5	1,700	Belted to Atlas Machine Company continuous jointer, self feed.
1	15	1,700	Belted to Borg & Beck stave machine. This machine makes the staves out of which the barrels of the washing machine are constructed. The feed operation is like that of a continuous jointer.
1	7.5	1,120	Belted to 50-foot shaft, driving one barrel-hooping machine; one grindstone, 36-inch diameter; one barrel-polishing machine; one hoop bender, roll 8-inch diameter, 12 inches long; one flare machine, for flaring hoops; one hoop punch and webber. These hoops are put on barrels approximately 20, 23, and 36-inch diameter, 1-inch wide. The hoop bender makes the hoop conform to sloping side of barrel and punch and wetter fasten the two ends together completing the loop.
1	3	1,120	Belted to band saws.
1	5	1,700	Belted to Bordesman & Egan single surfacer.
1	3	1,220	Belted to one combination cut-off and rip saw.
1	3	1,120	Belted to one self feed 8-inch cut-off saw.
1	3	1,700	Belted to one 8-inch cut-off saw, friction feed.
1	7.5	1,700	Belted to line shafting driving four boring machines; two 6-inch wood lathes; one block saw, cuts out circular blocks; one scroll saw; one screw-driving machine; and one 8-inch circular saw.
1	2	1,700	Belted to one circular saw.
1	5	1,120	Driving 4,000-pound freight elevator.
1	5	1,120	Belted to heading cutter or bottom circler. This is a saw cutting circular bottoms of washing machines out of square boards.
1	5	1,700	Belted to two-drum 30-inch sander
1	3	1,120	Belted to shafting driving one emery wheel; one double emery wheel; one 8-inch disk grinder; and one band-saw file.
1	5	1,700	Driving elevator in dry kiln.
1	5	1,700	Belted to Chicago No. 20, two-spindle shaper, and 12-inch saw.
1	3	1,120	Belted to 12-inch cut-off saw.
1	3	1,120	Eelted to line shaft driving one 16-inch drill press; one 12-inch engine lathe; one 6-inch shaper; one Garvin miller; and one small polishing and buffing stand.
1	2	1,120	Belted to shafting driving one 16-inch drill press; one double emery wheel; and one drill on flexible shaft.
1	1	1,700	Belted to one small conveyor for barrels. This takes the washing barrels from cooper shop on first floor to assembly shop on second floor where mechanism is put in.

The adoption of central-station service by the Voss Brothers Company has resulted in considerable saving over the mechanical system of power transmission formerly employed. Although dry kilns are operated continuously no coal is ever purchased, the sawdust and refuse, not salable, being sufficient to furnish all steam necessary. Considerable revenue is obtained from such refuse as can be profitably sold.

The sawdust is delivered by fan into boiler room. It is shoveled into the boilers by hand. The system used in dry kilns is as follows. A small engine taking steam from boiler at 60 pounds pressure drives a large fan. This draws air in from kilns over a set of steam coils and discharges it back to kiln. The exhaust of the engine is used in the steam coils. All condensed steam is returned to the boiler by a vacuum pump, the only loss being in steam supplied to the glue pots. Another small engine and fan is used to heat the building.

The kilowatt-hour consumption of this installation for a period of 12 months is: January, 2,920; February, 5,270; March, 5,320; April, 5,340; May, 5,540; June, 4,840; July, 4,460; August, 4,690; September, 5,100; October, 5,160; November, 5,210; December, 4,620.

The details of the motor drive are as shown in the table.

Electric Sign in Warren.

The Turnbull Public Service Company is installing a sign 35 feet high over the Electric Building, in Warren, O., reading from both sides, "Do It Electrically, T. P. S." In all there will be 1,200 lamps.

Los Angeles Power Cut Off.

On January 6 a fire in the Vernon substation of the Pacific Light & Power Corporation interrupted the power supply to Los Angeles. As street cars, as well as lighting, are supplied over this line, there was a serious interruption to traffic.

Electric Sign Data

Getting the Most Out of Electric Signs.

We present herewith the second suggestion for an electric sign that may be used by central-station and sign salesmen in interesting prospects. The tendency of the times in all progressive communities is to advertise the advantages of such communities in a way that compares favorably with the most advanced commercial publicity methods. In this connection, an ever-increasing number of cities are selecting suitable slogans and advertising these slogans by means of electric signs. Durham, N. C., is one of the recent converts to this list of cities and the slogan sign selected in this case has received favorable comment from all sections of the country.

An interesting commentary on electric advertising by D. L. Gibbs is appended herewith: "Electric sign advertising, of course, includes a marvelously wide field of activity. We can scarcely realize that what we now regard as feeble and ineffectual attempts to catch the eye with the little incandescent lamp were once samples of marvelous advancement in electric business-getting.

"I think we are quite likely to narrow the field of advertising by electric lights, to signs with reading on them or with some peculiar flashing design, but as a matter of fact, everywhere a light glows we can find a call. The little light that burns over the doctor's or the undertaker's doorbell, the red lights burning in the theatres or the convention halls over the word 'Exit' and some other red lights, in drug stores, in front of police stations, over first-alarm boxes and elsewhere, all carry a message.

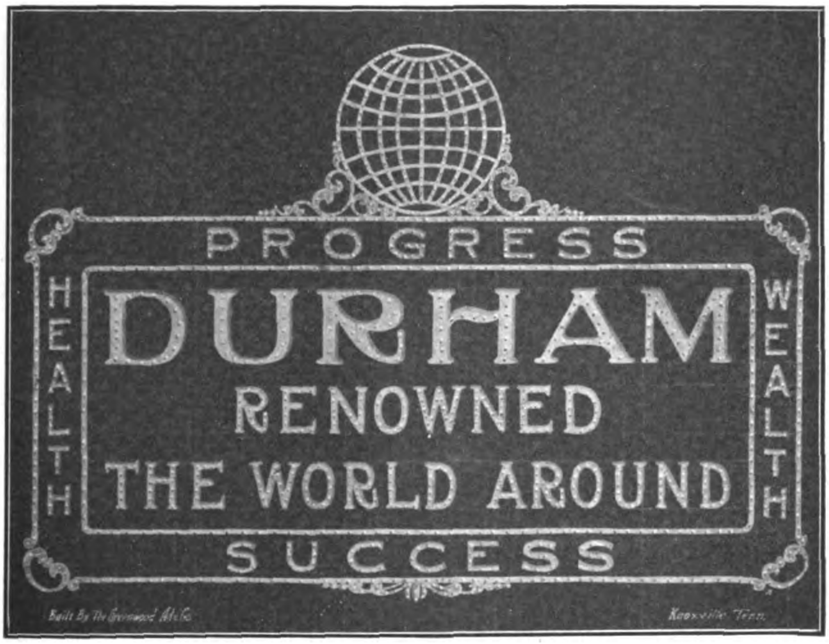
"I have no actual figures upon which to base my deductions. I have not been able to check my theories with so-called 'results,' but I believe that at least one form of advertising-value of electric signs, is that in geometrical progression, is as the cost of construction, the sign increases: that is, power to attract attention. That means that a sign costing $10 may be expected to attract the attention of 40 people in a given time, while one costing $100 may be expected to attract the attention of 1,600 people. This assumption, of course, is made with the understanding that both signs are displayed in localities frequented by a sufficient number of people to make the comparison fair.

"This does not mean, however, that the forty people in one case and the 1,600 in the other are attracted with sufficient power to bring sales, but is simply my idea of what such signs can do in catching the eye. A man may easily be attracted by the light or the design of a sign and not carry the impression away with him of what the sign is for.

I do not believe that a sign costing $10, put in a locality that is large enough to make a $100 sign effective, will have much, if any, commercial influence. It might possibly attract the commercialized attention of one person. The $100 sign, however, may be reasonably expected to exert a commercialized influence over at least ten people."

Attention is again called to the necessity in the electric sign field for such data as we present herewith. There will be published in this section each week a sketch or photograph of some original or noteworthy sign that may be used in interesting prospects in a similar line. Data will be given regarding the equipment of the sign, color and flashing effects and approximate first cost.

As shown, these data together with illustration will be published as a data sheet of standard size that can be cut from the page if desired.



Electric slogan sign built for the City of Durham, N. C., by the Greenwood Advertising Company, Knoxville, Tenn. Ordered by Henry L. Doherty & Company, of New York, managers of the Durham utilities, and presented to the city.

The sign is 50 feet high and 40 feet wide. The letters vary from 20 inches to 4 feet in height. There are 1,200 lamps used.

Flasher effect comprises the turning of the "world" on its axis continuously. The borders of the sign have shimmering or scintillating effect. The words flash on one at a time, completing the story of Durham's fame.

The color effects are as follows: the world is outlined in red; outside border and scrolls are all in green; the inner border is amber; letters between the two borders in red and inner letters in white.

Betts & Betts flashers and color caps are used.

The sign was shipped complete the eleventh day after the order was received.

Price will be given on request.

Electrical Construction

THE RELATION OF THE CONSULTING ENGINEER TO THE CONTRACTOR.[1]

By F. A. Vaughn.

In considering the relation of the consulting engineer to the contractor, the element that "looms up" larger and more prominently than any other is that described by the magical, justly popular and perhaps much abused word "co-operation." While there may be pleasant business, technical and social relations between the contractor and the engineer, the most essential relation by far is that of co-operation in the common service for the benefit of the customer of the contractor and the client of the engineer—of co-operation in order to secure for the individual who pays for the services of both contractor and engineer an installation of which all three may be justly proud.

You will, I believe, agree with the above analysis when I recall to your mind the many important advantages that accrue, not to the customer alone, but to the contractor as well, by the type of co-operation referred to above. Every one of you would undoubtedly rather do good work than slovenly; rather use good material than poor; rather put in a complete and thorough installation in which you can take pride as well as make a profit, than to put in one in which you can only make a profit; you would also rather work against fair and equal competition than be subject to rash and unreasonable competition from irresponsible concerns.

With the above assumed premises established, the way is opened to the proper relation of the engineer to the contractor.

Every consulting engineer who is worthy of his profession, naturally sets himself an ideal and a code of ethics that will build for him a reputation which will command the confidence of his clients in whose interests his efforts must be used in the broadest sense. He therefore must, by experience and other educational means, fit himself to know, for any particular client's installation and condition, what are the best and most dependable materials and methods. By specifying these in detail, the engineer will put all contractors on an equal basis, because they know in detail what is expected; will eliminate the possibility of "skimping," as well as the necessity for "playing safe" by excessive bidding to cover ambiguous points; will compel and popularize the use of good material and high-grade workmanship because of its merits; will demonstrate, as a disinterested adviser to his client, the advantages and economies of good work, thereby establishing the proper relation between just compensation to the contractor and good value to the client; and will in general establish higher standards, the general adoption of which will eliminate the demand for cheap materials and cheap labor and by the establishment of these conditions will be establishing what is best for the client, the contractor and the engineer. This, then, is the co-operative part which the engineer should play in this triple relation. The contractor can do his share in the co-operation by giving the engineer the benefit of his experience and his conscientious efforts to comply with the specifications, to the end that the installation is praiseworthy and the client is satisfied that the money he has paid to both the engineer and the contractor is well invested.

By co-operation such as above described, the quality of engineering installation in the community will be raised and good workmanship will be at a premium, as it should be; and this will all be accomplished without the efforts of the contractor, except, of course, the necessary and legitimate effort of doing good work according to specifications. Without the engineer in the field, clients are apt to ask and expect a contractor to "engineer" his installation, as well as to construct it, thereby forcing the contractor to labor, worry and expense that he probably is not willing to do, organized to do or paid to do. His function is to construct, according to the requirements of the client as expressed through the specifications of the engineer, just as the engineer's function is to plan and specify, but not to construct.

It may be suggested that the engineer is an unnecessary factor because there is usually an architect connected with the work who is, or should be, able to specify all of the engineering features of an installation as well as the structural, architectural and artistic ones.

It is believed a little consideration will show that, in these days of wonderfully intricate, complete, comprehensive and often elaborate buildings which an architect is called upon to construct, and the tremendous strides and rapid advancements of all branches of applied sciences or engineering, an architect who devotes much of his time or energy to keeping sufficiently in touch with the engineering features of his installation is sacrificing the architectural side of his work, which is the channel along which his very best efforts should progress, or else he is not devoting enough time and ability to master the engineering side; for the engineering branches involved in a modern installation—electrical engineering, mechanical engineering, heating and ventilating engineering, illuminating engineering, etc., are highly technical and specialized branches which require different talents, character of mentality and foundations, than those found generally in men naturally equipped to be architects.

So in this co-operative scheme it is necessary to include the architect, and the same spirit of helpfulness for a common good should prevail throughout. The requirements of the client can now be thoroughly, intelligently and accurately specified in detail so as to insure a thorough understanding of them by the contractor without the necessity of imposing on his time or abilities; and it should be noted that the more minutely the specifications are written, the better insurance the contractor has that any competing concern will be required to furnish exactly what he himself has figured and the more assurance there is of equivalency of purpose and intention.

Specifications which do not specify are like laws which do not carry with them their own interpretation—they require the interpretation of the courts or other authority before they are really valuable. An architectural specification asking tersely for a "home to house a family of four" would appeal to all of us as highly inadequate and ridiculous; yet it is hardly more inadequate than an engineering specification for an "A. C., 220-volt generator of 250-kw. capacity" although it is believed the latter example is no exaggeration. In either case the client would get something which would perform the function he desired, in a way, but how satisfactorily is entirely unknown and indeterminate.

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[1] An address delivered before the eleventh annual meeting of the Electrical Contractors' Association of Wisconsin.

Brevity and terseness are much-to-be-desired characteristics of any composition written or spoken: but unfortunately it is usually impossible, in a matter involving so many details as an electrical installation, to state those details in such a definite and exact way that there can be no uncertainty as to what is required, and yet make that statement a brief one. The only safe way, therefore, to secure what is required is for the engineer or architect to specify minutely all details of the installation, even though to do so involves great trouble and expense. By such exact and complete specifications, not only is the client assured of getting the best installation for the money expended, but the contractor is protected against unscrupulous persons bidding for and probably securing the contract for the work.

A consulting engineer is therefore to be regarded as a co-worker, in the truest sense of that word, with the contractor. The whole influence of any consulting engineer who measures up to his profession is in the direction, first, of protecting the reliable and high-grade contractor from unfair and cut-throat competition; and second, to educate the client to the wisdom of putting in a first-class installation, thereby enabling the contractor to get a fair profit for first-class work. A more general recognition of this ground of common interest between the contractor and the consulting engineer would do not little to improve the conditions in the contracting field.

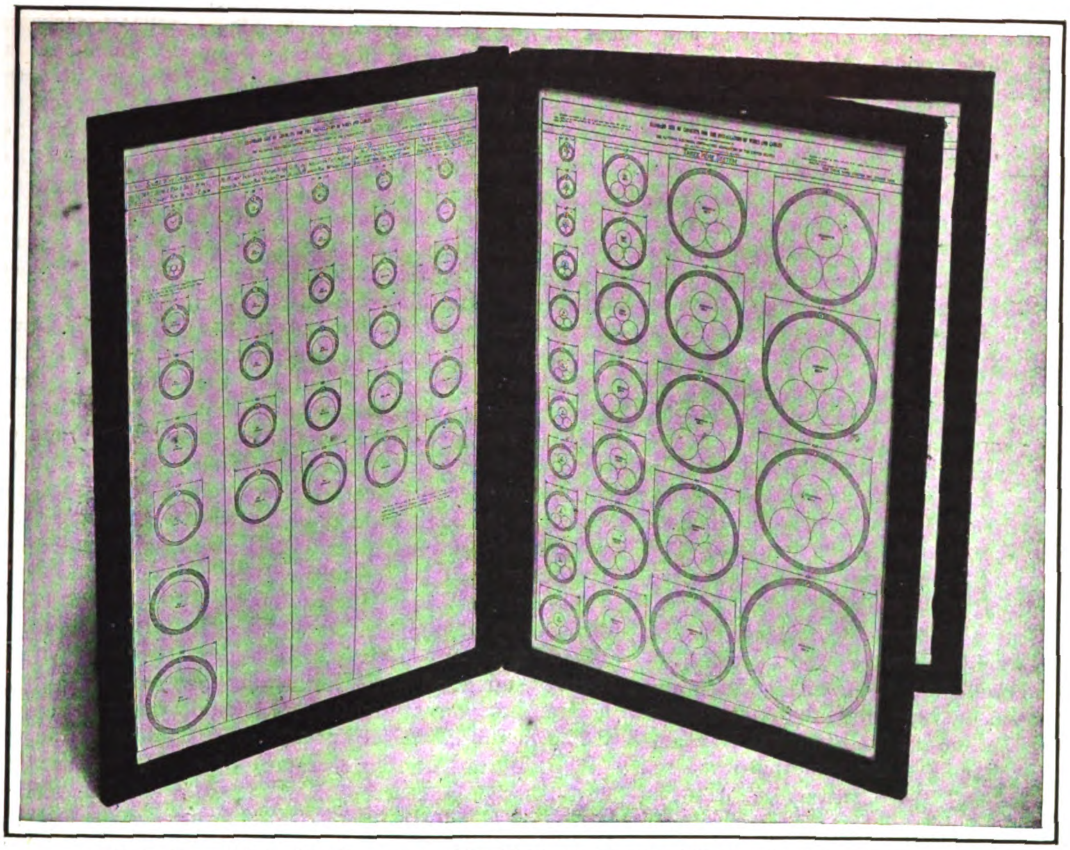
Conduit and Wire Charts.

The National Electrical Contractors' Association has revised the charts illustrating the sizes of conduit to be used for different sizes of wires and cables. A new set of six charts has been prepared, giving accurate data with reference to the proper size of conduit to be used for any particular installation. These charts have been prepared after careful study of actual working conditions and have been officially adopted by the National Electrical Contractors' Association as standard.

The charts, which are shown in the illustration herewith, represent the conduits and conductors, full size. They show the size of conduit needed for each combination of wires and also the actual external diameter of the conduit and the carrying capacity of wires of different size. These are in accordance with the National Electrical Code for 1913.

The charts are substantially framed in wooden frames hinged together and provided with a backing board for convenience in hanging. There are three frames in the complete set, two charts being mounted in each frame. The charts will be of value not only to the electrical contractor, but to the architect and engineer. They have been prepared by the National Electrical Contractors' Association for the purpose of standardization, and architects and engineers will find it sufficient to write into their specifications that conduit shall conform to the N. E. C. A. standard. The Association is supplying the charts at cost, which is $3.00, f. o. b., Utica, N. Y.

The secretary of the Association is George H. Duffield, 41 Martin Building, Utica, N. Y.



Conduit and Wire Charts Prepared By National Electrical Contractors' Association.

MIDWINTER MEETING OF ILLINOIS CONTRACTORS.

Illinois State Association Has Successful Gathering at Springfield.

The semi-annual meeting of the Electrical Contractors' Association of the State of Illinois was held at the New Hotel Leland, Springfield, on January 16 and 17, and was pronounced one of the most successful yet held by that organization. The total registration was 104, of whom 67 were members.

The opening session was called to order on Friday at 11 a. m., by President W. J. Ball. In the absence of the mayor of Springfield, who had been expected to make an address of welcome, this was done by H. A. Zinn, of the Ecco Engineering Company. The meeting was opened for general discussion and the representatives of jobbing houses and manufacturers were called upon. The following responded: G. A. Lundberry, of the Western Electric Company; Gus Harter, of the Harter Manufacturing Company; C. W. Beach, of the Adams-Bagnall Company; I. A. Bennett; T. Ensley, of the Diamond Electric Company; E. E. Rines, of the Federal Electric Company; V. A. Sweet, of the Inland Electric Company; E. H. Joseph, of the Electric Appliance Company; W. F. Hruby, of the Simplex Wire & Cable Company; J. E. Cather, of the Manhattan Electrical Supply Company; W. P. Clawson, of the Edison Storage Battery Company; T. E. Hughes, of the Monarch Electric Company.

Mr. Lundberry stated that his company believed in a differential between the contractor and the consumer and was ready for any proposition along this line. Mr. Harter also favored such a difference between the jobber and the contractor. It should not be possible for the consumer to buy material at a lower price than that at which it can be secured by the contractor. Mr. Bennett, like Mr. Harter, favored three prices for the three classes of purchasers. He considered that both the jobber and the contractor are entitled to a profit in handling their goods. Mr. Ensley stated that his company is offering protection to the contractor by refusing to step over his head and sell to consumers at the contractor's price. He favored the Association's policy of holding contractors to a profit on every job. Mr. Beach called attention to the fact that although his company had discontinued its Chicago office, it still carried stock in a store room at that point.

Mr. Swett stated that there were three kinds of contractors: (1) the one who wants the best, (2) the one who wants the cheapest, and (3) the one who does not know what he wants. The first class is the easiest to sell to, and the second is the hardest. The third is learning by coming into the contractors' association.

Ernest Freeman, president of the National Electrical Contractors' Association, was then called upon and pointed out that both that Association and the Society for Electrical Development stand for the same purpose—co-operation. The Contractors' Association was formed for the purpose of helping each other and furthering the business, while the Society for Electrical Development had as its first object to make more business. He considered it advisable for every contractor to join this society, which works disinterestedly as regards the different elements in the electrical business. Where there are differences between these elements it will study them and try to adjust them, so as to avoid friction. Unless all engaged in the business participate in association work, it is harder to accomplish good results.

President Ball pointed to the large membership already attained by the Society for Electrical Development and said he considered it poor advertising for any contractor to stay out of it. He then called upon H. T. Schmidt, of Davenport, Iowa, who announced that the Iowa contractors would hold a meeting on February 2 at Waterloo, Iowa, for the purpose of organizing a state association. He invited all of the Illinois men to attend and give the new association the benefit of their experience.

W. J. Collins pointed out that all branches of the electrical business had grown up in a single generation. At first all of these branches were under one head but with the growth of business a number of units have branched out, which are represented by the supply men, contractors, manufacturers and central stations. Each of these prospers best under conditions which mean success for the others. Electrical work represents only a few per cent of the total cost of a building, so that the difference in cost between good and poor construction is a small matter to the owner, who often leaves the choice of material to the contractor. The manufacturer and supply man should cater to the contractor, who often determines also the extent of the installation. It is to the interest of the central station to co-operate with him also. All four elements constitute one big chain and every link in it should be kept strong.

R. Haas expressed his faith in the State Asociation and pointed out what had been accomplished by a similar association of plumbers. In that trade manufacturers and jobbers will not sell except to the legitimate plumber who has passed an examination and has his license and an established place of business. Where there are local associations of plumbers they will sell only to members of such associations. There is no good basis for selling to the consumer directly and there should not be in the electrical business.

E. J. Burns, who is secretary of a local association covering Rock Island, Moline, East Moline and Davenport, pointed out that the co-operation of the members is bringing about good results. He had participated in the campaign to organize the state of Iowa and stated that out of 25 letters sent to prominent Iowa contractors, 18 had responded affirmatively.

Alex. M. Knauber, president of the Faraday Electrical Association, said that the electrical contractor had been regarded as the lowest rung of the ladder among the building trades by the architects and builders. He has been buffetted around a great deal but has reached the point of resenting it. In Chicago the local organization of contractors is changing the former attitude. The manufacturer and jobber too have regarded the contractor as an unimportant element in the industry and they had been going ahead to do business regardless of him. Now the contractors are taking things in their own hands and they will effect a change in this attitude. They are now collecting data on the subject of relations with the jobbers and manufacturers, and want the latter to cooperate with them. If they will not do so, and continue selling direct to the consumer, the contractor will try to force them to take a different course. This is harder in the big cities like Chicago than in the smaller places.

The session then adjourned.

The meeting on Saturday morning was called to order at 10:10 a. m., with President Ball in the chair. Representatives of the electrical journals were first called upon. M. G. Lloyd, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, spoke of the importance of organization and of the value to the contractor of belonging not only to the local, state and national contractors' associations, but also to such associations as the Society for Electrical Development and the Illuminating Engineering Society.

L. D. Spake, of the *Electrical World*, favored co-operation and affiliation with the Society for Electrical Development.

W. P. Clawson then called attention to the field for home-lighting outfits in the rural districts. He pointed out that there is a big demand for this class of apparatus, which at present is being filled largely through other lines of trade; whereas, the electrical contractor should take hold of it and make it his own field. He gave evidence of the opportunities along this line and then gave a brief description of the Edison storage battery and the work which it will do.

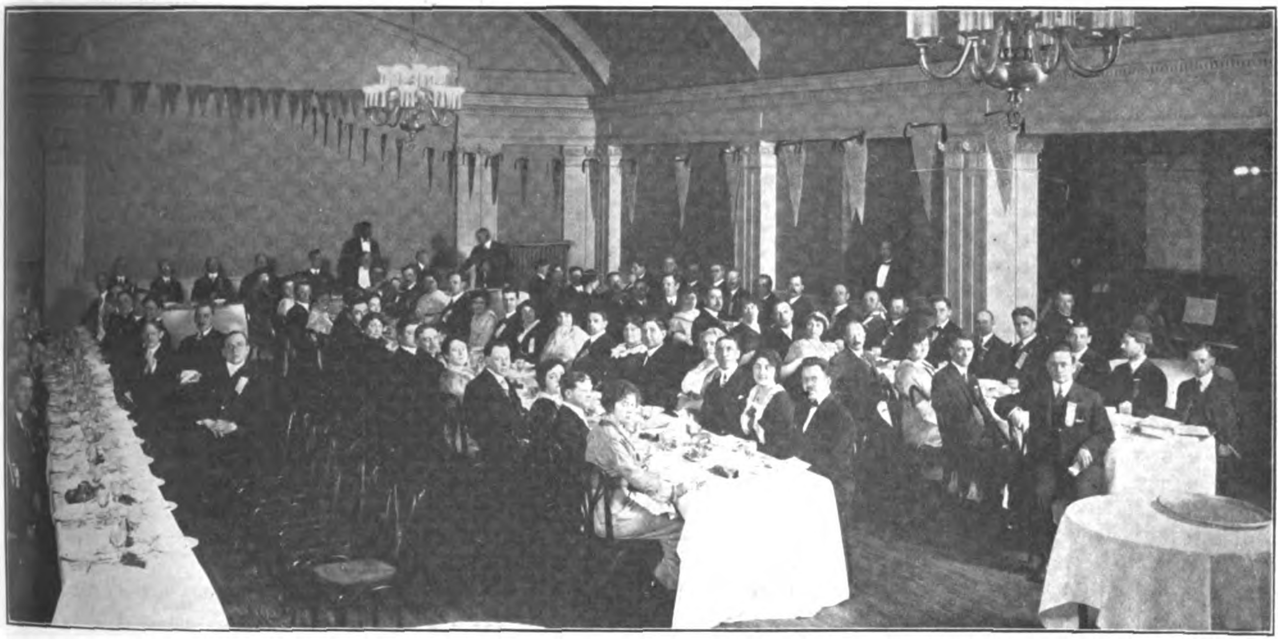
J. E. Latta, of the Underwriters' Laboratories, then made an address favoring the use of high-grade material. He explained the method of revision of the National Electrical Code and the change in the specification for rubber-covered wire, which has been made in 1911, and gone into effect the following year in all places where there was good inspection. In many towns, however, where there is no regular inspection, old-Code wire is being used, and what is worse, wire is in some places being used which does not even come up to the old-Code specifications. He deplored this condition and appealed to the contractors to stand for the best quality of materials as well as of workmanship. He pointed out instances which illustrated that it paid the contractor to do this if he handled the matter in the right way. He also explained the operations of the Underwriters' Laboratories and their relation to the work of the contractor.

Brief remarks were also made by P. J. Cratty, of the Weber Electric Company; T. A. Brooke, of the Illinois

Electric Company; B. J. Mockenhaupt, of the William P. Crockett Company; and C. W. Wilkins, of the National Carbon Company.

State License.

A discussion of the question of a state license for electrical contractors followed. C. R. Kreider stated that efforts had been made for 10 years past to get such a bill through the state legislature, but without results. There are only a few states which have such laws, but there are many cities in the country which have local registration. Minnesota has a law applying only to large cities, of which there are three in the state. Opposition has been based largely upon the grounds that it prevents temporary employment of those who might otherwise be thus engaged, and that it was against the interests of organized labor. It has been thought that the contractor was aiming to restrict his field and create conditions similar to a trust. He considered that workmen as well as their employers should qualify and that a license should be based upon the ability to comply with the necessary qualifications. The conditions should be the same as in plumbing, where a license is good at any point within the state and the collection of local fees for registration was excluded. In order to accomplish anything in the way of legislation he thought it was necessary to have a man representing the interests of the contractors constantly on the ground at Springfield while the Legislature was in session. In answer to a question as to whether any method had been worked out for enforcing compliance with a state license law in small places, he stated that violation is made a misdemeanor but that there is no state official whose business it is to enforce the law. This must depend upon the licensed contractors in any town calling attention to violations of the law. It has been attempted to incorporate the National Electrical Code in a bill, but this had not been found feasible.



Banquet of Illinois Electrical Contractors, Springfield, January 17.

R. C. Bierdemann thought the Association should go on record as favoring a state license, so that the jobbers and manufacturers would know their attitude and during their travels over the state could inform other contractors of the conditions.

John Mueller, Jr., inquired as to what points a state license should cover. He did not consider it a trust of association members but thought that a law of that kind should require an examination to show fitness for the work and should involve a fee which would merely be sufficient to cover the expenses of examination and enforcement of the law. Regulations for wiring could be put into effect by empowering the state fire marshal to issue a code and he could stipulate the National Electrical Code. He should have power to revoke a license if the work were found not to come up to the standard thus established. Each contractor should take the matter up with the representative from his own district in the State Legislature. He had done this personally and felt confident that they would have support from the representative from his district.

R. W. Poelma thought the members of the Association should first agree upon what they want and then work for it.

A. M. Knauber expressed the same sentiment and thought they should consider not only what was for their own best interests but also what other interests might be affected by the provisions of the bill, and find out what its effects would be. If such other interests were considered and protected they could probably secure co-operation in pushing the bill. The fire-insurance interests, for example, should be enlisted in the movement.

W. J. Collins pointed out that the interests of the electrical jobbers was the same as that of the contractor, as their business would be facilitated if there were a smaller number of contractors with fixed places of business and greater responsibility. Such conditions would make collections more sure.

Ernest Freeman thought all contractors would favor a license and made a motion that the Association go on record as favoring a license law covering the installation of electrical wiring and apparatus. This motion was passed.

C. R. Kreider pointed out that the masons had recently gotten a license law which required an examination for mason contractors and a fee of $100.

Local Associations.

The discussion then turned to the question of local associations and Mr. Knauber made an address pointing out the advantages of local associations, which permitted their members to get acquainted and work together for common ends. The idea that a competitor is an enemy should be dropped. The members should take home with them a copy of the Chicago registration ordinance and work for a similar provision in their home towns. This movement will educate the people of the State up to a state license law. Destructive competition should be eliminated and competition based not upon price but upon quality of work.

W. J. Collins read a written communication dealing with the difference in conditions in different places. Usually the supply of contractors exceeds the demand, resulting in bargain sales or going down and out. Contractors should stop knocking each other and should co-operate and work harmoniously. Competition is often the destruction of trade, because it is so often unfair.

William McGuineas regarded a competitor as a financial enemy. Competition is the life of trade but the death of the trader. Uncontrolled competition is not a basis for any industry. It has been claimed that competition is the only condition resulting in honesty, but he thought that the opposite was true and that competitive conditions necessitated dishonesty in business. The organization should strive for the least competitive condition.

Central-Station Co-operation.

The discussion of central-station co-operation was then taken up and J. C. Marron opened the discussion. Contractors have often regarded the central station as a competitor, but he had found that they were usually ready to co-operate and would meet the contractor more than half way if the contractor would do his part. Contractors usually have been too busy to attend to this matter. It should be appreciated that the interests of the contractor and the central station are mutual. The contractor has been too ready to criticize the central station without taking up matters directly with them and showing the central-station man where they could work together. The central station on the other hand does not realize how much load the contractor obtains for it by the solicitation of business and the installation work which he does. The day for competition is over—co-operation is the thing.

W. J. Collins told of what had been accomplished in Chicago by co-operation with the Commonwealth Edison Company. A wiring plan for old houses, involving a plan for payments extended over two years, has been accomplished, financing of which is undertaken by the central station, which is also supplying the advertising matter. A schedule of prices has been fixed by the central station to which its own solicitors adhere. The contractors have found that they can adopt this schedule with profit to themselves. Many property owners bear no love for the central station and prefer to give the work to a contractor if he offers the same prices. Many customers also prefer to pay cash, but where they wish to pay in installments the central station pays the bill and makes collections when billing the customer for current. The contractors had to do some work to get this arrangement adopted, but he attributed it largely to the organization of the Society for Electrical Development.

John Hughes had previously worked with a central-station company as an employee and realized that contractors often complain against the central station unjustly. If they would endeavor to work harmoniously and would take up any matters of dissatisfaction directly with the central station, conditions would be much better. He saw no particular harm to the contractor when the central station cut prices on current-consuming devices, as he had found in Champaign that they sold just as many irons as before the central-station campaign on this article. He found the wiring of old houses more profitable than jobs on new buildings, as a better price could be secured, and he had been working in co-operation with the public service companies along this line with an arrangement for time payment similar to that adopted in Chicago.

Liability Insurance.

Liability insurance was the next subject taken up, and W. J. Collins made the principal address. He pointed out that the law now required employers to carry liability insurance of one kind or another and he gave figures which he had collected in regard to rates and the amounts of premiums paid by electrical contractors. Formerly the rate had been $2.10 but it had been brought down to $1.25 by securing a separate rating for employers of this class. He had found that among 37 contractors paying at a rate of $1.50, the company's losses had amounted to only seven per cent of the premiums. It was thus evident that after allowing for expenses the rate should be cut at least in half. The matter of mutual insurance had been considered and it was generally regarded necessary to have a combined pay roll amounting to $1,500,000 to make mutual insurance feasible. Single companies having a pay roll larger than this usually carry their own insurance. He favored a state mutual association for electrical contractors, in case better terms could not be secured from the existing companies. The combined pay roll of the contractors was about $4,000,000 and he thought that they could operate at a cost not exceeding 60 cents per $100 of pay roll. He thought existing companies would make a rate of 90 cents or better rather than lose the business.

A. M. Knauber corroborated this, as a 90-cent rate had been promised and he thought an even better one could be secured.

Upon motion of J. C. Marron a committee was appointed to consider the feasibility of organizing a mutual association with power to negotiate with existing insurance companies for a rate for the electrical contractors of the state.

Frank E. Valentine, of The Inter-Insurers Exchange, then made an address pointing out the good features of inter-insurance, which has all of the advantages of a mutual association but at the same time limits the individual liability of the members. He pointed out that the rates of the stock liability-insurance companies had been enormously increased upon passage of the workmen's compensation act. In most mutual companies the payments were limited and the assessments were uncertain. Under his scheme the assessments are limited.

The session then adjourned.

Closed sessions were held on Friday afternoon and Saturday afternoon, at which among other things there were reports of committees and discussions on the relations with jobbers and with central stations. The question of a state license for electrical contractors was also further considered. It was decided to hold the next meeting of the Association in Danville on June 19 and 20.

On Friday evening there was a theater party. On Saturday afternoon the members and guests were taken in a special car to the works of the Sangamo Electric Company, which were inspected.

On Saturday evening there was a banquet and dance at the Leland Hotel. An address was made by G. A. Northcot, former lieutenant-governor of the State.

President Ball announced the appointment of the following committees. On Local Organization: W. J. Collins, John Hughes, C. E. Stapp, W. J. Burns and R. A. McLaughlin.

On Central-Station Co-operation: A. M. Knauber, W. J. Collins, E. F. Pendergast, William McGuineas, F. E. Bolte.

On Liability Insurance: C. R. Kreider, J. C. Marron, W. J. Collins, John Mueller, Jr., E. J. Burns.

The Boosters Committee and the Educational Committee were continued.

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City Electrician Wanted.

Examinations for the position of city electrician will be held by the Civil Service Commission of Cleveland, O., January 28. The place is now held by Maurice Sarbinsky, who will become secretary to Director of Public Utilities Stage.

National Association of Electrical Inspectors.

Thomas Henry Day, president, 59 Deerfield Street, Hartford, Conn.
H. S. Wynkoop, vice-president, 13 Park Row, New York, N. Y.
William Lincoln Smith, secretary and treasurer, Concord, Mass.
James E. Cole, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.
J. E. Latta, assistant secretary.

Executive Committee

Eugene N. Davis, chairman, Brookline, Mass.

Frank R. Daniel
R. P. Strong
Henry A. Knight
C. H. Fletcher
Washington Devereux
James B. McCarthy
James H. Fenton
R. J. Forsyth
C. W. Mitchell
A. W. Hopkins
G. W. Perry
George L. Collison
T. H. Fritts
A. H. Soper
T. W. Bowry
F. G. Hartwell
A. A. Moffitt
Thomas D. McColl

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Secretary's Message.

The Secretary has very little matter to bring before the Association at this time, as owing to the press of work during the holiday season the members have apparently been too busy to supply him with any large amount of information and no questions.

The regular monthly meeting of the Eastern Massachusetts Section was held January 15 at the office of the Commissioner of Wires of Boston. About twelve were present, it being a very unpleasant day and transportation to and from the city being seriously interfered with by the destruction by fire of one of the signal towers in the Boston and Maine terminal yard.

The members of the Western New England Section are looking forward to their next meeting which comes on February 8, at New Haven, the home of the chairman of their Executive Committee, when a visit will be made to the Sheffield Scientific School.

In regard to the questions appearing below there is little to be said; questions 251 and 252 bring up the vexed question of domestic heating devices. The Code requirements are plain enough on the subject, except in one regard, which is indicated in one of the answers to question 251. The difficulty is to see that they are lived up to. We may inspect and rate and fuse circuits just as long as we please, and so long as heating devices of varying size are made and arranged so they can be plugged into the ordinary socket, receptacle or baseboard outlet they will be so inserted regardless of what we do; neither could a force of inspectors comparable with the police force in one of our large cities prevent it.

You cannot prevent a person, frequently a seamstress or maid, but not infrequently the mistress herself, from putting a five-ampere, 125-volt iron into a 250-watt key socket, provided said socket is nearer to where she wants her ironing board, no matter how much you inspect. In conversation one of my inspector friends told me he went into the sales room of one of the largest light and power companies in the vicinity recently and speaking of this point to the salesman (not as an inspector but as a simple purchaser of an iron) got the reply from him that they didn't care about this matter at all, their business was to sell the goods and sell all they could. He said: "So and So wouldn't let any one use this thing in that way out in —— would he?" "Not if he knew it," was the reply, "but how in thunder is he going to find out?"

Now what can the inspector do with a considerable territory to cover when people talk that way? It is bad enough for the municipal officer with a comparatively small territory, and what can the insurance man do in his much wider territory?

In my own municipality we have pretty nearly exterminated the difficulty (our only source of power being a municipal plant) by giving a domestic heating and power rate of 3 cents per kilowatt-hour as against 9 cents for lighting, practically no charge for an additional meter, and in consequence there is a heavy inducement to have a special circuit run where any heating devices of any size are to be used.

It seems to me that the only way out of the difficulty is ultimately to get irons and similar portable heating devices fitted with attachment devices which will not fit the ordinary socket, or some similar arrangement (though how or what I confess I do not now see) and in the absence of this try whenever we have a chance to do a little *educating* ourselves. It is hard work but it means quite a bit of increase in peace of mind, as I can certify after several talks to local women's clubs, etc.

Grounding on Water Pipes.

Question 249. When the water service to a building is a lead pipe, what is the best form for making the ground connection without melting the lead pipe through a poor connection to said pipe?

Answer 1 (S). An approved ground-clamp if properly installed, should make a good connection. I have seen good connections made by winding the pipe with a great many turns of small wire. No. 14, B. & S., will make a good job if properly applied. The connection should be soldered, if possible to do so.

Answer 2 (J). So far as possible we discourage the use of lead piping for a conduit ground. When permitted at all we require the connection to be made at a fitting of harder metal—not directly to the lead.

Answer 3 (F). If this question refers to the grounding of alternating-current secondary systems, see Rule 15, National Electrical Code. If to the grounding of interior conduits, see Rule 28*f*.

Answer 4 (Q). Use ground connector made of copper band with sufficient exposed to operate largest fuse without heating. The conductivity of lead pipe should also be considered in case of larger fuses.

Answer 5 (V). There should be no danger with a proper ground clamp.

Answer 6 (P). There are a number of approved and satisfactory ground clamps, the use of which will obviate nearly all chance of melting a lead pipe through poor contact. See list of approved fittings.

Answer 7 (B). The rules call for an approved clamp, and it would seem as if a properly constructed clamp would give suitable connection if rightly installed. If conditions should arise where service pipe was such as would not permit of the use of a ground clamp, we would approve of wire wrapped around pipe and soldered in similar manner as a wiped joint on lead-covered cable.

Answer 8 (N). Make it if possible to the brass work of shut-off cock on street side, or by wrapped wire wiped like a joint, an ordinary friction ground clamp is very uncertain and should never be used if avoidable. Neither should a lead pipe ground anyway.

Answer 9 (I). In this city we use a standard ground clamp and we have little trouble from their working loose.

Answer 10 (Y). By the use of approved ground clamp or plug. See fine-print note, section 15*g*.

Answer 11 (M). The installation of several ground clamps would distribute the possible current over a large area and thus decrease heating offset. If possible to do so, it would be preferable to shunt the lead pipe with a wire at least as large as the ground wire.

Answer 12 (E). I feel a ground clamp on a lead pipe should be examined frequently, as they are apt to loosen. If possible it would be better to attach to clamp on the street side of main cock, which is generally brass.

Answer 13 (V). We would not allow a ground to lead pipe; would prefer a driven ground.

Answer 14 (D). Connect the ground wire with the brass fittings on the end of lead service, *or else provide some other source of ground.*

Answer 15 (O). Ground connection should not be made to a lead pipe under any circumstances.

Answer 16 (R). Lead water pipe is not considered as a good ground connection for a grounded secondary. In case of lead-pipe water services I should ground my secondaries outside of the building to a ground plate installed in an approved manner.

Cutouts For Heating Devices.

Question 250. Six heating devices (chocolate warmers in this case) of 264 watts rated capacity each, are found connected to single wiring circuit, no individual fuse cutouts having been provided. Does this conform to Code requirements? Is Rule 25a intended to require a switch and cutout for each heater, as Rule 81b requires them in the case of motors, or may any number of heaters be attached directly to a single circuit of sufficient capacity, fused only for the total connected load?

Answer 1 (W). It does if the fuse is not over 10 amperes. Each heater of more than 660 watts capacity must be protected by a cutout and switch. "Each" in Rule 25*a* means every one of a number taken separately: and is mandatory for a cutout and switch for each individual heater.

Answer 2 (D). Heating elements may be dependent upon one cutout where capacity does not exceed 660 watts.

Answer 3 (U). Six such heaters can be connected to a two-wire circuit without individual cutouts if circuit is not fused for more than 10 amperes.

Answer 4 (V). In this case *two heaters* could be under the protection of one cutout and controlled in pairs or singly as would best satisfy the conditions.

Answer 5 (O). Rule 25*a* is intended to require individual cutouts for any and all heaters of 6 amperes capacity or over. The point is further covered by Rule 23*d*, first paragraph.

Answer 6 (Y). The six heaters should be grouped on two circuits, each circuit protected by fuses not larger than 10 amperes capacity.

The second part of the question is included in the above.

Answer 7 (R). It does not conform to the Code. Referring to Rule 25*a*, heaters of less than 660 watts capacity may be grouped together on one circuit provided the circuit is protected by fuses not larger than 10 amperes capacity.

Answer 8 (B). The six devices referred to are presumably for use on so-called 110-volt systems, although question does not specifically so state. On this supposition, each heater would take 2.4 amperes, or a total of 14.4 amperes for the six heaters, which it is plain would be a violation of Rule 25*a*, which permits the grouping of heaters of 660 watts or less under a single set of uses "provided the rated capacity of the fuses does not exceed ten amperes."

A separate cutout is required where heater is of more than six amperes or 660 watts capacity.

Answer 9 (N). The question is capable to two answers. I am informed by my corporation counsel that the legal reading of the second sentence of Rule 25*a*, can only be interpreted taken by itself to permit the grouping of any number of heaters whatever on a single circuit provided no one of the heaters is over 6 amperes or 660 watts capacity, and provided, further, the fuses are not of over ten amperes capacity. The wording apparently refers to individual unit size, but taken in connection with Rule 23*d*, in which the 660-watt requirement just as clearly refers to the group rating, it would quite possibly require a judicial decision to interpret the relation of the two clauses in case of controversy. We have therefore by municipal by-law forbidden the grouping of heaters totalling more than 660 watts to one cutout. The chance of using the 1,320-watt privilege of Rule 23*d*, paragraph 2, is eliminated because the heaters do have flexible cord attachments.

Answer 10 (E). This question rather suggests the lady who had a three-light fixture in her dining room. In one socket she had a chafing dish, in another a percolator and in the third a toaster, and she complained because there was no place to have a lamp. The condition expressed is not in accordance with Code requirements. Rule 25*a* does not require a switch and cutout for each electric heater, unless the electric heater is of more than six amperes or 660 watts capacity. It is not permissible to attach any number of heaters to a circuit any more than it is permissible to attach any number of lamps to a circuit. Should the combinded capacity of a group of electric heaters under the protection of one set of fuses, exceed ten amperes, then, in my judgment, the circuit should be divided that it may be within the rule.

Answer 11 (Q). Under Rule 25*a*, each heater of more than six amperes capacity must be protected by a cutout and controlled by indicating switch, single-pole, up to a capacity of 660 watts. When heater of greater capacity is used, double-pole switches are used to comply with switch rules. Plug connections of sufficient capacity can also be used to make and break cords, these cords always being double-pole. When small heaters are used these could be grouped up to a 660-watt capacity controlled by a single-pole indicating switch or plug connectors used.

Answer 12 (H). The local conditions shall govern the installation referred to in this question. Assuming the voltage on the line to be 110, the apparatus requires 16 amperes. It does not conform to Code requirements.

Rule 25*a* is intended to require a switch and cutout for each heater, etc. If the heaters referred to are used in one place, they should be on two circuits and fused as if they were a sub-circuit for lighting; if they are scattered all over the building, they should be on a separate outlet.

Answer 13 (P). The six 264-watt heating devices cannot be connected to a single wiring circuit, for the reason that they exceed in total capacity 660 watts (see rule 25*a*). This rule says clearly that the heaters "may be grouped under the protection of a single set of fuses." It says further—and just as clearly—that the number of heaters which may be grouped under a single set of fuses is limited (1) by the provision that the group shall not exceed 660 watts capacity; and (2) that the total current shall not exceed ten amperes.

Answer 14 (S). Rule 25*a* allows heaters of six amperes or 660 watts capacity, or less, to be grouped under the protection of a single set of fuses, provided the rated capacity of the fuses does not exceed ten amperes. In the question the voltage is not mentioned. If these heaters were made for 110 volts and installed on a 110-volt circuit it would be impossible for a ten-ampere fuse to supply the current. In this case I should require the load divided between two circuits.

If they were made for 220 volts and installed on a 220-volt circuit they could be grouped under the protection of a ten-ampere fuse as allowed by the Code rules. Rule 25*a* does not mention the voltage when allowing the use of a ten-ampere fuse.

Answer 15 (X). Unless the normal working voltage of these heaters is given the question can not be answered. The code ruling on the connected load is by watts capacity and the grouping in parallel of heater appliances of less than 660 watts each is limited to a total connected load of 10 amperes fusing. On a 110-volt circuit these six heaters could not be connected in parallel on one circuit while at 220 volts they may.

Iron on Fixture Outlet.

Question 251. An iron of five-ampere rating is plugged into keyless (660-watt) socket on an ordinary lighting chandelier. This is wired throughout with No. 16 fixture wire and controlled by a single-pole five-ampere indicating wall switch and protected by a six-ampere plug fuse. Does this installation conform with Rule 25a or should the switch and cutout be arranged to take care of the heating device only?

Answer 1 (W). Yes, it conforms to Rule 25*a*, as wired.

Answer 2 (D). The installation as described would comply with Code requirements.

Answer 3 (U). Yes, this conforms with Code requirement of Rule 25a.

Answer 4 (V). If the number of lamps on this circuit does not bring the total wattage above 660, including the iron wattage, all may be on one cutout. Switch is not mandatory.

Answer 5 (O). The installation described is standard provided the total load on the branch circuit (including the iron) is not over 660 watts. Rule 25*a* has been revised especially to cover this point; see also Rule 23*d*.

Answer 6 (Y). The five-ampere heater should be approved on the lighting circuit as described.

Answer 7 (R). An iron with less than 660 watts capacity is not required to be protected by a separate cutout. See second sentence, Rule 25*a*.

Answer 8 (B). This would comply with present requirements of the Code.

Answer 9 (N). This is allowable according to the present Code rules, provided the number of outlets and total wattage are within the limit.

Answer 10 (E). Where the iron is within six amperes or 660 watts capacity, it is allowable under Rule 25*a* to install and use an iron in the method described.

Answer 11 (Q). This is not a violation of Rule 25, as the socket has the capacity rating and the smallest wire in the circuit is not overloaded. Would suggest, however, that the fuse be increased to take care of the starting current.

Answer 12 (H). I would not pass a heating iron plugged into a lighting chandelier under any circumstances, as there is no guarantee whatever that the five-ampere iron now in use would not be exchanged for one of ten or fifteen amperes rating. We insist upon separate outlets for electric irons in every case.

Answer 13 (P). Rule 25*a* does not require the arrangement of a switch and cutout for the five-ampere smoothing iron alone under the conditions cited.

Answer 14 (X). The installation conforms to Rule 25*a*.

Answer 15 (S). I think that Rule 25*a* is very plain on this subject. The voltage of this flat-iron is not given. If it were 110 volts we would have 550 watts, which would be allowed by the Code. If it were 220 volts we would have 1100 watts which would not be allowed. I do not recommend a connection of this kind. My advice to builders and owners is, to have a separate circuit and fuses for flat-irons.

Detroit Inspectors Elect Officers.

At the second annual meeting of the Electrical Inspectors' Club of Detroit, held on Wednesday evening, January 7, 1914, at the offices of the Electrical Inspection Department of the Public Lighting Commission, Detroit, Mich., the following officers were elected:

President, R. J. Dotson, chief inspector, Highland Park.

Vice-president, Lew Borer, chief inspector, Pontiac.

Secretary and treasurer, Harvey Boyd, electrical inspector, Detroit.

The retiring officers are: W. E. Flickinger, president; Ben W. Clark, vice-president; Edward Snow, secretary and treasurer.

The annual banquet and installation will take place on Wednesday eevning, February 4, 1914, at 8 p. m.

New York State Electrical Contractors Meet.

The fifteenth annual convention of the Electrical Contractors' Association of New York State was held January 20 in New York City. There was a large attendance from city and state, over 200 being present. The proceedings were private, but delegates and invited friends enjoyed a tea and reception in the afternoon and a theater party and smoker in the evening under the management of the Metropolitan Electrical Contractors' Association.

Public Service Commissions

ILLINOIS.

The State Public Utilities Commission has issued a general order directing every public utility in the state of Illinois to have on file with the Commission, not later than February 1, 1914, and keep open for public inspection, schedules showing all rates and other charges and classification which are now in force or which have been at any time in force since July 1, 1913, for any product or commodity furnished by it; or for any service performed by it.

KENTUCKY.

A public utilities bill has been introduced in the Legislature. Representative Myers presented the bill, which enlarges the powers of the State Railroad Commission, giving it control over the rates and regulation of public service corporations of all kinds.

MARYLAND.

Residents of Rognel Heights, a suburb of Baltimore, recently filed a petition with the Public Service Commission asking that the Consolidated Gas, Electric Light & Power Company be compelled to carry out a contract made between the town and the Patapsco Light & Manufacturing Company, which the Consolidated Company absorbed. By this contract the Patapsco Company agreed to furnish street lamps for the community without charge in return for certain privileges. The contract was made in October, 1910, a few months after the law creating the Public Service Commission became effective. A few weeks ago the Consolidated Company notified the town that the free street lamps would be discontinued. An opinion prepared by William C. Bruce, general counsel to the Public Service Commission, states that a public service corporation cannot lawfully accept any compensation other than money for its services, and the Commission cannot consequently require the company to continue the service. He concludes that the contract in question is repungent to the letter and spirit of the commission law and legally void.

Regulation of the hours of work for employees of public service corporations is not within the province of the Public Service Commission, unless it is shown that there was overwork such as to impair their efficiency and endanger the safety of the public. This opinion was prepared by Mr. Bruce in the case of employees of the power plant of the Hagerstown & Frederick Electric Railway Company. These employees complained to the Commission that they were compelled to work 12 hours a day and asked the Commission to shorten the working period. There is no law regulating the hours of work of power-plant employees. Before taking any action the Commission has given the railroad company 10 days in which to show the 12-hour working day does not impair the efficiency of its operators.

MASSACHUSETTS.

The Gas and Electric Light Commission has approved the issue of the Agawan Electric Company, Agawan, Mass., of 1,000 shares of new capital stock, par value $100, at $100 per share, the proceeds to be applied to the payment of notes outstanding November 30, 1913. On September 5, 1913, the Commission approved the issue of original capital stock to the amount of $25,000 for the purpose of acquiring the plant and property carried on by a local contractor. The Amherst Power Company has acquired control of the company and purposes to operate it solely as a local distributing company, the energy to be supplied to it by the Amherst Company. The latter company has constructed a high-tension transmission line and substation at Agawan at a cost of over $100,000, and this expenditure was assumed by the Agawan Company and was represented by its promissory notes of November 30 last, amounting to $128,074.

NEW JERSEY.

The Board of Public Commissioners has approved of an issue of $150,000 six-per-cent, five-year notes by the Commonwealth Water & Light Company, Morristown, with the provision that the company will immediately commence the separation of its various properties into individual corporations. The company, which recently acquired control of the Point Pleasant Electric Company, will consolidate such interests and its electric properties at Lakewood under the ownership of the Lakewood Electric Company; in this same section, the company will arrange its water and sewer properties under the control of the Lakewood Water Company. In the northern section of the State the company will similarly segregate its water and electric properties into one district water company and one electric company.

NEW YORK.

The Public Service Commission for the Second District has submitted to the Legislature its seventh report, covering the year 1913. In the report it recommends several amendments to the present law. It asks for authority, such as is now possessed by the Interstate Commerce Commission, to suspend for a period of four months advances in rates pending investigation as to their reasonableness. The report points out that the New York Telephone Company has been acquiring the property but not the franchises of independent competing companies. The Commission recommends a law prohibiting the acquisition by one company of the plant and property of another without the written consent of the Commission, as is now the case with respect to gas and electric-light corporations. It urges jurisdiction over all telegraph and telephone companies, no matter how small. During the year permission was given to 17 new corporations to furnish gas or electric service in the state. Inspections have been made of 265 telephone exchanges, and 95 telegraph offices. Appendices to the report contain statistical summaries and comparisons. These include the comparative cost of fuel for steam power used in generating electricity by different corporations and tables showing the amount of stocks outstanding and dividends declared during the year.

OKLAHOMA.

The constitutionality of the act passed by the Oklahoma Legislature on February 10, 1913, authorizing the Corporation Commission to collect and disburse to individuals entitled to the same any excess charges that may be found to have been collected by public service corporations, is upheld by the Oklahoma Supreme Court in affirming the action of the Commission in regard to the refund demanded from the Pioneer Telephone and Telegraph Company. The court holds that the Pioneer Company is demanding and collecting a rate for its telephones in Oklahoma City in excess of that fixed by the Corporation Commission by its order of October 12, 1908, and must refund to its subscribers the excess, which amounts to approximately $62,000.

The order of October 12, 1908, provided that a telephone company should not increase its rates in Oklahoma without first making application to the Commission and submitting schedule of the proposed changes for its approval. In July, 1909, the Burrows Company of Oklahoma City filed complaint against the Pioneer Company under that order. The company contended that it acted under authority of a city ordinance and that the Commission's order could not set aside its rights under that ordinance. After a hearing, however, it was adjudged in contempt. The case was appealed to the Supreme Court, which after several hearings affirmed the Commission's action.

Thereupon the State, through its attorneys, filed a petition with the Commission, seeking to recover the amount of the excess charges alleged to have been collected, being at that time $60,357.20. The company contested the action, but judgment was entered against it for the amount and the matter was taken to the Supreme Court. The company did not question the correctness of the Commission's figures but alleged that the act of February 10, 1913, was repugnant to both state and federal constitutions. Both contentions were decided against the company by the court, which declares that "if this conclusion is incorrect the regulation of public service corporations provided for in the constitution in many instances would neither be adequate or effective." The opinion was written by Justice Robert L. Williams, who was chairman of the Committee on Public Service Corporations in the constitutional convention and drafted many of the provisions of the Oklahoma constitution fixing the powers and duties of the Corporation Commission.

It is understood that the Pioneer Company will take the case into the federal courts, although no final announcement has yet been made in regard to that matter.

The Corporation Commission still has up for hearing the application of the Pioneer Company for a raise of rates from January 1, 1914, which has been delayed on account of the serious illness of one of the attorneys for the company. The company has given a supersedeas bond to guarantee payment of any excess charges from January 1 on, if its application for an increase in rates is not approved by the Commission. The $62,000 excess covers the period from October, 1908, to January, 1914.

The Purcell Telephone Company is preparing to make a refund to subscribers of excess charges collected under a raise in rates made in 1911 without authority from the Corporation Commission. The excess is 25 cents per month on residence and 50 cents on business telephones.

VERMONT.

Orders issued by state public utility commissions may be enjoined by the federal as well as the state courts, according to a decision handed down on January 19, at Washington, D. C., by the United States Supreme Court. The case was that of the Vermont Public Service Commission against the Rutland Railroad Company, the court deciding in favor of the latter.

The Vermont Commission ordered the railroad company to improve its station at Vergennes. The railroad immediately brought suit in the federal district court to restrain the Commission from enforcing the order on the ground it had exceeded its statutory powers.

The Commission moved to dismiss the injunction bill on the plea that the railroad should not have sought relief in the Federal court, but should have appealed from the order of the State Supreme Court in accordance with the provision of the Vermont public service law.

The federal court overruled this contention and enjoined the order. From this decision the Commission appealed to the Supreme Court.

The opinion, which was delivered by Justice Hughes, states that the law directing appeals to be taken from the order of the Commission to the State Supreme Court provides only "an alternative and more expedious way of doing what might be done by a bill in equity. Whether the alternative is exclusive or concurrent, whether it opens matters that would not be open upon a bill or not, if exceptions are taken, is immaterial; the remedy in any event is purely judicial: to exonerate the appellant from an order that exceeds the law. The railroad was free to assert its rights in the district court of the United States."

In the district court the Commission did not oppose the railroad contention that the Commission had exceeded its powers in issuing the order. In its brief in the Supreme Court the Commission intimated that if unsuccessful in establishing its contentions as to jurisdiction, it would seek additional legislation by the Vermont legislature.

WISCONSIN.

The use of silent-number telephones has received the stamp of approval in a decision recently issued by the Railroad Commission. The opinion followed a complaint by certain subscribers of the Wisconsin Telephone Company in Milwaukee alleging that the practice complained of was discriminatory and unfair.

The Commission has ordered the Milwaukee Electric Railway and Light Company and the Milwaukee Light, Heat and Traction Company to abandon their zone system of fares on urban and interurban lines and to substitute therefore a schedule of rates based upon distance. This will entail a reduction of approximately two-thirds of the single-way fares.

The Madison Gas and Electric Company has been ordered to give gas and electric service to a consumer to whom such service was refused for the reason that certain bills contracted at various places of residence were still owing to the company. It was held that where a consumer was willing to make the deposit required by the company to insure the payment of current bills under contract for future service, the company was required to furnish service notwithstanding the existence of bills previously incurred and unpaid. It was admitted that this might cause a hardship in a few cases but that it ought to have the effect of making the company more careful in the matter of its credits and in the enforcement of the deposit provision of its contracts.

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Elihu Thomson Lectures on Wireless.

At the joint meeting of the New York Companies Section of the National Electric Light Association and the New York Electrical Society, held at the Edison Auditorium on Monday, January 19, Dr. Elihu Thomson delivered a lecture on "The Wireless Transmission of Electrical Signals." Dr. Thomson's lecture was illustrated with lantern slides and the large attendance, including a great many students of the New York Edison Company and such notables as John W. Lieb, Jr., Prof. M. I. Pupin, T. C. Martin, H. M. Edwards and W. J. Hammer, listened attentively and appreciatively. Among other things, Dr. Thomson stated that the General Electric Company had tried to establish wireless signaling between Lynn, Mass., and Schenectady, N. Y. The work was not very successful, the topographical condition of the intervening territory evidently interfering with transmission. Dr. Thomson stated, however, that a message got through occasionally, coming, perhaps, down the Hudson River and around by the water route via Cape Cod to Lynn.

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National Electric Light Association Convention.

The annual convention of the National Electric Light Association will be held at the Bellevue-Stratford Hotel, Philadelphia, from June 1 to June 5. All committees are actively at work and an excellent program is assured. All sessions of the various sections and the exhibition features will be held at the hotel, and it is expected that there will be a very large attendance at this very important convention.

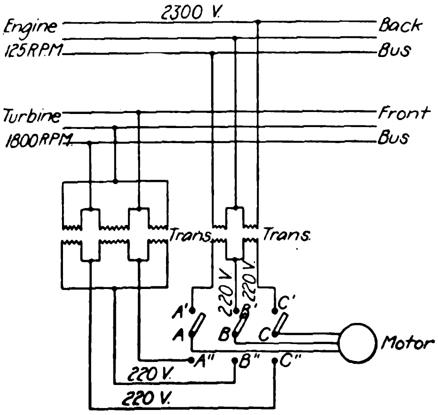
Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 193.—Repairs to Spark Coils.—Is there any way to remove the wax so as to permit making repairs on the coils of a jump spark coil box, such as used on automobiles, without spoiling the finish of the wood?—J. F. P., Canton, O.

No. 194.—Motor Circuit.—In operating a hot-well pump, we use a 220-volt three-phase motor, which derives its energy from a bank of three five-kilovolt-ampere transformers that are in turn fed from an outgoing power circuit. Any outside disturbance on this particular line would always drop the switch and consequently shut down the pump. In order to avoid this difficulty we used two transformers of 7.5-kilovolt-ampere capacity and which were fed from the back busbars, the leads being clamped to them. The secondary leads were run to the upper and lower terminals of a triple-pole double-throw knife switch, using the hinge terminals for the leads to the motor, as per diagram herewith. At the time of phasing out so as to keep direction of rotation the same, one turbine-driven generator was operating on the front buses, and an engine-driven generator on the back buses. In testing we used two 110-volt lamps in series and from terminal *A'* to *A"* there was no light, from *B'* to *B"* no light, and from *C'* to *C"* no light, but from *A'* to *C"* the two lamps burned dimly. We could not secure any light from any other connection. Thinking possibly that the dim burning of the lamps between *A'* and *C"* was caused by the generators coming up to synchronism, we inserted the plugs, but they were nowhere near that point, as the lamps on the synchronoscope and the instrument itself plainly showed. I have tried this over a great many times with the same result, which I cannot account for. Can some of your readers explain it?—R. J. H., Mason City, Iowa.



No. 194.—Motor Circuit Diagram.

No. 195.—Polyphase Meters.—Are any reliable polyphase watt-hour meters made with only one disk? Have they any advantages over the type with two disks on one spindle?—N. S. W., Peoria, Ill.

No. 196.—Speeding Up Street Cars.—If an electric street car designed for a maximum speed of 25 to 30 miles per hour is to be run part way in a rapid-transit subway at a speed of 40 to 45 miles per hour, can the motor and control equipment be readily adapted to the higher speed desired or must a motor equipment designed for the higher speed be substituted? Could this be accomplished satisfactorily by changing the ratio of the reduction gear?—B. F., Chicago, Ill.

No. 197.—Long-Distance Telephones.—In order to have satisfactory conversation over a very long telephone line, is it necessary that the telephones used at the ends of the line be of exactly the same make, or is it sufficient to have them of the same general type and built for long-distance service?—U. S. P., Cedar Rapids, Iowa.

Answers.

No. 183.—Purity Test for Sal Ammoniac.—I should like to know a simple but accurate way to test sal ammoniac. I find that considerable of this material being sold is adulterated with common salt or other cheap chemicals. The burning test is not accurate enough. I should like to be able to test about what percentage of the test sample is pure sal ammoniac and how much of it is adulterated.—F. H. W., Brooklyn, N. Y.

The chief impurities found in commercial ammonium chloride (sal ammoniac) are common salt, sulphates, fixed impurities, metallic impurities in general, and iron, in particular. Ammonium sulphocyanide and barium salts have been detected occasionally as a contamination of ammonium chloride. Before a quantitative test is made of a compound it is usual to determine just what it consists of. This is absolutely necessary where nothing is known about the compound. A complete qualitative test could be made, but, as the reader probably does not care to do any more than discover what the chief impurities are, and their amounts, it is sufficient to test qualitatively for the known chief impurities, and if found, to make a quantitative determination of them. We have noted the chief impurities above and will test for these only, with one exception, sodium, which the question states is introduced in the form of sodium chloride or common salt.

Sodium is always apparent to the naked eye by the flame test when this metal is present. It will often be found present in small quantities, even in so-called chemically pure salts. If the yellow burns off in about a quarter of a minute it is safe to report only a trace ot sodium present. The flame test for sodium is extremely delicate; in fact, a millionth part of a milligram of sodium may be recognized by means of the spectroscope. Practically, sodium occurs so frequently and is so persistent that simply rubbing a clean test wire with the fingers once will transfer enough sodium compound to the wire to give a distinct yellow flame coloration. The ammonium sulphocyanide may be tested for as follows: extracting by digestion with hot alcohol and, after the evaporation of the alcohol, dissolving the residue in a small quantity of water, sulphocyanide will be recognized by a blood-red color on the addition of a few drops of ferric chloride. Soluble barium salts will be recognized in the aqueous solution by a white precipitate on the addition of a few drops of dilute sulphuric acid. In the presence of lead, which would likewise be precipitated by the sulphuric acid, the two precipitates may be distinguished by the solubility of the lead sulphate in basic ammonium tartrate, whereas the lead will have been detected before, if the second-group test has been applied for metals, with hydrogen sulphide. Sulphates are detected in a diluted solution acidulated with hydrochloric acid, by a white precipitate, when tested with barium nitrate. Fixed impurities are indicated by a residue left after complete volatilization of the ammonium chloride, upon a platinum foil, or in a porcelain crucible. Metallic impurities may be detected in the aqueous solution previously acidulated with hydrochloric acid, by a coloration or precipitate when tested successively with hydrogen sulphide and ammonium sulphide. A precipitate thus obtained may be further identified according to methods given for analysis in groups by any good chemistry textbook on qualitative analysis. Iron may be recognized at once by a blue coloration, when the solution of the salt is acidulated with hydrochloric acid, and tested with potassium ferrocyanide.

Having determined qualitatively the presence of impurities, they may be determined quantitatively by methods given in good textbooks. The following tests are given as a means of estimation of the total impurities, and total true salt, which was the only quantitative estimation the question called for. Lack of space prevents a discussion of means of estimating each individual impurity. Some of these are hard to determine with the usual chemical equipment, and training of the average person.

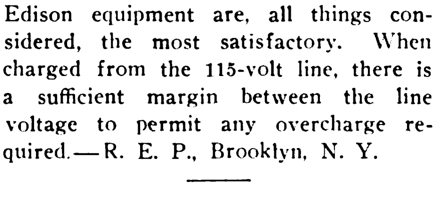
Weigh a clean and dry test tube (call its weight *a*). Then add some ammonium chloride, say one or two grams, taking care to deposit all of the previously powdered and dried salt in the bottom of the test tube. Weigh the tube again and call it *b*. Dissolve the powder by adding water to the test tube and then precipitate with a silver nitrate solution. Use only enough water to dissolve the salt, and use enough nitrate to completely throw down the precipitate, which is then washed with water and dried to a constant weight. Call this weight *c*. Wash the precipitate completely from the test tube onto the filter and wash with water. Be sure to get all the precipitate from the test tube, and all of it onto the filter paper. After having washed the precipitate a few times, dry it under the same conditions as before, to constant weight, then weigh and call this weight *d*. Then $b-a$ = the weight of the salt used and $d-c$ = the weight of the precipitate and $(d-c)/2.682$ should equal $b-a$, if the salt were pure and no errors were possible. The disparity between these values will give an idea of the purity of the salt, if care is taken in manipulating the apparatus, and avoiding all errors possible. Its purity, when free from other chlorides, may be conveniently and accurately determined volumetrically by dissolving 0.2 gram of the powdered and dried salt, in a beaker, in about 20 cubic centimeters of water, and after the addition of a few drops of a solution of potassium chromate, allowing a decinormal solution of silver nitrate to flow into the beaker from a burette, until with constant stirring the red coloration of silver chromate remains permanent. The number of cubic centimeters of silver nitrate solution which are required to produce this effect, when multiplied by the decimal 0.00535 will represent the amount of pure ammonium chloride in the quantity under estimation. By using exactly 0.2675 gram of the salt, and proceeding as above, the number of cubic centimeters of silver nitrate solution required to effect a complete precipitation, multiplied by two will indicate at once the per cent pure ammonium chloride.—H. E. W., Chicago, Ill.

No. 190.—VEHICLE BATTERIES.—What number of cells is most commonly used at the present time for the storage batteries of electric vehicles? Is there likelihood of standardizing this so as to simplify the charging equipment and raise the efficiency of charging?—P. S. J., Rockford, Ill.

The number of cells used for storage batteries of electric vehicles varies with the type of battery, the motor, and, to a certain extent, with the size of the vehicle. In the lead equipment 42 and 44-cell batteries are the most common. At least five well known makers list the 42-cell equipment, while five other prominent concerns prefer 44 cells. One maker furnishes a 40-cell battery. Exceptions are noted in some of the smaller vehicles. A 24-cell outfit is supplied with a 750-pound wagon, while a 30-cell battery is found on 500 and 1,000-pound wagons. For Edison battery equipments 60-cell batteries are practically standard. In the 750-lb. wagon 40 and 48-cell Edison batteries are used by some makers. The number of battery cells is governed also by the motors which are available. The standard ratings of vehicle motors are 48, 60 and 85 volts. These are supplied in current outputs depending on the work required. The 48-volt motor is used with 24-cell lead and for 40 and 48-cell Edison batteries; the 60-volt motor with 30-cell lead and 60-cell Edison; and the 85-volt motor with the 40, 42 and 44-cell lead equipments. The low-voltage batteries are an expensive proposition when charged from the usual 115 to 120 volt direct-current lines. A large amount of energy is unnecessarily wasted in the charging rheostat. The only advantage of the low-voltage equipment is the lower first cost of battery and motor. The space occupied by the battery is decreased. This is an advantage when the battery is placed under either the seat or a front hood. The 44-cell lead and the 60-cell Edison equipment are, all things considered, the most satisfactory. When charged from the 115-volt line, there is a sufficient margin between the line voltage to permit any overcharge required.—R. E. P., Brooklyn, N. Y.

No. 191.—CODE PROBLEMS.—1. Should rule 59*f* of the National Electrical Code be construed to require all outlet boxes to be independently supported? If so, I would like a few suggestions as to how it could best be done in the construction shown in the accompanying sketch, where sheet-iron fillers are used in place of tile and all outlets must be under these fillers, thus leaving no concrete to support the box.—2. Rule 28*f* states that gas pipes must be securely fastened in outlet boxes. How should this be done when the gas fitter merely drops a nipple through the box?—E. L. L., Bowling Green, O.

By reference to the accompanying diagram I believe the inquirer will understand a very simple way of fastening the box independently. By threading the conduit as shown and placing locknut above and below the sheet-iron filler the box can be independently and securely supported.—W. W., New York City.

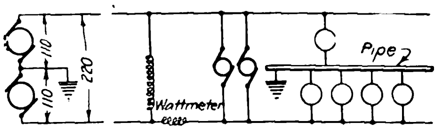


No. 191.—Code Problem.

To secure a gas pipe in the case mentioned in the second part of E. L. L.'s question will depend on the length of the nipple between the gas pipe and top of box. If this is a close nipple, a washer or several washers can be slipped onto the nipple between the end of gas pipe and box to just fill the clearance between them and thus prevent dropping of the pipe into the box. A nut or washer and nut on the nipple inside the box locks them together. If a long nipple is used, it should be threaded far enough to permit placing a locknut above and below the box.—H. B., Toledo, O.

No. 192.—GAS PIPE AS NEUTRAL CONDUCTOR.—Some time ago I came across an installation where the electrician, instead of putting in another wire to make a three-wire circuit out of a two-wire circuit, used the gas pipe for neutral conductor. The customer complained to me that ever since this was done his electric bill has increased considerably. I should like to know if using a gas pipe as neutral (which, of course, is not permitted) would of itself cause increase in current consumption and, if so, why?—W. F., New York City.

A 220-volt circuit can be assumed, since this is the most common for three-wire installations, giving 110 volts between the middle wire and either outside wire. With a straight two-wire circuit the arrangement stated would be impossible, for the rule is to ground the negative side, and thus there would be no potential difference between the negative wire and the gas pipe, and the customer would simply get 220 volts between the positive wire and the pipe. It must therefore be assumed that two generators are used, or the generator is wound for a three-wire circuit, with neutral grounded. The pipe being grounded, would act as a neutral and the voltage between the pipe and either wire would be 110. A possible explanation of a higher meter reading is as follows. Suppose customer has been using motors and lamps on 220 volts and decides to change lamps over to 110. He will connect his lamp leads between the gas pipe and the outside wires, leaving his motors connected between the two outside wires. Now his wattmeter is connected for 220-volt service as shown in sketch. If he connects all his lights between the pipe and one outer wire, his meter will read the product of 220 volts times his lighting current, instead of 110 volts times the lighting current that he is actually using, thus doubling his lighting bill. If his lighting load is exactly balanced his meter will read correctly, but any unbalancing will cause his wattmeter to indicate a consumption in excess of that he is actually using.—V. A. C., Cleveland, O.



No. 192.—Gas-Pipe Neutral.

Wisconsin Electrical Association.

Sixth Annual Convention, Milwaukee, Wis., January 15 and 16.

There were approximately 250 members and guests registered when the sixth annual convention of the Wisconsin Electrical Association was called to order at the Hotel Pfister, Milwaukee, Wis., on January 15. A large amount of business was transacted at the four technical sessions which were held morning and afternoon of January 15 and 16, and the closest attention was given to the reading and discussion of the numerous subjects presented. A considerable portion of the program was devoted to the reports of standing committees, with but few papers. It has been the experience of the Wisconsin Association that more information of value to the greatest proportion of the membership can be obtained through committees working the entire year than by asking individuals to prepare papers in a limited amount of time.

While from every standpoint, the sixth annual convention was a notable success, there are two features of the technical program which will characterize the meeting as the most successful yet held by the organization. The paper by Halford Erickson, member of the Wisconsin Railroad Commission, entitled "Some Problems of Public Utility Accounting and Rate Making" is one of the most comprehensive and valuable contributions yet made to the voluminous data already available on this subject. The paper by S. E. Doane, chief engineer of the National Electric Lamp Association, on "High-Efficiency Incandescent Lamps and Their Central-Station Applications," was also particularly interesting, as it touched upon one of the vital present-day problems in central-station operation. The prelude to this paper which comprised a résumé of Mr. Doane's observations of central-station conditions in Europe, was both interesting and important in that it showed the extreme measures which the foreign utilities are adopting to secure small customers and the excellent results which they are obtaining in this respect. Statistics on the number of customers connected in most progressive American cities seem insignificant when compared with statistics from foreign cities of like size.

The first session of the convention was called to order by President William H. Winslow promptly at 9:30 a. m., on Thursday morning. The reading of the annual presidential address was the first item of business. Mr. Winslow commented on the fact that there are a large number of companies in the state that are making little or no real progress. While it is true that it is difficult to largely increase sales in small communities of very slow growth, it is also true, he said, that wonders have been accomplished under such conditions. The same situation applies in regard to the street and interurban railway companies of the state.

Mr. Winslow reviewed the activities of the Association during 1913, a major portion of which were in connection with legislative matters. An exceptionally large number of bills were introduced during the past year, many of which were of vital interest to public utilities, and it was therefore incumbent upon the Association to keep in close touch with these matters.

Mr. Winslow stated that at the last meeting of the Wisconsin Gas Association its Executive Committee was authorized to co-operate with the Electrical Association on legislative and other matters of common interest, and he therefore recommended that a committee be appointed to confer with the former association and to also consider whether or not a consolidation of the two associations or the formation of a general utility association would be preferable and desirable. Mention was made of the existing public utility and stock and bond laws of Wisconsin and their effect upon the public-service corporations. The latter, Mr. Winslow thought, has had a tendency to retard development of new companies.

In conclusion, Mr. Winslow recommended that a committee be appointed whose duty it shall be to ascertain what has been done in the state in the way of supplying electricity to farmers, what methods have been used, what results obtained and what the outlook for a profitable development of such business is.

A committee consisting of three past-presidents of the Association, viz., George B. Wheeler, Irving P. Lord and Ernst Gonzenbach, was appointed to consider the president's address and report at a later session.

George Allison then presented the report of the secretary-treasurer, which showed the business and financial conditions of the organization to be in a very flourishing condition.

A slight change was made in the order of business and the paper by H. G. D. Nutting, of Milwaukee, entitled "Practical Accounting System For Small Central Stations" was presented. As explained in the preface of Mr. Nutting's paper, the object of the system which he presents is to furnish the small-plant operator, who fills every position from the manager to meter man, with short cuts in practical accounting, eliminating books. The forms, which were shown on a screen, were worked up by Mr. Nutting when he was in charge of a small plant, and have been subjected to practical tests. Many excellent ideas are embodied in this paper and more extended mention, together with reproduction of the forms advocated, will be published in a subsequent issue.

Questions relative to details of the system proposed were asked of Mr. Nutting at the conclusion of his paper, several of which related to the relationship between the system advocated and that proposed by the Railroad Commission. Mr. Nutting explained that while his forms were different than those of the Commission they were based fundamentally on the principles involved in the latter.

R. M. Howard thought that the forms were of such importance to the small companies that they could well be printed by the Association and supplied to those desiring them, at nominal cost.

H. A. Miles, of Durand, asked as to what disposition was made of the difference in amount between total earnings and total cash received. Mr. Nutting stated that this must be posted on the form showing uncollectable accounts.

C. A. Seifert of the Railroad Commission called attention to the exhibit of the Commission in one of the adjoining rooms, showing a complete set of forms which had been worked out along the lines of those presented by Mr. Nutting. Mr. Seifert explained that while the Commission does not insist upon the use of these particular forms, the information that will be required from companies necessitates the use of these or some similar ones.

Mr. Nutting closed the discussion by urging small-plant operators to give serious consideration to the subject of simplifying accounting systems, and he stated that the Commission's requirements and the utility's requirements are mutual in this respect.

A paper was then presented by John B. Sanborn, an attorney of Madison, Wis., entitled "Review of New Laws Affecting Public Utilities." Mr. Sanborn, during 1913, was engaged by the Association to represent it in all legislative matters, and his paper commented briefly on some of the laws of particular interest to members of the Association.

New Laws Affecting Public Utilities.

Mr. Sanborn referred to the legislation enacted in the State of Wisconsin, pointing out that although the activities of the legislature during 1913 were without precedent public-service corporations of the state did not receive any considerable attention. He explained, however, that many of the general laws enacted were of interest to utilities as corporations.

The most important of the laws now governing the relations between employer and employee is the Workingman's Compensation Act, and some rather important changes were made in this during 1913. The defense of "contributory negligence" was wiped out to the employer of four or more in common employment. This was done, not because of any inherent objection to the validity of such a defense, but in the desire to encourage the acceptance of the Act by employers of the state.

Another provision tending to bring as many employers as possible under the law, is that which places on them the burden of signifying their election not to be subject to the law. The intention to give every injured employee subject to the Act compensation for his injury is seen in the change from "wilful misconduct" which would defeat the recovery under the Act of 1911, to the "intentionally self-inflicted injury," which is necessary to defeat it under the Act of 1913.

Every employer subject to the Act is required to either take out indemnity insurance or convince the Industrial Commission that he does not need to do so.

Mr. Sanborn explained that the Income Tax has probably affected public-service corporations as little as any one in the state, because of the large personal property taxes which they pay.

On the financial side, the stock and bond law was amended to allow an increase of stock up to the actual value of the property of the corporation. Injunctions against orders of the Railroad Commission are regulated by two Acts amendatory to the Railroad Commission law and the Public Utility law. Under the former, no such injunction can be obtained unless the parties to the proceedings before the Commission are also parties to the proceeding before the court. In the latter, any party in interest may interplead in the action and if an injunction is sought in any action other than the one to set aside the order of the Commission, all parties to the action before the Commission must be brought in.

Municipal ownership of street railways is encouraged by allowing their acquisition, at any time instead of confining this to the three years prior to the expiration of the franchise. The Commission is given power to require the joint use of tracks by street or interurban railways, but in order to do this, it must find that public convenience and necessity requires this use of tracks.

A new water-power bill was enacted which requires that all future developments of more than 250-horsepower be public utilities; or as the Act states it, "for developing hydraulic or hydroelectric power for sale to the public." Such development must be by a municipality; an existing public utility; or a corporation specially organized for the purpose. Such corporation desiring to develop a water power owned by it, must apply to the Railroad Commission, which must approve the location of the dam, both with reference to its effect on navigation and development of power. The applicant must agree to certain conditions, the most important of which are to fully develop the water power and to install auxiliary power on the demand of the Commission; not to contract for the sale of the power for more than 30 years from the date of the franchise, after which date, the Commission may regulate the distance from the dam at which power is to be sold; to subject contracts for the Commission; to allow the collection of the franchise fee after 30 years, based on developed horsepower; to allow the acquisition of the property at any time within 30 years on payment of just compensation to be determined by the Commission, and without any allowance for the franchise and at any time after 30 years by the payment of the value of the physical structure at the date of the taking and the value of the power site at the date of the franchise, excluding, however, any value of the power site, by reason of its availability in connection with water power, except as far as such value had actually been paid for, for the property prior to the passage of the Act.

Mr. Sanborn held that in view of all the uncertainties arising out of the constitutional and practical questions involved in this Act, the immediate development of new water power in Wisconsin does not seem to be bright.

In conclusion he thought that the public-service corporations of Wisconsin had been very thoroughly regulated during the past 10 years. Whatever may be the exact proportion between the well and ill-advised parts of this regulation, there is no doubt that a rest from further changes for a few years at least, is highly desirable.

President Winslow, at this point, called attention to the importance of central-station companies making a thorough study of line extensions, considering their cost, the revenue attainable therefrom; maintenance, etc. He thought it desirable for a utility to have a specific policy that would apply in the matter of extensions, the fundamentals of which could be the same for all companies.

H. G. D. Nutting stated that at present the policies of companies in the matter of making extensions varied greatly. Some companies will make extensions only when the annual gross revenue from such extensions equals the first cost, sometimes the revenue is distributed over two or three years; and still other companies have no set rule in this connection. He emphasized the importance of making a careful analysis of the cost of taking on new customers in every case, and referred briefly to a formula which he has worked out involving the various costs that enter into extensions. These include interest on the investment, depreciation, taxes, operating expense, maintenance, overhead charges, etc.

A motion was made and carried to the effect that the incoming president be authorized to establish a standing committee to thoroughly investigate this subject.

Thursday Afternoon.

F. J. Natwick, a contractor of Grand Rapids, Wis., opened the meeting on Thursday afternoon with a brief address, in which, as a representative of the Wisconsin Electrical Contractors' Association, he asked for the co-operation and support of the central-stations. He thought that much good could be accomplished if the various electrical interests would work in harmony and if the various associations would co-operate with each other. He expressed the hope that at the next annual convention a paper would be presented outlining some feasible plan of co-operation with the contractors. The Electrical Contractors will meet again in Milwaukee in April, and Mr. Natwick extended a cordial invitation for central-station men to attend.

The final report of the Committee on Train Dispatching was then presented by E. W. Hammett, of Sheboygan, chairman. This report is an elaboration of the paper presented by Mr. Hammett at the convention last year, with specific recommendations for a street railway operation in Wisconsin. The recommendations include (1) that a telephone system be used between the train dispatcher and the various sidings; (2) the employment of a time table that gives comprehensive data on train movements; (3) written train orders; (4) a train sheet which should be an official record of the movement of all trains; (5) all sidings should be either numbered or named; (6) the dispatcher should be a man of responsibility and of character capable of properly performing the duties involved.

A somewhat extended discussion was entered into between Messrs. Pulliam, Hammett, Gonzenbach, Stearns and Treat. Mr. Pulliam held that many interurban lines are merely extensions of city lines and therefore steam-railroad dispatching rules do not apply. Mr. Hammett thought that on small roads the dispatcher could devote part of his time to other duties and thus justify his employment. Mr. Gonzenbach stated that the question of time-table rights was the most important consideration in interurban operation.

Following this discussion a paper entitled "Street Railway Traffic Surveys in Relation to Railway Operation, Management and Regulation" was presented by C. M. Larson, chief engineer of the Wisconsin Railroad Commission.

This paper points out that railway traffic analysis in its present form is a comparatively new science and large savings can be effected in construction and operating costs by the adoption of proper routings and schedules. A traffic-study department should be established on all large systems and where the expense of such a department is too large the manager, or traffic executive, of the system should make these studies individually. Mr. Larson proposed a field book in which such data can be tabulated and easily referred to.

Such traffic surveys as those outlined are essential if the company is to furnish the public with the best possible service. With traffic data at hand, every manager would be in a position to do his own regulating without appeal to the commission. Charts, showing the methods of making traffic surveys, were exhibited.

In the discussion Mr. Stearns of the Milwaukee Electric Railway & Light Company stated that surveys made by the Commission, in a manner similar to those outlined in the paper, had materially aided the traffic situation in Milwaukee. One result was that part of the cars on several lines were routed only to the limits of the heaviest traffic zones and were allowed to be turned back from this point. Mr. Stearns added that the Milwaukee company inaugurated, on January 18, a revised system of fares. The suburban traffic surrounding Milwaukee has been divided into mile zones and a fare of two cents a mile has been established outside of the regular five-cent city zone. Mr. Stearns explained that prepayment cars are used exclusively and passengers pay the additional fare on leaving the car. Messrs. Rosencrans, Ewing and Larson also entered into the discussion.

The report of the Committee on Electric Service Rules Revision was then presented by F. A. Vaughn of Milwaukee, chairman.

Electric Service Rules Revision.

This committee was appointed primarily as the representative of the Wisconsin Electrical Association to act officially with the Railroad Commission in revising electric service rules. The Committee reported its activities in this capacity, which are clearly illustrated in the acceptable rules established by the Commission. The report recommends that the Association have a standing Committee on Meters which would co-operate with other state committees with like functions and with national committees as well, so that a uniform standardized system of service regulation will be developed. Some of the hardships that have been imposed on utilities because they did not co-operate with commissions in explaining their positions were cited.

J. N. Cadby of the Railroad Commission opened the discussion endorsing the suggestion made by the Committee of having a permanent committee of the Association to study and report on this subject.

The work of the Standards Laboratory of the University of Wisconsin, which, in connection with the electrical engineering division of the Railroad Commission, has been making various tests and examinations in the interest of utilities, was outlined briefly by a member of the Laboratory staff. Results of tests made on meters submitted to this laboratory were announced as follows. Of a definite number of meters tested 50 per cent were of the portable, standard, watt-hour meter type. Of the alternating-current meters of this type 77 per cent were found to be outside of the one-half per cent limit of accuracy, and two and one-half per cent were found to be outside of the four per cent limit; of the direct-current meters of this type 87 per cent were found to be outside of the one-half per cent limit of accuracy, and 25 per cent outside of the four per cent limit. Some meters tested were as much as 15 per cent inaccurate. The laboratory has under consideration a standard type of shipping box suitable for shipping meters to be tested.

P. H. Korst.
President-elect, Wisconsin Electrical Association.

F. A. Vaughn called attention to the work of the Meter Committee of the National Electric Light Association, mentioning particularly the investigation at present being carried on to determine the status of maximum-demand instruments. Letters are being sent to all member companies, asking as to the types of maximum-demand instruments used and what time interval is approved for the various classes of service.

George B. Wheeler, of Eau Claire, as chairman of the Committee on Co-operative Advertising and Publicity, then presented his report. It is held that co-operative advertising under the auspices of the Wisconsin Electrical Association is unnecessary in view of the number of advertising companies well equipped to give such service, and also in view of the excellent advertising literature furnished by the large manufacturers. The Committee urges every utility company to use daily newspapers with greater regularity and greater liberality. It is incumbent upon public-service companies also to furnish the public through the newspapers, full details of its policies and intentions. Utilities have nothing to conceal in their business relations with their customers.

It is recommended that the Association take steps to advise the public that the regulation of public-service companies is more to be desired than public ownership, and the Advisory Committee of the Association is instructed to carry on a campaign in this connection.

President Winslow then appointed a nominating committee comprising O. C. Irwin, D. C. West and L. H. Lathrop.

Friday Morning Session.

The first item of business taken up on Friday morning was the report of the Committee on Overhead Inspection, of which S. B. Way was chairman.

Overhead Inspection.

The Committee observes that very little appears to have been accomplished in the past by the operators of overhead distributing systems in preparing or promulgating rules relative to systematic inspection of overhead systems, although the desirability of such systematic inspection is probably well recognized by all operators of such systems. The objects to be gained by systematic inspection are: (a) reduction in hazard to employees and the public generally; (b) the improvement of service rendered to customers.

The degree of hazards to life, limb and property and the character of the service delivered to customers are dependent, to a certain extent, upon the quality of material, the character of the workmanship and the plans employed in the original construction. To secure safe distributing lines, the prime requisite is, of course, good material, but good material is of little avail if the workmanship is poor, or the scheme of construction has not taken into account the conditions under which the line must be constructed and operated.

Ideal inspection can only be made with the aid of thoroughly competent inspectors, and the scarcity of such men constitutes the principal difficulty in securing the hoped for results. Utilities having organizations of such size as to make possible the maintenance of a separate department devoted to the inspection of the system and the correction and elimination of troubles as they are disclosed, can secure satisfactory inspection service without great difficulty, because the men who do the work are especially trained to look for trouble or conditions likely to cause trouble. In smaller utilities, this work must be done more or less incidentally with other work, but nevertheless should receive attention.

To safeguard workmen and to reduce the hazard incident to the vocation of linemen, requires that the lines be inspected with reference to space provided on the poles and between the wires carried on the poles or cross-arms, so that men required to work upon the poles will at least have an opportunity to keep clear of grounded or live wires while working on other wires. It is likewise necessary to inspect, at the same time, for more or less hidden defects or hazards, such as grounded braces, rusted guy wires and decayed or burned poles, cross-arms and pins. Appliances which men are required to reach with relative frequency, such as cutouts, fuse blocks, disconnecting switches, lightning arresters, etc., should be so located and arranged as to be reached by a man standing on pole steps or on his supports without coming in contact with other equipment, especially ground wires cleated to the pole, or grounded guys.

Inspection, with a view of safeguarding the public generally, requires noticing and reporting all cases of unduly slack wires, decayed or burned poles, cross-arms and pins or contact with or small clearance from trees, building, other structures and other wires of all kinds. The likelihood of accidents to both employees and the public resulting from broken poles or wires may also be reduced if attention is given to the matter of properly guying poles, lines and equipping guy wires with strain insulators suitable for the voltage of the lines carried on the poles. Annoying and sometimes costly accidents to the public resulting from stumbling against guy rods entering the ground, may be minimized by placing around such rods wooden guards or boxes painted white, which will render them readily visible even at night.

The frequency with which inspection should be made will vary over extremely wide limits, depending upon the character of construction, proximity of trees, other lines and structures, voltage, and the relative importance of the different lines constituting the same general system. An important high-voltage transmission line delivering large quantities of power and upon which, perhaps, several communities depend, would require more frequent inspection than a less important line, in order to properly safeguard the service.

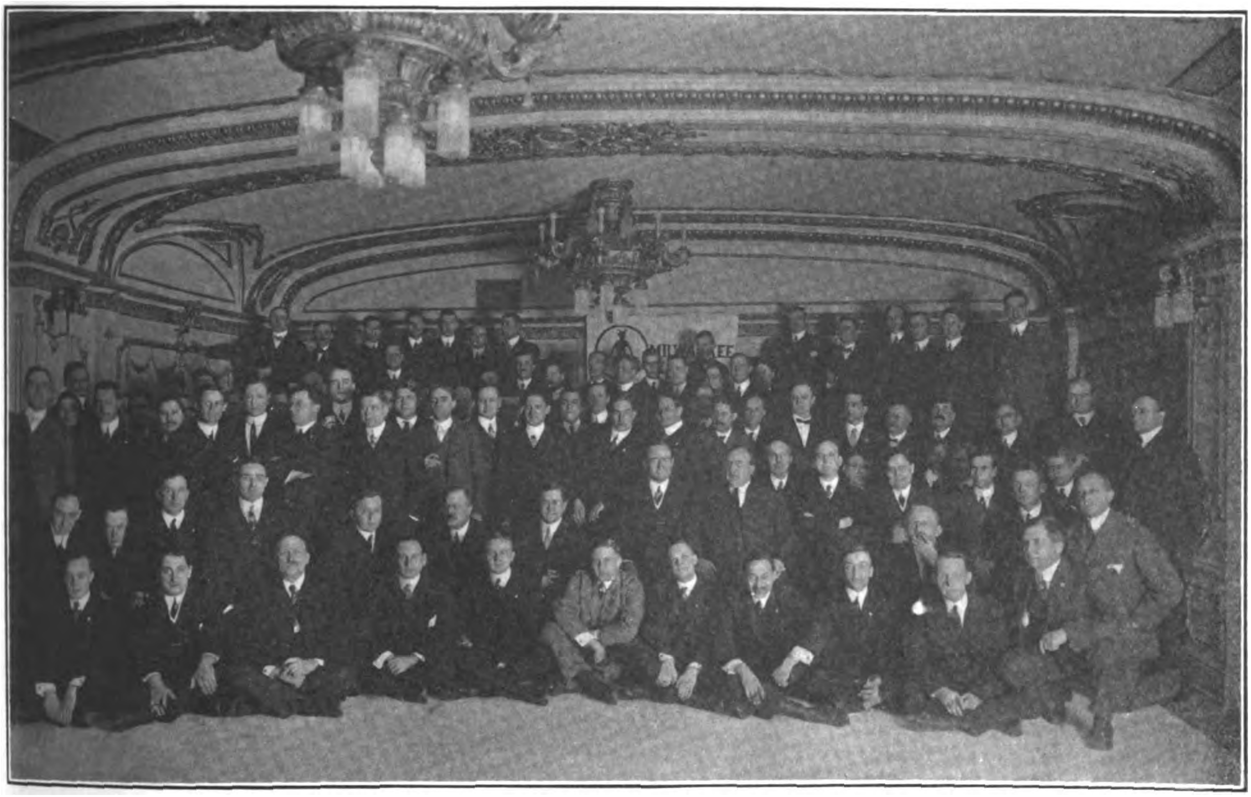
The committee believes the following schedule should be used in determining the minimum frequency of inspection of the several classes of the lines enumerated:

Voltage of Lines.	Frequency of Inspection.
7500 volts or over..	3 Months
1000 to 7500 volts..	6 Months
Less than 1000 volts	1 Year

To insure the inspection of the several classes of lines at the required frequency, a card index follow-up file will be found convenient. The report forms provided should be arranged to minimize the clerical work required of the inspector, by showing a diagram of a pole with cross-arms and pins and by giving a printed list of defects to be looked for, so that the inspector may check off readily the items which are not found, and indicate otherwise, as, for instance, by a cross mark, the locations of defects. The back of the report form should be used for further description in detail of conditions which cannot be indicated on the diagram, as, for instance, corroded guys and bad clearances.

This report was discussed by W. E. Haseltine. F. A. Vaughn, W. H. Winslow, P. H. Korst and S. B. Way. Mr. Haseltine suggested that the reports be printed and specially distributed, so that members could follow the excellent suggestions made.

Mr. Vaughn stated that overhead inspection needs to be standardized along the lines outlined by the committee. While details must be worked out by each company to cover local conditions, the fundamentals involved can be universally



Group at Rejuvenation of Sons of Jove Held During Convention of Wisconsin Electrical Association.

applied to all utilities. He added that standardization of inspection methods means protection in case of litigation.

Mr. Winslow supplemented Mr. Vaughn's remarks, stating that in addition to making periodical inspections utilities must be in a position to prove that such inspections have been made in case of damage suits, or other legal troubles.

Mr. Korst thought that the suggestions offered by the committee should be submitted to the Industrial Commission of the state, in line with its work in accident prevention. Mr. Winslow explained that the rules of the Industrial Commission do not cover inspection, but he thought that the Commission would welcome the co-operation of the Association. Mr. Vaughn added that the Association should put itself in a position to make suitable recommendations to the Commission and not wait for it to act first.

The paper by G. G. Post, electrical engineer of the Milwaukee Electric Railway & Light Company, entitled "Voltage Regulation. Its Necessity and How Accomplished" was then presented by the author. Mr. Post divided the subject into two general headings: (1) The Necessity of Regulation and (2) How to Accomplish Regulation. Under the first heading it was pointed out that good service is dependent upon good regulation and, as the function of the central station is mainly to provide service, the importance of good regulation can be appreciated. For lighting circuits the voltage should be maintained within three per cent of the normal voltage and within ten per cent on power circuits. Some of the objectionable features of poor regulation were mentioned such as shortening the life of lamps, reducing candlepower, etc. If central stations provide free lamp renewals, the shortening of the life of the lamps is expensive and if candlepower is reduced, dissatisfaction of customers results.

In general, regulation is accomplished in two ways; either by regulation at the station busbars or regulation of the individual feeders. The first gives satisfaction where only one feeder supplies the system and is accomplished either by hand or by means of an automatic regulator. Regulation of voltage on individual feeders is necessary in systems comprising two or more feeders.

In direct-current systems of 150-kilowatt capacity or less automatic regulators of the Tirill type can be used to advantage. In systems larger than 150-kilowatts, Tirill regulators can be used but additional means must be provided. The greatest reliability of service is obtained by tying together the various feeders at the busbars. The practice of the Milwaukee Electric Railway & Light Company in this connection was cited.

In alternating-current systems the regulation is the same as in direct current for the small plants. In larger alternating-current systems records should be obtained from outlying sections, and the main voltage of the busbars should be maintained at such a value as to give the best results at the customer's installations. In making voltage surveys, Mr. Post pointed out that, as it is impossible to place suitable instruments in a customer's premises, voltmeters should be placed in boxes and mounted on poles in various parts of the system.

Numerous lantern slides were shown illustrating various types of regulating apparatus and voltage charts of the Milwaukee company, showing unusual disturbances with explanation as to their cause.

In the discussion it was pointed out by one small utility operator that the rules of the Railroad Commission are unnecessarily severe in the matter of regulation. It was stated that Mr. Post's paper showed the elaborateness of detail that must be carried out to comply with the rules. Such equipment and work is almost prohibitive for the small central stations.

W. E. Hazeltine reported that he has encountered no difficulty in meeting the Commission's requirements as to regulation, and this in view of the fact that lighting and power service is taken from the same lines. He added that Tirill regulators were used.

V. A. Hain, of Chicago, stated that it is essential to make careful voltage surveys in order to determine upon the remedies that must be applied. The regulation of lighting feeders should first be considered, as the effect of poor regulation on these customers is decidedly more noticeable than in the case of power customers. Good regulation, however, is also essential on power lines, in order that motors may operate at their highest efficiency. Mr. Hain pointed out that meters run slow if voltage is below normal and this affects the revenue of the central station.

A very interesting paper entitled "High Efficiency Incandescent Lamps and Their Central-Station Application" was then presented by S. E. Doane, chief engineer of the National Electric Lamp Association.

High-Efficiency Lamps.

Mr. Doane's paper was divided in two parts, the first dealing with the results of an extened investigation made of central-station conditions in Europe, with special reference to the activity of these companies in going after the business of the small customer; and the second part dealt with the construction and applications of the new high-efficiency tungsten-filament lamps. Regarding European conditions, Mr. Doane said that central-station practice has been more extreme there than in this country. There is less interchange of ideas and practice and less discussion between central-stations than here.

Interesting statistics were presented covering an European city of about 650,000 inhabitants where a privately owned plant was in completion with a municipal plant. The former had about 40,000 meter customers and about 25,000 customers on limiting devices. The city plant had about 24,000 customers on limiting devices, making a total for the city of over 90,000 customers. The average connected load of the 25,000 customers of the private company is 21.7 watts. The rates cover everything from a single 10-watt lamp upwards. This single 10-watt lamp is supplied for 16 cents per month, including wiring rental.

Dividing his observations under the headings of soliciting; installing; billing and collecting; metering and its equivalent; and relations with contractors, Mr. Doane said that as regards soliciting the activity of most European companies is centered on the small customer on the theory that the housewife, whom they figure they must address, will insist on electric light being installed in her home if her poorer neighbor has it, whereas the reverse is not true. The customer's installation is often financed in some manner by the central station. Collections are made periodically in small installments, with a sufficient additional amount to pay interest on the money thus invested.

The billing and collecting schemes are most ingenious, consisting of making out a card with a number of coupons attached once a year and handing this card with the coupons attached to the collector, and billing the collector at each period for the total amount charged to his account. Twelve of the coupons are attached if collection is to be made once a month, four if to be made once a quarter, etc. At the period named the collector exchanges a coupon for the cash. The collectors, in many cases, are employees of beer gardens, etc., and work without commission.

All of these small customers are charged on a flat-rate basis and invariably a circuit-breaker or limiting device of neat compact appearance and low first cost is used. In most cases the cost of this device does not exceed $1.50. Lamps of the very highest efficiency are installed with suitable reflectors, the average small customer using 1.8 lamps each. Customers buy their own lamps.

In practically every city investigated the contractors and central-stations were working in harmony. The contractor secures, in some cases, financial assistance in the purchase of his supplies. The central station points out that in as much as they expect to finance their customer in any event that they only have to carry this financial load a few days more if they finance the contractor also, and consequently it means little to them whether they pay their money out for the material or for the completed job. By purchasing in quantity and billing these supplies to the contractor on open account, and then crediting him with the installation, they can use their size and financial standing to assist the contractor which merely means financing the business as a whole.

Speaking of the new high-efficiency lamps, Mr. Doane briefly described the theory upon which they are manufactured, and the chemical action resulting from the use of nitrogen gas in the bulb. The feature of this latest development is tungsten wire coiled into a small area to reduce convection loss when operated under gas pressure to reduce evaporation. Commercially it will, of course, modify central-station practice to some extent. Mr. Doane stated that unless arc lamp manufacturers produce something new, the end of the arc lamp is indicated as clearly as is that of all the other older types of electrical illuminants.

While, when used at the highest amperage, an efficiency as low as one-half watt per candle is obtained, as lower amperages are employed there comes a place where the vacuum lamp is more efficient, the reason being that the less mass of wire allows a greater percentage of loss due to heat convection. The new development, although revolutionary in scientific effect, will simply extend the commercial fields to which incandescent lamps have been applied in the past. Mr. Doane, in conclusion, urged that the lamps be referred to by their efficiency and size without regard to the particular construction which makes these efficiencies possible at the sizes given.

In the discussion F. A. Vaughn inquired whether contracts for service with the small customers in Europe, covering long periods, were made with the householder or the tenant. Mr. Doane explained that there is no set rule for this but usually, if the contracts cover a long term, they are made with the owners. The amounts involved are so small that the new tenants do not hesitate to assume the monthly payments when moving into wired apartments or houses.

C. M. Axford asked if the central station or contractor carries the wiring accounts. He also called attention to the efficiency of the long-burning flame-arc lamp which approximates that of the new tungsten-filament lamp. He spoke also of the effect of voltage on lamps and thought the central station should have the control of the lamps to be used by customers to insure proper service.

S. B. Way thought the American central station must follow along the same lines as indicated by Mr. Doane in securing the business of the small customer. The flat rate with limiting device partially answers this question, but not where heating devices are used.

Mr. Doane explained that invariably central-station companies have been able to place customers wishing to use heating devices on a meter basis. He added that the limiting device is one of the best opening wedges for meter customers so far known. Answering Mr. Axford as to flame-arc-lamp efficiencies, Mr. Doane said that should the high-efficiency tungsten lamp be equipped with a reflector, so as to give the same distribution as the flame-arc lamp, the efficiency of the former would be correspondingly greater.

MILWAUKEE
CHAPTER

Chicago Degree Team Which Conducted Rejuvenation in Milwaukee.

Friday Afternoon Session.

The paper by Halford Erickson, member of the Wisconsin Railroad Commission, entitled "Some Problems of Public Utility Accounting and Rate Making" was presented at the opening of the afternoon session. Owing to the absence of Mr. Erickson, J. E. Doolittle of the Commission presented this paper which will be published in full next week.

Reports were then presented by the Membership Committee and Auditing Committee, the former reporting several new members and the latter indicating the books of the Association to be in a satisfactory condition.

A. A. Gray, of Chicago, then spoke briefly regarding the Society for Electrical Development, outlining the functions of this society and the good that can be accomplished if the co-operation of all interested in the development of the electrical industry can be obtained. It is confidently expected, Mr. Gray said, that the active work of the society will begin in March of this year, as all indications point to the successful raising of the fund of $200,000 which was set as the initial amount required.

F. J. Natwick again spoke of the desire of the electrical contractors of the state to actively co-operate with central-station interests and he recommended that a committee be appointed to attend the next meeting of the Wisconsin Electrical Contractors Association.

The Nominating Committee then reported its selection for officers for the ensuing year and the secretary was instructed to cast the ballot of the Association for the following candidates:

President, P. H. Korst.
First vice-president, M. C. Ewing.
Second vice-president, W. E. Haseltine.
Third vice-president, B. F. Lyons.
Secretary-treasurer, Geo. Allison.

Mr. Korst then took the chair and

George B. Wheeler presented the report of the Committee on the President's Address. It was recommended by this Committee that the incoming president appoint a Committee on Associations; a Committee on Rural Extensions, and also that the advisory board of the Association be authorized to reimburse Secretary Allison to the amount of $300 for clerical work in connection with his office.

The two papers entitled "Comparitive Maintenance of Car Electrical Equipment" were then presented. E. Taylor of the General Electric Company presented one paper and Clarence Renshaw of the Westinghouse Electric & Manufacturing Company presented the second paper on this subject. Both papers dealt with economies in railway operation incident to the replacement of old type electrical equipment with modern apparatus.

Entertainment.

The entertainment provided was somewhat of a departure from the usual diversion which has been an annual feature of the Wisconsin meeting, in that a theater party on Thursday evening, with an informal supper following, took the place of the usual annual banquet. At the supper, at which Ernst Gonzenbach acted as toastmaster, addresses were made by Messrs. Searle, Axford, Hobson, Bowler, Allison, Gould and Wheeler.

On Friday evening a rejuvenation of the Sons of Jove was held at the Wisconsin Hotel at which 24 candidates were initiated. A supper and cabaret followed the initiatory ceremony. The entire Chicago Degree Team, under the management of Mr. Hawkins, was present to conduct the ceremony.

Exhibits.

During the convention a meeting of the Wisconsin Electrical Exhibitors Association was held, at which the following officers were elected: President, J. C. Schmidtbauer, Julius Andrae & Sons Company, Milwaukee. Vice-president, W. H. Tompkins, Western Electric Company, Milwaukee. Secretary-treasurer, H. F. Boggis, C. J. Litscher Electric Company, Milwaukee.

Exhibits were maintained by the following companies: Allis-Chalmers Manufacturing Company, Julius Andrae & Sons Company, Central Electric Company, Duncan Electric Manufacturing Company, Electric Appliance Company, General Electric Company, Harter Manufacturing Company, Illinois Electric Company, C. J. Litscher Company, Moloney Transformer Company, National X-Ray Reflector Company and the Western Electric Company.

National Independent Telephone Association.

Brief reference was made in our issue of last week to the seventeenth annual convention of the National Independent Telephone Association, which was held at the Hotel La Salle, Chicago, on January 13 to 15. The total registration at the convention was about 450. The large attendance at the meetings, the interest in the proceedings and the attention given to the telephone exhibits all indicated a very successful gathering.

The first session was opened on Tuesday afternoon by President Manford Savage. A nominating committee was elected, composed of C. E. Tarte, C. C. Deering, W. N. McAnge, Jr., B. Adams, and G. R. Johnston. A committee on resolutions, consisting of N. G. Hunter, H. D. Critchfield and M. S. Taylor, was also elected. The main feature of this session was the eloquent address by J. Adam Bede, ex-congressman from Minnesota, who in his talk referred to the development of the country, the many problems it had brought about, the positive manner in which these problems are being solved one by one, and the assurances that further progress will involve new problems which must be taken up in the same way. Mr. Bede enlivened his address with many characteristic sparkling and humorous references.

On Wednesday morning the session opened shortly after 11 o'clock with an address by Richard Yates, ex-governor of Illinois, and member of the new Illinois Public Utilities Commission. He referred briefly to the act of the last legislature through which the new commission of which he is a member was created, and spoke of some of the duties, powers and rights of the commission. He was pleased to note that the association had expressed favorable opinion as to commission regulation and that it promises to co-operate with the commission. The service of telephone companies, as well as that of nearly all utilities, can be improved. The differences that have arisen between the utilities and the public are largely of an economic nature and it is the province of state commissions to adjust these differences. He was pleased to see that the efforts of the new commission had been welcomed by the press, the utilities and the public in general. Light must be thrown on all public utilities and there must be publicity of accounts. In the handling of all utility problems there is a threefold interest, viz., the utility company, the consumers of the utility and the state. The introduction of the latter new factor into the regulation of the utility business is not to be feared, since it preserves all that is good and allows full co-operation. Mr. Yates stated that the desire of the commission was to maintain an unbiased attitude and to refrain from decision or public discussion of all cases that likely will come up before the commission before they are presented. The commission realizes it is a court as well as a board. Comparing the work before the new Illinois Commission with that under the jurisdiction of the Public Service Commission of the Second District of New York, Mr. Yates showed that the New York Commission has a total of 924 companies under its control, whereas the total utility companies under the control of the new Illinois Commission is 3,023; classified as follows: 255 steam-railroad corporations, 306 electric street railways, 8 express companies, 647 electric light companies, 152 gas companies, 1,462 telephone and telegraph companies, 84 waterworks companies, 18 water-transport companies, 8 water-power companies, 83 miscellaneous utility corporations.

William Fortune, president of the Indianapolis Telephone Company, then gave a talk on the income tax law. In this he called attention to the fact that most of the regulations respecting the new tax are based on British practice. The regulations drawn up by the government authorities for carrying out the law have imposed a mass of bewildering requirements, many of which are impracticable and unreasonable; new interpretations and regulations are being issued from time to time, so that a feeling of indefiniteness as to exactly what is required has arisen. The most unsatisfactory feature of the new regulation is that requiring collection of the tax at the source. Mr. Fortune called attention to the serious defects of this policy and the difficulties that will be encountered thereby. An enormous amount of "red tape" is thrown onto American financial institutions. Conditions in this country are not what they are in England and it is against the principles of the American people to assume that everyone is dishonest. Therefore, Mr. Fortune urged that the association take part in the strong movement now being made to bring about a change in this impractical requirement of the income tax law.

The report of the Nominating Committee was then submitted. It contained the names of 21 nominees for directors, and 14 others were to be nominated from the floor; four nominees were designated in the latter manner and the ballot ordered printed.

The afternoon session was devoted chiefly to the annual presidential address.

President's Address.

In opening his address, President Savage said that conservation is the live topic of the day and therefore it seemed proper that the Association take up active measures looking toward the conservation of the interests of the stockholders of operating telephone companies. In the early days of the independent telephone industry permanency of the investment was not given proper consideration. This, however, is now insisted upon by state regulatory commissions. He referred to the work of James J. Hill in railroad building, in which incidentally a great deal of attention was devoted to the development of the country tributary to the railroads, but at all times the interests of the railroad stockholders were conserved.

Many mistakes were formerly made in the telephone industry. Many independent telephone men have insisted that any one departing from the policy adopted 15 years ago is guilty of disloyalty. The public, however, has discarded loyalty to independent telephone companies for law, and has openly declared that its only interest in the telephone business is to get the best possible service at the lowest rate. The law has been changed to fit economic conditions. There are now very many telephone men, however, who insist that the telephone business shall adapt itself to changing conditions and enable itself to make the same progress that is being made in all other lines of the business world. Mr. Savage compared the conditions of the transcontinental railroad and of the farmer with the telephone industry, showing that the same rules of following up-to-date methods produce a profitable business.

In the earlier days of independent telephony it was necessary, on account of the imminent danger of destruction, to maintain eternal vigilance as the price of existence. But now, since the numerous antidiscrimination statutes, the public utility commissions in many states and the increasing powers of the Interstate Commerce Commission prohibit discrimination, authorize the physical connection of lines and in general prohibit unfair practice, it seems that the time has come when telephone men may devote their energies to urging a high standard of efficiency and to placing the industry on a firm and permanent foundation, so that there shall be little difficulty in obtaining additional capital for further development.

Mr. Savage reiterated his belief in the local control of local telephone business. He spoke of the great recent advances made in the development of the telephone industry, particularly the recent agreement between the American Telephone & Telegraph Company and the Federal Government authorities. In connection with this, there are many details to be worked out before a satisfactory plan of connection between independent and Bell toll lines can be worked out. The agreement states publicly that the Bell interests do not want to do all of the telephone business of the country; this in itself is a tremendous stride in advance. This concession should be accepted in the spirit in which it is presumed to be made and independent telephone men should therefore seize the opportunity to serve the interest of their stockholders and assist in placing the entire telephone industry on a permanent paying business. The enmities of the past must be thrown aside and all must go forth with kindly feelings to meet the new conditions. The time now is ripe for constructive and not destructive methods.

Referring to a recent address by Chairman Clark of the Interstate Commerce Commission, President Savage thought it was time to let the dead past bury its dead, and to face the future in the living present. Since this attitude was so clearly stated by Mr. Clark, he thought it should be supported since other regulatory bodies are taking the same view. In doing this no basic principles need be abandoned. The interchange of service has been insisted on by independent telephone men for a long time. It is necessary merely to modify the principles and to discard lines of action followed in former years. The old days of unrestricted, cut-throat competition in the telephone business must cease. In order to get the most benefit from the recently announced agreement, the independent telephone interests must agree on exactly what they want in the way of long-distance facilities. Since the self-interest of the Bell companies depends upon carrying out the apparent spirit of the agreement, fear of its real intent is unwarranted. If legislation is needed or if positive rules by the Interstate Commerce Commission are required to secure the benefits of the agreement, it will not be difficult to obtain these when all parties agree.

The former antagonism of the two telephone camps has produced a timidity in the minds of the investing public that has placed their stocks and bonds nearly at the bottom of the investment list. It has also encouraged the enactment in many cases of laws so drastic, and educated the people to telephone rates so low, as to make it dubious whether a telephone company in the future can give up-to-date service and make a reasonable profit. The public is now well able through various specific laws, state and interstate commissions, to take good care of itself against monopoly and oppressive tactics on the part of any utility. It should be left to commissions and to the public to decide whether one or two systems shall furnish the telephone service in any community.

Mr. Savage compared the giving of telephone service to the construction of a telephone cable, in which the insulation of the wires corresponds to the self-interest of the individual companies and the outer sheath to the National Association. The latter has attempted to keep pace with the changes of the times. The opinion is being more and more generally held that unlimited competition is a curse. "Monopoly" and "competition" are two of the most abused words of our language. It is high time, therefore, that we substitute in place of them the word "co-operation." Since most of the obstacles in the way of co-operation have now been removed, it is only right to expect that telephone companies will co-operate with each other and with the various regulatory commissions in developing the telephone service and the business to its utmost. As the first instance of an opportunity for co-operation, Mr. Savage called attention to the need of careful consideration of the details for long-distance service. What is now needed is self-control and a sensible view of the situation.

In closing, Mr. Savage referred to President Wilson's openly expressed gratification that the business interests of the country are adjusting themselves to changes brought about by recent legislation and the spirit of the times, and therefore there is no dishonor in any independent telephone man co-operating with those with whom he must do business and thus quickly accomplishing what the government desires.

On motion of Judge Hunter, who eulogized the address of President Savage, the address was unanimously approved by the convention. The remainder of the session was devoted to a general discussion of points to be cleared up in the conference proposed to be held during the following session between an official of the American Telephone & Telegraph Company and the convention. Several speakers asserted they had already made toll contracts with subsidiary Bell companies on better terms than were offered in the December 19 agreement. Efforts should therefore be made to crystallize the desires of the independent interests so that these may be taken care of in determining the working details of the agreement. Taking part in this general discussion were W. H. Bryant, N. G. Hunter, H. P. Folsom, W. J. Thomas, G. W. Schweer, C. E. Tarte, C. J. Garlow, T. W. Allen, J. D. Powers and J. B. Earle. A motion was adopted calling for the appointment of a committee to consider the matter further; N. G. Hunter, W. H. Bryant and H. P. Folsom were appointed to constitute the committee.

Election of Directors and Officers.

On Thursday morning the last session of the convention opened with the announcement of the balloting for directors of the association for the ensuing year. The election resulted as follows: Manford Savage, Champaign, Ill.; N. G. Hunter, Wabash, Ind.; J. B. Earle, Waco, Texas; W. J. Thomas, Shelbyville, Ky.; C. Y. McVey, Cleveland, O.; L. D. Kellogg, Chicago, Ill.; Warren Pratt, Kearney, Neb.; F. B. MacKinnon, Topeka, Kans.; H. C. Todd, Maryville, Mo.; H. B. McMeal, Chicago, Ill.; C. E. Tarte, Grand Rapids, Mich.; W. C. Handlan, Wheeling, W. Va.; P. J. Weirich, Monroe, Wis.; J. M. Plaister, Fort Dodge, Iowa; Terry W. Allen, Jackson, Tenn.; Roy B. McCanne, Rochester, N. Y.

Directly after the session closed the new board of directors met and organized by electing the following officers:

President, N. G. Hunter.

Vice-president, C. Y. McVey.

Secretary-treasurer, F. B. MacKinnon.

Resolutions.

The Committee on Resolutions submitted a series of resolutions that were adopted. Of these, the first affirmed the belief of the association in locally owned independent telephone systems and that the people in any locality be permitted to determine the kind of telephone service they desire; the enactment of laws was favored that would secure to any and every local telephone system adequate long-distance service, but, if such laws could not be secured, then additional Federal regulatory control to insure this was favored; the control of local or intrastate business should be left to the states; laws should be passed to prohibit any operating telephone company from manufacturing or selling telephone apparatus or supplies; what constitutes lawful business and unlawful business should be legally defined. The income tax law should be amended to provide for information at the source but not collection or deduction at the source. Other resolutions thanked the exhibitors, press, hotel and others who had contributed to the success of the convention. The seventh resolution called on the board of directors of the association to receive suggestions from members respecting desirable details to be included in the agreement for the use of Bell toll lines, that these be formulated into a definite plan and submitted to the American Telephone & Telegraph Company in conference and then, if agreed upon, to the attorney-general of the United States for approval; if it shall be found that the Interstate Commerce Commission has not sufficient power to carry out such agreement, congressional enactment to give it this power should be sought.

Considerable discussion took place of one clause in one of the resolutions, which in its submitted form favored government operation of long-distance lines as an alternate, if legislation insuring the use of such lines to all telephone companies was not secured. Much opposition was expressed to any seeming approval of government ownership or operation and this was finally amended to read "additional regulatory control by the Federal Government." Among those taking part in this discussion were H. P. Folsom, N. G. Hunter, F. H. Woods, G. H. Glass, J. B. Earle, G. W. Schweer, H. D. Critchfield, T. W. Allen and P. J. Weirich.

It had been expected that N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company, would be present at the last session of the convention, which was planned to be a conference on toll connections between independent companies and the Bell interests. Mr. Kingsbury had promised to be present and explain the recent agreement covering this matter but was prevented by serious illness from so doing. In a telegram, however, he expressed his regret at being unable to be present. He added, "We are working out the details of the plan. There are many complications, but we shall do what we can to make the operation of the plan a complete success. Our attitude is to do much, and do it as well, in the way of co-operation along the lines proposed, as we consistently can and not as little."

President Savage expressed regret that ex-Governor Hadley of Missouri, who was to speak before the convention, was called away and was unable to return before the close of the meeting. He then made a brief address thanking the members for their support during his administration. The convention thereupon adjourned.

At the directors' meeting following adjournment besides electing the officers, as already stated, a committee, consisting of N. G. Hunter, M. Savage, C. E. Tarte, C. Y. McVey and F. B. MacKinnon, was appointed to take up, on behalf of the association, the working out of the details respecting the agreement for the use of the Bell toll lines.

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Western Red Cedar Association Meeting.

The regular annual meeting of the Western Red Cedar Association was held in Spokane, Wash., on January 12, 1914. The meeting was called to order by President Culver at 10:45 a. m. with all members, except one, represented.

The minutes of the previous meeting were read and approved, after which President Culver presented his annual address, which was as follows:

This association is the successor of the Idaho Cedarmen's Association, which was organized January 3, 1906, by three cedar dealers who are still members.

The chief reason for the formation of this association was the making of a set of rules covering the specifications of standard cedar poles, which was immediately consummated. With slight changes, the original specifications are universally used throughout this section and acceptable generally to the various construction companies.

In August, 1908, the association initiated a movement to obtain application of the lumber rate to cedar poles, at that time the pole rate being 10 cents per hundred pounds in excess of the lumber rate. After several months' continuous effort by our organization, and the personal efforts of various members, the railroads granted our request, thus enabling producers to increase their sales in competitive territory, thereby stimulating the pole business in this locality.

At our annual meeting in 1913, the present title of our association was adopted, that the name might be more representative of the district in which our products originate.

During the first half of the year, poles, posts and piling moved freely at fair prices. A general recession of trade during the latter half of the year has taken place, and today the industry is in a very unsatisfactory state. Your president believes, however, that very shortly a more healthy condition of affairs will prevail.

Stocks are not overly large and fairly well assorted. It is expected the output during the present winter will be greatly restricted. Owing thus far to lack of snow, practically no stock has been hauled. In addition, owing to the poor market in the latter part of the year, the usual preparations for cedar production were not undertaken. Another factor tending toward curtailment is the lack of activity by the sawmill companies, which annually produce considerable cedar which they find mixed in with their saw timber.

It is understood that cedar dealers in Michigan, Wisconsin and Minnesota are suffering from somewhat similar climatic conditions; therefore, the general outlook at this time would indicate a lesser output than for several preceding years.

That we may bear in mind the extensive use of poles for conveying electricity, let me remind you that in the United States there are over 800,000 miles of pole lines, there being in service today over 32,000,000 poles. The annual renewal requirements are over 4,000,000, and of these large totals it is claimed over 65 per cent are cedar.

We may have some confidence in predicting a fair movement of our commodity during the coming year, based upon the following: Tariff and currency bills are generally satisfactory and out of the way. Some additional trust legislation will no doubt be enacted by the present Congress, and we are led to believe it will tend to clarify the Government's position by defining limits in which large business can be conducted legally and without molestation.

The general opinion is that Eastern railroads will soon be permitted to advance their freight rates 5 per cent, thus enabling them to more readily market their securities and expend large sums for betterment. Your president would urge upon the members the importance of shipping stock fully up to grade. Some of us are not always particular to have a competent inspector at the loading point. A good pole is a good advertisement; while a poor one may lose a customer and cause oceans of trouble.

We should also use our utmost efforts to have the National Electric Light Association adopt our specifications for cedar poles. Large quantities of poles are purchased annually under specifications of the association; the advantages therefore of the desired action are obvious. It might prove profitable to ascertain if all Pacific Coast and Canadian cedar dealers are thoroughly familiar with our specifications and are using same.

The Forest Products Exposition will be held in Chicago, April 30 to May 9, inclusive, and in New York from May 21 to May 30. A display of Western cedar at these expositions would no doubt prove a great advantage to our industry.

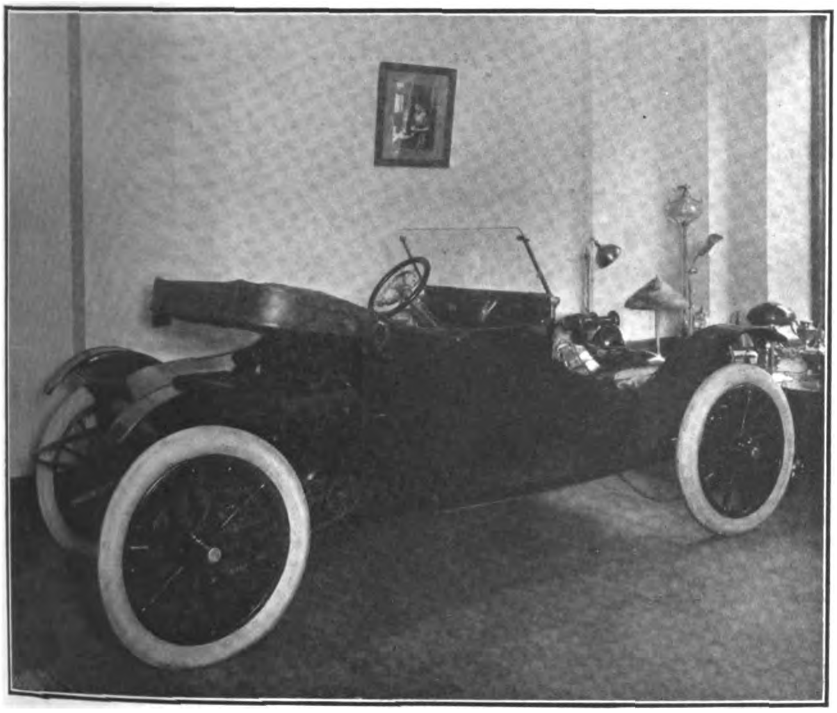
A short discussion followed the reading of the address, in which E. A. Lindsley, of the Lindsley Brothers Company, spoke briefly on the importance of having an exhibit at the Forest Products Exposition to be held in Chicago and New York. Mr. Lindsley stated that he had taken the liberty of reserving a space at the Exposition with the understanding that if the

Western Red Cedar Association did not care to have an exhibit, the Lindsley Brothers Company would.

The report of the secretary and treasurer was read, showing a substantial balance on hand in the treasury.

The Committee on Constitution and By-Laws, consisting of W. M. Leavitt, of the National Pole Company, E. A. Lindsley and President Culver, reported that they had prepared a constitution and by-laws as ordered, which they presented. Various amendments were offered and after a lengthy discussion they were adopted as amended.

The matter of an exhibit at the Forest Products Exposition in Chicago was then taken up and after a short discussion, E. T. Chapin, of the E. T. Chapin Company, moved that a committee of three be appointed by the chair to devise ways and means and make all arrangements for an exhibit at the Exposition, at an expense not to exceed $1,200.



Bailey Electric Roadster Exhibited in New York.

The election of officers and directors was carried out as provided by the new constitution, and M. P. Flannery, vice-president of the association during 1913, was unanimously elected president.

W. M. Leavitt, western manager of the National Pole Company, was elected vice-president.

R. C. Jones, of the Lost Creek Cedar Company, H. C. Culver, of the Sandpoint Lumber & Pole Company, and E. T. Chapin were elected directors of the association for the year 1914.

The following committees were selected by the Board of Directors:

Pole Committee: C. P. Lindsley, chairman; W. M. Leavitt, M. P. Flannery.

Post Committee: Frank Culver, chairman; L. D. MacFarland, M. Stewart.

Piling Committee: H. C. Culver, chairman; G. E. Merrill, E. T. Chapin.

Railroad Committee: G. C. MacDonald, chairman; W. G. Chaney, L. H. Clark.

Forest Products Exposition Committee: E. A. Lindsley, chairman; E. T. Chapin, W. M. Leavitt.

Inspection Commitee: C. P. Lindsley, chairman; Frank Culver, H. C. Culver.

The Board of Directors elected R. L. Bayne, of the Lindsley Brothers Company, as secretary and treasurer for the year 1914.

A motion was made that a vote of thanks be extended to the retiring president, H. C. Culver, for the efficient work he had done during the year 1913. This was unanimously carried.

After a short discussion the Commitee on the Forest Products Exposition was instructed to take up with the National Electric Light Association the matter of having specifications for Western red cedar poles adopted by that association. At the present time the National Electric Light Association has specifications covering yellow pine poles, Eastern white cedar and chestnut poles, but have none covering Western red cedar. It is the belief of the association that the Western red cedar poles are far superior to any of the other three now covered by the specifications of the National Electric Light Association, and it is therefore hoped that during the year 1914 specifications will be adopted by the National Electric Light Association for the Western poles.

Those present at the meeting were: M. P. Flannery, B. J. Carney & Company; G. U. Bacon, B. J. Carney & Company; W. G. Chaney, W. G. Chaney & Company; E. T. Chapin, E. T. Chapin Company; C. P. Lindsley, The Lindsley Brothers Company; R. L. Bayne, The Lindsley Brothers Company; R. G. Jones, Lost Creek Cedar Company; W. M. Leavitt, National Pole Company; L. D. McFarland, Northern Mercantile Company; G. E. Merrill, Pacific Fir Company; H. C. Culver, Sandpoint Lumber & Pole Company; E. F. Hitchner, Sandpoint Lumber & Pole Company; Louis Crombie, The Valentine-Clarke Company; G. C. McDonald, Western Lumber & Pole Company.

Bailey Roadster Exhibited in New York.

To the number of automobile shows which kept New York busy for two weeks, still another was opened Monday evening, January 5, in the Forty-second Street showrooms of The New York Edison Company, where the Bailey electric roadster was displayed from January 5 to 10 inclusive, under the auspices of the New York Electric Vehicle Association.

The 1914 model roadster made the trip down from Boston, and had to be taken apart and reassembled, in order to get it in the Edison showroom.

To get the Bailey car through the narrow doorway, the body was removed, the batteries taken out and the car turned on its side. Then the car was put together again before the eyes of an interested crowd. This little electric roadster made its way down from Amesbury, Mass., to New York through the severe weather of January 3 and 4 without mishap of any kind. It is the same type of electric that did the run from Boston to New York last fall in eleven hours running time, an average speed of 21.5 miles an hour, and from New York to Chicago at an average of 17 miles per hour for the entire distance.

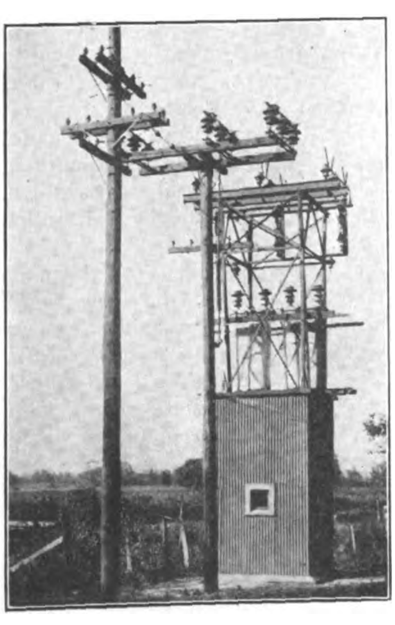
Hill climbing is another specialty of this type of electric vehicle. In 1910, to show its capacity, a Bailey car climbed Mount Washington. Last fall, the present type roadster took a trip from Boston to Burlington, Vt., crossing the main range of the Green Mountains The average speed for this trip was 19 miles an hour, well up to the average speed of powerful gasoline cars covering the same roads. For ordinary use, a distance of from 80 to 100 miles on a single charge is gauranteed, at a speed of 20 miles an hour on ordinary roads.

New Electrical and Mechanical Appliances

Standard Outdoor High-Tension Substations.

The increasing tendency toward standardization of equipment is well shown by the accompany illustration. This is a standard 22,000-volt three-phase substation manufactured by the Delta-Star Electric Company, Chicago Ill., and is shipped complete ready for erection. The central-station manager is therefore enabled to order a complete substation ready for use just as readily as a package of lamps, meters, etc., and as all parts are of standard dimensions no difficulty is experienced in erecting the equipment at a minimum expenditure.

In this substation the high-tension control and protective equipment is that known as the MRC type, the poles being either wood or steel as desired. By the use of such standard equipment the central-station manager saves considerable expense necessary in design and laying out substations for weatherproof service.



22,000-Volt Outdoor Substation.

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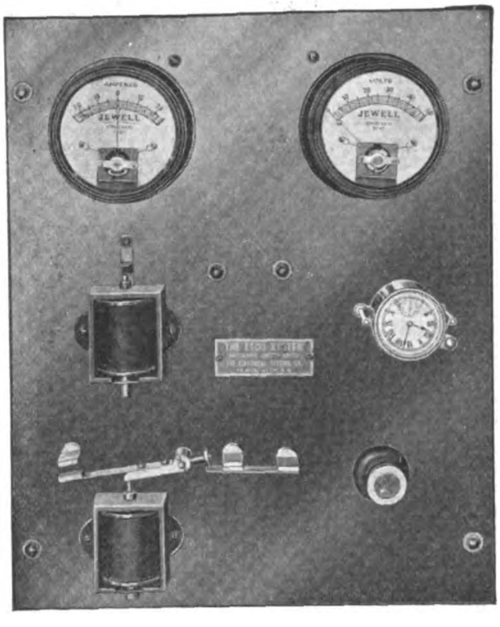
The Etco Electric Light System.

This system, consisting of a storage-battery lighting plant with an automatic switchboard, is now being offered to the trade by the Electrical Testing Company, 350-52 Knoxville Avenue, Peoria, Ill. As the generator is nearly always belted to a large engine which is doing other work, this plant is not made self-starting because it would make an unnecessary strain on the battery.

In operating these plants it is necessary to start the engine; then the automatic switchboard places the battery on charge and throws the balancing cells in series with the lighting circuit to maintain the proper voltage. When the battery becomes fully charged the cutout acts and the charging is discontinued. This action does not stop the engine, but a small high-grade time switch in the ignition circuit can be adjusted to shut down the engine at any time.

In nearly every case the engine can be pumping water or doing other work while the battery is being charged. Should the battery become fully charged, it will be cut out while the engine will continue to perform its other work until shut down by hand or by clock.



Switchboard Panel for Light Plant.

Due to the automatic features it is not necessary to install the plant all in one place. The generator can be installed in a shed or shop with the engine, the battery in the basement and the switchboard in any convenient place. It is said that perfectly steady light can be obtained with this system from the generator at the same time that the batteries are on charge. This can be accomplished with practically any style of gas, oil or gasoline engine.

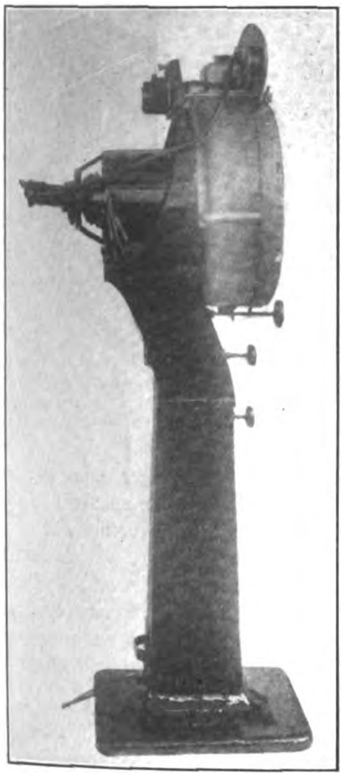
Demonstration of Inherent Regulation for U-S-L Electric Starter and Lighter.

The United States Light & Heating Company, of Niagara Falls, N. Y., is making a special effort to demonstrate clearly and forcibly at the various automobile shows the system of inherent regulation used with the U-S-L electric starter and lighter, which was described in our issue of January 10, 1914. Inasmuch as this method of controlling the generator output secures practically ideal action without the necessity for any regulating apparatus whatsoever, automobile engineers and the automobile-buying public in general are deeply interested in its operation.

Demonstrator of U-S-L System.

In anticipation of the demand for demonstration, the company has arranged a special operating exhibit which is now being shown at its booth in the Chicago automobile show. Illustrations of this exhibit are shown herewith. The apparatus consists of a U-S-L motor-generator of the inherently regulated type driven as a generator by a small direct-connected motor. At the top of the pedestal which supports the motor-generator and motor, is a panel carrying an ammeter and a tachometer. The ammeter shows the generator current output and the tachometer revolutions of the generator per minute.

The motor develops one horsepower at 2,000 revolutions per minute. Its speed during demonstration is over 2,000 revolutions per minute at times, which, of course, is in excess of the speed ever reached by the average automobile engine in service. The generator commences battery charging at approximately 250 revolutions per minute, and gives maximum output at 500 revolutions per minute. The generator, therefore, requires little more than one-quarter horsepower when delivering maximum energy.



Side View of Demonstrator.

To all outward appearances, the U-S-L motor-generator of the inherently regulated type is similar to the type employing an external regulator. The difference lies simply in the disposition of the field coils. The arrangement of the coils in the new type is such that the machine is self-regulating. No carbon piles or other resistances are used, and, hence, all energy waste is reduced to a minimum. The generator commences to charge the battery at an exceptionally low speed, insuring ample battery capacity for starting for even the slowest driver. All adjustments have been done away with.

Unique Power Plant for Ford Motor Company to Have Combination Steam and Gas-Engine-Driven Generators.

The Ford Motor Company, Detroit, Mich., has placed contracts for a gas-engine-driven electric power plant that will be not only one of the largest gas-engine plants in the country but will be in many respects absolutely unique. The company has appropriated in the neighborhood of a million dollars for the project, which will put into effect plans Mr. Henry Ford has long had in mind for utilizing the waste heat of the ordinary producer gas engine.

Four 6,000-horsepower Hamilton-Gray gas and steam engines of novel design will drive the same number of engine-type, direct-current generators running at 80 revolutions per minute. A plan view of each engine will be similar to a cross-compound steam engine, with two cylinders in tandem on each side. One pair of cylinders will be operated by producer gas and the other by steam. The steam will be generated from the water used in the water jacket of the gas engine, further heated by the exhaust gases and by waste heat from the producer gas plant. This water or steam will be used as the feed water for the boiler which supplies the steam-engine cylinders. A heavy flywheel will equalize the characteristics of the gas and steam-driven elements of the engine.

Each of the generators will have a normal rating of 3,750 kilowatts. These generators are designed for much higher efficiency than ordinarily found in commercial direct-current practice. Full-load efficiencies will be not less than 94.5 per cent. By these means and by the utilization of energy usually lost in waste heat, it is proposed to make the new Ford power plant the most economical in the country in respect to cost of production per kilowatt-hour. The armatures will be of split construction, which is necessitated by clearance requirements through tunnels and bridges in shipment from Ampere to Detroit, and the generators will be finally assembled at the Ford plant. These large generators will be manufactured by the Crocker-Wheeler Company, Ampere, N. J.

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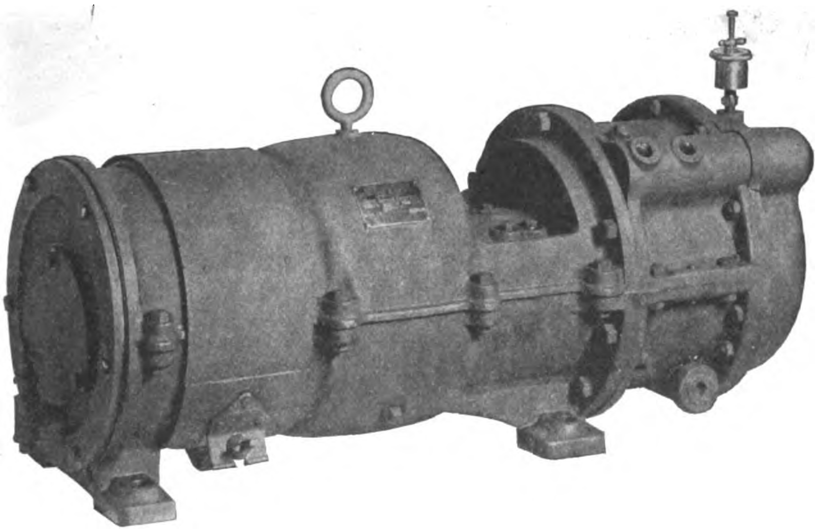
A One-Kilowatt Turbogenerator Lighting Unit.

Light is frequently wanted in limited areas where steam is available but suitable electric power is not, as on contracting operations, small industrial plants, steam launches, etc. To provide a means for supplying electric light under such circumstances, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently put on the market a small turbogenerator which will operate an arc lamp and a few incandescents at the same time, or about forty 25-watt Mazda lamps, or their equivalent, alone.

This unit is very compact, being only three feet long and one and one-half feet high, and can be installed anywhere, provided the unit is kept horizontal. It requires practically no attention when operating; there are no delicate adjustments to make; and all parts are easily accessible.



Small Turbogenerator Lighting Unit.

The turbine and generator are mounted in the same frame. The turbine is of the impulse type and has a governor which keeps the speed uniform for all variations of load and steam pressure. The full rating of one kilowatt will be developed on 90 pounds steam pressure, and satisfactory operation can be obtained with pressures up to 250 pounds. The weight is 283 pounds. The rated voltage of the generator is 120 volts.

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The Utah copper output, which has broken previous yearly records, reached 137,307,485 pounds in 1912 and slightly over 158,200,000 pounds in 1913, an increase of about 15 per cent.

Unit-Type Laboratory Wheatstone Bridges and Resistance Boxes.

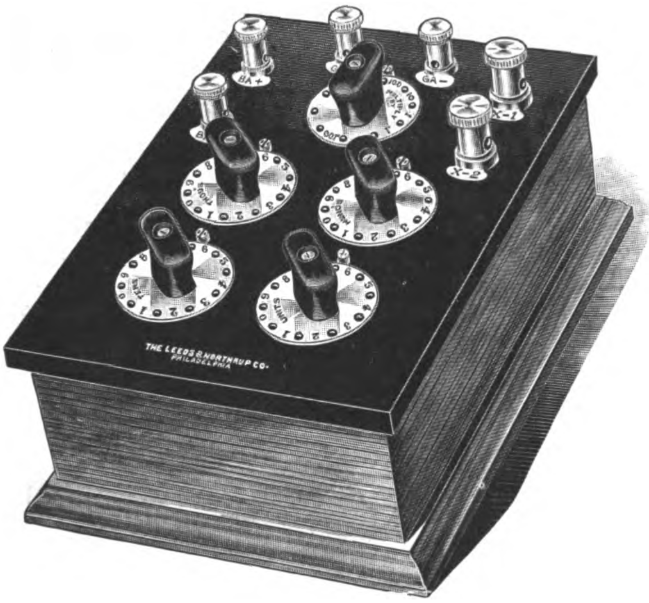
A short time ago there was described in these pages a new type of portable Wheatstone bridge testing set of the dial type, introduced by the Leeds & Northrup Company, of Philadelphia, Pa. The particular advantages of this set, as claimed, were small size, light weight, low price and the fact that the dial contacts were all inside of the containing case and thus protected against dust and dirt. The success of this instrument and the wide sale which it has already had has led the company to place on the market a laboratory type of Wheatstone bridge of similar construction and laboratory resistance boxes with two, three or four dials. The method of construction of these instruments has made it possible to supply laboratory equipment of the dial type much cheaper than similar instruments of the plug decade type. The unit-type Wheatstone bridge, as it is called, is shown in the illustration herewith.

The advantages of the dial type Wheatstone bridges and resistance boxes over similar instruments of the plug type may be briefly stated as follows: First, facility of manipulation; second, elimination of delay and inconvenience caused by loss of plugs when using the plug type instruments; third, greater ease in keeping the contacts clean.

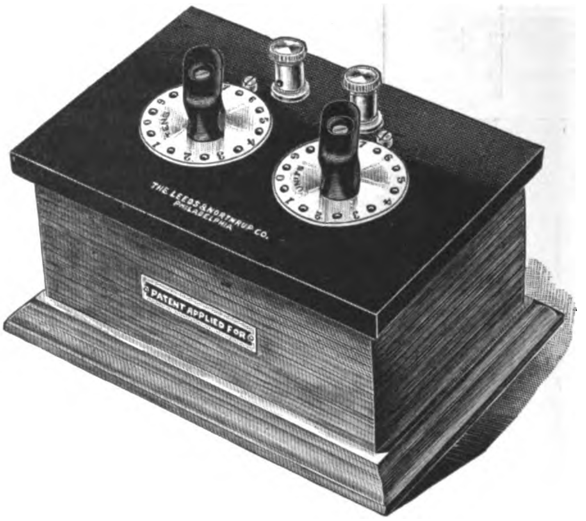
In regard to these particular instruments the Leeds & Northrup Company makes the following claims: In the Wheatstone bridge the ratio coils are guaranteed accurate to within one-twentieth per cent and the rheostat coils to within one-tenth per cent. In the resistance boxes all coils are guaranteed accurate to within one-tenth per cent. All resistance values are adjusted in the company's laboratories to twice their guaranteed accuracy. All coils are wound upon metal spools, thus eliminating the possibility of change in the resistance values of the coils, due to change in physical dimensions of the spool, as may happen in the use of wooden spools.

As will be noted from the illustration, the dial contacts are all mounted within the box and are therefore protected from dust and dirt. Furthermore, the contacts are inverted and therefore should dust get into the box it cannot gather upon the contact surfaces. They are, however, easily accessible for cleaning.

The switches are made of three leaves of phosphor bronze, each having independent bearing upon the contact plates. The ends of the switches are bent so that they do not lie tangent to their path of travel, thus eliminating the possibility of wearing rings in the contact plates.



Dial Decade Type of Wheatstone Bridge.



Dial Decade Type of Resistance Box.

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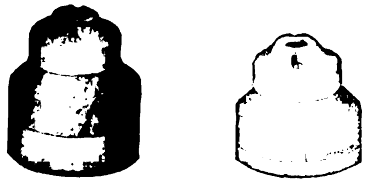
Attachment Plugs for Metal Molding.

In keeping with its policy of developing new fittings and appliances to extend the usefulness of its metal molding, the National Metal Molding Company, Pittsburgh, Pa., has placed on the market two new attachment plugs. Of these the No. 360 attachment plug is made to be mounted directly on "National" metal molding and is provided with a base plate having an ear that blanks the molding opening at one side of the porcelain base, thus making these fittings all "dead end" in style. They may easily be converted into the continuous type by twisting off this ear with a pair of pliers. The No. 390 attachment plug can not be mounted directly upon the molding but is made for use with a special porcelain subbase where it is necessary to mount an attachment plug at an elbow, tee or crossover in the molding. These two fittings are also furnished with a composition cap.



Attachment Plugs for Metal Molding.

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New Building in Pittsfield Plant.

The General Electric Company is preparing plans for a new building in addition to its plant in Pittsfield, Mass., which will be larger than any now standing there. The cost will be about $500,000, and the structure will be five stories in height. It will be used for small-transformer work. Despite the local rumor that many employees would be laid off two weeks ago, only about 50 hands were laid off at the Pittsfield plant.

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Swiss-English Telephone Service.

The Swiss Federal Council has approved the agreement entered into by the Swiss telephone authorities and the telephone authorities of England and France for the establishment of better service between Switzerland and England by way of Paris. The present arrangement of using double relay stations provides satisfactory temporary connections only between London on the one side, and on the other, Basel by way of Paris and Belfort, Lausanne by way of Paris and Dijon, and Geneva by way of Paris and Annemasse or Lyon. The connections between other Swiss and English points have been unsatisfactory.

The new day rate for a three-minute conversation with London is $1.74, and the night rate is $1.04.

Current Electrical News

LIGHTING AND POWER.

(*Special Correspondence.*)

FORT DODGE, IOWA.—The City Council will expend $80,000 for transformers.

SINGER, LA.—Dr. J. W. Brown will construct an ice and electric light plant here.

VALLEY JUNCTION, IOWA.—Street lamps will be installed in this city. Address the city clerk.

PT. ANGELES, WASH. — The Olympic Power Company has been granted a franchise in this city.

WILLIAMSBURG, VA.—The City Council is planning to construct an electric power plant at this place.

STERLING, NEB.—Mr. Marks, of Wymore, Neb., is planning to construct an electric-lighting plant at this place.

HAZELTON, N. D.—An electric light plant will be established here and electric lighting installed. Address the city clerk.

SAN ANTONIO, TEX.—A better lighting system will be established here. Address Mayor Brown for information.

ELK POINT, S. D.—The Council is considering ways and means to install a municipal light plant. Address the city clerk.

BAUDETTE, MINN.—Eight thousand dollars will be expended for an electric light plant here. Address the city clerk.

TECUMSEH, MICH.—A municipal lighting system will be established here. Address the city clerk in regard to this project.

WAYCROSS, GA.—The Hebard Cypress Company will establish an electric power and light plant here at a cost of $80,000.

RICHMOND, IND.—Mayor William J. Robbins has announced that a new street arc-lighting system will be installed at this place.

CAMPBELLSVILE, KY. — The Campbellsville Public Utilities Company is planning to construct an electric-light plant here.

ALBION, MICH.—The Commonwealth Power Company's plant, which was recently destroyed by fire, will be rebuilt at an early date.

BELLEVILLE, ILL.—Definite steps are being taken towards establishing "White Way" lighting along the two principal downtown streets.

BRISTOL, PA.—The Public Welfare Association is arranging for the purchase of a pulmotor, to be presented to the Borough, for public service. A.

DELL RAPIDS, S. D.—Bonds have been voted for the construction of an electric light system at this place. Address the city clerk for particulars.

LAWRENCE, KANS.—A "White Way" to extend for five blocks on the main business street of Lawrence is expected to be installed soon.

RUSK, TEX—The Rusk Light & Power Company has increased its capital stock from $10,000 to $20,000 and will enlarge and improve its electric light plant here. D.

PLEASANTON, TEX.—The Pleasanton Ice & Electric Light Company is expending $5,000 in installing new machinery and enlarging and improving its plant here. D.

BLOOMINGTON, NEB. — Bloomington voted upon the proposition of issuing bonds amounting to $8,500 for an electric-lighting system which carried by a large majority.

FT. WAYNE, IND.—The Board of Public Works is planning to extend the lighting plant here. Address F. E. Singrey, chairman of the Board of Works, for particulars.

CLEBURNE, TEX.—The Cleburne Street Railway is planning to erect a large power plant. A site is being searched for and other preliminary arrangements are being made.

LOS ANGELES, CAL.—The Southern California Edison Company is doing preliminary work, preparatory to establishing two additional generating plants in San Bernardino County.

WACO, TEX.—The Texas Power & Light Company will erect a power plant at this place in the near future at a cost of $200,000. Machinery costing about $800,000 will be installed.

LA CENTER, KY.—This place is considering establishing an electric-light plant, in connection with other public utilities. The mayor may have information concerning the project.

BREWTON, ALA.—$12,000 in bonds has been voted for the construction of an electric light plant here. Address J. B. McCrary, engineer of Atlanta, Ga., for further particulars.

MARTINSBURG, W. VA.—The Martinsburg Power Company will enlarge its power plant at this place so as to provide electricity for the proposed railway between Martinsburg and Hagerstown, Md.

PHILADELPHIA, PA. — Harmon Dyer, Fifth and Walnut Streets, is preparing plans and specifications for a one-story electric power plant to be erected at Pottsville, Pa., for supplying factories with power. N.

MINNEAPOLIS, MINN.—A special Council Committee is considering a plan of assessing the cost of ornamental street lighting to the benefited property owners. Address Alderman William for particulars.

LEXINGTON, KY.—This city may require the public service corporation to construct underground conduit systems in the congested district for the purpose of reducing the fire hazard caused by overhead wire. G.

HOOD RIVER, WASH.—The Odell Development League has appointed a committee to secure an engineer to make estimates as to the cost of constructing a power plant. Address Mark Cameron for information.

SIBLEY, IOWA.—The proposition for a municipal electric lighting plant in Sibley carried by a large majority. Bonds to the amount of $18,000 were voted. Immediate steps will be taken for the installation of the plant.

TUCSON, ARIZ. — The Federal Light & Power Company has announced that it will make extensive improvements in its local lighting system and street railway equipment, involving an expenditure of about $200,000.

CENTRALIA, WASH.—The Commissioners of Thurston County have granted the Washington Public Service Company a franchise to install a system of electric light and power lines in the southeastern portion of the county.

CARROLLTON, KY.—This city will purchase a new boiler, a new alternating-current generator and a new switchboard. The purchases will be made within the next 90 days. Address R. L. Bartlett, superintendent, for further information. G.

MARYVILLE, TENN. — The Aluminum Company of America, which is to receive power for the operation of its plant from the Tennessee Power Company, will put up a power plant of its own to be used for emergency purposes, it is stated. G.

JEFFERSON, KY.—This place is considering plans for providing an electric-light system, and will take bids on the installation and maintenance of street-lighting equipment in the near future. Dr. D. A. Floore is chairman of the board of trustees. G.

ZANESVILLE, O.—In order that the New Concord Water & Power Company may carry out proposed improvements the State Utilities Commission has granted permission to issue $17,000 20-year six-per-cent bonds to be sold at not less than 90 per cent.

GLEASON, TENN.—The Gleason Light Company is being organized for the purpose of furnishing light and power for this town and vicinity. A number of contracts for lighting have already been signed and an ice plant will be run in connection with the power station.

PORTLAND, ORE.—City Auditor Barbour has been instructed by the City Commission to advertise for bids for the installation of a new lighting system in the city hall. Plans and specifications have been prepared and may be obtained from Electric Inspector Plummer. O.

CENTRAL CITY, KY.—Plans for the establishment of a large power plant here to be used for the operation of a traction line from Central City to Greenville and Drakesboro, Ky., are being made. An application for a franchise has been made to the City Council. Eastern interests are said to be behind the project. G.

HARLAN, KY.—Mine owners here are considering establishing their own power plant, on a co-operative basis. The plant would be built at Harlan and would provide current for the operation of mines in the Southeastern Kentucky field. The Kentucky Utilities Company, at Lexington, has plans for a similar proposition. G.

MORRISTOWN, N. J.—The Morris Electric Company will build a new transmission system from its Whippany-Boonton lines at Monroe to the plant of the Hanover Brick Works at Whippany. This company has entered into a contract with the power company for electric power and will convert its plant from steam to electric operation. A.

PITTSBURGH, PA.—In an opinion just handed down by Judge Cohen, the Duquesne Light Company will be compelled to place its wires underground in Main Street, Steuben Street and Park Way. A city ordinance provides that wire must be underground on these streets and the electric company had endeavored to have the ordinance declared void. S.

MORRISTOWN, N. J.—The Jersey Power Company of Boonton has made application to the Board of Public Utility Commissioners for permission to issue securities for $75,000, to be used for extensions in its system. The company plans for the construction of a transmission line from Boonton to Dover, and other improvements. A.

MT. VERNON, WASH. — The Pacific Northwest Traction Company will extend its lighting service to supply the residents along the McLean Road, from Mt. Vernon to La Connor. Engineers of the company have completed the preliminary survey, and in all likelihood the installation of light and power lines will be made in the immediate future. It is rumored that the company has under consideration the power plant at La Connor. O.

GREENFIELD, MASS.—Plans for the construction of a 35,000-kilowatt hydroelectric plant for the Turner's Falls Company are being worked out, and it is anticipated that work on the hydraulic features will be undertaken in a few months and that the station will be in operation in about two years. The projected plant will be at Turner's Falls, on the Connecticut River, about 1.5 miles below the present station. There will be a head of 54 feet available. W.

TACOMA, WASH.—Commissioner of Light Nicholas Lawson will receive bids in connection with the installation of the $36,000 cluster-lighting system as follows: 31,500 feet of No. 8 5,000-volt steel-taped cable; 2,500 feet No. 10 Duplex 5,000-volt cable; 252 6.6-ampere inverted luminous-arc lamps; 246 metal lamp posts; 225 series cutouts, 15,000-volt insulation; 5 6.6-ampere series-arc mercury-rectifier sets, without switchboard panel. Each bidder may bid on any or all of the units. The closing date has not yet been announced. O.

PORTLAND, ORE.—Guy W. Talbot, president of the Portland Gas & Coke Company, and of the Pacific Power & Light Company, here, has announced that these public service corporations will expend for improvements and betterment during 1914 a total of $547,000. Of this, the Gas Company will spend $352,000, the Pacific Power & Light Company, $155,000, while an appropriation of $40,000 has been made for equipment and improvements on the Walla Walla Railway, a subsidiary of the latter concern. O.

SEATTLE, WASH.—The County Commissioners of King County recently granted a third franchise on suburban territory for electric light and power purposes to the Puget Sound Traction, Light & Power Company, which now possesses authority to occupy the suburban field on all sides of Seattle, except on the Elliott Bay side. Officials of the company announce that work of development will commence soon. The latest franchise granted empowers the company to set poles on 50 county roads, and 50 flats in the territory between Bothell on the north, and Bellevue and Medina on the south, and Lakes Sammamish and Washington, on the east and west. The company is granted authority to string wires for telephone, telegraph, electric light and power purposes, and enjoy the privilege of a franchise for 38 years.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

BALDOCK, S. C.—The Baldock Telephone Company, has incorporated with Wick Ashe, president.

KENOSHA, WIS.—The estimated cost of rebuilding the Kenosha Home Telephone Company line is $60,000. C.

RIVERSIDE, CAL. — The Pacific Telephone & Telegraph Company has been granted a one-year franchise to operate in this city.

GRAND MARAIS, MINN.—Lake Shore Telephone Company has been organized with a capital of $50,000 by F. E. Bell and others. C.

BOTTINEAU, N. D.—Turtle Mountain Farmers Telephone Company has been incorporated with a capital of $15,000 by John A. Frederickson and others.

YELTON, OKLA.—Honzel Telephone Exchange has been incorporated with a capital of $340 by Larkin Haynes, Otto Stanley and Paul Ritter, all of Gate. P.

MIAMI, FLA.—The Miami Telephone Company, will erect a three-story exchange building here and operating boards costing $4,000 will be installed.

TOMBALL, TEX.—The Tomball Spring Telephone Company has been incorporated with a capital stock of $15,000 by J. J. Trichel, F. F. Trichel and others.

ELM GROVE, OKLA.—Farmers Mutual Telephone Company has been incorporated with a capital of $1,000 by Tom Green, A. H. Ezell and R. H. Gasswint, all of Chester. P.

OKLAHOMA CITY, OKLA. — Pleasant Hill Telephone Company has been incorporated with a capital of $375 by C. H. Keller, O. Hartwell and J. J. Coltrans, all of Oklahoma City.

CHEHALIS, WASH.—The Lewis County Commissioners have granted a telephone franchise to the Boistfort Telephone Company to operate its lines over the county roads west of this place. O.

OKLAHOMA CITY, OKLA.—Lone Elm Farm & Telephone Company of Perry has been incorporated with a capital stock of $1,000 by Peter Ewry, John W. Ruth, John Ritthaler, all of Perry. P.

NASHVILLE, TENN.—Silver Point Home Telephone Company has been incorporated with a capital of $1,000 by J. M. Johnson, L. D. Burton, W. E. Jones, William Julian and G. B. Lafever.

DOUGLAS, ARIZ. — This city is soon to have direct telephone connection with the southern portion of the Sulphur Spring Valley, the line to be constructed by the Mountain States Telephone Company.

NEW BRUNSWICK, N. J.—The New York Telephone Company has made application to the Board of County Freeholders for permission to construct new lines in Piscataway and Woodbridge Townships. A.

SCRANTON, PA.—Announcement is made that the Lackawanna Railroad will extend its wireless system, now in operation between this place and Binghamton, N. Y., to Port Morris, N. J., and westward to Bath, Pa.

OKLAHOMA CITY, OKLA.—An Oklahoma charter has been issued to Fargo Telephone Exchange of Fargo, capitalized at $3,000. The incorporators are O. J. Schliecker, N. C. Schliecker and W. J. Driskell, all of Fargo. P.

BARTLESVILLE, OKLA. — The Pioneer Telephone & Telegraph Company has made an appropriation of $40,000 for repairs and extensions on its Bartlesville plant. Most of the money will be expended in placing wires in cables or underground. P.

JOB, W. VA.—Elkins-Dry Fork Telephone Company has been incorporated with a capital of $5,000. The incorporators are C. S. Armentrout, Hoton; B. Y. White, Job; R. U. Harold, Malmon; William M. Flint, Bowden, and E. H. Arnold, Elkins.

TRANQUILITY, CAL.—The San Joaquin Valley Telephone Company has applied to the Railroad Commission for permission to issue capital stock in the sum of $10,000, of which $7,500 is to be given in exchange for the telephone system of the San Joaquin Valley Farm Lands Company, and the remainder to pay for improvements and extensions to the systems.

PASCO, WASH.—Farmers living above Pasco on the irrigated farms have organized a company to install a telephone system. Stock in the company is to be subscribed by those located in that part of the district. George H. Reasoner, here, is president, and J. H. Sylvester, secretary-treasurer. The Chamber of Commerce of this city has endorsed the movement, and a petition has been circulated among local business men to assist in the construction.

FORBES, MINN.—Forbes Rural Telephone Company has been incorporated and will engage in a telephone business with headquarters at Forbes, and connections with Clinton, Nichols, Fayal, Mesaba Mountain, McDeavitt and several unorganized townships. The company has been capitalized at $5,000. The incorporators are A. P. Quaal, Severin Johnson, J. Mobroton, Jacob Peterson and Patrick Cobb, all of McDeavitt, and Charles Borg and Gust Lind, of Clinton.

ELECTRIC RAILWAYS.

(Special Correspondence.)

BLAINE, WASH. — The Blaine-Lynden Electric Railway Company has been organized to build an electric line between Blaine and Lynden.

ATLANTA, GA.—The Georgia Railway & Power Company will build an electric railway on Howells Mill Road. Address Preston S. Arkwright, president.

ALTOONA, WIS.—A franchise has been granted to the Chippewa Falls Alley Railway Light & Power Company. Address C. M. King, mayor, in regard to the matter.

SHELBYVILLE, KY. — The Business Men's Club reports that Eastern interests are considering financing the construction of a traction line from Shelbyville to Frankfort, Ky. G.

SAUSALITO, CAL. — The Marin County Electric Railway has filed articles of incorporation with a capital stock of $100,000. The directors are B. F. Ames, A. Harper and W. W. Hicks.

COLUMBUS, KAN.—Petitions have been presented to the City Council for an election on issuing $10,000 bonds as a bonus to the Kansas Central Traction Company for building an interurban between Altamont and Columbus.

EVANSVILLE, IND.—The Evansville & Olney Traction Company is planning reorganization and the construction of a line from Evansville to Olney, Ill. This plan involves the construction of a bridge over the Wabash River at Mt. Carmel, Ill. G.

WOODSFIELD, O.—Monroe County capatilists are seriously considering the advisability of building a new electric line from Woodsfield through Barnesville to Cambridge. Estimates have already been secured on the cost of constructing such line. R.

YOUNGSTOWN, O.—The survey for the new interurban line from New Castle to Ellwood City is completed and Mahoning Valley Company officials are seeking the necessary rights of way and franchises. The new line will be part of the Mahoning Valley Railway Company. Its construction will be rushed. R.

SACRAMENTO, CAL.—The Railroad Commission has granted permission to the Sacramento Valley Electric Railroad Company to construct the first unit of its projected electric railway from Dixon due south 12.5 miles to a connection with the Oakland, Antioch & Eastern Railroad. The estimated cost of the road is $228,000.

NASHVILLE, TENN.—The Louisville & Nashville Railroad Company is reported to be planning the electrification of its Gallatin-Scottville branch in Southern Kentucky. A trolley system will probably be used, as plans are being made to secure current from the Scottville Electric Light Company. An extension of the line to Glasgow, Ky., is also contemplated. G.

BARBER, IDAHO.—Officials of the Idaho Traction Company assert that an interurban line from Boise to this city is to be built in the immediate future, and that the line will be completed and in operation before the close of the year. Tentative plans for the extension have been made. It is the present understanding that the line will be extended from South Boise to this city, a distance of 4.5 miles. Ultimately, the Idaho Traction purposes building a line west from Caldwell to Payette and Weiser. O.

CENTRALIA, ILL.—Articles of incorporation have been filed by the Illinois Counties Railroad Company. The object of the corporation to build an interurban line from Irvington in Washington County to Salem through Centralia, Central City, Junction City, Sandoval and Odin. The capital stock is $300,000. The incorporators are G. E. Eis, H. A. Warner, E. E. Fyke, H. M. Warner and F. L. Pfeiffer, all of Centralia.

TACOMA, WASH.—There are indications that the Canadian Pacific Railway is preparing to carry out its long-planned project of operating electric trains from Vancouver, B. C., through Bellingham, Everette and Seattle to Tacoma, 180 miles and eventually to Portland, Ore., 140 miles further. Stone & Webster, of Boston, who control the street railways of Tacoma, Seattle, Everette and Bellingham, are understood to be closely allied with the Canadian Railway in the Puget Sound undertakings.

HARRISBURG, PA.—The Sewickley & Edgeworth Railway Company, backed by some of the richest men in Western Pennsylvania, has been chartered in Harrisburg, with a nominal capital of $12,000. The promoters have a plan to connect the Coraopolis terminal of the Pittsburg Railways company with the trolley line at Leetsdale, Pa., thus establishing continuous electric railway service between Pittsburgh and all important points in Ohio and Indiana. The fashionable borough of Sewickley has for more than 20 years kept the trolley car outside its limits. It is planned now to move the Pennsylvania railroad tracks to the bank of the Ohio River and let the trolley line operate over the present railroad right of way. If this can be arranged Sewickley's Council will give the trolley road a franchise. The project involves the expenditure of several millions.

NEW PUBLICATIONS.

MUNICIPAL OWNERSHIP CARTOONS.—The Municipal Ownership Publishing Company, 17 East Thirty-eighth Street, New York City, has published a collection of cartoons by E. W. Kemble, accompanied by limericks by G. Mayo. These aim to put municipal ownership in a ridiculous light and point out the reasons for its failure.

RAILWAY HANDBOOK.—The General Electric Company, Schenectady, N. Y., has published a Railway Handbook for 1914. This is of pocket size and contains much general information as well as material that will be of interest and value to those connected with electric railways. There are also a number of pages in the back for notes. It is bound in flexible leather.

PROPOSALS.

ELECTRIC WIRE AND CABLE.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 3 for large quantities of electric wire and cable, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedules 6272 and 6273.

ELECTRIC-LIGHT PLANT. — Bids will be received on February 3 for installing an electric-light plant in the courthouse, for a set of storage batteries, also for required number of chandeliers, switches, lamps, globes, etc. Address W. E. Paulson, county auditor, Minnewaukon, N. D.

ELEVATOR PLANT.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 16 for an elevator plant in the post office at Denver, Colo., in accordance with drawings and specifications, copies of which may be obtained from the Supervising Architect.

SWITCHBOARD.—Bids will be received January 27 for furnishing all labor and materials and installing one 14-circuit switchboard and one 20-circuit protector board, together with batteries and battery racks. Address Joseph G. Schuler, superintendent Department of Fire and Public Property, Wilkesbarre, Pa.

ELECTRIC WELDING OUTFIT.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until February 7 for furnishing electric welding outfit, etc., as per Canal Circular No. 823, copies of which may be obtained from any of the Assistant Purchasing Officers located in the large cities.

CONDUIT AND WIRING. — Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 17 for furnishing a conduit and wiring system and lighting fixtures at the post-office at Sedalia, Mo., in accordance with drawing and specifications, copies of which may be obtained from the Supervising Architect or the custodian of the site.

ELECTRICAL APPARATUS. — Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until February 3 for furnishing motor-driven air compressors, exciter sets, autotransformers, switchboard, etc., as per Canal Circular No. 822, copies of which may be obtained from any of the Assistant General Purchasing Agents.

ELECTRICAL MATERIAL. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 10 for furnishing 1,790 feet of single-conductor cable, as per Schedule 6285, and one electrically operated meat and food chopper, as per Schedule 6288, for delivery at the Navy Yard, Brooklyn, N. Y.; for three different motor-driven machines, as per Schedule 6283, for delivery at the Navy Yard, Portsmouth, N. H.; and until February 17 for furnishing 75 electric flash lamps, as per Schedule 6292, for delivery at the Navy Yard, Mare Island, Cal.; four red and green draw-bridge brass lamps, fitted for electricity; and eight brass lanterns, with red lenses, fitted for electricity, as per Schedule 6298, for delivery at the Navy Yard, Annapolis, Md.; for 200 portable telephone testing sets, as per Schedule 6301, for delivery at Eastern yards; and for four two-kilowatt transformers, 500 cycles, and 7,510 feet of interior-communication cable, as per Schedule 6301, for delivery at the Navy Yard, Brooklyn, N. Y.; and also for miscellaneous telephones and two switchboards and spare parts, as per Schedule 6302, for delivery at the Navy Yard Norfolk, Va.

FINANCIAL NOTES.

Gross earnings for December, 1913, of the several companies of the Massachusetts Consolidated Railways were $40,094, an increase of $1,388 over December, 1912.

The stockholders of the Adams-Bagnall Electric Company have authorized the issue of $300,000 seven-per-cent cumulative preferred stock, which will be taken by holders of the present $600,000 stock. The proceeds will be used to finance improvements already made.

The Utica Gas & Electric Company has sold to A. B. Leach & Company and Kean, Taylor & Company, $500,000 refunding and extension mortgage, fifty-year bonds, dated July 1, 1907. Bonds are part of an authorized issue of $5,000,000, of which $3,000,000 have already been issued.

Record gross earnings were made by the New York Edison Company in 1913. Operating revenues increased $2,000,000 or 10 per cent. The company, it is estimated, will show a balance for dividends equal to 19 per cent on its stock, all of which is owned by the Consolidated Gas Company.

John R. McCune, of Pittsburgh, has been elected a director of the Westinghouse Electric & Manufacturing Company, succeeding James S. Kuhn, and Paul D. Cravath has been elected a director, succeeding the late Anthony N. Brady. One vacancy still exists, caused by the recent resignation of Thomas W. Lamont, of J. P. Morgan & Company.

N. W. Halsey & Company, Russell, Brewster & Company and the Continental and Commercial Savings Bank, of Chicago, have purchased $500,000 first and refunding five-per-cent, 20-year bonds of the United Light and Railways Company, due June 1, 1932. The bonds are being offered at 86, to yield 6.25 per cent, and are redeemable at 102.5 and interest on any interest date on sixty days' notice.

National Carbon Company directors are asking stockholders for approval of a plan for sharing profits with employees. Stockholders are asked to set aside $500,000 of a new issue of stock to be given to its 4,000 employees, terms to be announced February 16.

The Montana Power Company has called for redemption at the Central Trust Company on March 1, the $1,496,000 first mortgage, six-per-cent sinking-fund bonds of the United Missouri River Power Company at 105 and interest. The bonds are retired in connection with the financing plan of the Montana Power Company which recently filed a mortgage to secure $75,000,000 of first and refunding bonds of which $6,000,000 have been sold to a syndicate of New York bankers.

A new corporation known as the Seven Cities Company has been organized in St. Louis with a capitalization of $250,000 stock and $250,000 bonds. The company has acquired the Russellville (Ark.) Water & Light Company and the public utility plants in Russellville, Dardenelle, Morrilton, Cabin Creek, Dover, Springdale, Fayetteville, Rogers and Bentonville, Ark. All these towns will be served from the plant of the Russellville Water & Light Company, which has a hydroelectric station on the Illinois River, in Arkansas.

A merger of the electrical properties in Newport News and Hampton, Va., under the name of the Newport News & Hampton Railway, Gas & Electric Company, with capital stock of $2,500,000, has been authorized by the Virginia State Corporation Commission. The Newport News & Old Point Railway & Electric Company some time ago acquired from receivers the rights of certain competing companies, and the whole reorganized property is now merged under one charter. It will include what were formerly the Citizens' Railway, Light & Power Company, the Hampton Roads Traction Company and the Newport News & Old Point Railway & Electric Company. It is understood that the present operating officials will continue in charge of the property.

At the annual meeting of the Columbus (Ohio) Edison Company, stockholders voted to sell the property and assets of the company to the Columbus Railway, Power & Light Company for a consideration in stocks of the latter company as provided under the merger agreement. The consolidation of all public utility properties in Columbus, with the exception of the Columbus Light, Heat & Power Company, will become effective February 2, the Columbus Edison having been the last corporation to act on the consolidation. The Columbus Light, Heat & Power Company will remain outside the merger, but its properties will be operated by the Columbus Railway, Power & Light under the existing lease to the Columbus Railway & Light Company. At the annual meeting of the Columbus Light, Heat & Power Company the board of directors identified with the Columbus Railway & Light interests retired and was succeeded by a new board representing the former officers and directors of the Columbus Public Service Company, which the Columbus Light, Heat & Power succeeded. Charles L. Kurtz was elected the new president. It is expected that after the new consolidation has been in effect for some time steps will be taken by which the Columbus Light, Heat & Power Company will also enter the merger and thus place all the public utility properties of Columbus under one owning, as well as one operating, corporation.

Dividends.

Automatic Electric Company; quarterly of one per cent, payable April 1, to stock of record January 25.

Brazilian Traction, Light & Power Company; regular quarterly of 1.5 per cent, payable February 20 to stock of record January 31.

Cambridge Electric Light Company; quarterly of $3, payable February 2 to stock of record January 20.

Chicago Railways; $4 on participating certificates, Series 1, payable February 10 to stock of record January 26, and $2 on Series 2, payable the same dates.

Columbus Railway Company; regular quarterly of 1.25 per cent on preferred stock, payable February 2 to stock of record January 15.

Commonwealth Edison Company; $2, payable February 2 to stock of record January 15.

Coney Island & Brooklyn Railroad Company; six per cent on capital stock.

Cuyahoga Telephone Company; a quarterly preferred dividend of 1.5 per cent, payable January 31 to stock of record January 15.

East St. Louis & Suburban; the regular quarterly dividend of 1.25 per cent on the preferred stock, payable February 2, to stock of record January 15.

Electric Bond & Share Company; quarterly of 1.5 per cent on the preferred stock, payable February 2 to stock of record January 21.

Federal Sign System; regular quarterly of 1.75 per cent, payable February 2 to stock of record January 2.

Fort Worth Power & Light Company; quarterly of 1.75 per cent on preferred, payable February 2 to stock of record January 20.

Grand Rapids Railway Company; regular quarterly of 1.25 per cent on preferred, payable February 2 to stock of record January 15.

Illuminating & Power Security Company; quarterly of 1.75 per cent on preferred, payable February 16 to stock of record January 15.

International Traction Company; regular semi-annual of two per cent on preferred, payable February 1 to stock of record January 24.

Jacksonville Traction Company; the regular quarterly dividends of $1.50 a share on its preferred stock, and $1.75 a share on its common stock, both payable February 2 to stock of record of January 22.

Lewiston, Augusta & Waterville Street Railway; regular quarterly of 1.5 per cent on preferred, payable February 2 to stock of record January 15.

Milwaukee Electric Railway & Light Company; quarterly of 1.5 per cent on preferred stock, payable January 31 to stock of record January 20.

National Carbon Company; quarterly of 1.75 per cent on preferred, payable February 14 to stock of record January 27.

Public Service Company of Northern Illinois; regular quarterly of 1.25 per cent on common and 1.5 per cent on preferred, both payable February 2 to stock of record January 15.

Railway & Light Security Company; semi-annual of $3 on common, payable February 2 to stock of record January 15.

York Railway Company, semi-annual of 2.5 per cent on preferred, payable January 24.

Report of Earnings.

COMMONWEALTH POWER, RAILWAY & LIGHT.		
November gross	$ 288,997	$ 149,420
Net after expenses, tax, interest	222,440	132,531
Balance after preferred dividends	142,440	102,531
Twelve months' gross	2,210,283	1,288,633
Net after expenses, tax, interest	1,769,481	1,150,673
Balance after preferred dividends	1,059,481	790,673

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 19	Jan. 12
American Tel. & Tel. (New York)	120¼	119
Commonwealth Edison (Chicago)	134	132
Edison Electric Illuminating (Boston)	251½	247
Electric Storage Battery common (Philadelphia)	49½	48¼
Electric Storage Battery preferred (Philadelphia)	49½	48¼
General Electric (New York)	144	140½
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅛	1⅛
Massachusetts Electric common (Boston)	12½	12
Massachusetts Electric preferred (Boston)	64½	63
National Carbon common (Chicago)	*135	135
National Carbon preferred (Chicago)	119	116
New England Telephone (Boston)	134	135½
Philadelphia Electric (Philadelphia)	26⅜	26¾
Postal Telegraph and Cables common (New York)	78½	76
Postal Telegraph and Cables preferred (New York)	66½	65¼
Western Union (New York)	59	58½
Westinghouse common (New York)	67⅝	66
Westinghouse preferred (New York)	115¼	116

PERSONAL MENTION.

MR. CLYDE KETCHAM, Weatherly, Pa., has been appointed superintendent of the local municipal lighting plant by the Common Council.

MR. A. V. WYNNE, formerly electrical engineer of the Trumbull Public Service Company, Warren, O., has been appointed superintendent of the Masillon (Ohio) Gas & Electric Company.

MR. JAMES P. WHALLEN has been elected a member of the Board of Directors of the Louisville Gas & Electric Company. He succeeds to the place on the board held by his brother, the late JOHN H. WHALLEN.

MR. S. WOLFF, formerly manager of the Cleveland office of the Allis-Chalmers Manufacturing Company, Milwaukee, has been appointed Chicago manager for the DeLaval Steam Turbine Company, with offices in the Peoples Gas Building.

MR. H. H. CUDMORE has been unusually successful during the past few months acting as special representative of the Society for Electrical Development. In every city that Mr. Cudmore has visited there is noticeable a very enthusiastic interest in the work of the Society.

MR. E. J. STEWART, city electrical inspector of Topeka, Kans., is the author of an exhaustive and very interesting article in *The Topeka Daily Capital*, January 12, describing the electrical and mechanical features and the protective value of the electrical fuse.

PROF. J. M. BRYANT, of the Department of Electrical Engineering of the University of Illinois, has recently been employed by three different cities of Illinois, namely, Jacksonville, Kewanee and Lewiston, as consulting engineer in connection with municipal electric-lighting work involving both technical and economic problems.

MR. CHARLES H. SEAVER has resigned his position as assistant advertising manager of the Commonwealth Edison Company and joined the advertising staff of Fairbanks, Morse & Company at its main office in Chicago. Mr. Seaver served in the General Electric Company's testing and advertising departments at Schenectady for three years. During the following two years he was an associate editor on the staff of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. For the last two years he has assisted Mr. Dana Howard in advertising work for the Commonwealth Edison Company, Chicago.

OBITUARY.

MR. RICHARD NOTT DYER, for many years counsel for Thomas A. Edison, died at his home in East Orange, N. J., on January 13. Mr. Dyer was a member of the firm of Dyer, Dyer & Taylor, of 31 Nassau Street, New York. He was born in Calais, Me., 56 years ago, was a graduate of the Columbia University, Washington, and was admitted to the bar in Chicago in 1879. Two years afterward he became Mr. Edison's attorney in the inventor's patent suits. He won the incandescent-light case after carrying it to the United States Supreme Court. He prepared the patent papers for the phonograph, kinetoscope and other important Edison inventions. Later he became counsel for the Sprague Electric Company and for several years was in charge of the patent work of the General Electric Company. He was for several years president of the City Club of East Orange and he was a member of the Country Club, the Union League Club and the Lawyers Club of New York and the Cosmos Club of Washington. His wife, a son and a daughter survive him. He was a brother of Commodore George L. Dyer, U. S. N., retired, and of E. W. Dyer, who was formerly associated in business with Mr. Edison.

MR. EDWIN EMERSON NOLAN, head of the Materials Disposition Department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., died at his home in Wilkinsburg, Pa., on January 13. Mr. Nolan began work with the Westinghouse Electric Company in 1887, just about the time it began operations on Garrison Alley in the city of Pittsburgh. He was subsequently made superintendent of the Allegheny factory of the company and as such had charge of building the first alternating-current generators for the Niagara plant, an installation which afterwards became famous throughout the world. In 1898 Mr. Nolan was sent by the Westinghouse Electric & Manufacturing Company to France to establish a factory at Havre, in which position he remained until 1902. At this time he returned to the United States, and on account of his familiarity with Westinghouse apparatus was placed in charge of the Materials Disposition Department, a position which he held until his death. Mr. Nolan received his early education in Mexico, and from his sojourn among the foreign population acquired a ready speaking knowledge of several foreign languages which made his services unusually valuable to the company in dealing with its numerous foreign interests. Mr. Nolan was a mechanical engineer and an inventor of considerable ability, one of his inventions being now in use on the modern street-railway motor, as manufactured by the Westinghouse Company. He was noted for his thoroughness in all undertakings, and was an exceedingly reliable and conscientious employee. His kindly disposition and method of dealing with men endeared him to the large number of acquaintances which he had made in this country and in many foreign countries. Mr. Nolan leaves a widow, two sons and two daughters. The deceased was born in Chicago, August 10, 1857.

Edwin E. Nolan.

NEW INCORPORATIONS.

CINCINNATI, O.—The Neil and Smith Electric Tool Company has been incorporated by John W. Neil and others. The capital stock is $30,000.

ONEIDA, N. Y.—The Bullock-Fortin Electric Company, Incorporated, has been incorporated with a capital stock of $2,000 by Lorenzo B. Fortin, Sheldon Bullock and George Kline, all of this city.

PHILADELPHIA, PA.—The Economic Power & Product Company has been incorporated under the laws of Delaware, with a capital of $10,000,000. George H. B. Martin, of Camden, is the principal incorporator. N.

FORT WAYNE, IND.—Fort Wayne Minature Lamp Company has been incorporated with a capital stock of $5,000 to deal in electrical appliances. The directors are Arthur G. Locke, Elsie L. Locke and Wendell C. Glass.

NEW YORK, N. Y.—Walsh Electrical Supply Company, Incorporated, has been granted articles of incorporation with a capital stock of $15,000. The incorporators are John L. Wilson, Brooklyn, N. Y.; George Kerr, Elizabeth, N. J.; and F. Elwood Hunt, of Brooklyn.

BROOKLYN, N. Y.—Bayley & Sons, Incorporated, has been granted articles of incorporation with a capitalization of $30,000 to manufacture gas and electric-light fixtures. The incorporators are George W. Bayley, Mary S. Bayley and Louise S. Bayley, all of this city.

NEW YORK, N. Y.—Curtis & Carhart, Incorporated, has filed articles of incorporation to manufacture and deal in electrical appliances. The capital stock is $10,000 and the incorporators are William F. Curtis, Benjamin I. Carhart, of New York City, and Percy Murley, of Stapleton.

DATES AHEAD.

Efficiency Society. Annual convention. New York, N. Y., January 26-27.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27-29.

Northwestern Cedarmen's Association. Annual convention, Escanaba, Mich., January 27-28.

American Electric Railway Association. Mid-year meeting. Engineering Societies Building, New York, N. Y., January 29-31.

Wisconsin State Telephone Association. Madison, Wis., February 11-12.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20.

Electrical Supply Jobbers Association. New Willard Hotel, Washington, D. C., February 17-19.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27.

State Independent Telephone Association. Des Moines, Iowa, March 10-12.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11.

Buffalo Electrical Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14.

Peoria Electric Show. Peoria, Ill., March 9-15.

American Railway Engineering Association. Annual convention. Chicago, Ill., March 17-20.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18.

With the Electrical Manufacturers

Electric Machinery Company, Minneapolis, Minn., has sent out a number of new illustration sheets for its pictorial folder of its products. Among these are direct-current generators and motors, induction motors and synchronous motors.

The Lux Manufacturing Company, New York City, has moved into a new factory and offices at the Factory Terminal Building, Hoboken, N. J. The company will have greater facilities and the output will be improved and turned out on a much larger scale.

Westinghouse Lamp Company announces that on January 19 it removed its administrative, executive sales, treasury, auditing and purchasing departments from the former offices at Bloomfield, N. J., to the Martin Building, at 1261 Broadway (corner of Thirty-first Street), New York City.

Sundh Electric Company, New York, N. Y., has issued a number of new loose leaves for insertion in its catalog of electrically controlled devices. These deal particularly with various types of Sundh circuit-breakers and the Sundh remote indicator of the variation of liquid levels.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., held its annual meeting on January 18 and elected Shiras Morris president and treasurer of the company, succeeding the late Alfred H. Pease. Charles A. Pease was elected vice-president, McKew Parr, general sales manager, and Arthur L. Shipman, secretary.

The United States Light & Heating Company has changed the location of its New York city branch sales office from 30 Church Street to 210 West Fiftieth Street. This brings the New York U-S-L service station and sales office into the same building. The general offices of the company will remain at 30 Church Street, however.

Electric Products Company, Cleveland, O., has issued a little booklet entitled "My Electric Car Simplified." This describes the various Wotton battery-charging equipments, including the guaranteed automatic rectifier, the complete charging panel, the Soakometer instrument and other devices used in making charging of electric-vehicle batteries automatic and reliable.

Pass & Seymour, Incorporated, Solvay, N. Y., has issued Bulletin 835, which is a well illustrated price list of the latest handy electrical wiring devices placed on the market by this well known firm. Among the many new devices described are fixture loops, rosettes, pendent switches, porcelain transformer cutouts, conduit clamps, attachment and test plugs, shade-holders, insulating tubes, cleats and bushings, etc.

The C. & C. Electric & Manufacturing Company, Garwood, N. J., announces that it has discontinued its Pittsburgh office, which has been in charge of Ludwig Hommel & Company; the territory heretofore covered by that office will now be taken care of by the Philadelphia manager of the company, J. C. Chamberlin. The company also states that it has appointed F. A. Saylor, with offices in the Greenwood Building, Sixth and Vine Streets, Cincinnati, O., as its agent for the southern part of Ohio.

The Allen-Bradley Company, 495 Clinton Street, Milkaukee, Wis., has published a very interesting treatise entitled "Guard the Motor," describing the type "H" alternating-current motor starters. This article, which should be in the hands of every engineer and electrician interested in the subject, is illustrated by a carefully worked up diagram showing the essential features of the motor control and explaining in detail the operation of the resistance units, switch contacts, overload relay, time-limit device, no-voltage release, operating lever, pressure equalizer and general construction. Copies of the bulletin containing this article will be sent to those interested upon request.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued catalog No. 44 dealing with resistance boxes and Wheatstone bridges. This is a 32-page publication with no less than 33 illustrations. Almost half of the catalog is devoted to valuable explanatory matter that should prove of great interest to anyone making resistance measurements. Several methods of combining resistance coils are described and the advantages of each set forth. The arrangement of Leeds & Northrup decades and ratio coils is described in detail. Methods of construction of coils, plugs, blocks, dial switches, etc., are explained and the adjustment of coils made clear. Over 50 types of bridges and resistance boxes are listed, also separate standard resistances, slide-wire or meter bridges, Kohlrausch slide wires and several ohmmeters.

The Trumbull Electric Manufacturing Company, Plainville, Conn., is distributing catalog No. 10. This gives a complete descriptive and illustrated list of Trumbull knife switches, snap switches, panelboards, cabinets, switchboards, cutouts, rosettes, receptacles, service boxes, insulating joints and other electrical specialities. The reference data throughout the book are made very easy of discovery through the use of thumb indications and cutouts. In addition to this reference system there is at the back a general index, alphabetically arranged, and also a cross index giving opposite the catalog numbers the list prices, schedules, page, standard package and carton. The new catalog is somewhat larger than the last one, covering 200 pages. It represents many additions and changes to the Trumbull lines. The panelboard pages have been entirely revised and there have been a good many changes in the design and prices. There have also been added snap switches, insulating joints and other minor accessories. The catalog is handsomely printed and illustrated and is in every way a credit to the company.

The Robbins & Myers Company, Springfield, Ohio, has ready for distribution its new catalog No. 130, devoted to Standard electric fans. This is a most attractive book of 48 pages with multi-color double cover. Each page has a neat border and the two middle pages have colored illustrations of residence scenes wherein electric fans manifestly add greatly to the comfort. There are also many other illustrations of this kind, all showing the wonderful utility of a fan motor in promoting efficiency as well as comfort in a variety of cases. Valuable suggestions are given to dealers for stimulating the sales of electric fans and it is made clear that these are no longer in the luxury group, but belong to the great class of present-day necessities. Detailed and illustrated descriptions are given of the several types of ceiling fans and the many types of desk and bracket fans, oscillating and non-oscillating, that are manufactured by the company. Small exhaust fans are also described and a few hat-cleaning motors. Specifications are given for ceiling, desk and bracket fans. Direct-current fans are made in a great range of voltages. Alternating-current fans are made for 110 and 220 volts.

General Electric Company, Schenectady, N. Y., has issued a number of new publications, of particular interest being the catalog of the company's extensive line of electric fans for the season of 1914. This publication includes portable and semiportable fans for table, wall and ceiling mounting, and also small ventilating outfits. A special moistureproof fan has been made for use on shipboard; the fittings on this are made of such material as to be noncorrosive. While this bulletin, which is No. A4197, has intentionally been made free from detailed technical data so as to make it suitable for popular distribution, it contains sufficient information to enable intelligent ordering of fans to meet any requirements. The catalog is, of course, very completely illustrated. Bulletin A4199 illustrates and describes G-E railway-motor gears and pinions and gives numerous curves and data of special interest to purchasers of such material. Bulletin A4143 is devoted to belt-driven alternators, known as the form B; these machines are made in capacities ranging from 50 to 200 kilowatts. Bulletin A4189 describes direct-current three-wire switchboards for use in small plants; these are suitable for 125 and 250 volts and for plants ranging from 10 to 100 kilowatts in rating.

Record of Electrical Patents.

Issued by the United States Patent Office, January 13, 1914.

1,083,915. Timekeeper for Telephones. C. L. Braucher and E. R. Johnson, Cincinnati, O. On an inclined plate secured to a desk set is a writing pad and a stop watch.

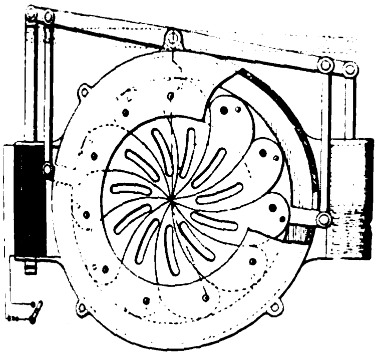
1,083,926. Microphone. L. Ericson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. A hand telephone set with receiver and microphone transmitter at opposite ends of the handle.

1,083,941. Control System for Electric Motors. J. S. Peck, assignor to Westinghouse Electric & Mfg. Co. A railway control system with master controller and interlocked relay-controlled switches.

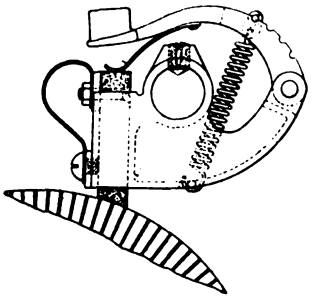
1,083,945. Cooling System for Transformers. K. C. Randall, assignor to Westinghouse Electric & Mfg. Co. Outside of the casing are vertical tubes to permit the oil to cool.

1,083,950. Circuit-Controller. H. A. Steen, assignor to Westinghouse Electric & Mfg. Co. An automatic controller for a reversing motor.

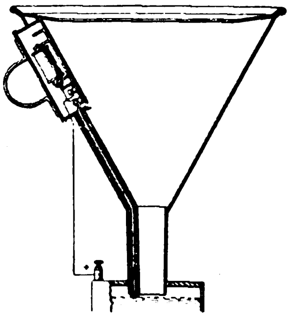
1,083,956. Electric Seam-Welding. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. Consists in first forming a number of spot welds along the seam and then forming a continuous seam by electric welding along the line of spots.



1,084,113.—Headlight Dimmer.



1,084,384.—Brush Holder.



1,084,444.—Battery-Filling Funnel.

1,083,959. Automatic Weighing Apparatus. C. C. Voglesong, Oakland, Cal. Has an electric motor to reciprocate the feeding device, a weighing receptacle with a counterweighted and electrically released bottom, and a controller adapted to stop and start the motor alternately with the action of the receptacle.

1,083,964. Elecric Spark-Producing Apparatus. G. W. Wacker, assignor to J. S. Bretz Co., New York, N. Y. Includes means for momentarily connecting a battery to the magneto in starting the engine.

1,083,965. Engine-Starting Spark-Producing Apparatus. G. W. Wacker, assignor to J. S. Bretz Co. A modification of the above.

1,083,979. Method and Apparatus for Separating Ores or the Like. O. A. Zander, Guldsmedshyttan, Sweden. A magnetic separator.

1,083,986. Trolley Wheel. J. P. Burns, Auburn, N. Y. Has a spring collar on the shaft.

1,083,992. Apparatus for Cleaning Articles. E. L. Couch, Hartford, Conn., assignor to Silverease Co. An apparatus for cleaning tarnished silver comprises an electrolytic solution and an anode containing 40% aluminum, 40% tin, 10% lead, and 10% antimony, the silver articles acting as cathode.

1,084,012. Device for Calling Cabs, Porters, and the Like by Telephone. A. Hinzpeter, Munich, Germany. Includes time-controlled means for closing telephone apparatus against other calls after a call has been made.

1,084,040. Dynamo-Electric Machinery. A. L. J. Scherbius, assignor to General Electric Co. A three-phase commutator machine has a drum compensating winding with connections to receive the three brush currents and auxiliary poles with windings that receive the currents from the two brushes adjacent thereto.

1,084,047. Automatic Railway-Control System. C. S. Stanton, Cooperstown, N. Y. Electrically controlled system for cutting off the motive power and applying the brakes, and an alarm associated therewith and arranged to release the brake and restore the power.

1,084,059. Signaling System. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Includes a main and a number of series-connected local stations, each with a local storage battery, a special arrangement permitting charging the batteries from the line.

1,084,070. Loud-Speaking Telephone System. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Has a differential microphone transmitter with three electrodes.

1,084,077. Reversing Switch. T. Burchfield Elliott, Independence, Kans. Has two sets of contact bars and a pivoted sliding lever engaging one or the other set.

1,084,078. System of Electrical Distribution. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Includes a main dynamo, several auxiliary machines (one of which is in opposition to the main dynamo), a storage battery and means for charging the same.

1,084,079. Dynamo-Electric Machine. V. A. Fynn, assignor to Wagner Electric Mfg. Co. A dynamo with two shunt and a series winding has means for connecting the armature and one shunt in circuit with a storage battery for running as a motor, and means for connecting the second shunt in series with the first and in opposition to the series winding for operating the machine as a generator to charge the battery.

1,084,083. Welding Machine. J. H. Gravell, assignor to Hale & Kilburn Co., Philadelphia, Pa. The primary coil encircles the secondary and core; the secondary has terminals that are adjustable.

1,084,096. Ignition System for Internal-Combustion Engines. J. Marx, Hartington, Nebr. The speed-controlling lever adjusts a detent to regulate the sparking.

1,084,100. Automatic Fire and Burglar Alarm. L. A. Meyers, Sauk Center, Minn. For attachment to telephone circuits; a rocking bar successively breaks the circuit.

1,084,104. Magnetic Break-Switch. G. E. Palmer, assignor to Palmer Electric & Mfg. Co., Boston, Mass. A multipolar circuit-breaker with the several contacts mounted at different heights and in different vertical planes.

1,084,113. Headlight-Dimmer. G. G. Rosino and F. W. Thomas, Sandusky, O. Has electromagnetically shifted plates. (See cut.)

1,084,129. Method of Softening the Ends of Electrodes and Other Carbon Articles. J. W. Brown, assignor to National Carbon Co., Cleveland, O. Consists in sending a current through the end and confining it almost entirely to the outer portion thereof.

1,084,147. Support for Electric Service-Wires. G. Hopkins, Portland, Ore.; H. M. Palmer, administrator of said Hopkins, deceased. Comprises a pair of pivoted sections and sleeve portions carried thereby and adapted to engage the cross-arm pin.

1,084,148. Device for Transmitting Force by Means of Magnetized Rings. A. Huguenin, Zurich, Switzerland. Comprises rings carried by disks, blades on the rings and an electric coil secured to one of the disks.

1,084,150. Process of Electrolytic Production of Copper. N. V. Hybinette, Christiana, Norway. Consists in circulating the electrolytic from the cathode to the anode.

1,084,155. Tracing Device for Copying or Duplicating Machines. E. R. Lochman, Boston, Mass. Includes a special circuit-making and breaking device.

1,084,189. Telephone System. F. M. Wolf and R. M. Austin, Monroe, Wis. Removal of the receiver from the hook causes intermittent opening and closing of the signaling circuit.

1,084,192. Internal-Combustion Engine Comprising Rotating Cylinders. E. Becker and F. Dinslage, assignors to Siemens & Halske, A. G., Berlin, Germany. The spark plug of each cylinder is connected to a section of a contact ring.

1,084,199. Fireproof Electrically Conducting Bodies and Process of Manufacturing the Same. G. Egly, assignor to Gebrueder Siemens & Co., Lichtenberg, Germany. Free silicon and a carbonized binder are molded into the desired form and then caused to absorb carbon and oxygen by heating in a suitable environment.

1,084,206. Attachment for Mouth-Pieces. A. C. Gaynor, assignor to L. Block, New York, N. Y. An annular disinfectant holder is clamped to a telephone mouthpiece.

1,084,220. Apparatus for the Electric Lighting of Motor Cars and for Other Purposes. M. Metz, Coventry, England. A switch for connecting the lights to part or all of the battery.

1,084,239. Telephone Attachment. W. J. Stuart, Portland, Conn. Means for holding the counterbalanced receiver to the ear.

1,084,261. Lamp Support. R. E. Ewing, assignor to Pittsburgh Lamp, Brass & Glass Co., Pittsburgh, Pa. A spring holder for supporting a lamp socket.

1,084,274. Apparatus for Graphitizing Carbon. P. L. T. Héroult, assignor to Electrode Company of America, Niagara Falls, N. Y. The material is passed through a vertical graphitizing chamber with a circular electrode at the top and bottom so as to be acted upon by the current passing between the electrodes.

1,084,277. Automatic Pressure-Switch Controller. C. S. Jennings, assignor to Lamson Co., Newark, N. J. The controller for the motor driving the blower is governed by an air-pressure piston.

1,084,304. Inhaling Device. B. C. Vaughn, assignor to S. C. Vaughn, Pittsburgh, Pa. Includes an electric heater for vaporizing the medicine.

1,084,305. Coin-Controlled Mechanism. R. Watson, assignor to G. C. Yocum, Scranton, Pa. An electromagnet releases a detent when its circuit is closed by a coin.

1,084,317 and 1,084,318. Electric Locomotive. W. Dalton, Schenectady, N. Y. The first patent relates to the new New York Central type of locomotive wherein the cab ends are swiveled on two separate eight-wheel, motor-driven trucks. The second patent relates to interlocking of the leading and trailing trucks.

1,084,328. Telephone Attachment. E. Gransaull, New York, N. Y. Attached to the receiver is an extension sound tube with trumpet convenient to the ear.

1,084,351. Apparatus for Extracting Metals from Their Ores. H. S. MacKay, assignor to MacKay Copper Process Co., Riverside, Cal. For a combined electrolytic and leaching process.

1,084,362. Lamp Support. H. C. Reagan, Philadelphia, Pa., assignor of one-half to W. R. Benson. Carries a number of tubular lamps between the upper fixed and the lower movable arms.

1,084,364. Windings for Electrical Machines. E. Rosenberg, Berlin, Germany. Has shunt and series fields so connected that the voltage is unchanged regardless of speed or direction of the machine.

1,084,365. Constant-Output Generator. E. Rosenberg. Has a series field arranged to be saturated by a fraction of full-load current, and commutator brushes so positioned as to produce with the armature windings circuits in which the current opposes the field magnetization.

1,084,375. Portable Electric Lamp. G. B. Swinehart, Seattle, Wash. The socket and reflector holder are pivoted to the upright standard.

1,084,379. Screwless Carbon-Holder. W. W. Wile, Bluffton, Ind. A compound cam clamp.

1,084,382. Circuit-Closing Device. W. W. Alexander, Denver, Colo.; E. T. Keim, administrator of said Alexander, deceased, assignor to Protective Signal Mfg. Co. The contacts are inclosed in a casing and closed by depression of the rail on its top.

1,084,384. Brush-Holder for Dynamo-Electric Machines. T. S. Allen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has an integral weight secured to the spring pressure finger to increase its inertia. (See cut, page 209.)

1,084,396. Electromagnetic Switch. E. R. Carichoff, assignor to General Electric Co. Has a shunt closing coil and a series overload coil which first opens the shunt circuit and then quickly opens the switch.

1,084,397. Ignition-Indicating Device for Internal-Combustion Engines. A. de Clairmont, Toledo, O. In a cabinet are several helical vacuum tubes electrically connected to the ignition circuit.

1,084,416. Electric Trap. J. Entwistle, Utica, N. Y. A rat trap with electrocuting contact plates.

1,084,444. Battery-Filling Funnel. C. O. Keagy, B. K. Tollinger and W. H. Beatty, Philadelphia, Pa. Secured to the outside of the funnel is a buzzer with insulated wire alongside the nozzle to signal when the battery has been filled. (See cut, page 209.)

1,084,466. Electric Furnace. G. Méttler, Berlin, Germany. Has a carbon resistance cone below a gas burner.

1,084,469. Voltage-Regulating Means. H. Nehlsen, assignor to General Electric Co. A polyphase double induction regulator connected to special voltage taps on the transformer.

1,084,503. Automatic Brake-Controlling Device. G. C. Sweet, U. S. Navy. Provides for electromagnetic shifting of the air-brake valve.

1,084,506. Electrically Operated Air Brake. H. L. Tooker, Winslow, Ariz. Includes a slide valve controlled by an electromagnet.

1,084,540. Ventilating Fan. J. M. Dayiantis, Chicago, Ill. A double-ended fan motor has a spring-held screw-driver on each guard to engage the set screw of the fan blade, and a stop-arm for stopping either blade.

1,084,542. Open-Wire-Testing Instrument. C. L. Faries, Phoneton, O. A Wheatstone bridge set for determining the relative capacities of two conductors.

1,084,543. Spark Plug. F. M. Furber, Beachmont, Mass. Relates to details of construction.

1,084,551. Inclosed Electric Arc Lamp. M. Körting, assignor to Körting & Mathiesen Aktiengesellschaft, Leutzsch, Germany. A flame arc with a cooling chamber over the combustion chamber.

1,084,556. Electrolytic Apparatus for the Clarification of Sugar Solutions. H. McCubbin, Lahaina, Hawaii. The electrodes in a closed chamber are adjusable from the outside.

1,084,560. Panelboard. R. H. Olley, assignor to Crouse-Hinds Co., Syracuse, N. Y. Provides special mounting for switch bases on the branch circuit bars.

1,084,589. Electric Meter. G. M. Willis, assignor to Chicago Electric Meter Co., Chicago, Ill. Has an adjustable magnetic shunt for the retarding magnet.

1,084,590. Electric Motor. H. L. Zabriskie, assignor to Diehl Mfg. Co., Elizabeth, N. J. An inclosed motor with controller for the sections of the field coil.

1,084,592. Apparatus for Marking Photographic Films or Plates. O. Chouinard, assignor to J. W. Berwick, New York, N. Y. Contains an electric lamp and switch therefor.

1,084,594. Induction Generator. F. E. Norton, Lynn, and F. A. Wilson, Nahant, Mass. Insulating walls between the inductors form passages whereby a stream of vapor can be passed over the collectors.

Reissue 13,675. Engine Starter. T. J. Gray, Indianapolis, Ind., assignor to Gray Engine Starter Co. Original No. 1,081,268, dated Dec. 9, 1913. An electric motor can be gear-connected to the engine.

Patents Expired.

The following United States electrical patents expired January 19, 1914.

575,322. Incandescent-Lamp Socket. R. B. Benjamin, Chicago, Ill.

575,332. Electrically Illuminated Jugglery Apparatus. M. Cronin, London, England.

575,341. Clutch for Arc Lamps. E. Finkbeiner, Brooklyn, N. Y.

575,346. Electric Railway. W. Grunow, Jr., Bridgeport, Conn.

575,354. Electric Rail-Bond. W. Jens, Johnstown, Pa.

575,366. Electrical Controller. W. H. Morgan, Alliance, O.

575,394. Magneto Telephone. S. D. Field, Stockbridge, Mass.

575,419. Telegraphy. P. B. Delany, South Orange, N. J.

575,449. Telegraph-Battery Jar. A. L. Werner, Delano, Pa.

575,454. Series-Multiple Controller for Electric Motors. E. M. Bentley, Lawrence, N. Y.

575,455. Deep-Sea Electric-Current Meter. C. L. Berger, Boston, Mass.

575,479. Electric Elevator or Hoisting Machine. R. M. Hunter, Philadelphia, Pa.

575,490. Means for Operating Electric Motors. J. F. McLaughlin, Philadelphia, Pa.

575,573. Electrical Controlling Apparatus. O. H. Pieper and A. F. Pieper, San Jose, Cal.

575,615. Electric Motor and Device for Conducting Currents Thereto. D. N. Osyor, Newark, O.

575,653. Electrical Condenser. J. C. Lee, Brookline, W. R. Westcott, Cambridge, and E. C. Robes, Medford, Mass.

575,668. Illuminant for Incandescent Lamps. A. De Lodyguine, Pittsburgh, Pa.

575,679. Magnetizing Box. C. A. Hussey, New York, N. Y.

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THE TEN-WATT LAMP.

Progressive central-station men are coming to appreciate that the ten-watt tungsten lamp, when properly advertised and applied, is one of the best devices for encouraging the use of electricity that has ever been developed. It is not very far back to the days when the thought of any considerable number of these units being in use in a single house or store sent the cold chills down the back of the lighting-company manager, long accustomed as he was to thinking in terms of 50-watt, 16-candlepower carbon lamps. And it may be admitted that even today a good many managers still fail to realize the immense power for good residing in this humble but exceedingly important size of 10 watts per bulb as a long-hour burner in places not requiring intensified illumination. We have hinted this before in these columns, but no apologies are needed for referring to the matter in its relation to publicity and soliciting, particularly in the home and store.

The cheapness of service resulting from the use of a ten-watt lamp is little realized by the public. Take the ten-cent-per-kilowatt-hour rate as a basis, and the cost of burning one of these units all night long in these dark winter days barely reaches 1.5 cents, starting at dusk and running through to breakfast time. A half cent will cover an ordinary evening's run at a stairway landing, in a bathroom, on a porch, or in the cellar. It is time to let the customer know in no uncertain terms that if he operates lamps of this size in the odd corners of his establishment, he can be actually prodigal in his use of lamps without really feeling it. If he forgets to turn it out when he comes upstairs from attending to the furnace little harm is done. The old custom of turning off all the lamps every time one leaves the front end of one's apartment for the rear can be given up without the slightest fear that when the monthly bill comes in, the family savings will have to be invaded to meet it.

Until the householder has tried it, he cannot realize the difference in cheerfulness, comfort and safety which results from a liberal use of low-powered tungsten lamps around his place in locations where a high degree of illumination is not needed. One or two of these lamps left burning throughout the night in hallway or bathroom are sometimes invaluable in cases of sudden indisposition; they reduce the noise made by late comers to bed and prevent collisions in the darkness between sleepy members of the household and other objects of low or zero animation.

In the store the ten-watt lamp is equally useful in maintaining safe passage conditions to and from the basements; in the lighting of closets, window exhibits of limited size, doorways leading into stock rooms, bulkheads, rear entrances and safe exteriors. Instances could be multiplied almost without limit of the usefulness of such lamps, and if the central-station man comes to realize that one of these units burned for long periods may be of more value to him as a revenue earner than a device consuming much more power but operated for short times only, the results will soon be evident in his treasury. Nothing encourages the use of electricity on larger and larger scales more than its economical application in many small single installations. It is safe to say that if given half a chance, the ten-watt lamp will do more to discourage hair-splitting economies in the use of electricity by the consumer than any other practical lighting unit adapted to residential and small store service.

ELECTRIC EQUIPMENT OF AUTOMOBILES.

The use of electricity in the propulsion of motor vehicles is making rapid strides. The electric vehicle has shown its superiority to the gasoline truck for most purposes where short hauls are involved, and it is rapidly invading the field of passenger cars where the gasoline engine has been often considered supreme. The recent automobile shows in New York City and Chicago have made it very evident, however, that aside from the use of electric power for propulsion, electric equipment has become an important part of the motor vehicle and is to be found to a larger and larger extent every year in the gasoline cars.

While for ignition purposes the electric spark has always been a feature of such cars, other electrical equipment has been taking an important place. The use of electric lamps for headlights has gradually found more and more favor until now it is acknowledged as the ideal equipment for the purpose, and is found on nearly all cars. Following the spark coil, the magneto and the electric lamp, came the introduction of the electric self-starter. Few of the better class of gasoline automobiles are now offered without this feature, which is almost indispensable for the convenient operation of the gasoline machine. In connection with the motor starter, the use of electric lamps has been made more feasible, since the storage battery can be charged from the same machine if desired, although a separate generator for this purpose is often preferred.

The electric brake is a rather new innovation and a number of minor conveniences are now supplied which are operated by means of electric current. Among these are signals for indicating to persons both in front and behind when a machine is going to turn a corner; arrangements for cutting down the glare of headlights; the electric gear shifter; and telephonic apparatus for communication between the passenger and chauffeur.

Altogether, there is hardly a booth nowadays at an automobile show in which electric equipment is not a predominating feature, and it may be safely said that it is the electric accessories which make it possible for the gasoline automobile to hold its position in the field.

FEDERAL CO-OPERATION WITH STATE COMMISSIONS.

The regulation of public utilities by state commissions seems to have been accepted by the people of this country as a definite program of procedure for preventing the evils which seem otherwise inherent in the control of monopolies by private corporations. Most of the states now have such state commissions and a number of them are clothed with very broad powers as to scope and jurisdiction over public utilities of all kinds.

One of the important elements in such control of public utilities is the establishment of standards of service and investigations as to whether operating companies conform to such standards. To properly carry out this function it is necessary for a commission to have the services of a competent, efficient and fairly large engineering staff with suitable facilities for carrying on its work. While many of the states have followed the lead of Wisconsin and New York in framing legislation on this matter, few, if any of them, have followed those states in providing through legislative appropriation for such an engineering staff as shall be capable of properly handling the questions which must come up to them for investigation and solution.

In view of the fact that work of this nature if properly carried out independently by our state commissions would involve an enormous amount of work and much duplication of effort in the different states, it would seem logical and mutually beneficial if much of this work could be done in co-operation or by one central agency supplied with the proper equipment in men and facilities for doing the work. Apparently no such move has yet been taken by the individual commissions or by their national organization, known as the National Association of Railway Commissioners, but many of the state commissions have turned to the National Bureau of Standards for assistance along these lines. With the idea of increasing its usefulness in this direction, the Bureau of Standards, through the Secretary of Commerce, has asked Congress for an appropriation of $100,000, so that it may be enabled to employ engineers especially for this purpose and to create in its organization a division or group of men who might give their whole time to investigations along these lines. If the members of Congress were familiar with what the Bureau of Standards has already accomplished and with the possibilities for good which exist in the field here referred to, there would be no question about providing the funds for this important work. Most of the state commissions are not prepared to do all that it is desirable to have done and there is no need that each one should duplicate the work of the other. The help of the Federal Government would be quite appropriate in this direction, as it would be along the lines of the co-operative work which it is already doing through the Department of Agriculture, the Bureau of Education, the Bureau of Fisheries, and other federal agencies.

In a paper read before the last convention of the National Association of Railway Commissioners and reproduced in part in this issue, Dr. E. B. Rosa, chief physicist of the Bureau of Standards, has pointed out some of the ways in which the Bureau might be very helpful to the state commissions if such co-operation were made possible by Congress. Some work along this line has already been done, but at the expense of other activities of the Bureau, since men have had to be taken from other work in order to pay attention to such matters as the state commissions have requested the Bureau to take up. The making of electrical and other measurements which must enter largely into both the regulation and testing of service and in the metering of the product or commodity furnished by a public utility is directly in line with the work for which the Bureau of Standards was originally established. There is much other work, however, of an engineering nature which the experts of the Bureau are especially qualified to undertake, and they can, undoubtedly, be of great assistance to state commissions along such lines. A liberal policy upon the part of the Federal Government in rendering co-operation along these lines will be of direct benefit not only to commissions, to public service companies and to many industries, but also to the public at large.

There is no danger of federal interference in this manner with the authority of state commissions, since the services of the Bureau would be entirely in an advisory engineering capacity and would not be concerned with rates, accounting, capitalization and such matters as are not connected with standards of service or with engineering problems.

The Bureau has already given efficient help to a number of commissions along the line of establishing standards for gas and electric service and properly equipping the inspectors of the commissions with calibrated instruments and with methods for determining whether the standards are properly complied with. The technical problems connected with the work of regulation are increasing and there are doubtless many lines along which the assistance of the Bureau would be very helpful. The Intertstate Commerce Commission has already called upon it for co-operation in investigating the causes of railroad accidents so far as they relate to the use of defective material.

It is pointed out by Dr. Rosa that at least three of the states have, in the laws giving regulative authority to the state commission, specified that utility corporations shall be permitted to benefit in the form of stock dividends from economies in operation, which may be due to exceptional efficiency or improvement in methods of operation. This indicates that a larger rate of return upon the investment should be allowed under certain conditions of operation, the determination of which can only be adequately decided by engineering experts or at least through their help in specifying what conditions shall be regarded as standard and what as exceptional.

There can be no doubt that if the Bureau of Standards was provided with sufficient funds for the purpose it could soon build up an able staff of engineers and scientific assistants, who would be of great asssitance in the tremendous task which confronts the public utility commissions. But few of the state commissions have as yet gotten very deeply into their work. Most of their problems have yet to be worked out. If serious mistakes are made through lack of sufficient engineering assistance it would not only do injustice, but would be most regetable in indicating the failure of this method of regulation.

DEPRECIATION.

With the activity of state utility commissions in the regulation of rates of utility companies has come a more general recognition of the importance of giving proper attention to depreciation. This subject not only constitutes an important element in the determination of rates, but it is of course included in the standard systems of accounting which are being inaugurated by most of the state commissions. While the subject of depreciation upon its face appears quite simple, it is found to involve many difficulties when the attempt is made to properly consider it in the accounts of the utility company. Not only do the quantitative values for the depreciation offer frequent difficulties, but the distinction between depreciation which is to be covered by sinking fund and that which is to be covered by current repairs is not always simple. The article in this issue by Hon. Halford Erickson, of the Wisconsin Railroad Commission, should serve to make this matter more clear to utility managers, especially those connected with the smaller companies.

Of interest to the same class of managers will be the article by Mr. H. G. D. Nutting, which gives a convenient accounting system for the use of small central stations. The system involves no bound books, but a set of forms to be handled after the manner of the card index or the loose-leaf ledger, which is already common. A study of this system will no doubt be helpful to many.

Chicago Automobile Show.

The fourteenth annual show of the National Association of Automobile Manufacturers, occupying the entire Coliseum, Annex, First Regiment Armory and adjacent buildings was held in Chicago, January 26 to 31. The exhibit is credited with being the largest ever held, although fewer electrics were shown.

Aside from the exhibits of the vehicle manufacturers, however, the show is of significance to the electrical industry on account of the important position occupied by electrical apparatus in the gasoline car industry. Electric starting and lighting equipments for automobiles have made enormous advances during the past year and it is estimated that $25,000,000 will be spent for this equipment during 1914. Practically every manufacturer of gasoline cars represented at the show either provides electric lighting and starting equipments with the automobiles or is in a position to so equip their cars on demand.

The following manufacturers of electric vehicles were represented: Anderson Electric Car Company, Detroit; Argo Electric Vehicle Company, Saginaw, Mich.; Baker Motor Vehicle Company, Cleveland; Borland-Grannis Company, Chicago; Broc Electric Vehicle Company, Cleveland; Chicago Electric Motor Car Company, Chicago; Ohio Electric Car Company, Toledo; Rauch & Lang Carriage Company, Cleveland; Standard Electric Car Company, Jackson, Mich.; Woods Motor Vehicle Company, Chicago; and the Waverley Company, Indianapolis.

Electric Vehicle Meeting in Chicago.

The regular weekly meeting of the Chicago Section, Electric Vehicle Association of America, was held at the Lexington Hotel, on January 27. This location was selected because of its proximity to the Coliseum where the automobile show was in progress and several of the visitors attending this function were present at the meeting.

Captain Charles Healy, of the Chicago Police Department, in charge of the traffic squad, was the first speaker. He presented statistics showing the extent of the traffic congestion in the business district of the city which strikingly indicates the need for cooperation between police, vehicle operators and pedestrians. Captain Healy outlined the work of the traffic squad and commented on pending ordinances which if passed should tend to relieve congestion.

Hyden Eames, of Cleveland, was the next speaker. He spoke of the parking ordinance referred to by Captain Healy, pointing out that the availability of the electric is one of its main advantages and therefore some system should be devised whereby electrics could be parked so as not to interfere with traffic, but still be convenient to the business district. Mr. Eames briefly outlined the development of the electric vehicle industry and commented on the causes for its slow advance. The factor of safety of the electric was ample 15 years ago; the prices then or now are not excessive so that the main cause for the comparatively slow advancement has been lack of knowledge on the part of the public as to the advantages of the battery vehicle and lack of proper facilities for caring for the machines.

Mr. Eames said that the principal problem of the industry and one on which all elements meet on common ground is that of properly educating the public. In this connection private charging at home should be encouraged and in this the garage men should co-operate, as the business of the latter depends upon the gross number of electrics in use, whether charged at home or in public garages.

Brooklyn Section Meeting.

T. I. Jones, chairman of the Commercial Section, National Electric Light Association, and general sales agent of Edison Electric Illuminating Company of Brooklyn, delivered on January 12 his annual address before the members of the Brooklyn Company Section, N. E. L. A., on the development in the electrical field in Brooklyn during 1913.

E. A. Leslie presented a paper entitled, "Central-Station Service for Manufacturers." Mr. Leslie's paper brought forth spirited discussion from a number of members. Those who participated in the discussion were T. Bates, F. L. Leitner, J. L. Wilson, W. H. Grove, G. J. Leibman and C. H. Stevens.

More than 700 members of the Section and a number of out-of-town visitors connected with the industry attended. Mr. Jones's talk was illustrated with lantern slides covering specific installations, to show the trend toward the use of electric light, heat and power for Brooklyn homes, factories and stores. One feature that he laid particular stress on was the fact that within the limits of Brooklyn there are a number of farms that are completely equipped for electric service, including power for cow-milking machinery.

Following Mr. Jones, short addresses were made by a number of the visitors present, among whom were included: Theodore Beran, of the General Electric Company, New York; C. G. M. Thomas, of the New York & Queens Electric Light & Power Company; P. S. Young, of the Public Service Electric Company, Newark; H. H. Barnes, of the General Electric Company, New York; C. A. Littlefield, of the New York Edison Company; A. A. Pope, of the New York Edison Company; R. R. Young, of the Public Service Electric Company; W. J. Clark, of the Westchester Lighting Company, Mount Vernon; W. L. Second, of the Westchester Lighting Company; C. A. Barton, of the New York & Queens Electric Light & Power Company, Long Island City; L. A. Coleman, of the United Electric Light & Power Company, New York; C. A. Greenidge, L. R. Wallis, of the Edison Electric Illuminating Company of Boston.

The meeting was closed with the rendering of a vaudeville entertainment by employees of the Company.

Peoria Electric Club.

The Peoria Electric Club held the regular semi-monthly luncheon on Saturday, Januuary 24 and the following speakers each gave a five-minute talk on his subject: Theo. Bass, "Electricity on the Farm;" H. M. Butler, "Business Outlook for 1914;" E. R. Elam, "Jovianism;" E. H. Joseph, "Why is a Traveling Salesman;" L. L. Owen, "Continuous Service;" C. E. Stapp, "Does a Contractor—;" J. R. Yocum, "8,000 Miles in a Road Louse."

There was a debate on the subject "Resolved, That a Salesman Can Play Baseball," with J. Downs supporting the negative and Tom Endsley, the affirmative.

Colorado Association Officers.

The officers of the Colorado Electric Light, Power and Railway Association for the current year are as follows:

President: W. C. Sterne, vice-president and general manager of the Summit County Power Company, 1008 Gas and Electric Building Denver, Colo.

Vice-president: W. F. Raber, general manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Colo.

Secretary-treasurer: Thomas F. Kennedy, Denver Gas & Electric Light Company, Denver, Colo.

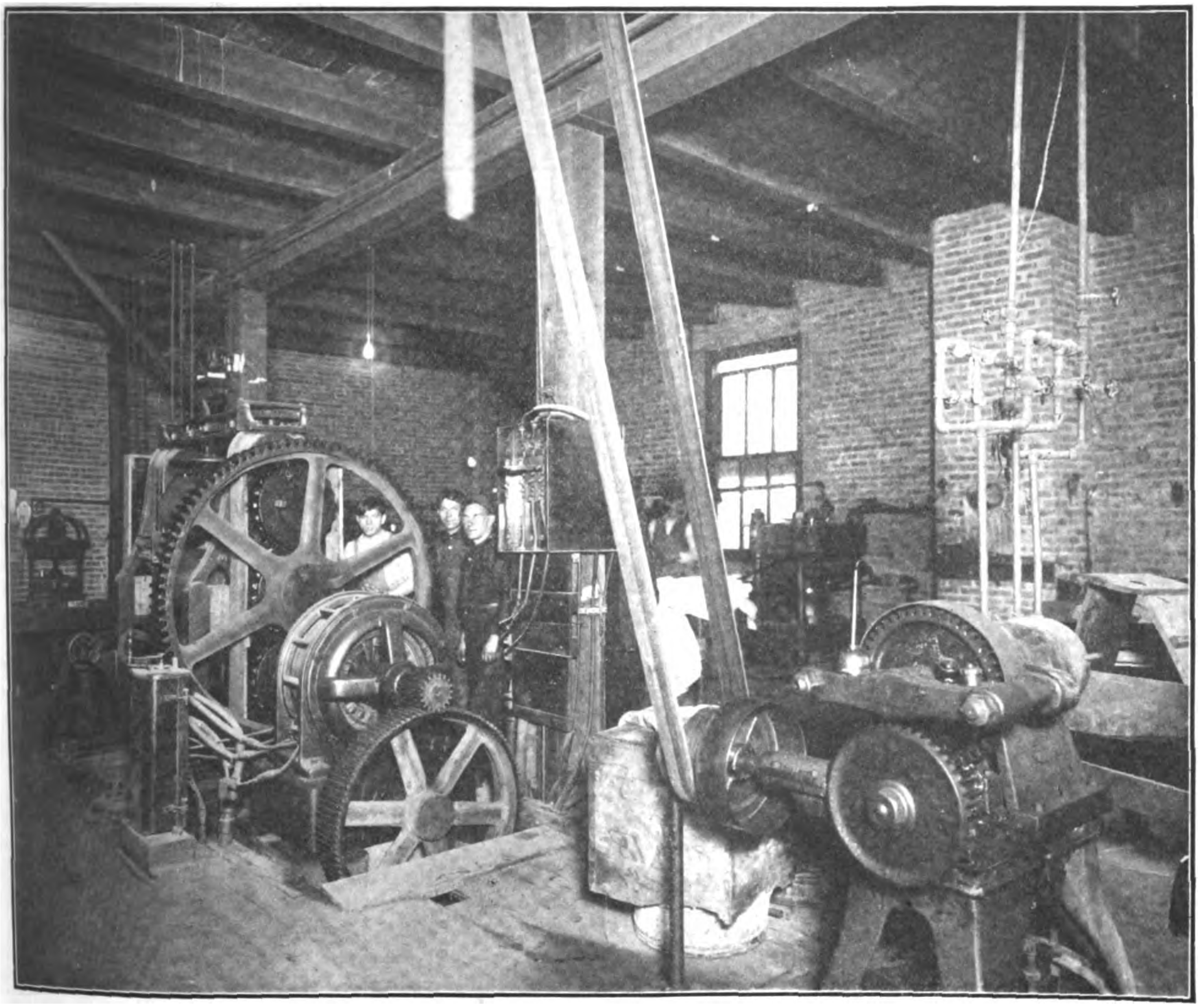
President Bond to Address Philadelphia Section.

The next meeting of the Philadelphia Section of the Illuminating Engineering Society will be held under the auspices of Drexel Institute, on Saturday, February 7, at 8 p. m., at the Institute. President Bond, of the Illuminating Engineering Society, will deliver a lecture on "Light and How to Use It." Admission will be by card, which will be forwarded to every member of the Section.

Electricity in Rubber Mills.

Although steam in varying quantities is required in rubber manufacturing, central-station power is being used in several instances with excellent results. In other cases a portion of the power is purchased and the utility is in a position to demonstrate the advantages of reliability of service in case of an accident to the private plant. Data are given on several installations.

In discussing the application of electricity to rubber mills it should be explained that there are several subdivisions of this industry, comprising factories engaged in refining the crude rubber into salable shape, those refining the rubber and making it up into various products, such as tires, tubing and mechanical goods, and those engaged in the process of reclaiming rubber, that is, taking old worn out articles of rubber and extracting the useful rubber remaining therein. While most of the processes involved in these various plants are common to all insofar as they go, there are special conditions that apply to each and must be considered separately when a motor installation is contemplated.

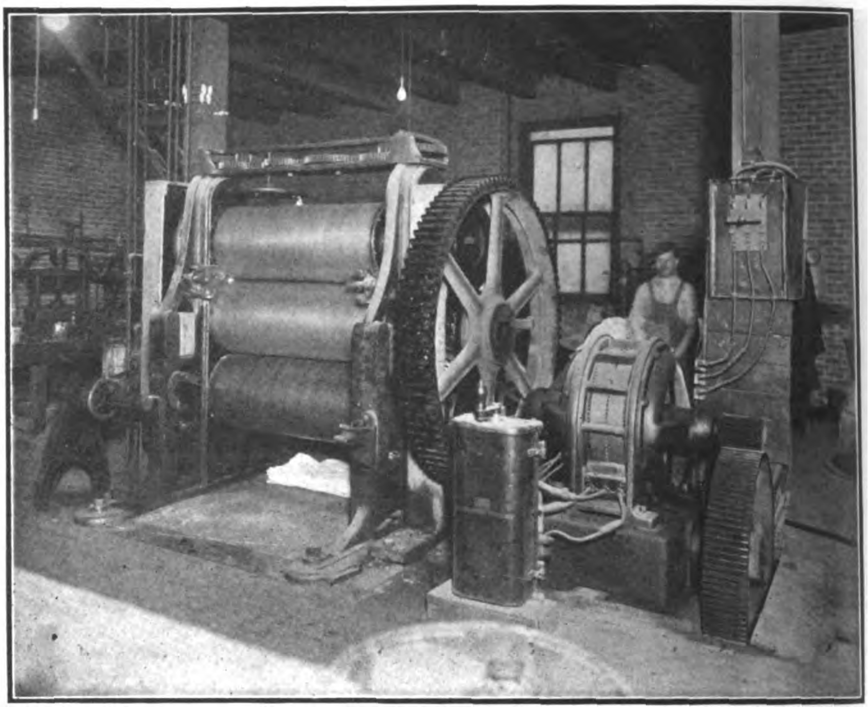


General View of Motor-Driven Machines in Vail Rubber Company's Plant, Chicago.

Due to the necessity of using steam in rubber manufacturing, the question of electric motor drive is only beginning to be recognized by rubber manufacturers as a factor of economy, and while there is an increasing number of plants replacing power-consuming line shafts with motors there is some hesitancy shown on the part of these companies to purchase power. The situation is, for comparative purposes, similar to candy manufacturing, breweries, paint manufacturing, laundries, etc., where, although steam in varying quantities is necessary, central-station power has demonstrated its superiority.

In many of the large rubber mills, however, it is frequently found that considered solely on the basis of cost central-station service cannot compete successfully with isolated-plant costs. Where such plants are found central stations should not ignore them as hopeless prospects but an effort should be made to supply part power for operation on certain days of the week, for instance; for overtime service; or for operating additional machines that may be added from time to time as the plant grows. Considerable of the business can be secured if the utility companies make only a reasonable charge and in a number of such instances profitable business results.

However, of greater importance than the immediate revenue realized is the fact that in case of a breakdown to the isolated plant (usually a frequent occurrence), or any emergency, the central station will be able to demonstrate in a convincing manner that cost is secondary to reliability of service.



35-Horsepower Motor Geared to Calender, Vall Rubber Company.

Rubber manufacturers, as a class, are more or less reticent regarding the power required by the various machines used in their establishments and, in fact, considerable secrecy surrounds the entire industry from the manufacturing standpoint. Very little data on power requirements and motor characteristics are therefore available but in any event specific details would be of little value because of the special machines used. There has, however, been presented before a recent convention of American Institute of Electrical Engineers a paper by C. A. Kelsey, dealing with electrical requirements of certain machines in the rubber industry, principally the machines which work up crude rubber and render it suitable for the manufacture of various articles. These machines are more or less common to all rubber mills and the data are therefore extremely valuable. (*Transactions,* American Institute of Electrical Engineers, XXXII, page 1599).

The principal source of rubber is the wild trees of Brazil, although cultivated rubber in increasing quantities is now produced in East India, Ceylon, Malayan Peninsula and Southern Mexico. The former reaches the factory in the form of balls or biscuits about a foot in diameter. Cultivated rubber is universally washed and sheeted at the plantation and is shipped in the form of cakes or folded sheets.

After the biscuits have been cut into chunks and softened in a bath of warm water, they are fed into a cracker or rough washing mill. This mill consists of two or three rolls between which the rubber passes, is torn apart and rolled out into a rough sheet. Water flowing through the rubber in its passage through the rolls washes out part of the entrapped dirt.

These mills run at a constant speed of 20 to 25 revolutions per minute. The load is very irregular and depends upon the feeding of the mill. A three-roll washer with continuous feeding requires an average of 25 to 35 horsepower with power peaks of 100 horsepower.

The rough sheet is then passed through a single set of rolls where it is further washed and rolled out into a sheet or "crepe."

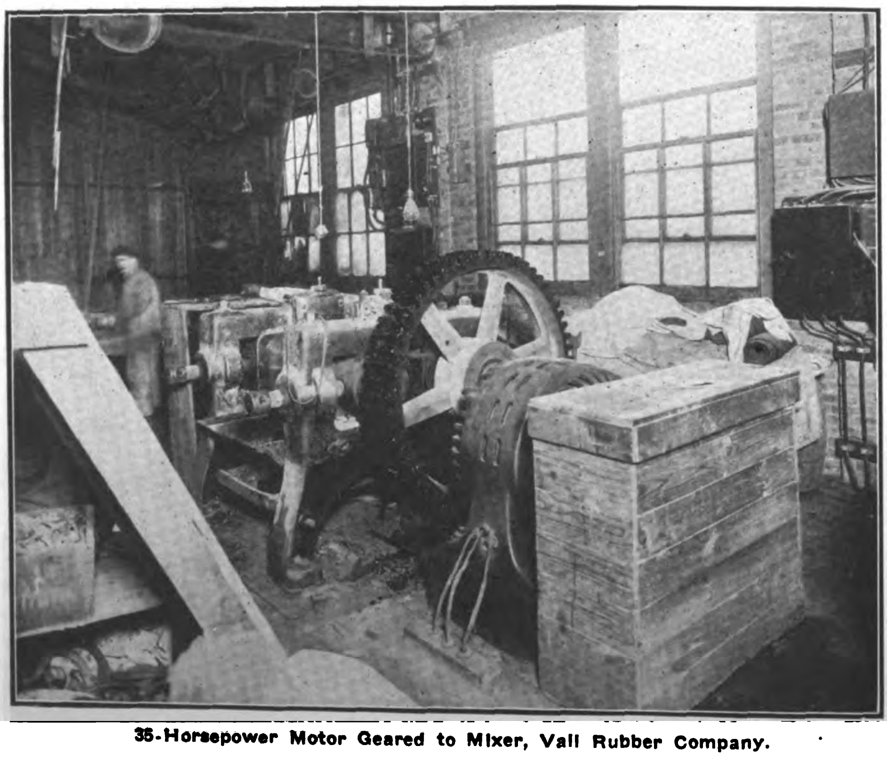
These mills run at a constant speed or about 25 revolutions per minute. The load is fairly uniform as the rubber is already in the form of a rough sheet. The power required averages 20 to 25 horsepower and occasionally runs up to 50 horsepower when the sheet is introduced between the rolls after being doubled.

After the crepe has been dried in a drying room where it is suspended from the ceiling or placed in a vacuum drier, it is ready to be masticated and mixed with the suitable ingredients to form various compounds.

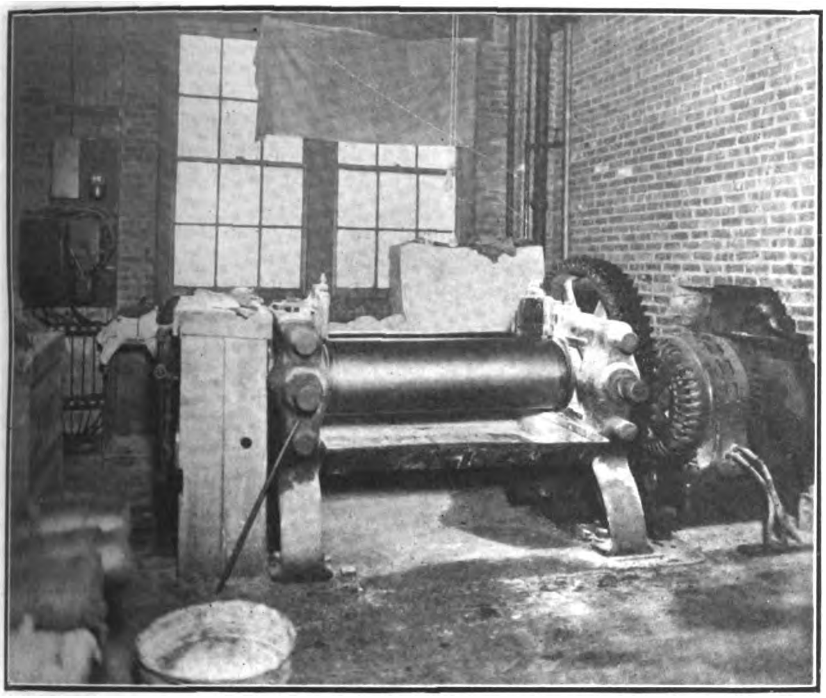
The dried crepe must be worked or masticated into a homogeneous and plastic state before the ingredients are added. This is most economically done in a shorter mill than a mixing mill. The power required at the begining of the process is greater than at the end and runs up to high value as the rubber is cut free from the roll and doubled back in again. From tests on a 50-inch face mill the average power was 37 horsepower and the maximum 74 horsepower, while a 60-inch face mill required an average power of 90 horsepower and maximum of 140 horsepower.

Pure rubber is never used in the manufacture of rubber articles without first adding to it some other substance. Different materials are employed depending upon the use and desired characteristics of the rubber product. Some materials increase the elasticity, some impart hardness and toughness and some act as mechanical fillers to cheapen tht product without materially affecting the desired characteristics.

Where the rubber is masticated in the mixing mill, the predetermined weight



35-Horsepower Motor Geared to Mixer, Vall Rubber Company.



35-Horsepower Motor Geared to Refiner, Vail Rubber Company.

of the various substances are added in a powdered or liquid state only after the masticated rubber has been thoroughly worked and warmed. As the ingredients impart different degrees of hardness and toughness to the final product so will the power to drive the mill vary.

The speed of the rolls ranges from 20 to 25 revolutions per minute. A 40-inch face mill requires about 20 horsepower average and 40 horsepower maximum on relatively soft compound and 25 horsepower average and 55 horsepower maximum on hard compound while a 60-inch face mill requires 55 horsepower average and 120 horsepower maximum on medium compound.

In some installations the compound after leaving the mixing mill is passed through machines that strain it and reduce it to a very thin sheet. The strainers are in principle like a meat grinder. A feed screw revolving inside a water-jacketed cylinder forces the compound through a fine mesh screen which is backed up by a perforated plate. This removes all solid foreign objects which ordinarily find their way into the material. The compound becomes heated more or less as it passes through the strainer and the final temperature must be kept below a given value. The heating varies with the compound and the initial temperature. An efficient means of maintaining maximum output is to vary the speed. This therefore requires an adjustable-speed motor. A two-to-one speed range is sufficient. The power required is 25 horsepower over the whole range. The harder compounds, requiring high torque are run at the slow speeds and the soft compounds requiring less torque are run at the high speeds.

After passing through the strainers the compound is passed through a refiner which is a small mill whose rolls are held very close together. The compound is run through at a thickness of approximately three mills, being passed through several times and finally scraped off the roll as it comes through. It is then bundled up and is ready for the warming mill.

The mills are run at constant speed and uniform load. The power required does not exceed 25 horsepower.

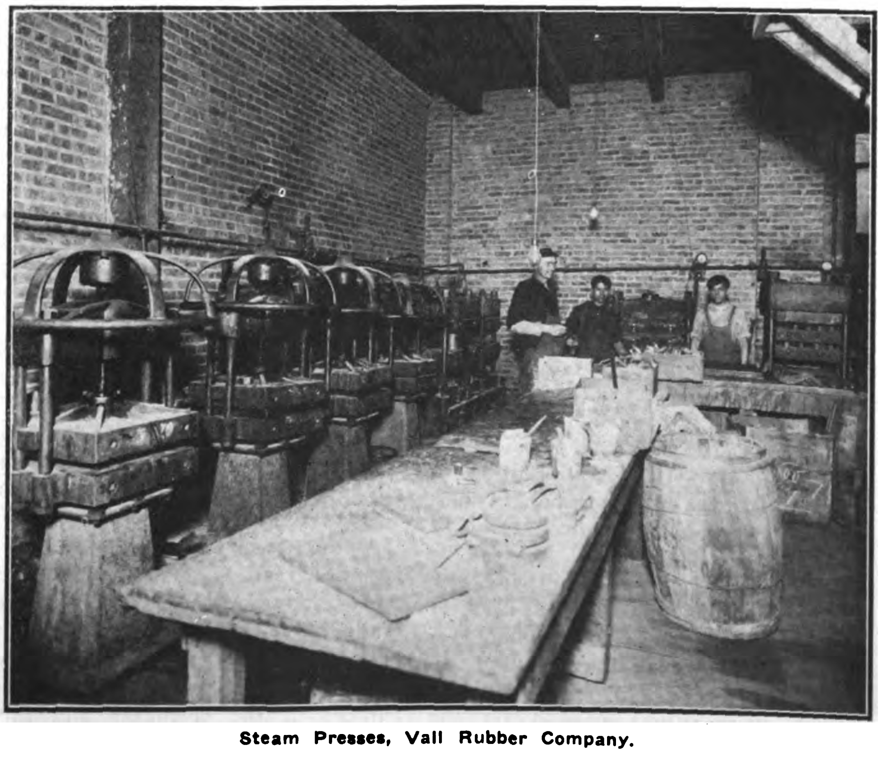
Although the compound is warmed in the mixing mills, it cannot always be used at once in the calenders and, moreover, it is beneficial to the compound to let it season before calendering. Warming mills are therefore essential to warm the compound when it finally comes to the calenders. These mills are identical with the mixing rolls excepting they are equipped with steam heated rolls. The power required is slightly less than for the mixing rolls.

When the article to be produced is tubular or ringed shaped the compound is forced through tubes. This machine is similar to a strainer excepting that instead of a screen and perforated plate the machine is fitted with a disk which delivers the compound in the form of a tube.

The speed and power requirements approximate those of a strainer.

Practically all rubber compounds with the exception of those run through tubes and for the manufacture of mold articles are sheeted in a calender. This machine has a series of rolls two or four in number arranged one over the other between which the compound is passed to form a sheet. The surface of the rolls is finished smooth and the space between the rolls is adjustable to a very fine degree. The rolls are fitted with steam and water connection to heat or cool the compound as required.

The power required to drive a calender varies over a wide range, depending on the character of the compound, thickness, width and speed. The speed is limited to that at which the compound can be run without blistering or the forming of a rough surface. When



Steam Presses, Vail Rubber Company.

the calender is started up with cold rolls the permissible speed is higher than after the cooling rolls become heated. As these rolls become heated, it is necessary, in order to obtain the desired surface of the sheet, to reduce the speed. A fine speed graduation is therefore necessary to maintain a maximum output. The torque required depends upon the thickness and material and there are so many combinations possible together with the speed requirements that it is difficult to formulate any rule to determine the power. The motor must be large enough to meet the extreme conditions.

From a number of tests made it is found that an 18-inch diameter, 40-inch face, three-roll calender running at a surface speed of 37 feet per minute, requires an average of 20 horsepower. A 24-inch diameter, 48-inch face three-roll calender running at a surface speed of 35 feet per minute requires an average of 35 horsepower and a 22-inch diameter, 65-inch face, three-roll calender running at a surface speed of 36 feet per minute requires an average of 45 horsepower.

Some compounds that are run through the calender in successive layers which build up to 0.5-inch or even 0.75-inch must be run at approximately 20 feet per minute while for "friction" work the speed of the driven roll may be 80 feet per minute. The thick sheets will require slightly greater torque than the average thickness while the torque for so-called "friction" work is considerably less.

The term frictioning is applied to that process performed by a calender in forcing a soft-rubber compound into the meshes of cotton fabric. It is preliminary to the skimming or coating of the fabric. The rubber compound is very soft and plastic and is rubbed in by the action of the driven roll which travels at a faster speed than the roll carrying the fabric.

As the compound and fabric are fed through in a continuous sheet the power required for a given material, thickness and width is quite uniform.

In considering the power and speed requirements of the different machines, it is seen that the mills for working up the rubber and mixing it to form the various compounds, call for extreme overloads but for short duration. By grouping these mills and driving by a single motor the load peaks can be reduced. Instead of the maximum values being 200 per cent of the average, it has been determined that this can be reduced to 150 per cent by driving with one motor a group of six mills used for masticating, mixing and warming.

Where individual drive is used, alternating-current polyphase squirrel-cage motors are best suited to carry the high load peaks. By grouping the mills, a motor of a smaller capacity than the aggregate of the individual motors can be employed. Moreover, synchronous motors can then be installed and assist in correcting the power-factor of the general power load. The mills are generally equipped with jaw clutches which can be open or closed while the shaft is running. The synchronous motor can thus be disconnected from the mills at starting. The selection of squirrel-cage or wound-rotor induction motors depends upon the local starting restrictions, as the squirrel-cage motor will easily bring the shaft up to speed even with all mills connected.

Direct-current motors are sometimes used when this is the power available but they are more expensive and not so well suited to the load conditions.

The calenders, as mentioned, require close speed control over a range of four to one. This can best be accomplished by a direct-current motor, which is the general practise. A number of schemes have been employed to accomplish this. Among them might be mentioned the multi-voltage and adjustable voltage methods.

The motor is excited at constant field strength and the armature supplied with a variable voltage. This variable voltage can be produced by a series of different voltage generators or by a rotary compensator or booster set.

A modification of the preceding is a three-wire, two-voltage source of armature supply combined with adjustable speed by field control. The first mentioned methods produce a wide speed range but are expensive because of the number of machines required for each calender. The second method produces a less speed range but is less expensive, particularly where a large number of calenders are installed.

With the more recent general application of commutating poles to direct current motors a greater speed range is permissible with constant armature voltage and varying field strengths.

This last mentioned method results in the simplest equipment as a whole. The motor must be larger but therefore more substantial, while the control can be made extremely simple, or it can be made entirely automatic, thus calling for a minimum of attention and care from the operator.

The tubers also require a direct-current motor and the last mentioned method of speed control is particularly adapted to these machines.

As the power to drive the mills is by far the greatest portion of the total power, alternating current will generally be selected. This therefore requires a motor-generator set or synchronous converter to deliver direct current to the calenders and tubes. These machines can be used to correct the power-factor of the general power circuit.

As the motors to drive the mills are run at constant speed, starting devices are only required. A speed controlling device must however, be furnished with the motors driving the tubers and calenders. The former machines are simple in operation and a controller for hand operation which combines starting and speed adjustment is sufficient. The calenders however, require closer attention and must be capable of starting and stopping by the simplest means on the part of the operator. This is best met by a control which enables the operator to bring the calender up to speed by moving the controller handle around to obtain the desired speed. Automatic acceleration should be provided to limit the current input while the controller handle is being moved around. It should then be possible to shut the calender down by pushing a button located on the calender. The speed of the calender should be retarded by dynamic braking of the motor. This is to provide a safety feature in respect to the operator in case his hand should be caught between the rolls. Also, it is desirable to stop quickly to save material otherwise wasted by the coasting of the motor. It should then be possible to bring the calender up to the same speed as before by pushing a button on the calender. Means should be provided for reversing the direction of rotation of the motor to assist in manipulating the calender and also in case anything should be caught between the rolls and it becomes necessary to back it out. The control should also include overload and low-voltage release features.

◆

Pittsfield Company Extends Street Lighting.

The Pittsfield Electric Company, Pittsfield, Mass., has voluntarily agreed to supply current to the 1,100 incandescent and 150 arc lamps used in city lighting a longer time in the morning hours than they have hitherto burned. It has been the practice to turn off the street lights at 15 minutes before sunrise, but under the new arrangement the company will keep them burning until about 6:40 a. m.

◆

Holyoke Rates Reduced.

The electric lighting rates in Holyoke, Mass., will be reduced about 20 per cent beginning February 1, according to an announcement of the Municipal Lighting Commission. It is stated that the Commission will enter the power field, overtures being made to manufacturing plants in the vicinity to obtain current from the Holyoke plant.

Rubber Mill Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Rubber mill manufacturing all kinds of mechanical rubber goods, rolls, inner tubes, solid tires, novelties and special devices. The output of the mill varies. Running hours per week, 60.

Total connected horsepower, 115. Total number of motors installed, 5. Average kilowatt-hours per month, 3,420.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	3,500	May	3,000	September	3,900
February	3,500	June	3,400	October	3,300
March	3,700	July	2,800	November	3,700
April	3,500	August	[illegible],600	December	3,200

Load-factor, 5.4 per cent; operating-time load-factor, 12 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	35	600	Back-geared to a Birmingham rubber calender.
1	35	600	Back-geared to grinder or refiner, rolls 18 by 20 inches, speed-driving roll 20 revolutions per minute, other roll 16 revolutions per minute.
1	35	600	Back-geared to a mixer with rolls 15 inches in diameter and 50 inches long, operated at a speed of 16 and 20 revolutions per minute.
1	15	1,120	Geared direct to a Royle No. 3 perfected tubing machine.

All motors installed in this plant are of the squirrel-cage induction type.

Rubber tire factory, manufacturing a complete line of inner tubes and casings for automobiles, bicycles, etc. Plant operates 60 hours per week. Squirrel-cage induction motors are used exclusively.

Total connected horsepower, 300. Total number of motors installed, 9. Average kilowatt-hours per month, 22,368.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	12,752	May	19,677	September	26,532
February	19,668	June	23,593	October	27,844
March	20,909	July	24,446	November	24,130
April	21,780	August	23,162	December	23,918

Load-factor, 13.7 per cent; operating-time load-factor, 29 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
2	35	600	Each geared direct to rolls for preparing raw rubber for calenders.
1	100	720	Geared direct to a Birmingham rubber calender.
1	35	600	Geared direct to mixer, two rolls 15 inches diameter by 50 inches long, speed 16 and 20 revolutions per minute.
1	15	1,120	Driving by chain a rotary valve type, single-phase, dry-vacuum pump.
1	35	600	Back-geared to grinder, two rolls 18 inches by 20 inches, speed-driving roll 20 revolutions per minute, other roll 16 revolutions per minute.
1	15	1,120	Geared direct to a Royle No. 3 perfected tubing machine.
1	25	900	Geared direct to a Royle No. 2 perfected tubing machine.
1	5	1,120	Belted to line shaft driving machine-shop equipment; and buffing and grinding wheels for rubber working.

Rubber mill doing principally a jobbing business, that is, order work, although a limited line of inner tubes are also manufactured. Plant operates 60 hours per week.

Total connected horsepower, 75 Total number of motors installed, 3. Average kilowatt-hours per month, 3,057.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	2,130	May	2,850	September	4,540
February	2,360	June	3,060	October	2,810
March	2,570	July	2,800	November	4,530
April	2,570	August	3,430	December	3,030

Load-factor, 7 per cent; operating-time load-factor, 18 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
1	15	1,120	Belted to a line shaft driving one tubing machine; on small rubber lathe; and one double buffing and grinding stand.
1	25	900	Geared to mixer, rolls 15 inches diameter by 50 inches long.
1	35	600	Geared to rubber calender.

Commercial Practice
Management, Rates, New Business

House-Wiring Campaign at Columbus, O.

The Columbus (O.) Railway and Light Company some time ago began an extensive house-wiring campaign. A careful canvass of the city, recently completed, shows that there are 4,301 houses in Columbus where electricity is not in use. Hence the campaign.

In order to bring electric service within the reach of all the company has perfected an arrangement with the electrical contractors of the city whereby the work may be done and paid for on the installment plan—30 per cent of the cost on the completion of the work and 70 per cent in five monthly payments.

With the starting of the campaign the company will open its "new-business" department in commodious quarters at 104 North Third Street, and will conduct the work from there. The new department, which will include the old contract department, will be placed in charge of W. A. Wolls, who has been in the company's service for 15 years.

Details of a systematic plan of campaign, covering the entire city, have been perfected. Solicitors will be started out to visit the unwired homes. They will carry specimen plates showing standard electric fixtures of varying cost. Blank wiring applications will be sent out, showing each householder in minute detail how much it will cost him to wire each room.

"Many people have the idea that electrical wiring is very costly and it is to puncture this fallacy that we will conduct the campaign," an official of the company stated recently. "For instance, our solicitors will be able to show, through a brief computation, that the cost of wiring an average eight-room house is but $78, including the necessary fixtures."

Interesting pamphlets have been prepared, setting forth the attractive features of electric service, and calling attention to its safety, convenience, cheapness, cleanliness, beauty and brightness. One pamphlet takes up in detail the methods of wiring old houses with a minimum of trouble. Attention is particularly called to the multiplicity of labor-saving devices which are now open to use in homes where electric current is available.

Canvassers, in soliciting new business, will give the applicant the option of having the work done by any electrical contractor which he may select, of in turning the details over to the company. In the latter event the work will be split among all the electrical contractors of the city, a uniform price having been agreed upon.

"We believe that through the campaign we can bring comforts and economies of electricity to thousands of people," Rail-Light officials declared, in announcing their campaign.

Recreation Center for Boston Edison Employees.

The Edison Electric Illuminating Company of Boston is erecting three buildings and laying out grounds, for a recreation center, in connection with the new service station on Massachusetts Avenue, Boston. There will be a library, recreation building, and a combination dining hall and auditorium grouped on three sides of a square which will be given over to tennis courts and a putting green for clock golf. The buildings will be of terra cotta with cement-stucco finish, the inside finish being of scoured plaster and cypress. The fronts of the three buildings will be provided with ample piazzas which will be connected by means of a curving covered walk, the total length of this promenade being 683 feet.

The buildings and grounds will be under the management of a separate department, with a superintendent and corps of assistants. The center is for the use of the 1,900 employees of the Edison Company, who may have guests, and will furnish the advantages of a club, to which there will be no dues nor contributions. A restaurant, open continuously, will be a feature of the place, and there will be accommodations for entertainments and dances, a billiard and three pool tables, four bowling alleys, lounging rooms, shower baths, a writing room, game and committee rooms, and 13 sleeping rooms.

The employees of the company are scattered over the 700 square miles of the Edison territory, but some 500 will be employed in the service building, of which the recreation groups is a part, and the central location of this station makes it available to employees in all parts of the territory. The management will provide every facility for the fullest and most beneficial use of the center.

Growth of Muskogee Gas & Electric Company.

The Muskogee Gas & Electric Company was organized December 28, 1906, to take over the business of the Muskogee Electric & Gas Company and the Muskogee Ice & Power Company. The organization was perfected by H. M. Byllesby & Company and the property came under its management at that time.

The city and company have fulfilled all promises and predictions. In the seven years from January 1, 1907, to January 1, 1914, the population increased 50 per cent. As compared with this, the company's electric customers increased 173 per cent.

The company's gas output for the year 1907 was 448,378,000 cubic feet. For the calendar year just ended it was 1,683,437,000 cubic feet, an increase of 274 per cent. For the same period the company's electric output increased from 2,810,000 to 5,661,000 kilowatt-hours, an increase of 101 per cent. From an electric station capacity of 1,540 kilowatts, improvements, extensions and additions from time to time have increased the capacity to 4,000 kilowatts. The company's connected load comparison in detail follows:

	1913	1907	Increase	Per Cent Increase
Customers	3,256	1,190	2,066	173
Kilowatts lighting load	4,021	949	3,072	323
Horsepower in motors	2,453	478	1,975	413
Total connected kilowatts all purposes	6.056	1,373	4,683	341
Miles pole line	77	21.2	55.8	263
Population per meter	9.3	17	.....	...

California Towns Lower Rates.

A reduction in electric rates from eight to seven cents a kilowatt-hour for Los Angeles, Riverside, San Bernardino, Orange and Kern counties, but not including Los Angeles city, effecting a saving to electric consumers of approximately $250,000 a year, was declared on January 6 by the Southern California Edison Company.

The reduction is the second made by the company, the first being declared about a year ago when a maximum rate of eight cents was declared, reducing the rate from nine and 10 cents per kilowatt-hour and effecting a saving at that time to consumers of about $240,000 a year.

AN ACCOUNTING SYSTEM FOR SMALL CENTRAL STATIONS.[1]

By H. G. D. Nutting.[2]

The purpose of this paper is to show forms and methods to be used by the busy plant operator who fills every position from manager to meter man. It applies particularly to the requirements of the Wisconsin Railroad Commission but can be used with some modifications in other states. The data given are the result of the development of a system in an actual central station, modified in accordance with the opinion and judgment of accountants in larger central stations.

Accounts are kept for three reasons: (1) to show the condition of the business at any time; (2) to show its tendencies; and (3) to detect fraud.

Only simple, short methods should be used making the complete and accurate record of a transaction in the shortest time possible and with the smallest amount of work.

The "objective system" is recommended. That is,—using original memoranda and vouchers, and filing them as permanent records of the transaction.

The Shannon No. 12 filing case and clip is used for all filing. The following filing cases are required.

(1) Monthly and Yearly Reports. (File by dates.)

(2) Invoices Unpaid and Paid. (File separately, alphabetically and by dates.)

(3) Purchase Orders Filled and Unfilled. (File separately, alphabetically and by dates.)

(4) Cancelled Check File. (File alphabetically by dates.)

(5) General Transaction. (Journal, Day Book and miscellaneous entries of controlling accounts). One file case for each month. File by dates and number sheets at end of month.

So far as the accounting records are concerned, the ultimate object is to facilitate the making up of the annual Railroad Commission report.

All forms are based on and designed to work to the making of the monthly report, the recapitulation of which makes up the Railroad Commission report. The monthly report is shown by forms 1, 2, 3, 4 and 5. In order to show the working of the forms complete, they are provided for a combination electric and water plant. The monthly report consists of:

(1) Income account; (2) balance sheet; (3) detailed report of income and expense; and (4) statistical sheet. It also provides for: (a) monthly statement of income or deficit; (b) disposition of net income; and (c) monthly statement of accounts receivable. Each account is given a number and all entries made by number.

Some accounts are included that need not be kept in the divided form shown on the report, particularly in Class C plants. In any particular case these can be combined into one. The same is true of the statistical data.

Service Ledger.

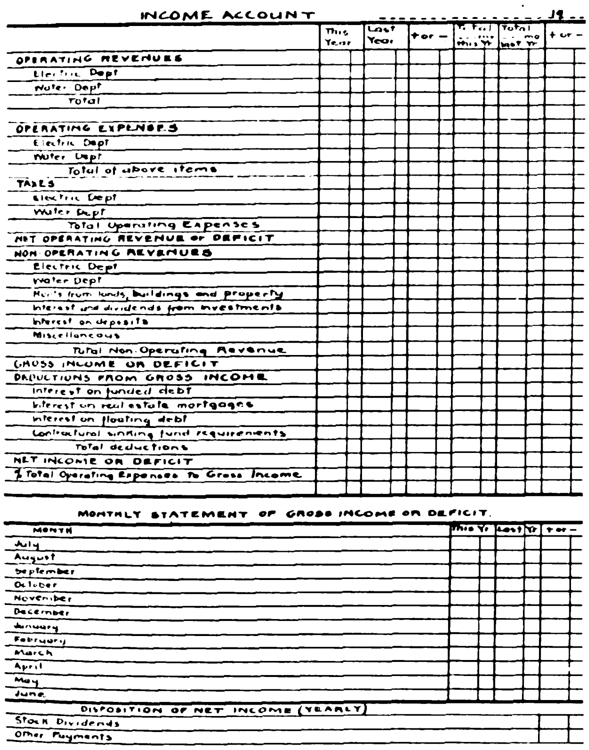
A proper record of the service earnings and their sources is essential. The consumer's service ledger is the book provided for this purpose. There are nearly as many forms of consumer's ledger as there are utilities. In general their make up may be based on (1) names; and (2) premises.

If based on names they may be arranged alphabetically or routed. If on premises they are usually routed. On account of the fact that, when a consumer moves, the premises data remain the same, the premise basis is recommended.

The consumer's ledgers may be, (a) horizontal; or (b) vertical. The horizontal ledger is one whose consecutive monthly records continue in a horizontal line and throughout several pages as the year proceeds. The vertical ledger is one whose consecutive monthly records continue in vertical columns. Usually one sheet will take care of four years, two years on each page.

In the horizontal ledger one sheet may contain about 25 premise records. In the vertical ledger each sheet is the record of only one premise. The horizontal type has the advantage of a monthly check. Also a greater number of accounts can be conveniently handled. It is therefore recommended. The vertical type cannot be checked monthly, but can be checked yearly.

Form 17 and 18 shows the ruling for the horizontal ledger designed for combination plants. Utilities having only one department can either leave



INCOME ACCOUNT ------------------ 19..

	This Year	Last Year	+ or −	Total this Yr	Total mo last Yr	+ or −
OPERATING REVENUES						
Electric Dept						
Water Dept						
Total						
OPERATING EXPENSES						
Electric Dept						
Water Dept						
Total of above items						
TAXES						
Electric Dept						
Water Dept						
Total Operating Expenses						
NET OPERATING REVENUE or DEFICIT						
NON-OPERATING REVENUES						
Electric Dept						
Water Dept						
Rents from lands, buildings and property						
Interest and dividends from investments						
Interest on deposits						
Miscellaneous						
Total Non-Operating Revenue						
GROSS INCOME OR DEFICIT						
DEDUCTIONS FROM GROSS INCOME						
Interest on funded debt						
Interest on real estate mortgages						
Interest on floating debt						
Contractural sinking fund requirements						
Total deductions						
NET INCOME OR DEFICIT						
% Total Operating Expenses To Gross Income						

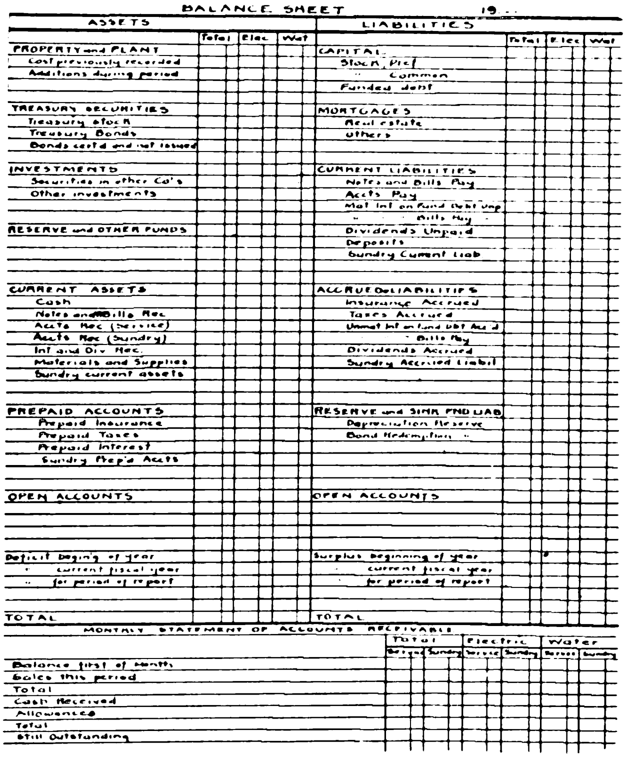
MONTHLY STATEMENT OF GROSS INCOME OR DEFICIT.

MONTH	This Yr	Last Yr	+ or −
July			
August			
September			
October			
November			
December			
January			
February			
March			
April			
May			
June			

DISPOSITION OF NET INCOME (YEARLY)

Stock Dividends	
Other Payments	

Form 1, Income Account.



BALANCE SHEET 19..

ASSETS	Total	Elec	Wat	LIABILITIES	Total	Elec	Wat
PROPERTY and PLANT				CAPITAL			
Cost previously recorded				Stock, Pref			
Additions during period				" Common			
				Funded debt			
TREASURY SECURITIES				MORTGAGES			
Treasury stock				Real estate			
Treasury Bonds				others			
Bonds cert'd and not issued							
INVESTMENTS				CURRENT LIABILITIES			
Securities in other Co's				Notes and Bills Pay			
Other investments				Accts Pay			
				Mat Int on Fund Debt Unp			
				" " Bills Pay			
RESERVE and OTHER FUNDS				Dividends Unpaid			
				Deposits			
				Sundry Current Liab			
CURRENT ASSETS				ACCRUED LIABILITIES			
Cash				Insurance Accrued			
Notes and Bills Rec				Taxes Accrued			
Accts Rec (Service)				Unmat Int on fund Dbt Acc'd			
Accts Rec (Sundry)				" Bills Pay			
Int and Div Rec.				Dividends Accrued			
Materials and Supplies				Sundry Accrued Liabil			
Sundry current assets							
PREPAID ACCOUNTS				RESERVE and SINK FND LIAB			
Prepaid Insurance				Depreciation Reserve			
Prepaid Taxes				Bond Redemption "			
Prepaid Interest							
Sundry Prep'd Accts							
OPEN ACCOUNTS				OPEN ACCOUNTS			
Deficit begin'g of year				Surplus beginning of year			
" current fiscal year				" current fiscal year			
" for period of report				" for period of report			
TOTAL				TOTAL			

MONTHLY STATEMENT OF ACCOUNTS RECEIVABLE

	Total		Electric		Water	
	Service	Sundry	Service	Sundry	Service	Sundry
Balance first of month						
Sales this period						
Total						
Cash Received						
Allowances						
Total						
Still Outstanding						

Form 2, Balance Sheet.

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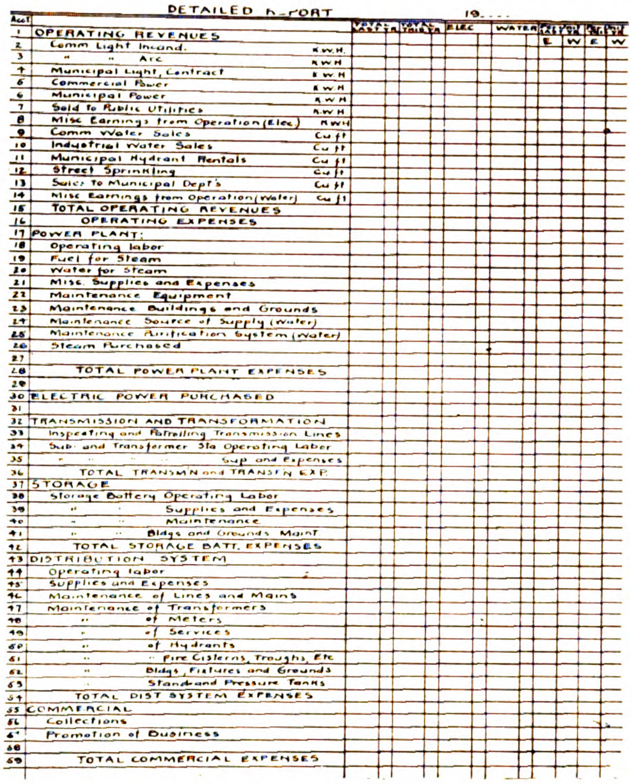
[1] A paper presented before the recent convention of the Wisconsin Electrical Association.

[2] Assistant to the president, Clement C. Smith properties.

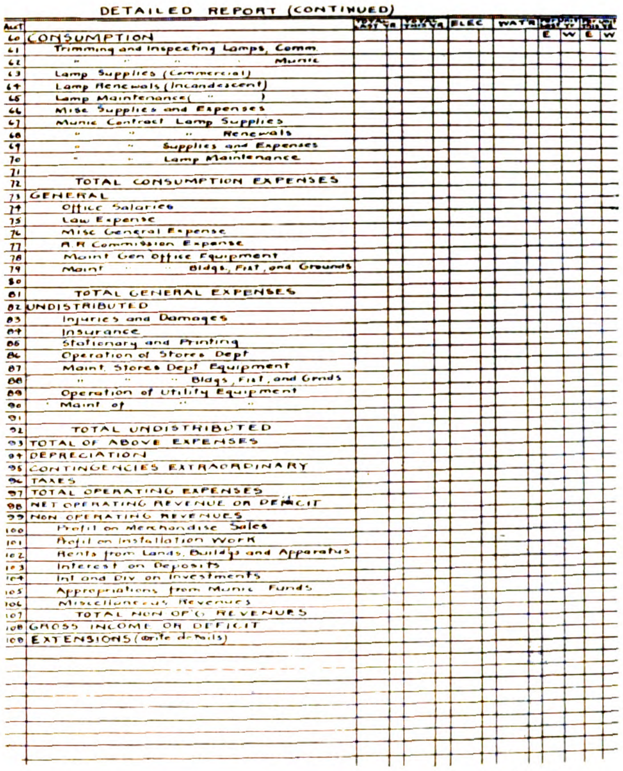
the unnecessary columns blank or omit them entirely in ruling. Manifestly omitting them entirely will reduce the size of the covers.



DETAILED REPORT 19....

Acct			TOTAL LAST YR	TOTAL THIS YR	ELEC	WATER	PER UNIT LAST YR		PER UNIT THIS YR	
							E	W	E	W
1	OPERATING REVENUES									
2	Comm Light Incand.	K.W.H.								
3	" " Arc	K.W.H								
4	Municipal Light, Contract	K.W.H								
5	Commercial Power	K.W.H								
6	Municipal Power	K.W.H								
7	Sold to Public Utilities	K.W.H.								
8	Misc Earnings from Operation (Elec.)	K.W.H								
9	Comm Water Sales	Cu ft								
10	Industrial Water Sales	Cu ft								
11	Municipal Hydrant Rentals	Cu ft								
12	Street Sprinkling	Cu ft								
13	Sales to Municipal Dept's	Cu ft								
14	Misc Earnings from Operation (Water)	Cu ft								
15	TOTAL OPERATING REVENUES									
16	OPERATING EXPENSES									
17	POWER PLANT:									
18	Operating labor									
19	Fuel for Steam									
20	Water for Steam									
21	Misc. Supplies and Expenses									
22	Maintenance Equipment									
23	Maintenance Buildings and Grounds									
24	Maintenance Source of Supply (Water)									
25	Maintenance Purification System (Water)									
26	Steam Purchased									
27										
28	TOTAL POWER PLANT EXPENSES									
29										
30	ELECTRIC POWER PURCHASED									
31										
32	TRANSMISSION AND TRANSFORMATION									
33	Inspecting and Patrolling Transmission Lines									
34	Sub- and Transformer Sta Operating Labor									
35	" " " " Sup and Expenses									
36	TOTAL TRANSM'N and TRANSF'N EXP.									
37	STORAGE									
38	Storage Battery Operating Labor									
39	" " Supplies and Expenses									
40	" " Maintenance									
41	" " Bldgs and Grounds Maint.									
42	TOTAL STORAGE BATT. EXPENSES									
43	DISTRIBUTION SYSTEM									
44	Operating labor									
45	Supplies and Expenses									
46	Maintenance of Lines and Mains									
47	Maintenance of Transformers									
48	" of Meters									
49	" of Services									
50	" of Hydrants									
51	" " Fire Cisterns, Troughs, Etc									
52	" Bldgs, Fixtures and Grounds									
53	" Standpipe and Pressure Tanks									
54	TOTAL DIST SYSTEM EXPENSES									
55	COMMERCIAL									
56	Collections									
57	Promotion of Business									
58										
59	TOTAL COMMERCIAL EXPENSES									

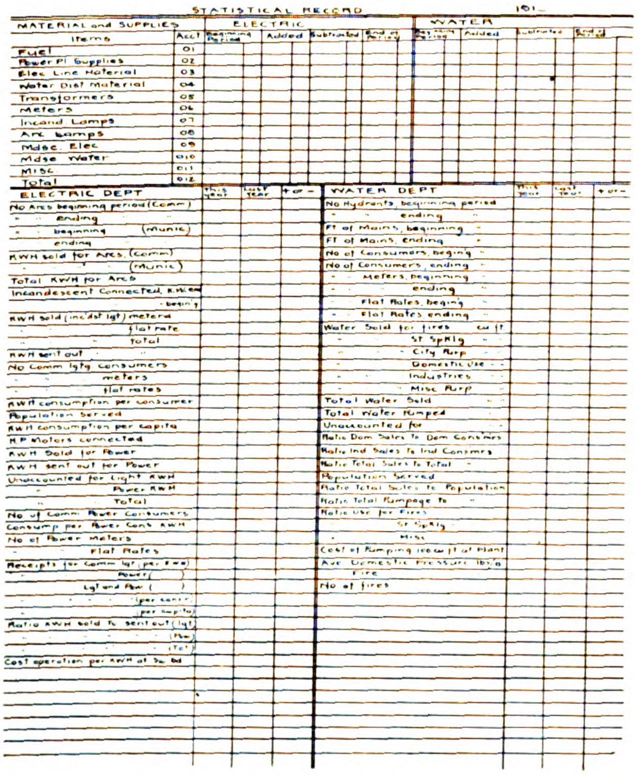
Form 3, Detailed Report.



DETAILED REPORT (CONTINUED)

Acct		TOTAL LAST YR	TOTAL THIS YR	ELEC	WATR	PER UNIT LAST YR		PER UNIT THIS YR	
						E	W	E	W
60	CONSUMPTION								
61	Trimming and Inspecting Lamps, Comm								
62	" " " " Munic								
63	Lamp Supplies (Commercial)								
64	Lamp Renewals (Incandescent)								
65	Lamp Maintenance (")								
66	Misc Supplies and Expenses								
67	Munic Contract Lamp Supplies								
68	" " " Renewals								
69	" " Supplies and Expenses								
70	" " Lamp Maintenance								
71									
72	TOTAL CONSUMPTION EXPENSES								
73	GENERAL								
74	Office Salaries								
75	Law Expense								
76	Misc General Expense								
77	R.R Commission Expense								
78	Maint Gen Office Equipment								
79	Maint " " Bldgs, Fixt, and Grounds								
80									
81	TOTAL GENERAL EXPENSES								
82	UNDISTRIBUTED								
83	Injuries and Damages								
84	Insurance								
85	Stationary and Printing								
86	Operation of Stores Dept								
87	Maint. Stores Dept Equipment								
88	" " " Bldgs, Fixt, and Grnds								
89	Operation of Utility Equipment								
90	Maint of " "								
91									
92	TOTAL UNDISTRIBUTED								
93	TOTAL OF ABOVE EXPENSES								
94	DEPRECIATION								
95	CONTINGENCIES EXTRAORDINARY								
96	TAXES								
97	TOTAL OPERATING EXPENSES								
98	NET OPERATING REVENUE OR DEFICIT								
99	NON OPERATING REVENUES								
100	Profit on Merchandise Sales								
101	Profit on Installation Work								
102	Rents from Lands, Buildgs and Apparatus								
103	Interest on Deposits								
104	Int and Div on Investments								
105	Appropriations from Munic Funds								
106	Miscellaneous Revenues								
107	TOTAL NON OP'G REVENUES								
108	GROSS INCOME OR DEFICIT								
109	EXTENSIONS (write details)								

Form 4, Continuation of Detailed Report.

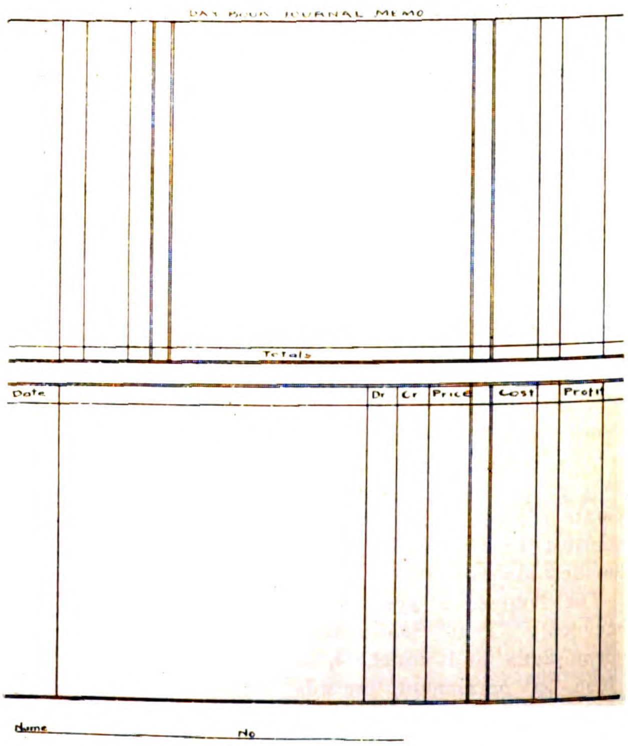


STATISTICAL RECORD 191–

MATERIAL and SUPPLIES		ELECTRIC				WATER			
Items	Acct	Beginning Period	Added	Subtracted	End of Period	Beginning Period	Added	Subtracted	End of Period
Fuel	01								
Power Pl Supplies	02								
Elec Line Material	03								
Water Dist Material	04								
Transformers	05								
Meters	06								
Incand. Lamps	07								
Arc Lamps	08								
Mdse. Elec	09								
Mdse Water	010								
Misc	011								
Total	012								

ELECTRIC DEPT	This Year	Last Year	+ or –	WATER DEPT	This Year	Last Year	+ or –
No Arcs beginning period (Comm)				No Hydrants, beginning period			
" " ending				" " ending "			
" " beginning (Munic)				Ft of Mains, beginning "			
ending				Ft of Mains, ending "			
KWH sold for Arcs. (Comm)				No of Consumers, begin'g "			
" " (Munic)				No of Consumers, ending "			
Total KWH for Arcs				" " Meters, beginning "			
Incandescent Connected, KW end				" " ending "			
" begin'g				" " Flat Rates, begin'g "			
KWH sold (inc'dst lgt) metered				" " Flat Rates, ending "			
" " flat rate				Water Sold for fires cu ft			
" " total				" St. Sp'k'g "			
KWH sent out				" " City Purp "			
No Comm lgtg consumers				" Domestic Use "			
" " meters				" " Industries "			
" " flat rates				" " Misc Purp "			
KWH consumption per consumer				Total Water Sold "			
Population served				Total Water Pumped "			
KWH consumption per capita				Unaccounted for "			
H.P Motors connected				Ratio Dom Sales to Dom Cons'm'rs			
KWH Sold for Power				Ratio Ind Sales to Ind Consmrs			
KWH sent out for Power				Ratio Total Sales to Total "			
Unaccounted for Light KWH				Population Served			
" Power KWH				Ratio Total Sales to Population			
" Total				Ratio Total Pumpage to "			
No of Comm Power Consumers				Ratio Use for Fires			
Consump per Power Cons KWH				" St Sp'k'g			
No of Power Meters				" Misc			
" Flat Rates				Cost of Pumping 1000 cu ft at Plant			
Receipts for Comm lgt (per KWH)				Ave Domestic Pressure lbs/a			
" Power ( )				" Fire			
Lgt and Pow ( )				No of fires			
" " " (per consr)							
" (per capita)							
Ratio KWH sold to sent out (lgt)							
" " " (Pow)							
" " " (Tot)							
Cost operation per KWH at Sw bd							

Form 5, Statistical Record.



DAY BOOK JOURNAL MEMO

Totals

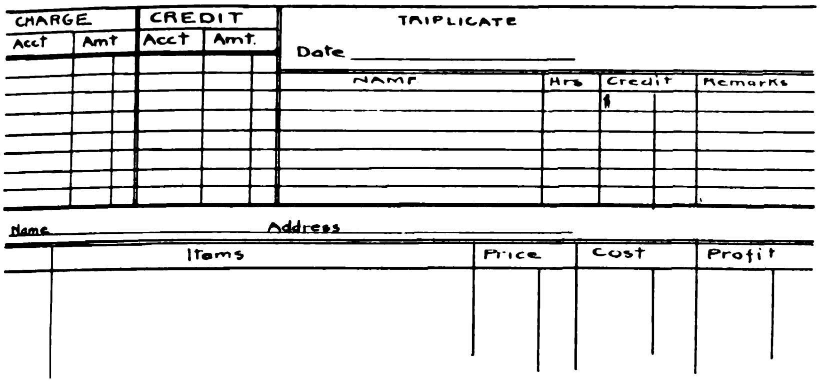
Date		Dr	Cr	Price	Cost	Profit

Name ________ No ________

Form 13, Day Book Journal Memo.

The consumer's ledger form shown provides for the entering of the premise number as a basis for billing. The next column provides for the entering of five names of succeeding consumers who may live in a given premise. This makes it possible to route the accounts, thus facilitating billing from the meter reading books. At no time in the process is it necessary to shuffle meter-reading sheets, bills or consumers ledger sheets.

Attention is called particularly to some features of this form, which are the invention of George Allison, and which have made it convenient and practical. One is the provision for taking care of new accounts without disturbing the order of routing. Each page is ruled for 25 accounts. Only 20 of these are filled out, the other 5 being left blank for new accounts. When a new consumer is connected between any two present consumers, the premise number is written in one of the five extra spaces at the bottom of the sheet and its line (or account) number inserted on the line between the two accounts where it should have



CHARGE | CREDIT

Acct | Amt | Acct | Amt

TRIPLICATE

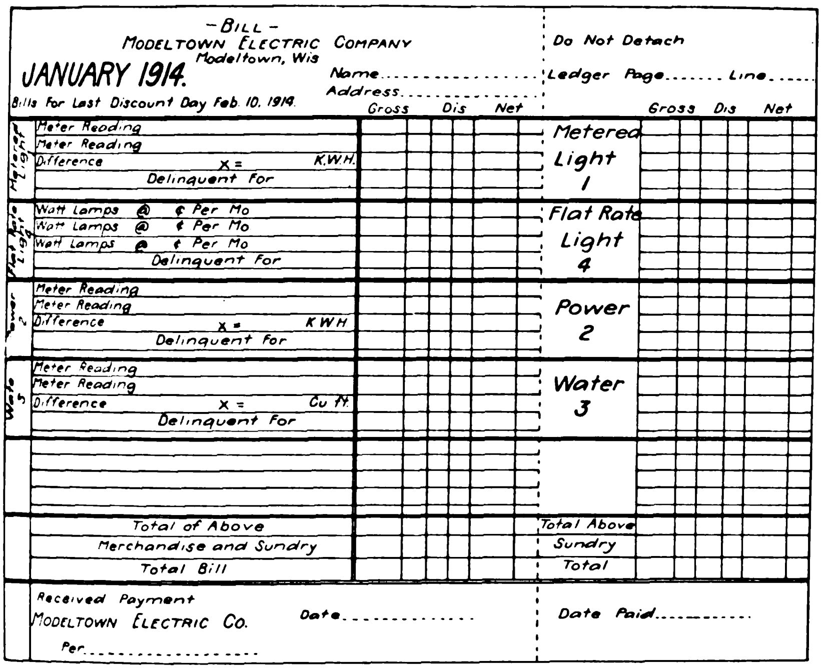
Date

Name | Hrs | Credit | Remarks

Name Address

Items | Price | Cost | Profit

Form 8, Credit Memo. for Supplies.



– Bill –
Modeltown Electric Company
Modeltown, Wis

JANUARY 1914.

Bills for Last Discount Day Feb. 10. 1914.

Name ....

Address ....

Do Not Detach

Ledger Page .... Line ....

Gross | Dis | Net

Meter Reading

Meter Reading

Difference X = K.W.H.

Delinquent For

Metered Light 1

Watt Lamps @ ¢ Per Mo

Watt Lamps @ ¢ Per Mo

Watt Lamps @ ¢ Per Mo

Delinquent For

Flat Rate Light 4

Meter Reading

Meter Reading

Difference X = KWH

Delinquent For

Power 2

Meter Reading

Meter Reading

Difference X = Cu Ft

Delinquent For

Water 3

Total of Above

Merchandise and Sundry

Total Bill

Total Above

Sundry

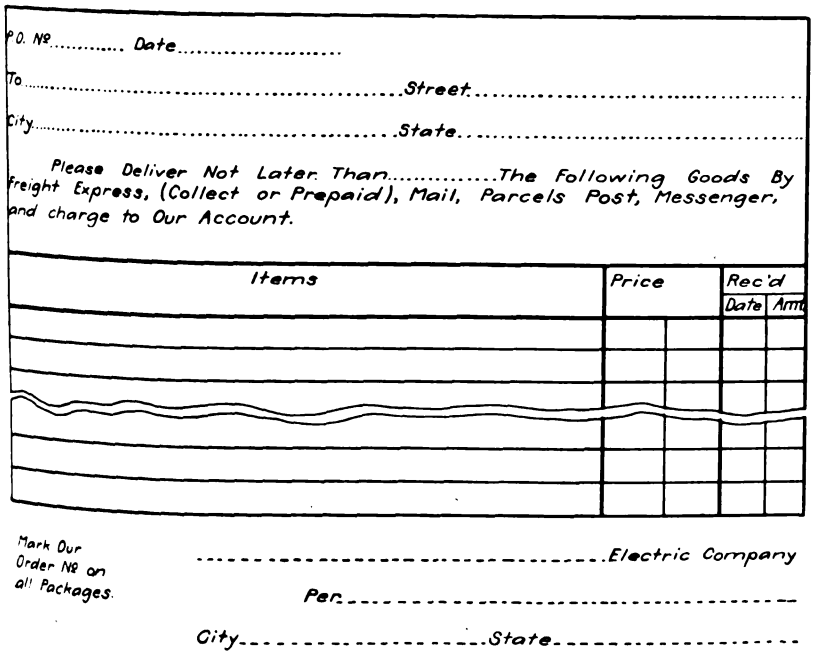
Total

Received Payment
Modeltown Electric Co.
Per ....

Date ....

Date Paid ....

Form 9, Customer's Bill.



P.O. No .... Date ....

To .... Street ....

City .... State ....

Please Deliver Not Later Than .... The Following Goods By Freight Express, (Collect or Prepaid), Mail, Parcels Post, Messenger, and charge to Our Account.

Items | Price | Rec'd Date | Amt

Mark Our Order No on all Packages.

.... Electric Company

Per ....

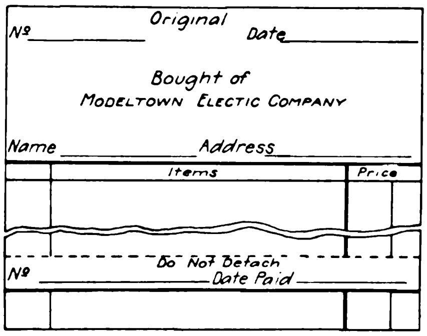
City .... State ....

Form 10, Purchase Order.

been. This scheme can be extended further by carrying over the additions to the last page of a certain district. Then, when recording the bills in the consumer's ledger, those not appearing on the page in accordance with their normal routing, are thrown out and entered in a group on the page at the end of the particular district.

Another feature is the novel scheme for taking care of current month discounts. The net-bill columns are numbered and these numbers carried to the "current month discount" column so that any discount entry can be identified with its principle. Inspection of the form will show how this is done.

The use of the consumer's ledger goes hand in hand with billing for service. The methods of doing this are based on the meter reading sheet. (Form 11.) The meter reading sheets are of different color for each department and are arranged in route books, the number of route books depending on the size and arrangement of the city. When the meter books are brought in the method of procedure is as follows: (1) Calculate consumption and record on meter sheets; (2) figure bills but do not total; (3) transfer bills to customer's ledger; (4) enter delinquent accounts on bills; (5) transfer sundry accounts to service bills; (6) total each bill; and (7) add earnings from consumer's ledger net-bill column, enter on journal voucher memo, post to general ledger, charging accounts receivable and crediting earnings by departments.



No .... Original Date ....

Bought of
Modeltown Electric Company

Name .... Address ....

Items | Price

Do Not Detach

No .... Date Paid ....

Forms 6 and 7, Bill for Supplies.

The bills are now ready to send out. Several methods of placing the bills in the hands of the customer may be followed: (1) they may be delivered; (2) mailed in envelopes; or (3) mailed on post cards. Without discussing the advantages and disadvantages of each method, the first method is recommended in most cases.

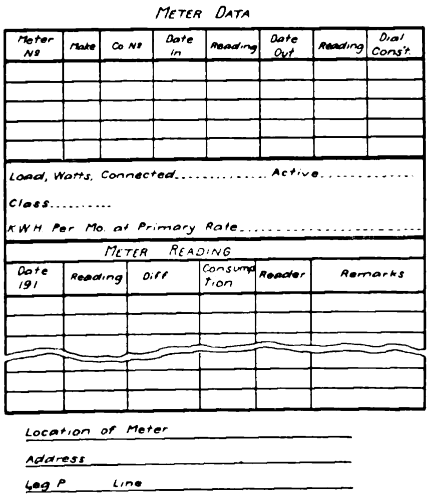
Collections.

The bill forms recommended contemplate the use of the prompt-payment discount. It is generally conceded that this is the best scheme for collecting the majority of the bills.

One of the principal disadvantages

of billing and collecting as described and recommended in the foregoing arises out of the customer's failing to bring in his bill when he comes to pay. This necessitates the cashier's looking up his ledger page number and making out an entirely new bill. On last discount day this delays the speed of handling customers and makes some of them disgruntled. It is suggested that merely the total amounts owed be placed on the bills in such cases, leaving off the meter readings and consumption unless asked for by the consumer.

An alphabetical index of consumers, giving their ledger page numbers is essential. On account of its simplicity, a 3 by 5 card system is favored. Each card will state simply the customer's name and ledger page number. Any other historical information regarding the customer may be placed thereon if desired. It has also been found that the customer can be trained to remember his ledger page number. This often facilitates the making out of bills.


METER DATA

Meter Nº	Make	Co Nº	Date In	Reading	Date Out	Reading	Dial Cons't

Load, Watts, Connected.............. Active..............

Class..........

KWH Per Mo. at Primary Rate..........................

METER READING

Date 191	Reading	Diff	Consumption	Reader	Remarks

Location of Meter

Address

Leg P Line

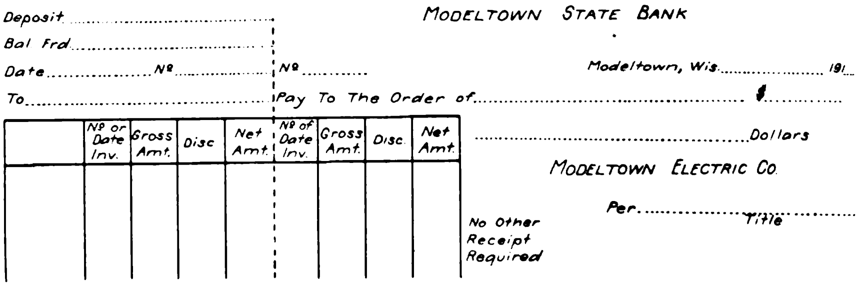
Form 11, Meter Data.

Purchase Orders.

Form 10 is provided for purchase orders. These are put up in book form in two colors. The original is sent to the vender and the duplicate (carbon) left in the book. The orders are numbered consecutively. Every purchase of anything to be invoiced should be on a purchase order. This does not include petty cash purchases. Salesmen should not be permitted to make out orders on their own blanks. Each purchase order should state specifically what is wanted. Too much care cannot be exercised in making out orders. Often apparently small mistakes cost considerable money to rectify.

Purchase Invoices.

Vendors usually acknowledge orders. Upon receipt of acknowledgment by the purchaser it should be checked against the original order and placed on a spindle for future reference. It is not necessary to file or keep acknowledgments after the goods have been received. When the goods come in they should be checked against the duplicate purchase order. The duplicate purchase order should be kept in a "live file" till all goods are received, and moved to a transfer file when order is complete. This can be done in one file case.


Deposit..............................

Bal Frd..............................

Date..................Nº..................

To......................................

Nº............

MODELTOWN STATE BANK

Modeltown, Wis........................191_

Pay To The Order of.. $............

	Nº or Date Inv.	Gross Amt.	Disc	Net Amt.	Nº of Date Inv.	Gross Amt.	Disc.	Net Amt.

....Dollars

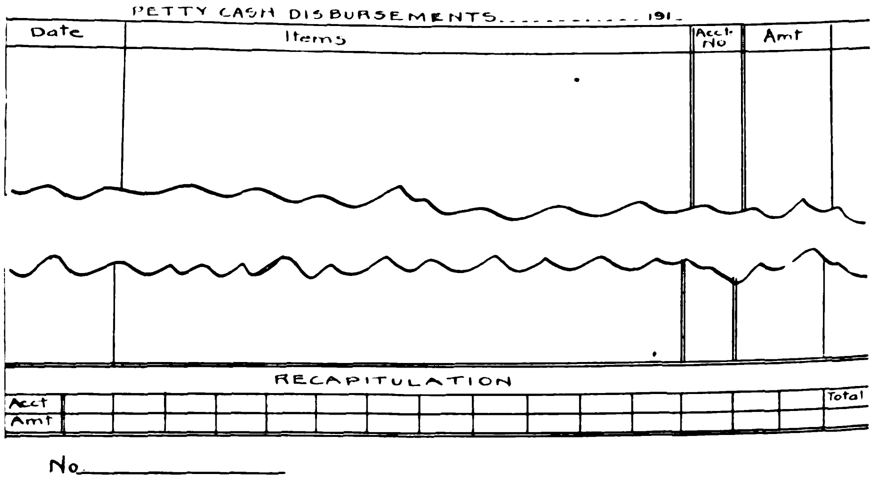
MODELTOWN ELECTRIC CO.

Per.........................Title

No Other Receipt Required

Form 12, Voucher.

There are several ways of handling purchase invoices. The following is recommended as one of the simplest. When the invoice comes in, record it on invoice record (Form 16) and place it in a file labeled "Unpaid Invoices," arranged alphabetically and file by date. In order to keep proper records of purchases every purchase should be charged to the proper account on the invoice record giving the total of each invoice and the account to which it is chargeable before the invoice is filed. The sum of this list, at the end of the month, will be charged through the day book journal to the ledger to the various accounts and credited to accounts payable. Purchase invoices should be discounted if possible, the largest discounts being taken first. In other words the "Unpaid Invoice" file should be kept nearly empty. All invoices should be paid by check (Form 12). The check shown is self explanatory. When cancelled and returned it acts as a receipt, and should be filed by date under the name of the payee. After the check is written its number should be recorded on the invoice it is meant to pay and the invoice filed alphabetically by date under "Paid Invoices." Invoices should always be completely paid if possible, i. e., payments "on account" should be avoided. If it is necessary to make a payment "on account" the date and amount can be recorded on the invoice and the invoice returned to the "Unpaid File."


PETTY CASH DISBURSEMENTS..............191_

Date	Items	Acct. No	Amt

RECAPITULATION

Acct																Total
Amt																

No.____________

Form 14, Petty Cash Disbursements.

At the end of the month the check book stubs should be added and recorded on a day-book journal memo.

Post in the ledger the total to accounts payable, Dr., and to cash, Cr.

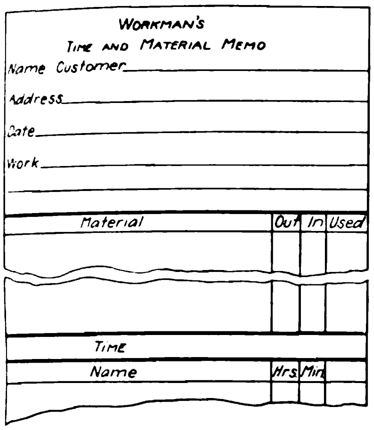
Stores and Supplies.

One of the hardest problems of the small-plant manager is taking care of his stores and supplies, on account of his inability to employ a storekeeper and still make it easy for all workmen to get stores quickly.

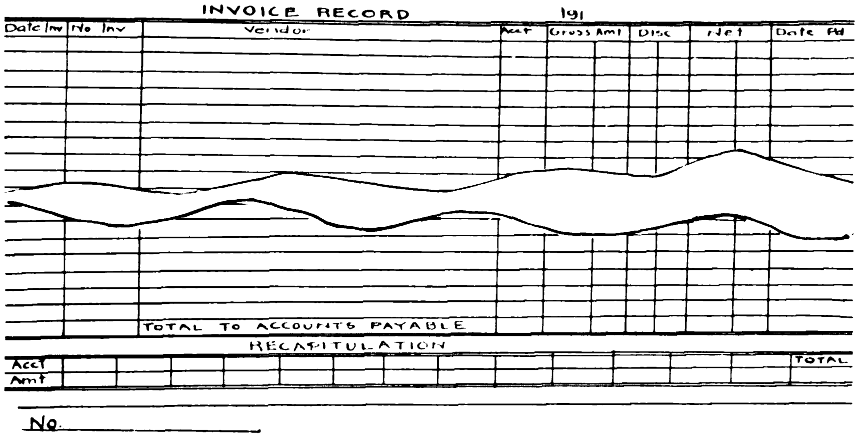
All transactions involving the sale or use of supplies or materials are recorded on forms 6, 7 and 8. This is put up in pads (or on autographic registers) having original, duplicate and triplicate. The various processes are as follows.

Cash Sale of Supplies From Store.

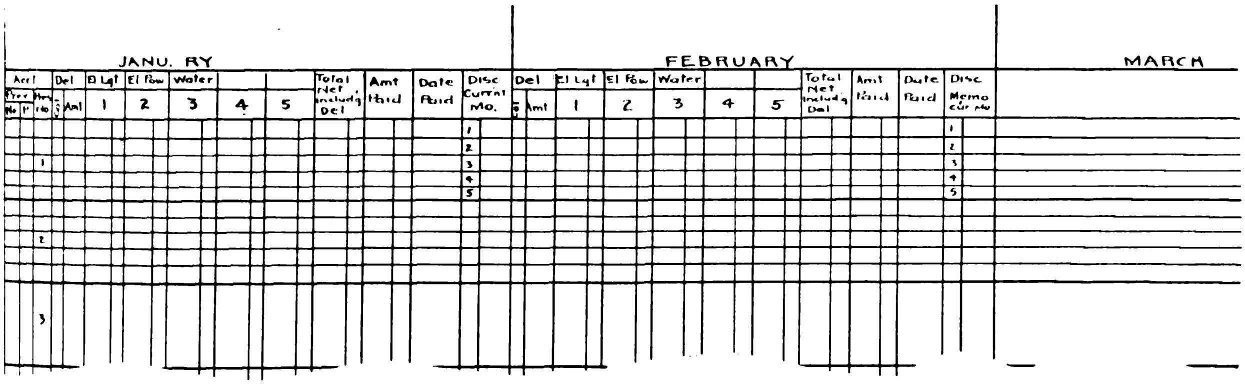
Enter items sold and its price on the original, writing the word "cash" in the blank provided for "name." In the average small plant it is necessary to use only the "triplicate" for this. Then several items can be put on one sheet. This of course requires a sheet (Form 8) to be removed from the pad in the morning of each day and kept in some


WORKMAN'S
TIME AND MATERIAL MEMO
Name Customer
Address
Date
Work
Material
Out
In
Used
Time
Name
Hrs
Min

Form 15, Workman's Time Card.


INVOICE RECORD
191
Date Inv
No Inv
Vendor
Acct
Gross Amt
Disc
Net
Date Pd
TOTAL TO ACCOUNTS PAYABLE
RECAPITULATION
Acct
Amt
TOTAL
No.

Form 16, Invoice Record.


JANUARY
FEBRUARY
MARCH
Acct
Prev Acct
No
P.
Del
Amt
El Lgt
El Pow
Water
1
2
3
4
5
Total Net including Del
Amt Paid
Date Paid
Disc Current Mo.
Memo cur Mo

Form 17.

convenient place for recording entries. The original and duplicate can be thrown away. At the end of the day the sheet is filed in the current month "general transactions" file.

Credit Sales From Store.

Use forms 6, 7 and 8. Write name of purchases on original and record items purchased. Insert price. Give purchaser original, which is his bill for the material. If he goes away without it, mail it to him. The essential feature of collecting accounts receivable promptly is prompt billing.

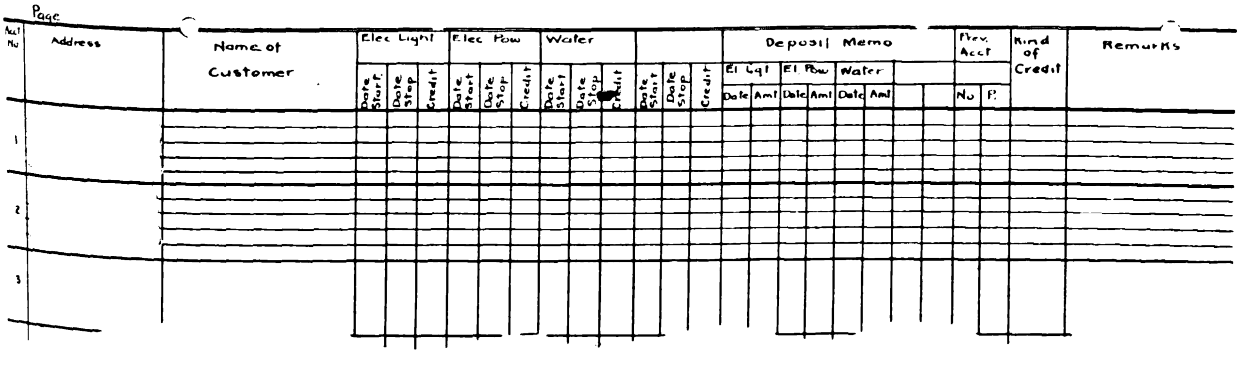
Retain duplicate in a file of "Sundry Accounts Receivable Unpaid." File alphabetically. When bill is paid, tear off "Cash Stub" at bottom. Put cash stub on daily receipts spindle and receipt bill (if customer brought it). If he did not bring it make him out another statement on a bill head provided for the purpose. When posting cash stubs, remove duplicate from "Sundry Accounts Receivable Paid" file. Summarize stubs at end of day. Record on day-book journal voucher charging cash and crediting sundry accounts receivable. The duplicate is used only for memorandum purposes. The triplicate is filed in the "Current Monthly Transactions" file after entering the cost of the materials purchased and the profit charge sundry accounts receivable and credit the proper stock account and profit on merchandise sales.

This system contemplates the careful keeping of a price book which is not a difficult thing to do.

Credit Sales and Expense Account Charges.

This includes credit sales of both material and labor. All jobs, whether they are to be charged to persons or expense accounts, are first recorded on workman's card (Form 15). This first record is made when the attention of the office is called to the necessity of doing the job. The job card is made out in original and duplicate. The original is retained in the office as a follow up. The duplicate is given to the workman as an order. All time and material used on a particular job is recorded on this card by the workman. When the job is done he turns in the card but it must not be carried beyond the end of the month. In case a job is not finished a new card must be made.

When the workman brings in a job card, the data it contains are transferred to form 6, 7 and 8. If chargeable to a personal account it is entered on the original and handled like an


Page
Acct No
Address
Name of Customer
Elec Light
Elec Pow
Water
Date Start
Date Stop
Credit
Deposit Memo
El Lgt
El Pow
Water
Date
Amt
Prev. Acct
No
P.
Kind of Credit
Remarks
1
2
3

Form 18, Customers' Ledger.

ordinary merchandise credit sale as previously explained. If chargeable to an expense account the original and duplicate are torn off and thrown away and the entries made only on the triplicate. The triplicate is then filed in the "current month transactions" file.

Any personal bills remaining in the "Sundry Accounts Receivable" file at the time of billing for service are entered on the service bills and this continued so long as they are unpaid.

Petty Cash Disbursements.

Petty cash disbursements are entered on Form 14. No separate "petty cash" fund is carried. All payments are made direct from main cash drawer and checked against income and outgo daily. As many items as possible are recorded on each "petty cash disbursement" sheet and recapitulated each day or when sheet is full. File in "Current Month Transactions" file.

Recording Cash Collections.

Each day several stubs are received, representing collections for service and sundry accounts. These are placed on a spindle at the moment of receipt. At the end of the day they are summarized, checked against the cash drawer and collected on Shannon double-file clips. At the end of the month they are added. Entry is then made on a day-book journal sheet charging cash and crediting respectively service accounts receivable and sundry accounts receivable.

Pay Roll.

All labor is recorded on job cards. power-house men and others working on only a few accounts are issued enough cards to cover those accounts. They turn them in at the end of the month and they are entered on Form 8 (triplicate). Each workman's name is placed on the sheet but his time is credited to accounts payable. At the end of the month each man's time can be recapitulated from the sheets. Check is written and the amount charged to accounts payable and credited to cash in the regular summing up of the check-book stubs.

Any excess in the price of labor over cost in job orders is credited to profit on wiring and installation on the individual sheets.

At the end of the month depreciation and other regular monthly entries are made on the day-book journal sheet. All transactions required for permanent history are filed in the "Current Month Transactions" file. When this is complete at the end of the month, all sheets are numbered and posting started. Convenience in posting is effected by means of a posting sheet. This is simply a long sheet ruled in as many columns as can be conveniently handled. No account numbers are printed in the columns but these are written in as required during the posting operation. A debit sheet and a credit sheet is required. Each is divided as to electric accounts, water accounts, and electric and water accounts. After posting and summarizing these sheets the totals are carried to the general ledger. After posting the regular forms of trial balance are taken off.

This paper is presented with the realization that it is not easy to discuss so much detail in a way it can be easily understood. The workings of most of the forms will require considerable deep thought. Those who are in daily contact with accounting problems may see some scheme or short cut which appeals to them.

Educational Work of the New York Edison Company.

Twenty-six pupils in the commercial school of The New York Edison Company have completed the prescribed courses with the rating that entitles them to the Edison "A" gold button recently presented to them by Arthur Williams, the company's general inspector. The badge represents a rating of 90 per cent or over in the two years' work prescribed in the company school. This, however, is open to all member companies of the New York Companies Section of the National Electric Light Association, and two of the recipients, Messrs. Leask and Montgomery, are members of the New York and Queens Electric Light & Power Company.

The first year's work covers courses in History and Development of Electricity; Elements of Central-Station Business Getting; Basic Principles of Individual Efficiency; Effective Speaking and Business Letter Writing. In the second year subjects are Hygiene, Health, Recreation, and Elements of Psychology; Basic Principles of Salesmanship; and Policies and Organization of The New York Edison Company.

Of the 24 Edison pupils who were thus graduated with highest honors, 22 are still with the Company, most of these occupying better positions than when they commenced the school work.

Safety First in Electrical Plants.

The Tenney Service Association, consisting of the managers of various public utility companies operated by Charles H. Tenney & Company, Boston, Mass., has appointed a committee to devise plans for minimizing the number of preventable accidents to employees handling this line of work. Palmer York, of this committee, would be pleased to hear from any other companies interested in the work and will be glad to exchange ideas and suggestions for mutual benefit.

Puget Sound Rates Reduced.

The Puget Sound Traction, Light & Power Company and subsidiary companies have announced new schedules of rates applicable to Seattle, Tacoma, Everett, Marysville and King. The reduced rates have been approved by the Public Service Commission of Washington. One of the most important of the new rates is a charge of $2.00 per horsepower per month for current used for irrigating purposes during the summer months. As one horsepower will pump enough water to irrigate an acre, berry growers and others will be able to irrigate at the rate of $2.00 per acre monthly. There is an additional discount on contracts for five months. There is a 20-per-cent reduction in rates for lighting in Pierce and King Counties.

Electric-Vehicle Advertising in Springfield, Mass.

The United Electric Light Company, Springfield, Mass., is conducting a campaign of advertising electric vehicles. It urges the adoption by merchants of electric trucks for city and suburban delivery of goods, and points out that five-ton trucks can run 50 miles on a charge; that they do not freeze in the winter; and that it does not require a chauffeur-machinist to operate this type of vehicle. The wear on tires is also less than with gasoline machines.

The United Company has a fleet of 13 electrics, ranging from 1,000-pound cars to five-ton trucks. They have given entire satisfaction, and the company gives them unqualified endorsement.

Decoration Plans Wanted.

The State Convention of Eagles is to be held in Olathe, Kans., a town of about 3,500 population, next May and it is intended to prepare some electrical decorations for the event. S. M. Brockway, secretary of the Olathe Electric Light & Power Company, should like to receive from other central-station men who have done work of this kind and also from manufacturers and supply men suggestions for carrying out an appropriate scheme of decorations where the available resources are not unlimited.

The city attorney of Bristow, Okla., recently unearthed the ordinance granting a franchise to the local telephone company, which had been mislaid for several years, and found among other things that the ordinance provided for paying two per cent of the gross receipts to the city, a provision which has never been carried out. No record has been kept of the receipts, so that it probably will be impossible for the city to get an accounting.

Electric Sign Data

Some Aspects of Electrical Advertising.

With a view to stimulating interest in questions of vital importance concerning the development and regulation of electric advertising the N. E. L. A. has made the following pertinent suggestions:

The responsibility of the central station for esthetic results, the satisfaction of the advertiser and the increase in display lighting are incontrovertible. Any lack of interest, or unwillingness to assume a proper part of this burden, permits unregulated development and invites restrictions which react and retard legitimate growth.

The installation of unsightly displays or poor mechanical effects creates unfavorable comment and criticism, which eventually leads to unreasonable restrictions.

Care and intelligent judgment should be exercised in the selection and recommendation of displays to the advertisers. The most pertinent satisfactory type, design, size, color combination, flasher, effects, etc., should be selected and advocated. In this manner a result mutually beneficial to advertiser, company and city will be accomplished. At the same time the industry will be protected against unreasonable sign ordinances. All installations should be made with a view to anticipating future municipal requirements by furnishing displays of a high standard, good appearance and proper illuminations, thus offsetting unfavorable developments.

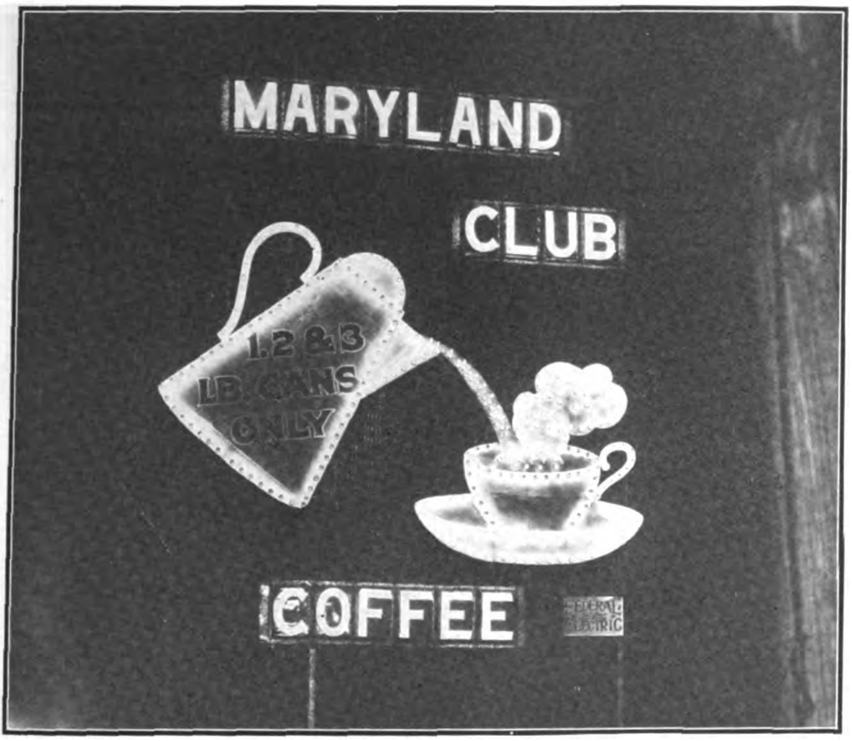
One of the most important features of electrical advertising is the value of motion. The increased efficiency and attractiveness of animated designs greatly exceed the difficulty and expense of caring for the necessary mechanical equipment.

No other form of outdoor advertising is at present so free from criticism and antagonism from esthetic reform organizations as electric advertising. On civic grounds electric advertising is generally recognized as highly desirable. It is the one advertising medium which at the same time serves a distinct commercial service and renders a distinct public service in lighting the thoroughfare. The merchant and manufacture—in fact all who offer commodities or service through this form of advertising—may erect displays indicating their presence, title, wares and functions and while deriving profit therefrom perform an act of appreciated public value.

All electric signs in so far as possible should be beautiful both day and night. Too frequently the daylight aspects are overlooked. As the average use of a display is 18 hours per day, two thirds of which is daylight and one-third artificial light, it is essential that a proper design and combination of pleasing colors be adopted.

Electric advertising in original creations embodying novel mechanical motion effects is the only medium of publicity which is read and reread without tiring the reader.

The central station derives a direct benefit, second only to that of the advertiser, in electrical advertising. In order to further this development central stations should be pioneers in this respect, showing proper evidence of their own faith in its merits by installing a display or displays of sufficient proportions and novelty to establish the highest standard in the community. It is not consistent to solicit actively this class of business while the principal electrical interest of the city is lacking in evidence of its own confidence.



Sign constructed and erected for the Maryland Club Coffee Company, of Baltimore, Md., by the Federal Sign System (Electric), Chicago, Ill.

The sign is approximately 14 feet wide by 25 feet high. There are a total of 400 five-watt lamps used.

The flasher effect simply comprises the lighting of the letters reading "Maryland Club Coffee" and then after a brief interval the coffee pot and cup. The stream of coffee and the vapor are studded with lamps.

No color effects are used.

The reading matter is composed of standard Federal letters, 16 inches high.

Price, complete, will be given on request.

Electrical Construction

Wiring Fixtures.

The careless, hasty workman seldom makes a success at wiring fixtures, especially so if the arm contains a right-angle turn. Usually the fault lies in the fact that proper preparations are not made to do the work. If the arm contains a right-angle turn the fixture wires will seldom pass through by being simply pushed through the tube. In almost every case it is advisable to first pass through a single wire to which the fixture wires may be attached. The method employed to make the single wire pass may be according to any good plan. Some of the best recommended plans are to tie a single ball from a pull socket on a string or thread, which may then be blown or pushed through the tube; another plan is to make a hook on one end of each of two pieces of fine wire, say 20 gauge wire; then by pushing in the two pieces from opposite ends they may be hooked together and the single wire drawn through. When using this plan, care should be taken to draw the wire through in the direction of the shortest run, past the right-angle turn. If the first single wire used is of very light gauge, another heavier-gauge wire may be attached and drawn through before attaching the fixture wires.

It is a mistake to remove the insulation from the fixture wires, so that the insulated ends lay close together. A much better method than this, is to remove the insulation from one, say for a distance of one or two inches more than the other, thereby avoiding compelling both ends to pass the same point at the same time; then too, the insulation should be removed with a sharp knife and the cut made cone shaped. This method makes it more certain that the insulation will not bunch up, should it happen to strike a slight obstruction in the fixture.

When drawing in the fixture wires, if any trouble is experienced because the fixture wires do not pass readily through the tube, it will be found to be of advantage to apply a lubricant to the inside of the tube, then fasten the end of the drawing-in wire in a vise, or wind its end around a nail and draw up tight with one hand and gently push the fixture wire through the tube in the desired direction with the other hand.

William A. Murray.

Boosting for Quality.

At the recent meeting of the Wisconsin Electrical Contractors' Association, one of the topics of discussion was the apparent unwillingness of the electrical contractor to boost quality material. There was so much competition and so important did it seem to be that a low price should be made on every job that came through, that the contractor dare not specify good material for fear of losing the job.

This is entirely different from the standpoint of at least one contractor. E. M. Raetz and Company, proprietors of the Electric Shop at 16 West College Street, Rochester, Minn., strike out for quality and keep on striking out for it even if they do not get home with the message until the second and third times after a job has gone to a low man. A reasonable amount of persistence in this direction has convinced this company that an unrelenting effort will convince any customer that the best kind of work, using the highest quality of material, is the cheapest in the end.

> **:- Why Electricians Estimates Differ -:**
>
> **THE answer is we never get a chance to explain. No specification ever made was complete. All estimates differ on the one thing not specified. QUALITY. Each bidder quoted you on HIS quality, all you can do is specify the location of lights and switches. The manner of carrying out your direction depends on the HONESTY and skill of the contractor doing the work—YOU never know the difference. Most of the work don't show anyway. Perhaps in five years after the job is done you will know more about the kind of a job you got. The object we are striving for is that some day no one will question our price on a job and we point with pride to the progress we are making toward our goal.**
>
> **E. M. Raetz & Co.**

Card Used by Electrical Contractor.

One of the ways that E. M. Raetz and Company talk quality is by submitting a copy of a message recently distributed by the firm of Jones & Kroeger, printers, of Winona, Minn., with each bid. The message in its identical form is reproduced herewith.

A proper use of such assistance as this, backed up by a few successful issues, will do much to help the far-sighted and quality-boosting contractor out of the difficult position that some of his weaker brothers place him in.

Quick Connections for Meter Testing.

In the testing of customers, 5, 10 and 15-ampere, 110 and 220-volt meters with a standard rotating portable test meter and testing rheostate, I find that much time can be saved in making connections with the proper use of a few standard wiring devices.

For connection for the potential coil of the test meter I use two test clamps soldered to the portable cord. These clamp on the blades of the entrance switch, and are safe and efficient. For connection for the load current I use a piece of No. 10 portable lamp cord. For connecting to the wiring in the meter cabinet, I have attached a small separable attachment plug, using only one contact of the plug, to each wire of the portable cord. Then by taking the fuses from the cutout of a circuit and inserting the attachment plugs in their place (taking care that the wired contact in the cap is in contact with the line side in the plug) a very quick and efficient connection can be made. Both the connection for the potential and load wires can thus be made in a moment's time and without disturbing any of the wiring in the meter cabinet.

E. M. Lothrop.

◆

Removing Static Charge From a Belt.

Recently I had trouble with a belt of a high-speed motor, the large amount of static produced by the fast-moving belt appearing to draw the belt close to the end plate of the motor, so that every time the joint in the belt came around it struck the oil well of the bearing. The pulley was approximately of the same size as the bearing housing. To overcome this I cut a piece of copper strip with teeth on the edge and soldered it in a slot cut in the end of a piece of No. 6 copper wire. I mounted this in front of the belt and connected it to ground. This remedied the trouble. The motor itself was not grounded.

William T. Estlick.

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Midwinter Convention of Minnesota Contractors.

The Minnesota Electrical Contractors' Association held a mid-winter meeting at Duluth on January 19.

The meeting was called to order at 10:30 a. m. by President A. W. Zahm, of the Minneapolis Electrical Equipment Company. President Zahm made an address in which he emphasized the desirability of better work and improved conditions, and laid particular emphasis upon harmonious working together to bring about closer relations between present and future members. This was followed by a general discussion, G. M. Jones and R. H. Eddy summarizing the discussion along the same lines at the national convention at Chattanooga.

After the reports of committees and officers, there was a discussion in regard to the bookkeeping system of the National Electrical Contractors' Association. The secretary was directed to obtain a complete set, which is to be sent to each member for examination and study for two weeks or longer. Each member is expected to go over this system thoroughly and see if it is possible to better his own system of accounting. It was also suggested that members call on other contractors who are not members of the association, explaining the system to them and pointing out its advantages.

An address was made by A. W. Lindgren on the Society for Electrical Development, in which he urged all contractors to join. This was followed by a discussion as to the benefits which might be derived by contractors through such membership.

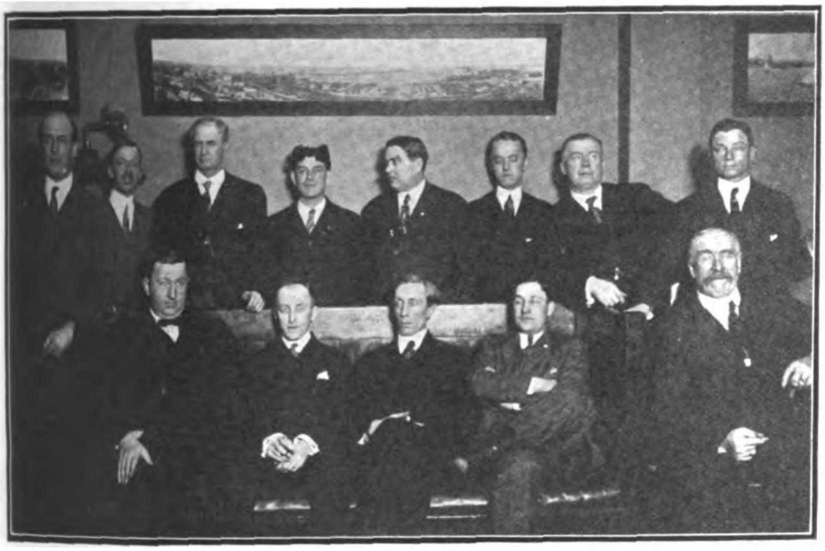
A discussion on attendance resulted in members being urged to attend meetings of both the state and national associations. Such attendance fully repays members through the new ideas and enthusiasm which is injected into their business and personal relations.

A Jovian dinner was served at the Elks Club and was a very enjoyable affair. Following this a photograph of the group shown in the accompanying illustration was taken.

The afternoon session was called to order at 2 p. m. St. Paul was selected as the place for the next meeting, which will be held June 15, 1914. The president appointed the following members upon the Publicity Committee: W. H. Vilett, Minneapolis, chairman; R. H. Eddy, St. Paul; A. W. Lindgren, Duluth.

In the evening a banquet was tendered the visiting members by the Duluth members. This was followed by a theater party.

The members attending the meeting, as shown in the group photograph, are as follows: Standing, from left to right; G. G. Ryder, Minneapolis; R. H. Eddy, St. Paul; G. M. Jones, Minneapolis; O. H. Bakke, Minneapolis; W. H. Villett, Minneapolis; J. M. Hannaford, Jr., St. Paul; George V. Burgess, Duluth; W. J. Chapman, Minneapolis. Front row, sitting, left to right: J. W. Day, Duluth; H. J. Auren; A. W. Zahm, Minneapolis; M. J. Lavalle, Minneapolis; William Burgess, Duluth.



Minnesota Contractors at Duluth.

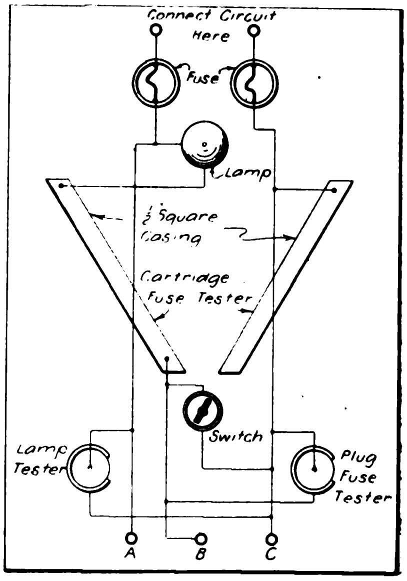
Baltimore Contractors Elect Officers.

The monthly meeting of the Electrical Contractors' Association of Baltimore, Md., was held on the evening of January 13 at the Hotel Junker. The following officers were elected: President, John S. Dobler; vice-president, William S. Samuel; secretary, William D. Young; members of Executive Board, William D. Young, Charles B. Mills and William Hernstein.

◆

A Convenient Test Board.

The accompanying illustration shows a test board which I made for use in our fixture room and which I find almost indispensable. This can be easily made in spare time at very little expense. The base may be of marble or hardwood, and almost any kind of receptacle will do for the fuses and lamps. For testing lamps and plug fuses I cut out one side of the threads in the receptacles, so that a lamp or fuse can be quickly inserted without having to screw it in. For testing cartridge fuses, I used two pieces of one-half-inch square casing arranged upon a slant, so as to take any size of fuse. The lamp at the top of the board is used to light the work bench when not testing by throwing in the snap switch, shown near the bottom. The whole board is protected by plug fuses in receptacles at the top of the board. The terminals at the bottom of the board marked *A*, *B* and *C* have long cords connected to them. These are used to test fixtures, etc., either in series with the lamp on the board or independently of it.



Test Board.

Allan A. Cunningham, Jr.

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National Code Changes.

The Underwriters' Association of the Middle Department, 316 Walnut Street, Philadelphia, Pa., has published a "Guide to Changes in National Electrical Code, 1913," which it is supplying for ten cents. This is a pocket edition in paper cover and includes in proper order all changes, amendments and new rules appearing in the 1913 edition of the National Electrical Code. Changes in rules governing fittings, materials and details of construction are run in index form only. The latter refers to Class D.

Among the Contractors.

The United Electric Construction Company, Philadelphia, Pa., has been awarded the contract for the entire electrical equipment for the addition to the Ritz-Carlton Hotel in that city. The contract includes engines as well as generators, switchboard, motors and wiring.

The Kingsbury-Samuel Electric Company, Baltimore, Md., has the contract for the wiring of a new five-story concrete building for Philipsborn's store. Galvanized conduit will be used throughout.

The Snyder Engineering Company has been organized in Pittsburgh, Pa., to do an electrical contracting business. The incorporators are G. E. Snyder, X. Snyder and R. B. Snyder.

The Blumenthal-Kahn Electric Company, of Baltimore, has been awarded a contract for the electrical installation in the erecting shop of the Western Maryland Railroad Company, at Hagerstown, Md. This installation includes 22 flaming arc lamps.

The St. Joseph Electrical Company of St. Joseph, Mo., is installing the complete electrical equipment in the fine new Emporia High School at Emporia, Kans. The installation is a very high-class one throughout and includes all wiring, hanging of fixtures, intercommunicating telephone system, and electric clock, besides the installing of all electrical apparatus in connection with the machinery for manual-training work. The building is expected to be completed about February 15.

The Sanborn Electric Company, Indianapolis, Ind., announces its removal to a new store and office building at 309-311 North Illinois Street. The new telephone number is 1550. There are also two Bell telephone trunks—Main 1017 and Main 1018.

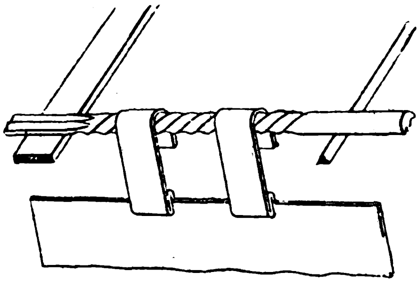
The contract for installing the electrict-light wiring, telephones and other equipment in the new President Street Railroad station of the Pennsylvania Railroad Company in Baltimore, Md., has been awarded to the National Electric Company. This company arranged the illumination of Baltimore's first Community Christmas Tree, which included 3,500 lamps on the tree, five spot lights at the base and a searchlight of 8,000 candlepower operated from a neighboring building. The plans for the illumination were laid out by George E. A. Fairley, assistant engineer for the Electrical Commission of Baltimore.

The Oklahoma Electrical Supply Company, Oklahoma City, Okla., is installing motors and lighting equipment for the Schram Glass Manufacturing Company at Sapulpa. The motors aggregate about 125 horsepower and are on a three-phase 60-cycle circuit. The wiring is in conduit throughout. This company has just completed also the entire installation of electrical work at the new refinery of the Waters-Pierce Oil Company at Sand Springs. This includes a generating plant with two 100-kilowatt Curtis turbines, and about 20 motors aggregating about 300 horsepower. This also was a conduit job. The wiring for the new Washington County courthouse at Bartlesville and the Masonic Home Dormitory at Darlington, which is being done by this company, is nearing completion.

B. R. Blair & Company, electrical contractors of Fort Worth, Tex., have recently completed the wiring, including a 90-drop annunciator system, for the new Chandler Hotel at North Fort Worth.

Busbar For Plating Vats.

A simple but, it is claimed, very valuable modification in the form of busbars for plating vats is illustrated in the accompanying sketch. Instead of a round rod or tube, a rod of angular cross-section is employed, and this is twisted so as to present a series of sharp edges to the suspending and contact hooks of the anode or work. It is claimed that such a rod is easier to clean and provides better contact. These claims are justified in practice. Certainly the condition of the circular busbars on many plating vats is appalling.—*Electricity.*



Busbar for Plating Vats.

LETTER TO THE EDITOR.

The Jobber-Contractor Relation.

To the Editor:

A great deal is written and said about the relation between the contractor and the jobber with respect to their encroaching upon each other's field of activity. From my point of view as a contractor it is unfair to the contractor, especially the smaller (not the curbstoner) ones, for the jobber to maintain a contracting business under another name and thus have an advantage over the legitimate contractor. He pays the regular price for his material. When this is the case it is not to be wondered at that the contractor will buy where he can get the best prices. He is forced to do this in self-preservation. The larger contractor is situated differently. He can buy in large enough quantities so as to go direct to the manufacturer.

We do not see the wholesale grocer going out and trying to get business away from his customer, the retail grocer. It seems that the only salvation the smaller contractor has is to ally himself with the "outlaw" jobber, or try and get in with some jobber as the contracting department of the establishment, thus getting the advantage of wholesale prices.

All this is demoralizing and is working in the wrong direction, and is not in accord with constructive policies.

We have been through this proposition and believe that the remedy is in the hands of the jobbers. If any of the fraternity are found to be carrying on a blind contracting business and this fact were made known and proven among the contractors, it would not be long before the outside business of this jobber would dwindle down to where he would take notice. Competition in the jobbing field has much influence on prices. This territory, for instance, is covered by state jobbers very thoroughly and Chicago jobbers also have their men out and are trying to make it pay. These men are expected to send in an order once in awhile, and whenever a good-sized job comes up the price of the material will be cut to the limit. The jobbers would do better if they confined themselves to some specialty instead of adhering to the present practice. The situation certainly needs a different system of handling if the jobber and contractor are each to make a living out of his business.

E. M. RAETZ.
THE ELECTRIC SHOP.
Rochester, Minn., January 17, 1914.

Exports of copper for the week ending January 22 totaled 8,822 tons; since January 1, 25,217 tons; same period last year 17,967 tons.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Keeping Concrete Out of Outlet Boxes.

In placing conduit and outlet boxes in concrete construction it is well before the concrete is poured to drill a small hole in the planking underneath and set the box directly over this. This will keep the box from being filled with fine cement, as the water and fine solid matter carried with it can run out at the bottom. The box is thus left empty.

Roy Ellerthorpe.

Handling Tape.

I have often had trouble in taping big joints where I held the whole roll of tape in my hand, as the edges often catch on the next turn of the roll and the tape becomes torn. I have found that this can be prevented by taking a pocket knife and drawing it across the flat side of the roll, so as to cut a thread or two at the edge of the tape. I scratch the roll in this way on both sides from center to edge in four or five places. This prevents the thread from catching and tearing off the tape, and it also makes it easier to tear off a small piece of tape.

Gordon Allen.

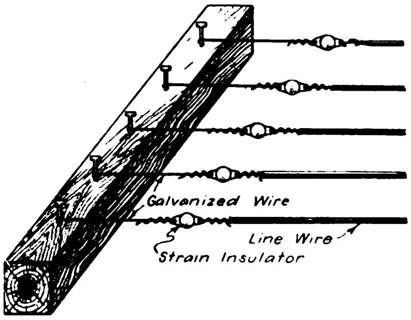
Hanging Short-Stem Fixtures.

When hanging fixtures having stems so short that the canopy can not be lowered so as to conveniently make the splices to the supply wires, proceed as follows. Cut the fixture wires to the desired length and attach them to the supply wires; finish making the necessary connections, complete, soldering the joints, and cover with tape. Then screw the fixture tube in the hickory; fish the fixture wires through the tube and make the connection to the socket last. Of course, the canopy should be pushed on the tube before connecting the socket.

William A. Murray.

Taking Up Slack.

A scheme I have often used to pull up slack in large feeders which are run open, as is often the case in mill construction, is as follows. Instead of the usual turnbuckle, simply take five-eighths or three-quarter inch screws and drill a small hole, as shown in the accompanying figure. After screwing the lag screw into the timber almost up to the hole, push the heavy galvanized wire into the hole, but not through, and wind up the wire until your line is tight. Of course if the line has much sag, this must first be taken out by means of a block and tackle, the same as you would for turnbuckles. If the line sags at any time you can always take it up by simply giving the screw another turn or so. No matter how great a pull is on the lag bolt it will never unscrew. The pulling strain is always next to the timber, due to the wire sinking into the wood as it is screwed in.

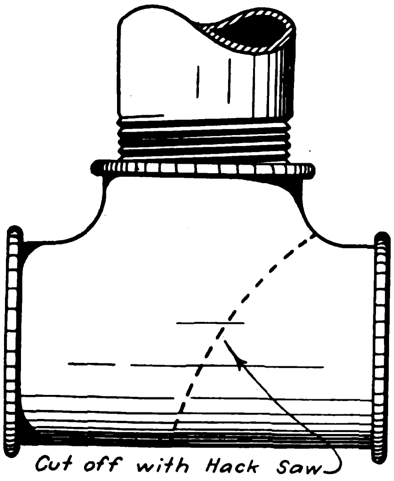


Taking Up Slack.

B. H. Fisher.

An Improved Bending Tee.

Many devices have been proposed for bending conduit, but to the practical man few of these are as handy as the one-inch tee. The accompanying figure shows an improvement on the ordinary tee. It consists in cutting off a beaded tee along the dotted line shown. This will make it easier to handle the pipe and bending is possible at new angles. If the tee is beaded it will not be likely to break in use.



Bending Tee.

Ben R. Browne.

Hoisting Pipe in Loft Buildings.

It is sometimes necessary for electricians to hoist their own pipe in new buildings, using a block and tackle. This is dangerous when not done properly. We hoist the pipe up in bundles, putting a sack over the end of the bundle. This is tied with an ordinary knot around the sack and then a half-hitch or two is taken around the other end of the bundle. The half-hitch tightens as the bundle is pulled up and the sack over the bottom end prevents any single pipe from slipping out. It is always safest to have the coupling ends of the pipe upwards.

On two-inch and 2.5-inch pipe we use a double hook made out of pencil rod and hoist up two lengths at a time by hooking one pipe to each side of the double hook. One half-hitch around both pipes near the top is all that is necessary. With three-inch pipe and larger sizes we hoist one length at a time.

A method we use for making up large pipes for risers is to cut a hole in a cap fitting the pipe and fasten an eye-bolt through this cap by putting a nut on the inside. The hole in the cap is made a little larger than the shank of the eye-bolt. Then the cap is screwed on, a rope tied through the eye-bolt and pulled up. While one man holds the pipe in position, another makes it fast. Henry Fleishman.

Handling Fixtures in the Shop.

We find a very convenient way to handle shower fixtures while building them up is to suspend an ordinary awning pulley from the ceiling, pass any suitable heavy cord or rope over this and on one end put a hook bent out of heavy wire. The other end we fasten to an awning cleat located at a convenient and accessible place near the bench, and the crowfoot is hooked to the hook and the fixture drawn up to a convenient height to work on. This is handy for wiring and assembling any fixture and beats climbing up a ladder to hang it to a rigid fastening. We have several such rigs in our shop. We use them mostly for showers, for which they work the best. This is also better than handling on a bench and saves scratching. Where we have small fixtures to handle we have a piece of old carpet on the bench, which saves marring the finish.

We keep all our small parts in cigar boxes, which are readily obtainable, and they permit of a very handy arrangement of parts on the shelf.

We keep standard nipples on hand, cut and threaded; it does not pay to cut nipples as needed and soil the hands and have to wash up when you come to handle casing and light-colored cord. E. M. Raetz.

Among the Supply Men

Effective and Attractive Window Displays.

One of the most interesting, instructive and elaborate window displays ever exhibited in the City of Seattle is herewith reproduced. The picture shows two trains, a freight and a passenger, electrically propelled, climbing the mountain grades which are encountered between the cities of Puget Sound and the summit of the Cascade range on the line of the Chicago, Milwaukee & St. Paul Railway.

This miniature railway was designed and built by Burton L. Stare, of the Northwestern Electric Supply Company and is on exhibition at the uptown offices of the company in the Prefontaine Building, Yesler-Way.

There are 265 feet of two and one-eighth inch gauge, rock-ballasted track, nine electrically operated semaphores and six automatic switches. The elevation is nine feet and the line has a grade of one inch to the foot on straight track and three-fourths inch on the curves.

Sixty gallons of water tumbling over the three waterfalls provides the power for operating the two trains, including the electrically operated semaphores and switches.

The passenger train is 11.5 feet long and the freight 13 feet. Both derive their motive power from a third rail. The motors on the trains draw the energy from this rail under the cars just as the trolleys of the city obtain their power from the overhead wire. The passenger train is equipped with 15 motors and the freight carries 14.

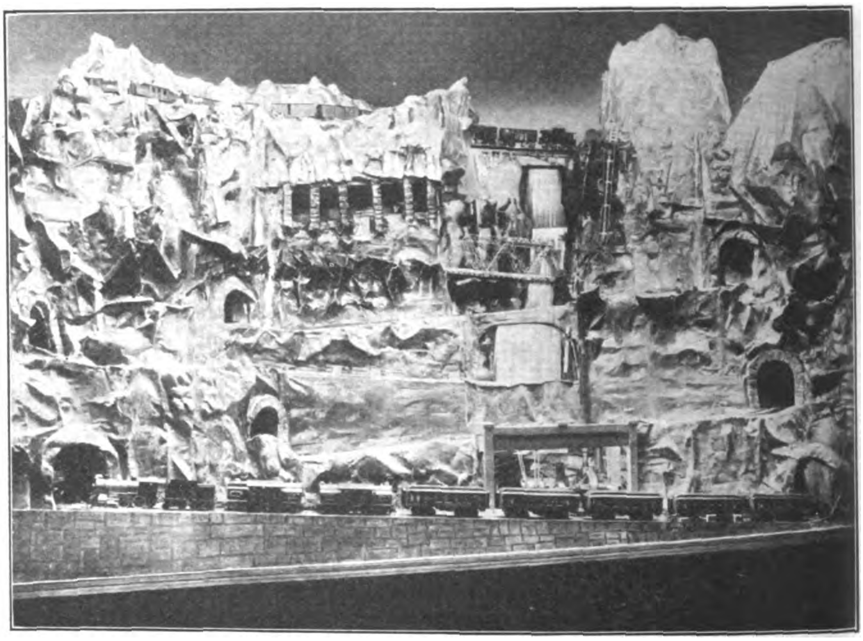
Contractors which operate the block signals and control the section of the track near it are placed at intervals along the line. As the trains go up the grades the contactors cut in a higher voltage to enable the train to negotiate the grade or to make a hard curve. More power is required on curves than on the straightaway. The potential ranges from 14 to 22 volts. Coming down the side of the mountain the reverse operation is performed, and decreasing the voltage acts as a brake holding the train in check.

As soon as one of the trains reaches a certain point, a section of the track will be killed and the semaphore set at danger. The train will be forced to stay at this point until the solenoid, back of the tunnel, closes the circuit on that section of track, releases the semaphore and sends the train on its way. There is absolutely no chance of collisions as the two trains can not get in on the same section of track.

The switches are operated electrically by means of contactors. When the passenger train arrives at a certain point the switches along the line are set. When it arrives at another station on the line it kills a section of the track and at the same time energizes the track in the loop at the top of the mountain where the freight is waiting. When the freight train makes the descent it uses another set of contactors, closes the switches it has used and opens the passenger loop switches so that the freight can not get in on the passenger track.

From the diminutive replica of a water-turbine power house at the foot of the mountain to the electrically operated semaphores and the tail lights on the miniature "Olympian" it is a complete electrically operated railroad on a small scale.

Through the passes of the Cascade Mountains the little trains glide, here emerging from a tunnel to wind about the face of a precipitous cliff; disappearing into the heart of the papier-mache mountain to reappear on the little steel bridge away up the gorge. With headlight flashing, yellow cars glistening, drivers grinding, the train is halted by the warning arm of the semaphore; the restraining arm of the signal tower drops, the block is clear and the train slowly, then faster, moves across the bridge and its tail light whisks from view into one of the many tunnels. Mr. Stare, designer and builder of the exhibit, states that he thinks it highly probable that the railroads of the future will be run without engineers, and that they will be started and stopped and controlled from the train despatchers office.



Window Display of Northwestern Electric Supply Company.

Illinois Electric Company Holds Big Sales Conference.

The Illinois Electric Company, Chicago, held a very interesting sales conference the week ending January 10. Addresses were made by a number of manufacturers' representatives during the week. The entire meeting was marked by close attention to the papers and discussions, and everyone present was well satisfied. The conference wound up on Saturday afternoon with a more or less open meeting at which addresses were made by

H. B. Kirkland, of the American Conduit Manufacturing Company, F. F. Skeel, of the Crouse-Hinds Company, and A. A. Gray, Chicago.

During the week T. P. Gaylord and William R. Pinckard, of the Westinghouse Electric & Manufacturing Company, took a prominent part before the conference, explaining the details of Westinghouse apparatus in connection with the new arrangements the Illinois Electric Company has made as sales agent for Westinghouse specialties. Among the salesmen of the Illinois Electric Company attending the conference were J. A. Duncan, Des Moines, Iowa; H. H. Morehouse, Ottumwa, Iowa; J. A. Sines, Los Angeles, Cal.; Cameron MacIntyre, Lincoln, Neb.; A. W. Dunham, Fond du Lac, Wis.; W. H. Pearl, Indianapolis, Ind.; F. H. Shumaker, Goshen, Ind.; F. P. Kennedy, Madison, Wis.; F. R. Pope, St. Louis, Mo.; Stuart Walters, Peoria, Ill.; Clyde B. Hightshoe, Des Moines, Iowa; D. C. Penniman, Minneapolis, Minn.; William T. Cowap, Oshkosh, Wis.; D. Newman, Chicago; William C. Booth, Chicago.

Washington Meeting of Electrical Supply Jobbers Association.

The next meeting of the Electrical Supply Jobbers Association will be held at Washington, D. C., at the New Willard Hotel on February 17, 18 and 19. Special cars for the meeting will leave Chicago *via* the Pennsylvania Railroad, Union Station, Canal and Adams Streets, on Monday, February 16, at 10:30 a. m.

The Esco Electric Supply Company, Albany, N. Y., reports an increase of 40 per cent for the last six months of 1913 over a similar period of 1912. For the first six months of the year the volume showed an increase of nine per cent. The company makes a practice of closing its place of business at 3:00 p. m. every Saturday and devoting the remainder of the afternoon to a sales conference, cleaning up stock and getting ready for a new start on Monday.

The Robertson-Cataract Electric Company, Buffalo, N. Y., held its sales convention from January 7 to 10, concluding with its annual "Ginger" dinner, at which 75 employees and guests were present. Among the guests at the dinner who had addressed the sales convention were A. D. Babson, General Electric Company; W. Hessel, Detroit Fuse & Manufacturing Company; F. X. Cleary, George Cutter Company; Thompson Cummings, Hubbard & Company; J. M. Smith, Holophane Works of General Electric Company.

Public Service Commissions

MASSACHUSETTS.

The Public Service Commission has approved the giving of free transportation by the Boston and Worcester Street Railway Company to district nurses of Wellesley.

The Commission, in its annual report, issued January 21, recommends a complete separation of the Boston and Maine from the New York, New Haven and Hartford Railroad Company, calls for the relinquishment by the New Haven of steamship lines under its control which have their terminus in Boston, and reiterates the views expressed in previous reports of the Railroad Commission that electric railway lines better serve the public when under independent management than under control of railroad interests.

NEW HAMPSHIRE.

The Public Service Commission has granted the petition of the Massachusetts Northeastern Street Railway Company for authority to issue $710,000 of capital stock.

The Commission has ordered the Maine Central Railroad Company to install electrically operated automatic crossing signals at Twin Mountain, Scott's, George's, Columbia Bridge and Crossing 141.2, north of the latter.

NEW YORK.

The Public Service Commission for the First District submitted its annual report for the year 1913 to the Legislature on January 19. The report was in manuscript form but will be printed later for distribution. It is largely taken up with the activities of the Commission in respect to rapid transit in New York City. There are 98 operating and lessor companies in actual operation under its jurisdiction. Of these, 68 are transportation companies, and 30, gas and electric companies.

NORTH CAROLINA.

The North Carolina State Corporation Commission has begun active effort to bring all electric light, gas, water and power companies under direct supervision of the State. To this end the Commission has issued a call to all such companies other than municipal corporations to file with the Commission within thirty days complete schedules of their rates and charges for each class of service, together with any schedules of discounts for quality of service or prompt payment. The Commission gives notice that all these companies will be called upon at the close of each calendar year to report covering their operations, and showing capital stock, dividends, etc.

OHIO.

The Public Utilities Commission has declined to give its approval to the issue by the Maloning County Light Company of capital stock to the value of $10,000 to be used to defray the expenses of a preliminary investigation of a project for an electric power plant, on the ground that the applicant has no visible or tangible assets and that its further contemplated plans of capitalization and operation have not been submitted.

OKLAHOMA.

The Oklahoma Corporation Commission has required an increase from $15,000 to $17,000 in the supersedeas bond given by the Pioneer Telephone Company to cover any possible excess charges in Oklahoma City pending the Commission's final action on the petition for approval of the rates which are now being charged. The company made a bond of $15,000 in January, 1913, but according to the most recent figures in the hands of the Commission this is not sufficient to cover the excess. This bond is entirely aside from the question of a refund for the period from June 1, 1909, to December 31, 1912, ordered by the Commission, and in which its action was affirmed recently by the state Supreme Court.

SOME FACTS RELATING TO DEPRECIATION AND RATE MAKING[1].

By Halford Erickson[2].

The subject of depreciation is one which has gained a great deal of prominence, especially since the introduction of government regulation of public utilities. In existing discussions upon it, however, most of the emphasis has been laid upon how depreciation is to be determined, and upon the necessity of providing for it. Concerning the methods of recording depreciation upon the books and records of the plant, or in other words, on the accountancy of depreciation, less has been said. It is of course true that the proceedings of technical societies, and other journals of this character, have dealt more or less exhaustively with this subject. On the other hand it is also a fact that in most standard books on accounting the subject is passed over without giving most of the facts that are desired by those who are looking for detailed information in the matter.

By depreciation is usually meant the gradual lowering of value of the property and equipment used for industrial and other purposes. In a broad sense it can perhaps be grouped and explained under the following four headings:

(1) Wear and tear, or minor renewals which are ordinarily made up of repairing or replacing minor equipment, as well as of the smaller parts of the larger units of the equipment as they wear out, or become useless otherwise. These are to be considered a part of the operating expenses under the various maintenance accounts.

(2) General decay, or that part of wear and tear which cannot be made good through the ordinary repair included above under (1). General decay also includes what is sometimes described as decrepitude or decline in value due to age and the action of the elements.

(3) Obsolescence, or the lowering of the value of property due to progress in the art or to the development of something newer, rendering the old equipment uneconomical, or public requirements by legislation, ordinances, etc.

(4) Inadequacy, or a reduction in value, resulting from unexpected developments and growth in business and demands for enlarged service coming from the public.

According to the definition of depreciation which characterizes it as a lessening in values, depreciation includes maintenance or upkeep as well as that lessening of value which is usually termed depreciation. In most systems of accounting, however, these two classes of outlays are kept apart. Upkeep or minor repairs are charged directly into the maintenance accounts, while such replacing of the larger parts as must be made from time to time are charged to depreciation. What is thus termed depreciation is as much of an operating expense as ordinary maintenance. Investors justly insist that such depreciation shall be made good in the charges that are made for the services rendered. If it was not made good in some such way as this their investment would sooner or later be an almost total loss. Without proper provision for depreciation the plants would also in comparatively short time be unable to render efficient service.

When charges or rates are high enough to cover such depreciation then it also follows as a matter of justice that the amounts so earned for depreciation should be set aside for the purposes for which they were collected, and not withdrawn from the plant or the business in the form of dividends or for any other purpose.

There are many reasons why it is exceedingly important that the amounts thus collected for depreciation should be kept on hand until needed, and then devoted to proper purposes. Unless they are so set aside there cannot always be any real assurance that the service will be kept up to an adequate standard. Without some such reserve to draw on, it is difficult for plants whose credit is strained, to secure the money with which to meet the cost of such extensive renewals as are frequently necessary in the public-utility business.

The chances also are that when the amounts so earned for depreciation have not been properly set aside, both for rate making and for other purposes, the present value, or the cost new less depreciation rather than the original cost or the cost new will be used as the basis for the valuation of the plant. At any rate there is a marked tendency in this direction on the part of appraisers almost everywhere. They appear to regard depreciation earned and improperly withdrawn in about the same light as the withdrawal of capital from the business. For many plants such omission of depreciation from the value upon which rates are based is likely to result in rates that are considerably lower than would otherwise be the case. The losses to the plant through the lower rates may then in the long run be even greater than its temporary gains from withdrawing the depreciation allowance from the business.

The omission of the depreciation charges from the operating expenses results, of course, in a higher net earning than is the case when the depreciation allowances are included therein. The omission to properly charge expenses with depreciation creates in fact false net earnings and this false net earning in turn often leads to higher than reasonable valuation of the plants for taxation and other similar purposes. In appraising property for taxation the assessors aim to find the market value. This value in often found by capitalizing the net earnings on about a six-per-cent basis. But if the net earnings are too high, because of the fact that depreciation has not been included in the expenses, then it necessarily follows that the assessed valuation will also be too high and that the plants are made to bear higher taxes than should be levied on them.

The amounts thus earned for depreciation would also, if set aside, constitute valuable assets in the business. They would in fact represent a reserve from which money for new extensions could be borrowed and kept until the outlays could be conveniently financed in the regular way. There are also many other purposes for which such reserves might be profitably employed. Thus they might enable the plant to do business on a cash basis and thus enable it to profit by all discounts and other advantages that usually accrue from having ready cash on hand. Many other reasons not only for making adequate allowances for depreciation but for devoting these allowances or reserves to their proper purposes might also be given. Those which have been outlined, however, would seem to be suffiicient to show that these matters are important enough for proper consideration.

In examining the books, records and annual reports of many plants one can hardly help noticing that there are many shortcomings in the methods they employ in recording on their books and records the various transactions that are connected with depreciation. Whether this is due to facts that the best practices in such matters have been overlooked or to the fact that the Railroad Commission in its classification of accounts has omitted detailed explanation upon these points is not clear.

Many, for instance, do not seem to clearly distinguish between maintenance and renewal items, nor between renewals and new construction. The result of this is that these accounts are often either over or under stated. The effect of this is not always the best either for the utility company or public.

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[1] A paper presented before the convention of the Wisconsin Electrical Association, Milwaukee, Wis., January 16.

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Many also fail to make proper entries for property discarded and taken out as well as for the new property which takes the place of the property taken out. One effect of this is that the construction accounts of such plants do not show even approximately the original cost of their property. Such omission constitute serious drawbacks in the appraisals of the plants for they deprive the appraisers of some of the most important elements that enter into the valuations.

There also seems to be some confusion as to the respective meanings that are attached to the depreciation reserve account and to the depreciation-reserve-fund account. The depreciation reserve account, as the term is commonly understood, is an account created by withholding a portion of the revenue for the purpose of renewing worn out and discarded equipment or plant. The depreciation-reserve-fund account on the other hand resembles a sinking-fund account. It is created by the transfer of actual cash to the depreciation fund which cash unless temporarily invested is there held until used for renewals. These distinctions between these two accounts are often overlooked and the one is therefore also often used for the purpose of the other.

Shortcomings of the kind described often lead to complications that are out of line with the best practise. It is quite likely, however, that many of these shortcomings can at least in part be traced to the fact that, as stated above, the Commission's classifications do not always go far enough in explaining the methods to be employed. An example in point is that there is therein no detailed description of the various entries that are necessary in order to show the full results of setting aside the depreciation allowance, the taking out of the discarded property, the replacement of it by new property, and the treatment of the scrap value. In this case the classifications show that the allowance for depreciation should be charged to a depreciation account in the operating expenses and credited to the depreciation reserve account, but they do not make such further explanations as may be necessary to the best practice of dealing with depreciation. For instance, they do not show very fully that the discarded property should, for its original cost, be credited to the construction account and charged to the depreciation reserve account; that the new property which takes the place of that discarded should, for its cost, be charged to the construction account, and credited to cash, nor that the scrap value of the discarded property should be charged to the material account and credited to the depreciation reserve. With such omissions in the Commission's classifications it is perhaps not to be wondered at that there should also be shortcomings in the records of many utilities.

Again, our classifications do not show as fully as they should the fact that, when the depreciation reserve is secured by cash and a depreciation-reserve-fund account is created, it is necessary to draw a voucher check for the amount, charging it to the said fund account, and crediting it to cash; that when a depreciation-reserve-fund account has thus been credited the discarded property, when taken out, should, for its cost, be charged to the depreciation reserve, and credited to new construction; that the cost of the new unit, which replaces the one discarded, should, for its entire cost, be charged to the construction account and credited to the depreciation-reserve-fund account for so much of this cost as may agree with the cost of the property replaced, while the amount by which the new property may exceed the cost of that which it replaces should be credited to cash; and that the scrap value of the equipment discarded should be charged to the depreciation-reserve-fund account and credited to the depreciation reserve account.

These are technical matters and should perhaps not be gone into here. They are, however, so closely connected with correct methods of accounting, that I thought best to make some reference to them. In the same connection it may also be said that each of the entries described should be accompanied by such explanation as will give a fairly complete history of the property involved for both sides of the transaction. Such explanations in turn would greatly facilitate such analysis of the construction accounts as may become necessary from time to time.

If the charges due to depreciation are not carried through the construction accounts, that is, if these accounts are not credited with the cost of the property taken out and charged with the cost of the property put in, but simply charged with the amount by which the cost of the new property exceeds the cost of the property discarded, then it becomes necessary in order to obtain some light on the original cost of the plant to analyze not only the construction accounts but the reserve accounts and maybe several other accounts as well.

The classifications of the Commission also fail to draw as distinct a line as is desirable between the maintenance and renewals. The relation between maintenance and renewals is so close that it is almost impossible in all cases to outline in advance just what items should go into the one account and what items should go into the other. This is one of the questions, however, which is being looked into and upon which we hope to be in position to furnish further facts before long. It is quite possible that in the end it will be found that the best way to deal with the matter will be to determine as best one may the total cost of both repairs and renewals and then to set aside into the reserve the entire amount and charge to it as made not only all the repairs but all the renewals as well.

Other shortcomings in the classifications might also be pointed out, but I have perhaps indicated enough of them to show what the situation is and to indicate that the Commission may be partly to blame for the fact that many utilities do not keep all of their accounts in accordance with most approved methods. Some of these omissions in the classifications have already been supplied by supplementary issues. Others will probably be covered in the same way in the near future.

Rates.

From a legal as well as from an economic point of view the rate schedules of public utilities should, under normal conditions, yield revenues enough to cover reasonable allowances for operating expenses including depreciation and interest and profits on the investment. Furthermore, the total cost represented by these amounts should be so distributed that each branch of the service and each class of customers therein are made to bear as nearly as practicable their just share of the entire amount. The cost of the service basis is thus in effect made the legal basis for rates. As normal costs are also the basis for normal prices, the cost of the service becomes the economic basis for such charges.

To correctly determine not only the total cost of the service but the respective proportions thereof, that should be borne by each branch and class of the service are exceedingly important tasks, for such determinations vitally affect not only the distribution of the social income but industrial and social developments. Such determinations are also difficult to make and this for the reason that both the theories and facts upon which they should be based are often complicated and even conflicting. Unless they are made with a fair degree of correctness, however, it is almost certain that some plants will earn more and others less than they should earn; and that some branches of the service and classes of customers will bear more and others less than their just share of the total cost.

While such determinations are difficult to make the complications involved therein can usually be overcome by a careful study and analysis of the facts and conditions involved, and by the application of sound methods to each step in the process.

The operating expenses are often relatively higher for some branches than for other branches. This is also true of the fixed charges. The situation in this respect is largely determined by local conditions. Under normal conditions each branch should bear its own operating expenses together with its full share of the interest charges. When conditions are not normal it may be necessary to so shift the interest charges that some branches bear less and others more than their normal share of the same. Ordinarily no part of the service should be allowed rates that are so low as not to cover the operating expenses plus at least something for the interest on the investment. For business that cannot be had on better basis the term operating expenses may have to be so construed as to mean additional costs that are incurred in taking it on. Mere inequalities in rates are not regarded as unjust until the point is reached where they result in some injustices to some one else. What is thus true in these respects for the different branches of the service is also true for the various classes of customers in each branch.

Attention is especially called to these rules and facts at this time because there are some who hold that while the cost of the service is a fair basis for rates for public utilities the figures to be used as the basis for rates thereunder should be the ones obtained when the total cost for the plant as a whole is divided by the total sales, say in kilowatt-hours and that the average thus obtained should be the rate for all branches of the service and for all classes in each branch; and further because there are many indications to the effect that we are soon likely to again be confronted by an agitation for a uniform meter rate of this sort. While such a basis as this disregards the effect of such factors as the demand on the plant, the hours of daily use of the service and numerous other conditions which vitally affect the cost of the service, it is on the face of it plausible enough to attract considerable support particularly among those who have not had the opportunity to carefully study the matter. In the past this demand for one uniform rate has been strong enough to be carried through. This is especially true for gas and water works. When well supported and directed it is likely to be more effective on public authorities than on the plants themselves. If it fails to carry the day when raised it is usually because the issue has been fairly and openly met on its merits.

Normal costs are ordinarly the basis for normal prices. Where active competition is largely absent costs are about the only basis upon which in the long run prices can be safely determined. While costs with certain limitations is in the public-utility field the most important basis for rates, the question arises whether by costs in this case is meant the cost for each branch of the service and for each class of customers therein as obtained when all the factors that enter into this cost are taken into consideration, or whether it means the average cost for all branches and classes regardless of the conditions. In order to shed some light on which of these two sets of cost is the proper basis for rates in the electrical field, it is necessary to analyze the conditions under which this service is rendered.

The nature of the electric utility is such that its products are more of a service than a commodity. Its products must be used in connection with the plant because they cannot be stored except to a limited extent. As electricity is largely used for lighting, the greatest demand on the plant is in the evening. While this maximum demand may not last long the plant must be large enough to meet it. The demand on the plant also varies with the seasons, being much greater during the winter than during the summer months. The effect of such variation in the demand is that for the greater part of the time as much as 80 per cent of the capacity of most plants remain idle. Public-utility service is also decidedly a service of decreasing costs. This is especially true of such service as can be rendered during such periods of the day when the regular demand or load is at the lower levels. From two-thirds to three-fourths or more of the total expense of the service when fixed charges are included therein are mostly independent of the amount of current or energy generated and are about as great when the output of current is smaller as when it is greater. Hence the greater the amount of current that can be sold during the off-peak hours the better is the load-factor and the lower the cost per unit of current will be. The power user as a rule enables a much better utilization of the plant then is the case for lighting users, and therefore also often oftain better rates. Current for power comes in competition with other forms of power. To a very limited extent this is also the case for current used for lighting.

In view of these and other facts in order they may become proper basis for rates, it is necessary to closely analyze the expenses of a plant and to classify them in accordance with their nature, branches of the service and classes of customers. In studying their nature, it is found that some of these items depend directly on the capacity of the plant and vary with this capacity; that others depend entirely on the customers of the plant and vary with the number of customers; and that there are still other items which depend entirely on the output of energy and vary with variations of the amount of this output. It is further found that there are also many items in the cost of the service which do not depend directly upon either the demand, the customer, or the output, but which are indirectly dependent upon two or more of them. They are in the nature of overhead charges. In addition to this it is also found that some of these expense items are relatively higher for some branches or parts of the service than for others.

In view of these facts it is necessary in order to established rates that are equitable to all, to separate those expenses which depend directly on the demand, the customers, and the output into their respective classes. It is further necessary to properly apportion the indirect or overhead expenses between these classes in such a way that each class is made to bear its proper share thereof. In addition to this it is also necessary to properly apportion these classes of expense between the different branches of the service. Likewise the customers must also be classified by branches of the service while those in each branch may have to be grouped in accordance with their demand on the plant and other characteristics of the service they obtain.

Now, these apportionments are logical and well within reason. If this is the case then it would also seem equally logical and reasonable that each customer or class of customers should bear its or their just proportion of each of the three classes of expenses that were named. That is they should bear demand costs in proportion to their respective demand in kilowatts on the plant; they should bear customers' costs in proportion to the number of customers; they should bear output costs in proportion to the respective amounts of current or energy used.

When the demand costs are thus allotted to the customer on the basis of the proportion of his kilowatt demand; when the consumer costs are assigned to him on the basis of the number of customers; and, when the output costs are apportioned to him on the basis of the kilowatt-hours used, it is of course found that while each customer bears only his just share of the respective demand, consumer and output costs, the average cost per each kilowatt-hour is much higher for those customers who use their service or installation a short time only each day than for those who use their installation for longer period each day.

A rate schedule under which each customer is made to bear his just proportion, in each case, of the demand. the consumer and the output expense thus results in higher average rates per kilowatt-hour for short than for long-hour users. While this difference in the rate or cost is just, it is often strenuously objected to by those who, as stated above, hold that the average cost per kilowatt-hour that is obtained when the total cost is divided by the total kilowatt-hours sold, should be the rate that is levied uniformly on all customers. Since residences or lighting customers are usually short-hour users, and power customers are often long-hour users it also follows that the average rate paid per kilowatt-hour is higher in the former case. This fact is often held up as an example of unjust discrimination. Even the ordinary demand schedule under which the rate for the first few hours of daily use of the active load is higher than for current used in excess of this is attacked because it is deemed unfair. In support of their position it is constantly alleged that such schedules are not just to small users.

Now, these criticisms of the demand system of charging are either misleading or well taken. If misleading or unjust, then it should be possible to establish this fact. If well taken, then this should also be made clear. While I do not hold a brief either for or against the demand method I desire to add a few additional facts to what I have already said.

It is a difficult matter to understand how any one who has fully analyzed the expenses and the operating conditions generally of public utilities can consistently deny that there are not certain expenses, such as fixed charges and standby cost that depend on the capacity of the plant which in turn is determined by the joint demand upon it by the customers and that if such is the case why these demand costs should not be borne by the consumers in proportions to their demand rather than on any other basis. There surely is a closer relation between these expenses and the demand in question than between these expenses and the kilowatt-hours used. Likewise it is quite clear that certain expenses, such as keeping customers' records, collecting the bills and other items of this nature, depend on the consumer; that they are about as great for small as for large customers; that they are much more closely related to the customers than to the kilowatt-hours used or any other unit and that for these reasons they ought to be borne in proportion to the number of customers. When it comes to the output cost, however, it is quite obvious that these depend more closely on the kilowatt-hours used than on any other unit and that they should therefore be distributed on this basis. Such distributions of the expenses as these just outlined furnishes material for the proper kind of cost curves, such curves as are used for scientific and other purposes where accuracy and sound conclusions are required. They also furnish sound basis for equitable rate schedules. At any rate, there are the best of reasons for believing that this is the case.

Those who have closely studied these questions well know that apportionments of the expenses that are required in the classifications outlined can be so made as to be fair to all concerned. There is, in the case of all utilities, a considerable proportion of items which depend directly upon each class of expenses and upon each branch of the service. Such items can be classified directly under that class and under that branch of the service for which they were incurred. There are also a considerable number of expense items which are common to two or more classes and two or more branches of service which can be fairly apportioned either on closely related units or on the direct expenses. To go into details on these points is hardly necessary here, since most of you are no doubt familiar with the methods employed for these purposes. Suffice it to say that the trustworthiness of such apportionments has repeatedly been established.

The cost basis of rate making thus outlined is also elastic enough to be adjusted to the various conditions that arise in this field. Under it consideration can be given to the long-hour user who, in addition, is also an off-peak user; to the long-hour user whose use also extends into the peak hours; to the short-hour but off-peak user; to the short-hour users whose use also comes during the peak hours and to practically all other conditions that may arise. Thus it can also be made to cover such customers who, for competitive or other reasons, can be had only on the so-called additional cost basis of charging.

When it comes to the method of charging, however, which, as stated above, is represented by the average cost per kilowatt-hour sold to all the current sold by a plant, the situation is different. The rate thus obtained will be the same regardless of the conditions. Under it the power user would pay the same rate as the lighting user and the long-hour user in both cases would be charged as much per unit as the short-hour user. If all customers were in the same class, if their demand was the same and also came at the same time, if they used the same amount of current, if there were no competitive or other conditions of this nature to contend against, if, in short, the similarities between them in the situation under which the services were rendered extended to every condition by which the price of the current could be affected then a uniform meter rate which is the same for all customers would no doubt be practicable. But such similarities are seldom if ever encountered. In actual practice it is found that the demand, the quantity of current used, and other conditions vary not only as between the different branches of the service, but as between the different classes of customers in each branch. These differences do not only extend to factors which affect the cost of the plant of furnishing the service but they also cover conditions which measure what the customers can afford to pay for it.

As in most cases, electric power costs less to furnish than electric lighting and as long-hour users are relatively much less costly per kilowatt-hour than short-hour users, and as in addition to these differences there are also many other conditions under which the costs differ as between various users, it must be quite apparent that a uniform rate, such as that just described, must be unjustly discriminatory. No rate schedule under which some are made to contribute more and others less than their just proportion of the revenues of the plant can be fair to all concerned.

Under a rate schedule, the rates in which represent the average cost for the plant and are therefore the same for all branches of the service and for all classes of customers, the cost for power and for long-hour users generally would be so high that the service could not be generally used for industrial and commercial purposes. Manufacturers, for instance, who are producing for the open market cannot afford to use current for power or other purposes unless it can be had at as low cost as power produced by other means. For most plants the average rate is much too high not only for competitive business, but for much of the long-hour service. Being too high, it also follows that they will not bring the business. Loss of business means loss of revenue. It means more than this. Since the cost per unit of producing current decreases with increases in the business, such restriction in the output not only reduces the revenues but it increases the costs per unit. It tends to reduce profits and to increase rates and hence results in losses to the plant and higher rates to its customers. No current should be sold at a loss but the more of it that can be sold at a profit the better for all concerned. These facts are well understood by the wideawake manager but seem to be hidden to a large proportion on the outside.

These illustrations may even be carried further. Business which cannot be had on better terms should be taken even if the revenues it produces only slightly exceed the additional cost the plant is put to by taking it on. The amount by which the receipts are greater than such additional cost may be counted as profits, for it aids in meeting the fixed charges of the plant and by its amount reduces the share that otherwise would have to be borne by the rest of the customers. Under the average cost or rate, however, business of this kind could not be had and such rates would therefore tend to restrict the business of the plant at the expense of all concerned.

The importance of the fullest possible utilization of the power plant can hardly be overestimated. Now, every plant has a peak load which is far above the average load and which peak load the plant must be equipped to meet. The capacity of this equipment determines very largely the fixed charges, that is, the interest, depreciation, taxes and insurance. If the capacity, because of the peak load, has to be out of proportion in size to the average load and the output of the plant therefore comparatively small, then it also follows that the fixed cost per unit of output will be high. If, on the other hand, the average load is high, then the output will be greater, and, as the fixed charges, which do not vary with the output, will then be distributed over a larger number of units of output, the amount per unit will of course be smaller.

This may be further illustrated: Thus, if the investment in a power plant amounts to, say, $100 per kilowatt of capacity, if the fixed charges thereon amount to 14 per cent, or to $14 per kilowatt per year; if, furthermore, the plant is operated the entire year, then the cost per kilowatt of output of current would be 0.16 cent when operated full capacity, about 0.32 cent when one-half the capacity was utilized and about 0.64 cent on a 25 per cent load-factor.

Similar effects of a more or less complete utilization of the plant may also be noted upon the operating expenses alone. Thus it developed in one investigation that the fuel cost per kilowatt-hour amounted to about 8 cents when the plant was operated at full capacity, about 1.5 cents when operated at 50 per cent of the capacity, and about 2.7 cents when operated at about 25 per cent of its capacity.

In another case, when both the fixed charges and the operating expenses were combined, it was found that the total cost per kilowatt-hour was about 1.5 cents when the plant was operated at full capacity; about 2.7 cents when operated at one-half, and 5 cents when operated at one-quarter of its capacity.

The figures for the cost of operation under different load-factors which have thus been given represent generating costs only. When the total cost is increased by all the remaining expenses these differences between the costs under high and low load-factors are considerably increased.

These facts have been cited because of their close relation to the rates that are charged for the services rendered. A high load-factor stands for low costs but a satisfactory load cannot possibly be obtained without rate schedules that for each branch and class of service are closely adjusted to the cost as is practicable under the circumstances. Under the varying forces that are now in operation in our business world it does not seem that the most advantageous loads could often be had under a uniform average rate which remains the same in all cases regardless of surrounding conditions.

Northwestern Cedarmen Change Name at Annual Convention.

The eighteenth annual convention of the Northwestern Cedarmens' Association was held at the Hotel Delta, Escanaba, Mich., on January 27 and 28. In line with the usual custom the meeting was well attended by the leading white-cedar producers of the northern tier. M. C. Moss, president of the Association, in calling the first session to order Tuesday morning, briefly reviewed the course of events in the cedar industry during the year. In 1913 there had been little of unusual development to record, either in cutting or in sales. Stocks were probably lower than heretofore. Business had been comparatively quiet, but the indications pointed to a better condition both as respects demand and price in the early future.

N. E. Boucher of Minneapolis, secretary of the Association reported that one new member, the Bell Lumber Company of Beaver Dam, Wis., had been received and that five companies had resigned because of not handling cedar products. Matters looking to reduction of freight rates had received constant attention. The Committee on Change of Name reported through its chairman E. L. Clark of the Valentine Clark Company, who recommended that the name of the Association be changed to "Northern White Cedar Association." This, he said, would definitely specify the character of the cedar handled by the northern producers as distinguished from the Western red-cedar handled by the Western Red Cedar Association. After some good natured opposition on the part of H. F. Partrige the change of name was decided upon practically unanimously. On Tuesday afternoon F. P. Vose of Chicago, secretary of the Electrical Credit Association of Chicago explained the plan and scope of the Credit Association work. A. O. Kuehmsted, president of the Credit Association, also spoke.

The eighteenth annual banquet was held in the large dining room of the New Delta Hotel. At the close of the festivities the Escanaba men were tendered a vote of thanks. A pleasant feature of the banquet entertainment was the impersonation by Charles Goodwin, a local lumber-mill operator and cedar producer, of a French Canadian lumber jack who forced his way into the dining room and insisted upon sitting at the guests table. After several recitations in dialect the make-up was removed and his identity revealed. Another feature of the entertainment was the singing of Joseph A. Naugle.

Tht Minnesota members of the Association were given permission to use the name of the Association in bringing suit against the railroads to recover the difference between the rates charged for shipping poles and posts, which are not at present included in the lumber schedule.

Upon the suggestion of E. L. Clark, a guarantee fund was subscribed to participate in the forest products exposition at Chicago and New York in the event of the committee specially appointed deeming it expedient to establish an exhibit of Northern white-cedar products. The Committee is composed of E. L. Clarke, L. A. Page, W. S. Thomas, J. C. Kirkpatrick, W. P. Bowring and H. S. Gilke.

The following officers were elected for the ensuing year.

President, J. W. Benham, Naugle Pole and Tie Company, Chicago.

Vice-president, L. A. Page, Jr., Page & Hills, Manneapolis, Minn.

Treasurer, W. B. Thomas, White Marble Lime Company, Manistique, Mich

Directors for two years, J. E. Gerich, McGillis and Gibbs, Milwaukee, Wis.; M. J. Bell, Bell Lumber Company, Beaver Dam, Wis.; L. A. Furlong, Valentine-Clark Company, to take place of E. L. Clark, resigned.

THE RELATION OF THE BUREAU OF STANDARDS TO THE PUBLIC SERVICE COMMISSION.[1]

By Edward B. Rosa.[2]

Many of the state railroad commissions have been transformed into public utility commissions, and given wide powers and responsibilities in connection with all public utilities. The intelligent exercise of these new functions involves an intimate knowledge on the part of the commissions and their engineers of a great many phases of engineering, electrical, mechanical and civil engineering, as well as gas engineering, telephone engineering, etc., together with the business methods and requirements of these various industries. Some of the problems are highly technical while at the same time very concrete and practical. The Bureau of Standards has been making a study of some of these problems, partly in response to a demand from the state commisions and cities which (in the absence of state commissions) regulate their own utilities, and partly in response to a demand for information from the operating companies and from engineering societies which are largely made up of representatives of such companies.

One of the investigations that has yielded results of great practical importance was concerning the electrolytic corrosion of gas and water pipes and lead cable sheaths by earth currents due to electric railways. The Bureau has made a very thorough study of the various proposals that have been made for applying protective coatings to such pipes and also of protecting them by bonding to negative busbars and by using insulated negative feeders from track itself. In the course of this investigation the engineers of the Bureau have made field examinations in many cities, both large and small, and with the co-operation of the gas, water, telephone and railway companies examined the pipes and made electrolytic surveys of earth currents. A complete system of electrolytic mitigation has been worked out for two cities and is being put into operation. The work has progressed far enough to demonstrate that the method may be successfully applied in many cases. This is a matter of great practical importance because hundreds of millions of dollars' worth of underground pipes and cables are subject to damage by electric railway current, and we believe the public service commissions can render a great service by seeing that the railways take such precautions as to reduce this damage to a minimum. Such questions should be kept out of courts entirely, and we believe that when the engineering aspects of the subject are better understood, street, railway companies will generally be ready to co-operate with the public service commissions, and to remove as far as possible, the cause of the trouble. In two of the cities studied by the Bureau, it was found that the saving of electric power effected by the methods of mitigation proposed was enough to pay a fair return on the entire cost of the changes and new construction required, and the system will be in better operating condition for the change. The work was conducted as a scientific investigation, although it was done in a thoroughly practical way and conclusions verified by frequent reference to working conditions.

Another investigation of great practical importance recently undertaken is on the life hazard in electrical work. There is great need of improvement in many respects in electrical practice, to reduce the danger to linemen, station employees, operatives of electrical machinery and the public generally. Manufacturers can help by impoving the design and construction of certain kinds of apparatus; constructing engineers can help by using better materials in many cases and installing dangerous apparatus with greater thought of the life hazard; operating companies can help by educating their employees and by adopting stricter rules for their protection and providing them with more and better safety appliances; public service commissions and city authorities can help by adopting better regulations and having frequent inspections; the press can help by creating public sentiment in favor of attaching greater value to human life, and warning the public of the danger. The operating companies and electrical engineering societies will cordially assist the Bureau in this investigation, and we hope to place some preliminary results in the hands of the public service commissions at an early date.

Another investigation of practical bearing to the public service commissions is on the instruments used in electrical measurements, and the methods of testing. The traveling inspectors employed by the state commissions render the companies and the public great service by checking up the master meters of the stations. These meters are usually not very portable, and traveling inspectors who are prepared to test them and to give local inspectors information render an important service.

These are some of the questions that the Bureau of Standards has been studying recently which come within the scope of the state public service commissions. For the lack of a sufficiently large scientific and engineering staff, we have been unable to do as much as we could wish, and have been unable to give the assistance to some of the state commissions which we have been asked to give and should have been very glad if possible. We hope that by another year our resources will be greater, and that we can take up in a thorough and scientific way many other problems connected with the public utilities.

One of the most serious objections that has been urged to the regulation of public uitilities by commissions is that if the same rate of return on the capital invested is allowed to all companies, it removes in many cases all incentive to the responsible officers of utility companies for enterprise, hard work and economy, and that in consequence both the public and the stockholders are losers and great injury is done the industries. As yet so little experience with rate-making has been had that one cannot say perhaps whether this has already occurred in some degree or not.

The California legislature recognized the importance of the matter and provided for it in the public utility act of 1911 in the following paragraph:

"Nothing in this Act shall be taken to prohibit any public utility from itself profiting to the extent permitted by the commissions, from any economies, efficiencies or improvements which it may make, and from distributing by way of dividends or otherwise disposing of the profits to which it may be so entitled, and the Commission is authorized to make or permit such arrangement or arrangements with any public utility as it may deem wise for the purpose of encouraging economies, efficiencies, or improvements and securing to the public utility making the same such portion, if any, of the profits thereof, as the Commission may determine."

The State of Idaho embodied the same paragraph in its recent public utility law, and the still more recent Pennsylvania law expresses the same idea in the following language:

"It shall be lawful for every public service company to participate, to such an extent as may be permitted by the commission, and deemed by the commission wise, for the purpose of encouraging economics, efficiencies or improvements in methods or service, in additional profits which may be afforded by such economies, efficiencies or improvements in methods or service."

These are clearly just and wise provisions if they can be realized. But the question at once arises, how shall the public service commission decide whether a given company has made such economies, efficiencies and improvements as to entitle it to additional profits? Of course the company would in each case supply the commission with all the data desired, but it will be difficult to decide whether the facts prove their contention, and what is a proper allowance in the dividends for such economies and improvements. Certainly the commissioners themselves will generally not be able to do this without the services of able engineers who know all phases of the business (gas, water, electric light, telephone, street railway or whatever it may be) and who can judge the performance of the given company by the performance of other companies working under similar circumstances. In other words, standards of efficiency and economy must be set, and a given company claiming to have comsiderably exceeded the average and asking to be allowed to pay a higher than the normal dividend must be judged by such standards. On the other hand, if a company is poorly managed, its performance will appear so by the same standards. Such a system would tend powerfully to promote economy and enterprise, and yield large benefits to the stockholders and the public. It is a flexible and just sliding scale, but to carry it out successfully requires an exceptionally well equipped commission. Its realization would certainly constitute a long step toward the scientific regulation and control of public utilities.

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[1] Portion of paper read at convention of National Association of Railway Commissioners.

[2] Chief physicist, Bureau of Standards.

But few commissions can maintain engineering staffs large enough and able enough to do all that is required to realize such a scheme. If, however, the states could co-operate effectively in this work, so as to utilize their combined resources most efficiently, and with the Federal Government assisting, it is possible that standards of economy and efficiency could be set and operating data determined that would be of vast service, not only enabling the commissions to act more intelligently and more justly but also (what is greatly to be desired) secure greater uniformity of action among the various commissions. The Bureau hopes to be in position soon to do something in this direction.

The change in recent years in the attitude of the public, the courts and the utility companies themselves toward the question of the responsibilities of public utilities to the public and their regulations and control by public service commissions, is nothing short of revolutionary. On all sides it is admitted not only that the public has the right to regulate and control but that the commissions can and do perform this difficult and responsible function justly and successfully. It is a remarkable tribute to those state commissions which in recent years have been acting as general utility commissions that in so short a time the justice and success of such regulation should be so generally admitted. But this success was not attained without effort. The highest constructive ability has been displayed, and earnest thought and hard work put into the task to achieve such success. To carry forward and develop the work in all the states will require the same constructive ability and the same earnest thought and hard work as have been displayed by those who have pioneered the movement. Without it failure may follow with a reaction in the public mind concerning the success of regulation by commission. With it success is assured from the outset, and success in far greater measure than has yet been realized anywhere. The benefits are not merely the material advantages accruing to the utilities and to the public which is served by the utilities, but also to the cause of good government and business and political ethics. The possibility of realizing business-like and efficient municipal government is enormously enhanced when the public utilities are taken absolutely out of politics and they are conducted and controlled on a high ethical plane. To the realization of such ends state and federal agencies should work in harmony and with enthusiasm, inspired by the success of the past and the possibilities of the future.

It will be seen from what has been said that the relation of the Bureau of Standards to the public service commissions is unlike that of the Interstate Commerce Commission in some respects and like it in others. It is like it in representing the Federal Government and in co-operating with the state commissions and striving to bring the latter closer together. But it has no legal authority over the utilities, holds no hearings of complaints, and renders no binding decisions. Its work is primarily scientific investigation, some of which is theoretical and refined (such as fixing of primary standards and methods of measurement) and some is very practical and concrete, and includes many of the most interesting problems of present-day engineering. We believe that there is an immense opportunity for usefulness in assisting to solve some of the problems presented by the public utilities, co-operating in this work with the state commissions and assisting them so far as possible to get full and reliable information, but not assuming any responsibility that belongs to them nor interfering in the slightest degree with their freedom of action.

Fixture Design Discussed in Pittsburgh.

Two papers were presented before the Pittsburgh Section of the Illuminating Engineering Society on January 16: "The Relation of the Illuminating Engineer to the Problems of Fixture Design," by A. B. Wilson and F. J. Blaschke; and "A Photometric Analysis of Diffusing Units with Varying Indirect Component," by E. B. Rowe and H. H. Magdsick.

As a preliminary to the papers of the evening, M. Lukiesh discussed the principles of the reflection of light as applied to colors, illustrating with lantern slides and with a number of tables the reflection and lack of reflection of colored light from various colored surfaces. This is a subject which has been largely neglected in illumination design, as has also the relative intensity in different parts of a room. The arrangement of brightness in the room will in the future form a large factor in determining the aesthetic quality of room decoration.

Mr. Blaschke defined a lighting fixture as an apparatus which supports a light source and whatever appurtenances are employed to direct or control the light. The primary object of a lighting installation is to provide light enough for one to see with ease and comfort. To the uninitiated this would seem a simple matter, but upon closer study the question reveals the difficulties involved in the determination of quantity, quality, direction, intensity, control and numerous other factors.

The elements of efficiency and decorative value must be combined in their correct proportions when applying illumination. Although not of equal importance, both these elements must be duly regarded if the most satisfactory results are to be obtained. The efficiency can be expressed in cold figures; decorative value and appearance are matters of taste and appropriateness and the designer must consider the idiosyncrasies of the probable purchaser of the product. The engineer should be able and willing to see beyond the plain data obtained by means of a photometer and a wattmeter. Fortunately we are not so devoid of appreciation of the beautiful or so mercenary as to measure merit in dollars and cents alone.

Since scientific lighting began to command the attention it now receives, the usual order of procedure has been to suit to the light source the other factors in a complete lighting installation. Reflectors, diffusers and fixtures have been designed mainly with a view toward accommodating a given size or capacity of light source, and in many cases, with a possible exception of the purely decorative installation, the customary procedure is logical. With improved light sources, notably the tungsten lamp, a scientifically constructed lighting unit was instrumental in bringing about early commercial success; and to utilize this illuminant economically the question of reflector design was attacked with such interest that competition became more keen among the champions of various distributing media than among the producers of lamps.

The selection of units that are not only suited mechanically but also answer the requirements from an artistic standpoint, falls largely to the illuminating engineer. The use of fixtures entirely out of harmony with other surroundings, even by the most inexperienced amateur, should be considered inexcusable; but unfortunately the combination of glassware with supporting devices never intended to be employed in conjunction therewith is frequently condoned. Perhaps in the future, designers will be able to prevent the misapplication of their products by specifying what combinations are permissible.

When fixtures are designed for the homes occupied by people of moderate means the style must necessarily lean toward the conventional and, although still a second consideration, the efficiency of the complete lighting unit must be given attention. In the case of industrial illumination, principally in the lighting of shops and factories, efficiency is of major importance. Where the designer is called upon to plan fixtures to complete a scheme of decoration he should sacrifice nothing for efficiency. The cost of operation in such instances is not of such vital importance as it is to the householder of limited means, and therefore the fixture designer should not be compelled to work under the handicap offered by an anticipated test of watts per square foot. Unorthodox as it may seem, it is true that in some instances the illuminating engineer takes no part in the fixture designer's work other than to determine the amount of light required on a given plane. Consultation should not be postponed until all other details have received attention.

Among the results due to the reduction in the cost of light, that is, particularly in the cost of providing the light source itself, is the extensive development of apparatus for applying light indirectly. Only in rare instances where natural conditions are favorable can indirect lighting be accomplished without the use of directing and diffusing media. Before the present high-efficiency light sources were developed, the necessity for directing and diffusing media was not realized to the extent it is today. The argument that such equipment would serve as a protection to the optic centers as well as increase the efficiency of the lighting unit could formerly not be consistently proved. The high intrinsic brilliancy of modern units, however, made evident the necessity for protection from direct rays and opened the way for the development of apparatus that would make it possible to utilize under proper hygienic conditions the greater part of the light produced. As a device that fulfills both demands, the semi-direct unit has been advanced.

The second paper was read by Mr. Magdsick.

In spite of the rapidly increasing use of glass bowls in which a considerable part of the total light it utilized indirectly with a smaller proportion of direct transmitted light, very little photometric data on the performance of these units seems to be available. The authors of the paper have therefore made a photometric study of the effect on the shape of the distribution curve and on the proportion of direct and indirect light due to variations in the contour of the glassware, the number and arrangement of lamps and some of the different kinds of diffusing glass which are now in commercial use.

One ever present difficulty in studying and classifying data of this nature is the differentiation of the so-called "opal" glasses. There are numerous methods by which such classification might be made:

First, on the basis of chemical composition.

Second, on the structure of the glass, as determined by micro-photographic tests.

Third, on diffusion characteristics, that is, the amount of transmitted and reflected light, absorption, etc.

Fourth, on the photometric performance of the glass in some standard reflector shape.

Fifth, on the basis of appearance by reflected or transmitted light, or both.

At present a rigid definition which would enable one who is reasonably familiar with illuminating glassware to grasp the fundamental characteristics of any unit without inspection or detailed description is lacking.

Tests were made on units of different contour and density of glass to determine the effect of different lamp arrangement, density of glass, contour, effect of chain interference and a symmetrical distribution from lamps and the variations caused by changes in lamp position with reference to the bowl.

For the range of conditions covered by these tests it was found: first, that the position of the lamp with reference to the bowl is an important factor in determining the distribution of light; second, that the results secured with various lamp arrangements are similar except in the case of a single pendent lamp, which gives a more extensive distribution than other arrangements; third, that the variation in total absorption of the various glasses is slight, but that the distributions secured differ widely; fourth, that the principal effect of variation in contour is to distribute a relatively larger proportion of the light in the 0°-60° and the 120°-180° zones as the diameter of a bowl is increased relative to its depth; fifth, that the appearance of the units is satisfactory in practically all instances.

The discussion was participated in by E. B. Rowe, C. O. Bond, M. Lukiesh, A. L. Powell, S. G. Hibben, G. H. Stickney, J. R. Cravath, T. W. Rolph, F. J. Blashke and Ward Harrison.

Mr. Bond suggested that a distinction be made between members of the Society: (A) professional illuminating engineers and (B) those laymen who are interested in illuminating engineering. Some of the colleges, or the committee on education should outline a curriculum, or certain standards to which a member must conform before he can be qualified as an illuminating engineer. He announced that the next annual convention of the Society will be held in Cleveland in September. He asked for a definition of a limit of intrinsic brilliancy—is it a certain value per square inch or is it relative, with respect to the background?

Mr. Lukiesh stated that no definition of glare is possible, as it is mostly a matter of contrast. A bare incandescent lamp, held towards a clear sky, will produce no sensation of glare. Present practice along this line appears to be entirely satisfactory. The lighting expert must become more of an artist than he has been. The consumer must either depend upon his own judgment, the reputation of the manufacturer, or the judgment of the salesman. The latter usually knows little about illumination, but prefers to talk about periods, etc. To secure the best results in general illumination, the educational committee should endeavor to train the fixture salesman, who will then furnish useful information to the customer, instead of talking about beauty, periods, etc. A lighting device cannot be really beautiful unless it is truthful and useful.

Mr. Hibben showed the results of a series of tests on indirect bowls, showing that with medium-density glass the transmitted light exceeded the reflected—hence more light is secured when the reflector is hung low. With a denser glass, the reflected light is in the preponderance, and more light is secured by hanging the bowl near the ceiling.

Discussion of Subways and Railroad Terminals in Chicago.

The joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, that was held on the evening of January 26 was the largest ever held in the Society's rooms. About 350 men crowded the auditorium library and committee rooms. R. F. Schuchardt presided. The election of officers for the Electrical Section of the Society resulted in the choice of F. J. Postel as chairman, H. M. Wheeler as vice-chairman, and E. W. Allen as member of the executive committee.

Bion J. Arnold, past-president of both organizations, was the principal speaker of the evening, taking as the subject of his illustrated talk "City Transportation, Subways and Railroad Terminals." This topic is now of very live engineering and pubic interest in Chicago and accounted for the large attendance.

Mr. Arnold opened his remarks with a reference to his 1902 report to the Chicago City Council on transportation problems. An attempt was then made to enlarge the authorized bore of the Illinois tunnel system, of which about six miles had been built under downtown Chicago streets. No good reason being given for this, he reported adversely on the request and the system was therefore extended on the original plan, totaling now over 60 miles of tunnels. The top of these tunnels is 33 feet below street surface. By special construction two superposed intersecting lines of subway can be built in space between Illinois tunnels and street surface, except at a few points where the tunnel roof will have to be altered.

In a more extended report made by Mr. Arnold in 1911, from which he quoted and showed many maps and diagrams, the principles that should govern in subway planning were laid down. Construction was recommended in several steps, of which the initial one was practically the same as the one recently recommended by the Board of Supervising Engineers. The routes and work proposed in this initial step form a nucleus to which can be added from time to time extensions and additions to make a comprehensive system of subways covering ultimately the main arteries in all parts of the city.

Mr. Arnold showed that the various steps in construction can be arranged to relieve not only surface congestion, but also that on downtown elevated railway lines and ultimately sufficient subways can be built to form a complete system of lines in which would be confined long high-speed express trains receiving traffic from points immediately adjacent thereto and from local surface car feeders. None of the subway lines proposed by the Board interfere with such development. The arrangement of stations was shown for two-track and for four-track subways, both single-deck and double-deck at intersecting points to avoid grade crossings. In any subway construction provision must be made for utility galleries to take care of water, gas, electric and other utility pipes and cables.

The very high investment involved in subway construction is justified only for running frequent, long and high-speed express trains, or where extreme congestion necessitates it. Outlying districts cannot develop sufficient traffic to warrant subway lines for many years; therefore initial work should aim to relieve the most congested streets. To build a subway costs three to four times as much as an equivalent elevated railway. The growth of Chicago surface-line traffic at present is at a rate of doubling itself in about 13 years.

Mr. Arnold concluded his address by speaking briefly of the need for rearranging the location of Chicago trunk railway terminals in order to permit the central business district to expand unhampered and to utilize more intensively the great area of central railroad property. He urged straightening of the river to open more streets and suggested that the railroads electrify and develop their suburban traffic by through-routing in separate subways.

In the discussion which followed the address, many questions were asked. Mr. Arnold said the financing of subway construction by special assessments on the property benefited is a very just and equitable plan, but unfortunately unpopular. However, two subways are now being built in San Francisco to his plans and the entire cost is borne by special assessment. James Lyman pointed out the increase in capacity that electrification would give the railroads. E. N. Lake spoke of extraordinary capacity of the new high-speed Boston subway running to Harvard Square, in which long trains with three-door cars are used. Mr. Arnold said that from the investment standpoint it is profitable to invest $2.50 to $4 for each dollar of gross receipts in surface traction lines, $4 to $6 per dollar of gross receipts in elevated lines, and $8 to $10 per dollar of receipts in subway lines. This distinction comes from the possibility of running longer trains at higher speed and with fewer employees, so the operating costs form a smaller percentage of gross receipts than with surface lines.

Planning Lighting Installations.

A joint meeting of the Chicago Section of the Illuminating Engineering Society and the Chicago Architects' Business Association was held on the evening of January 27 in the Art Institute, Chicago. Meyer J. Sturm presided, and the attendance was in excess of 100.

The principal paper of the evening was by J. B. Jackson and was entitled "Planning Lighting Installations." This paper took up the fundamental considerations affecting proper illumination of buildings, pointed out how proper results could be realized by attacking the problem in the right manner, gave data applicable for the determination of the proper intensity of illumination, the best arrangement of lighting units, the constants of electric incandescent lamps and the proper factors for taking into consideration, the reflecting power of walls and ceilings with different types of finish, when using different types of reflectors and glassware. The paper wound up by giving in definite order the proper steps to be taken in planning a lighting installation and a numerical example was worked out along these lines.

After a long business meeting by the architects, a talk on the fundamentals of illumination was gvien by William A. Durgin. This was one of a series of talks which is being given at the monthly meetings of the Chicago Section. Mr. Durgin dwelt especially upon the distinction to be made between intensity of the source, intensity of illumination and density of luminous flux. He carried out experiments to demonstrate the meaning of each one of these terms, and to show the values of the units of measurement, the candle, the foot-candle and the lumen.

There was but little discussion, the chairman calling only upon A. J. Sweet, of Milwaukee, who presented a brief statement of the ideals of the illuminating engineer, which are not merely to achieve efficiency in the utilization of light sources. He is also concerned with hygienic features, even more than with commercial features. He spoke briefly of the physiology of the eye and the great increase in its use in modern times, with the result that eye troubles are increasing at a tremendous rate. He pointed out the value of light in bringing out the features of architectural detail.

Some lantern slides of typical lighting installations were shown by H. B. Wheeler and F. K. Pinckney.

The next meeting of the Chicago Section will be held at Sears, Roebuck and Company on the evening of February 11. S. E. Church will describe the lighting installation in the company's buildings.

Lackawanna Extends Wireless System.

The Delaware, Lackwanna & Western Railroad is constructing additional wireless stations at Lake Hopatcong, N. J., and at Bath, N. Y. The former is 46 miles from New York City and the latter 100 miles east of Buffalo. When these stations are completed they will, with the stations already in operation at Scranton and Binghamton, provide for radio communication over the entire line with such trains as are equipped with wireless apparatus.

Both the east and west-bound Lackawanna limited trains will begin to handle commercial messages as soon as these stations are completed.

On January 24 a special train carried members of the American Society of Civil Engineers over the road from New York City to Nicholson, Pa. While this train was running at high speed, communication was held with the officers of the railroad in New York City, and with the *New York Times* by means of the wireless apparatus. Messages were communicated to the wireless station at Scranton and from there relayed by wireless to the station in the Woolworth Building, New York City. The trip of the civil engineers was for the purpose of inspecting the viaduct at Tunkhannock, which forms what is known as the Clark Summit cutoff. This has been erected at a cost of $12,000,000 and is the largest concrete viaduct in the world. It is 2,375 feet long, with 12 arch spans, and has a height of 242 feet above the stream which it crosses.

The Importance of the Current Strength On Brass Plating.

The strength of the current on brass or bronze plating is an exceedingly important portion of the operation, and lack of uniformity or means for regulating it is frequently the cause of failure in this important portion of the plating business. Not only is the maintenance of a uniform current necessary, but means for regulating it must be had. A dynamo may give a certain voltage while the brass tank is running, but if it drops when other tanks are thrown in, then it will not give good results in brass plating.

In brass plating the color of the brass deposit is paramount to everything else, and unless this color is maintained from day to day the work cannot be used. To obtain this color, which is usually an ordinary yellow brass, the current must be obtained with the greatest uniformity. There is always a certain current-density, indicated by the voltage, that will give the desired results, and this density must be maintained.

The manipulation of a brass solution is not difficult, contrary to the usual belief, when a uniform and proper current strength is obtained. It is known that too little free cyanide, so that the anodes coat over, causes a variation of color on the work, and so that copper, bronze, brass and zinc will often be deposited on the same article. The addition of a little cyanide, so that the anodes remain clean, is all that is required to correct this trouble. It is known that a brass solution that does not deposit its metal completely on an article is too lean in copper and zinc and must be built up with more carbonates. Too much gas given off from the work being plated indicates too strong a current, and if the deposit that forms is thin then too much free cyanide is present. Color is easily regulated by the addition of copper or zinc, as the case may demand.

After all these points have been corrected, however, nothing will be accomplished unless a uniform current is obtained. A suitable dynamo is necessary. One which shows a drop in voltage to a considerable extent when an additional tank is thrown on the line and cannot be restored is unsuitable for brass. A suitable rheostat is likewise essential for a brass solution, for the reason that while the dynamo may give a constant output, it may be (and usually is) of too high a voltage. It must then be reduced by a suitable rheostat. There is always one voltage that is right, and this must be obtained by means of a suitable rheostat.

In successful brass plating, therefore, it is essential that a dynamo be had that will give a uniform and full strength of current, and that a suitable rheostat be used which will enable one to cut down the current to the right quantity for producing the desired brass color. The successful brass platers have this equipment. —*Brass World.*

Western Inspectors Convene At Cincinnati.

The ninth annual convention of the Western Association of Electrical Inspectors was held at the Hotel Gibson in Cincinnati, O. The three-day convention began Tuesday morning, January 27, with a good attendance. President Ben W. Clark presided. Many important electrical inspection problems received careful consideration and free discussion. Revision of the association's constitution and by-laws was considered. A full report of the sessions will be given in our next issue.

The inspectors traveling by way of Chicago occupied a special car which left Chicago on Monday night. Monday afternoon was spent at the Underwriters' Laboratories, where some special tests were carried out under the direction of B. H. Glover, assistant electrical engineer. In the evening there was a theater party.

NOTES ON WAR ENGINEERING.

By P. S. Paganini.

The scientific improvement, of the last 25 years have increased and multiplied the importance and responsibilities of the engineering corps of an army far beyond the knowledge of the layman. To the past and still extant duties of bridging, road-making and position work in their different branches has been added all the service of sanitation, water supply, draining and the most important service of communication, either on the field or on the rear ways.

The engineering corps of an army, recruited on the basis of universal short service, consists in a general way of a highly trained set of officers, educated in special technical and military schools, and of a corps of non-commissioned officers, chosen among the trained privates, and who are kept as long as is possible in service by comparatively high pay and reenlistment premiums.

Privates are chosen among the men, who when presenting themselves for service are found to have previous training in skilled trades or some mechanical knowledge; or, if the quota of this kind of recruits is low, among men, by previous education or general appearance of inteligence and brightness, are thought to be capable of a quick development.

The shortness of their enlistment term requires a very intensive training and taxes to the utmost the ability and patience of the officers and non-coms, who every year find themselves obliged to deal with perfectly raw material, while at the same time continually losing their trained men by legal discharges at the end of service. Incidentally, it may be said that while much is as yet to be done to have all the apparatus with which army engineers have to deal, made practical for any kind of service under any kind of conditions, they are at present far superior in efficiency to the class of men that come in the natural order of things to handle them, and probably to this is to be atributed half of the breakdowns which occur in field service. Moreover, the short-service man of the fighting arms, owing to the length of his staying with the colors, is trained only for the business of fighting and he is absolutely helpless and hopeless in any other kind of work; and any other kind of work he dislikes and refuses to do, and that adds to the engineer's lot a large amount of details which in earlier times were taken care of by the fighting units.

In the late Turkish-Italian war, the

service and continuity of communications was obtained by the separate and combined use of telegraph and telephone companies with packs wireless and heliographic units, searchlight sections supplemented by motorcycles, bicycles and mounted orderlies. Telegraphs and telephones were used for permanent or semi-permanent work in and around fortified positions; telephones for field service; wireless for communication between the bases and detached columns, or between the colony and the mainland. On this service heliograph showed up very well and searchlights were used quite exclusively for the night explorations of the ground around fortified positions or at the outposts. These seemed to be more useful to blind the enemy and conceal the position when thrown across their line than for finding purposes, as the observer is practically blinded if not kept quite away from the searchlight rays; and if kept too far away he is apt to lose his working connection with the searchlight operator and be handicapped by a sudden shift or disappearance of the light.

The telegraph and telephone companies did a large amount of permanent work, from the begining of the war in September, 1911, to early in 1912. They enacted around Tobruk 40 kilometers of line, with 60 kilometers of wire, part on the ground, or under, with insulated and armored cable, part above ground with bare wire on light posts. Around Bengase, 132 kilometers of line; around Tripoli, 195 kilometers of telegraph and 40 kilometers of telephone lines, part under ground and part above, with 50 telegraph and 50 telephone stations and with an average of 2,000 messages per day.

The telephone was found indispensable and absolutely reliable during actions. The commanding officer was kept in constant touch with his report commanders. Any shifting of headquarters was quickly followed by the relaying of the wire by a second pack section while the first was engaged in taking up its own laid wire and getting ready for future work. No wire was ever left on the field, except for short lengths, or in case of retreat. At the outposts the telephone was found in some cases dangerous, as the ringing was apt to disclose the location of the outpost. Not much trouble was had by wire cutting, only by cable chafing on very hard and rocky ground, but grounds were easily discoverd and remedied. Friendly natives interfered somewhat with operations by excess of zeal in trying to get the laid cable out of the way of marching troops. The most useful and mobile pack section was found to consist of a cable cart and instrument cart, the lumber carriage being quite too long and heavy for quick movements. Undoubtedly the greatest advantages of the telephone in comparison with any other system of transmission of messages are its quickness and mobility.

Wireless telegraphy had a thorough try out. In October, Tripoli was in constant communication with the fleet outside the harbor, in November with Augusta (Sicily), about 400 miles away. Slowly the number of permanent stations were increased to eight and some 31,000 messages were exchanged and very little trouble was given by atmospheric conditions. For field service, its advantages in comparison with the telephone are; (1) cannot be cut by enemy; (2) any flank move can be made without relaying of wires; (3) it is not necessary to traverse the country between two points to obtain communication between the two points. Its disadvantages are; (1) slowness (2) interference; (3) inability to preserve secrecy. Remedies were found in using ciphers; by using the apparatus of different stations only at determined periods on the hour; by changing the wave length of transmitter from one fixed wave to another, after stated periods of time. The enemy not being very well supplied with strong apparatus, not much experience was had on what troubles interference from his side would have caused.

Owing to the sandy and rocky nature of the ground in Lybia the wagon and lumber section adapted to the good metal road of the continent, were found to be too heavy and it was necessary to have recourse to the pack mules or carrier camel sections. That decreased the practical range from 200 to 50 miles, as the weight and consequently the power of the engine had to be kept down to possible pack board. The only improvement in range was through a lengthening of the masts, which if too high would have required a complicated mast gear and lifting arrangement.

A typical pack station is made up of four loads; (1) the engine-dynamo load (the pack saddle which can be lifted and ready on the ground in one minute serving as bed plates for the generating units; (2) the instrument loads, in three cases—transformer, primary oscillating circuit, receiver with accessories and tuning testers (connections between the units being made automatically when the cases are piled on top of each other); (3) masts and earth, and (4) mast gears and antennae. The stations can be ready for transmitting in about 20 minutes. The masts not being generally longer than 30 feet are put together laying on the ground and then upended like a ladder. No load is larger than 200, the generating set of from two and one half to three horsepower weighing from 40 to 45 pounds. The electrical side is a one half kilowatt self-exciting low-frequency alternator, wired to give alternating for transmitter and a small supply of low-voltage direct-current for charging a small accumulator for the light in the receiver box.

Wireless was timed on an aeroplane, with good results as far as sending, but poor receiving, account of the noise. The apparatus weighed about 20 to 25 pounds.

Concluding the war was a thorough lesson in practical field engineering to the engineering corps, and future improvement of engineering materials for war purposes are expected to follow. Some have already been made. Only the other day a flying column was in touch with the supreme command after occupying Murzuk, a straight 500 miles as the birds fly. That would show a park station with a range of at least 200 miles, as that is the distance from the nearest station where a permanent outfit has possibly been established, and only camels were following the column.

Peoria Electric Show.

The Electric Show, which is to be held in Peoria, Ill., early in March of this year, will be conducted by the Peoria Electric Club. This organization meets twice a month on Saturdays for luncheon. The president is C. A. Hoppin, consulting engineer, and the secretary is E. H. Joseph, of the Electric Appliance Company.

The director of the show is T. D. Buckwell, manager of the Central Illinois Light Company.

The Electric Club is composed of representatives of all the various electric industries in the city. There is thus no doubt but that the Electric Show will be a success both as to the number of exhibitors and attendance from both the city and the surrounding towns.

On the evening of Friday, March 13, the Jovian Order will hold a rejuvenation in charge of Statesman E. R. Elam.

Society for Electrical Development.

The Board of the Society for Electrical Development met in New York City on January 26 and discussed a number of very important matters relating to the welfare of the Society. Fifteen directors were in attendance. Reports by the general manager and by the secretary-treasurer covering operations to date were read and accepted. Stephen L. Coles was made secretary-treasurer. The meeting adjourned to February 17.

New Electrical and Mechanical Appliances

American Production of Tungsten Ores in 1913.

Tungsten ores were produced during 1913 in six of the Western states: Colorado, California, Idaho, Arizona, South Dakota, and Nevada. According to preliminary figures collected by Frank L. Hess, of the United States Geological Survey, the production showed an increase over that of each of the two preceding years. The output for 1913 was equivalent to 1,525 tons of ore carrying 60 per cent of tungsten trioxide, and was valued at about $640,500. The production in the three preceding years was 1,330 tons, valued at $502,158, in 1912; 1,139 tons, worth $407,985, in 1911; and 1,821 tons, worth $832,992, in 1910.

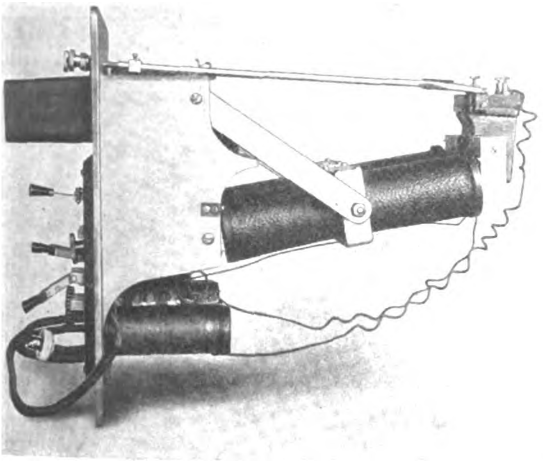
As heretofore, the Boulder County field, Colorado, was the largest producer, with an estimated output of 953 tons of ferberite in 1913, against 812 tons in 1912.

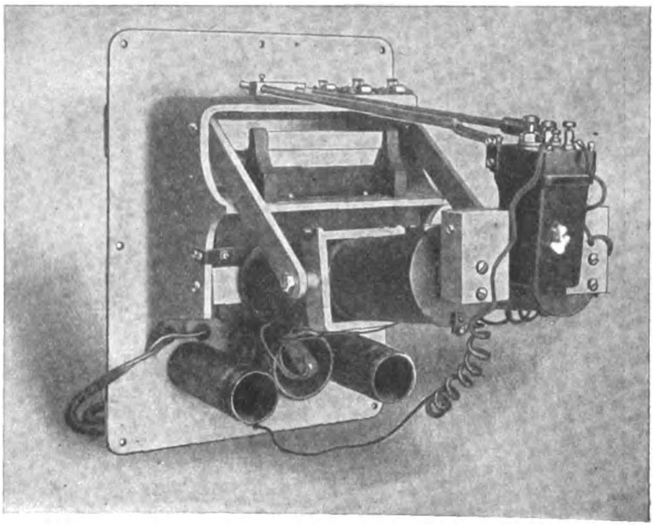
The Atolia district, California, was the second largest producer, and still makes a larger production of scheelite than any other district in the world. Nearly all the output was produced by the Atolia Mining Co., but small quantities were also produced from several mines at Atolia and the Stringer and Randsburg districts on the north.

Some wolframite was produced in the Clark Mountain region, in southeastern California. In Arizona scheelite was produced in the Old Hat district, 40 miles north of Tucson. Other than the Atolia district, this is the only district in the United States from which a production of scheelite is made.

Some hübnerite was produced in the Arivaca region, near the Mexican boundary line, south of Tucson, and at Dragoon, east of Tucson. A little hübnerite was also produced at Round Mountain, Nev., and in the Blue Wing district, Paterson Creek, Idaho.

Prices were better during the year than in 1912 and ranged from $6 to $7.50 per unit of 20 pounds at tungsten trioxide.


Simplex Peak-Voltage Meter—Side View.


Simplex Peak-Voltage Meter—Rear View.

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A New Form of Voltmeter for Measuring Peak Voltages.

In the testing of insulated wires and cables designed for a great variety of purposes a voltmeter often fails to measure adequately the stresses to which the dielectric is subjected. Based on the integration of the sine wave (on the square root of the mean square of instantaneous values) voltmeter readings give little or no indication of unusual peaks in the voltage wave or of surges in the circuit.

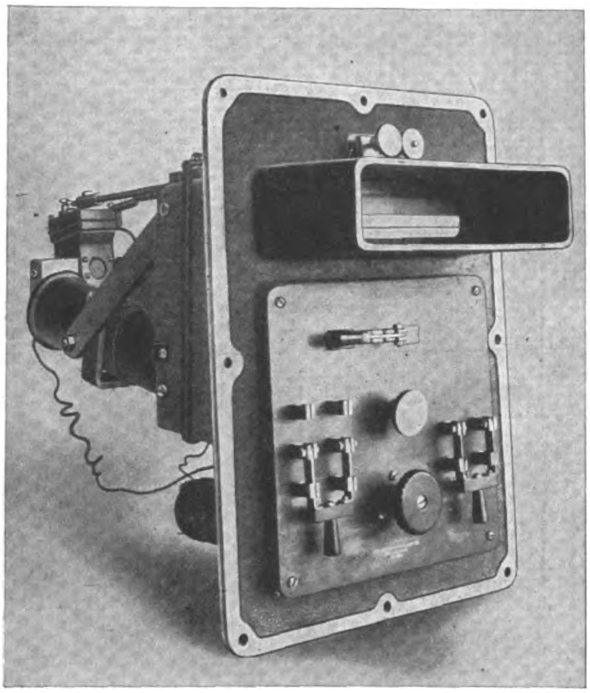
The need of an instrument which would give such readings arose in connection with the high-voltage testing of wires and cables, it being well known that in such tests the peak of the wave is what counts in breaking down the insulation. So long as a sine wave is maintained, the ordinary voltmeter indicates the peak voltage (a definite percentage above the voltmeter reading). But in cable testing there is a considerable charging current, due to the electrostatic capacity of the cable. As this current is likely to distort the wave form, the ordinary voltmeter may give no definite information as to peak voltage.

After trying and discarding both a spark gap, which proved to be too easily affected by outside conditions, and an oscillograph, which is too delicate an instrument for factory use, the engineers of the Simplex Wire & Cable Company, of Boston, Mass., proceeded to develop for their own use apparatus which would give the required results. Based upon the principle of the oscillograph, but with its movement confined to a straight line, the new instrument, illustrated herewith, indicates the peak of the voltage wave at the limit of oscillation along that line. It does not show the character of the wave or the form of its peak, but it does give very clearly the reading for that peak, whatever the shape of the wave may be.

This peak-voltage meter, in its original crude form, was used successfully in the Simplex factory for some time, and thus thoroughly tested out. It has just been completed in its present form, after an experimental period extending over two years.

The voltmeter, which is of switchboard type, measures about 10 by 12 inches on the front and 14 inches deep. It consists essentially of a heavy electromagnet, between the poles of which is located the vibrator. By a suitable arrangement of lamp, mirror and lenses, a beam of light is thrown on a ground-glass scale in front, graduated in volts. This instrument is connected, through a potential transformer, directly on the high-voltage circuit, the current being so small that the apparatus can be left in the circuit all the time. It can be quickly calibrated at any time by applying direct current of known voltage.

This interesting example of the development of an invention to meet a particular factory need might prove of considerable value in other lines as well as that of the manufacture of insulated wires and cable. But a striking feature of its development is that it shows the readiness of the American manufacturer to undertake both the deep study and the careful experimental work needed to provide him with the tools with which his regular work can be carried on to best advantage.



Simplex Peak-Voltage Meter Showing Control Board.

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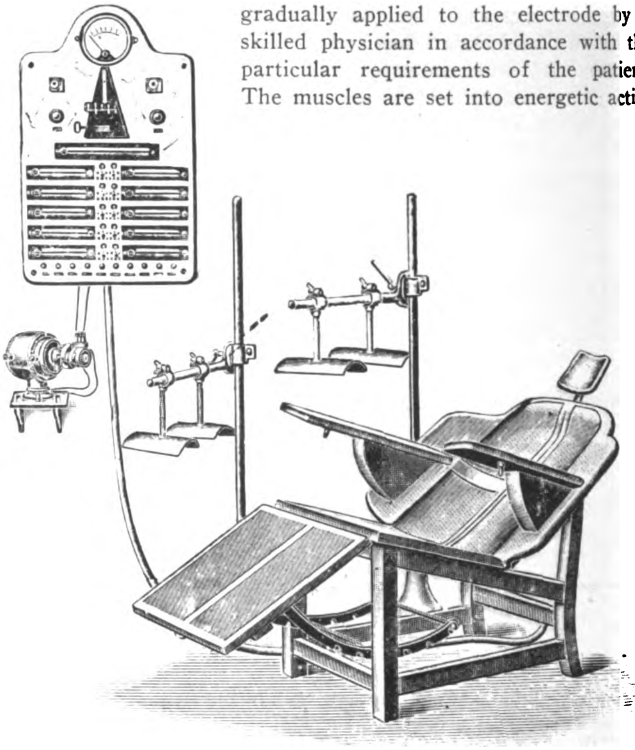
Electrical Apparatus for Treating Obesity.

The number of applications of electrotherapeutic methods is constantly increasing. One of the latest is its application in the treatment of obesity. This new method was developed by Dr. Bergonie, a French physician, who found that the muscles of the entire body could be compelled by electricity to perform energetic muscular work without the intervention of the will power of the patient. For this purpose Dr. Bergonie used a vibratory current generated by an induction coil. Although the treatment was found to be quite effective, the varying character of the so-called faradic current, due to the uneven action of the interrupter, was found to produce shocks and nervous effects that made the patient fidgety. To overcome this difficulty an improvement was devised by Dr. Nagelschmidt in which a constant direct current was used which was passed through a rotary commutator to produce an interrupted pulsating reversed current, the application of which to the patient is said to produce no unpleasant effects. In this manner stronger currents than heretofore can be employed without discomfort to the patient, which improves the effect and hastens the cure.



Chair for Electrical Treatment of Obesity.

The apparatus used in this treatment is shown in the accompanying illustration. The main portion of it is a so-called obesity chair, which is an adjustable operating chair provided with eight metal plates insulated from each other and serving as stationary electrodes for applying the current to various parts of the body. Two stands are provided, each with a number of movable electrodes by means of which the other side of the circuit is connected to any portion of the body, the current passing through the muscles from the stationary to the adjustable electrodes. The stationary and the adjustable electrodes are connected through a multiconductor cable to a compact switchboard on which there are reversing switches and control rheostats for each separate electrode, also a timing device called a metronome which periodically opens and closes the circuit to enable the muscles to recuperate for brief intervals. The source of current may be varied, either a direct current or an alternating current, of any voltage, which is passed through the proper transforming device to convert it to a direct current of relatively low voltage. This direct current is passed though a motor-driven commutator shown at the left in the illustration, which serves to produce an adjustable number of interruptions in this current, varying from 2,400 to 12,000 per minute. Thus in one adjustment the commutator makes 90 current interruptions per second and each current flow has a duration of one-twelvehundredth of a second.

In carrying out this treatment the adjustable electrode is applied to the particular muscle or fat tissue that it is desired to work upon and the current gradually applied to the electrode by a skilled physician in accordance with the particular requirements of the patient. The muscles are set into energetic activity by this application of the current. When properly applied a patient's will is not called into action and the entire treatment produces no fatigue, even when continued for one hour. At each treatment the patient loses approximately one-half pound, so that within a week he becomes lighter by from four to six pounds. The functions of various organs of the body are also stimulated, particularly the heart, which in many cases of this kind has suffered. The method usually consists in 25 treatments, then an interruption of treatment for one to four weeks and then a second series of 25 treatments. The weight reduction is most noticeable during the earlier treatments.

The apparatus used in this method is made abroad and sold in the United States by The Sanax Company, Incorporated, 125 East Twenty-third street, New York City.

A New Cable Car for Hanging and Repairing Aerial Lead Cables.

For use in hanging and repairing lead-covered telephone and telegraph cable for overhead lines, the Fairmount Electric & Manufacturing Company, Philadelphia, Pa., has placed on the market a new cable car with many advantageous features. This car, known as the "Aero" car, is shown complete in Fig. 1. In Fig. 3 are shown the four parts of the car when it is "knocked down" for shipment. Fig. 2 shows the car in use.

The Aero cable car has been designed with a view to minimum weight and extra strength, weighing but 20 pounds complete. It is constructed entirely of cold-rolled steel and crucible steel castings, except the seat and pick-up roller, which are of oak wood. All metal parts are sherardized or rendered rustproof, which assures free working of all parts at all times.

The car is arranged so that it can be taken down in four parts, as shown in Fig. 3. The parts interlock in such a way that it is not necessary to take any of the bolts or nuts off when assembling or disassembling; since all bolts are upset, this prevents them from becoming detached and lost.

The wheels of the car, which ride on the messenger wire, are corrugated in such a way that they pass freely over any cable hook or hanger which is not possible with smooth-faced wheels.

There is an adjustment on the car that permits the height to be increased or decreased for a long or short-bodied man, respectively. The brace bar which runs across the back of the car can be adjusted to upper or lower position while the workman is using the same on a messenger wire. Fig. 1 shows this bar in its lower position and Fig. 2 shows it in the upper position.

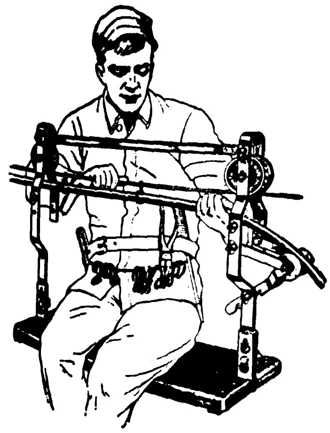


Fig. 2.—Car in Use for Hanging Cable.

The attachment shown on the left on the car in Fig. 1 is known as the pick-up roller and can be adjusted to different positions (according to length of hooks or hangers used) so that the cable will be brought to the proper distance from the messenger wire, thus permitting the cable hooks to be readily attached. See Fig. 2. Without this pick-up attachment a workman is compelled to hold the cable in position for attaching hooks and cannot attach half the number of hooks in a specified time as with the pickup attachment.

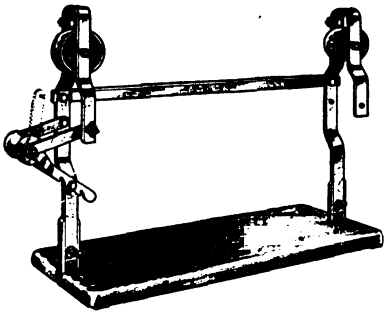


Fig. 1.—Aero Cable Car.

The minimum weight of this car and the small space occupied when knocked down for transport can be readily appreciated by telephone men, and permits, for instance, of one man placing the car and tools on a motorcycle and going miles into the country to repair a cable, which otherwise would necessitate two men and a wagon, or the shipment of car and tools and then hiring a team to haul the car and tools to the section where the trouble is located.

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Montana Copper Production.

The copper output of Montana declined about 9 per cent, from 309,738,873 pounds in 1912 to 280,658,000 pounds in 1913. This last was about 30 per cent less than the output of Arizona, the leading copper producer in 1913. The average price of copper decreased from 16.5 cents in 1912 to about 15.37 cents in 1913, and it is presumed that no efforts toward a record output were made by the larger smelting establishments. According to monthly printed statements, the Anaconda Copper Company was making an average of 22,000,000 pounds per month and the East Butte Copper Company about 1,125,000 pounds per month.

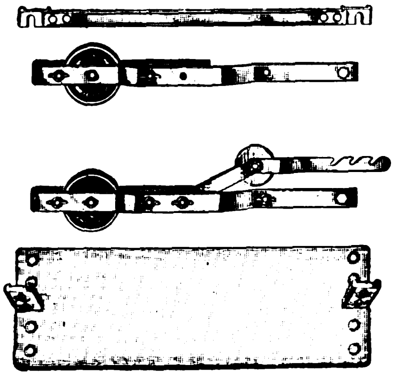


Fig. 3.—Parts of Car as Shipped.

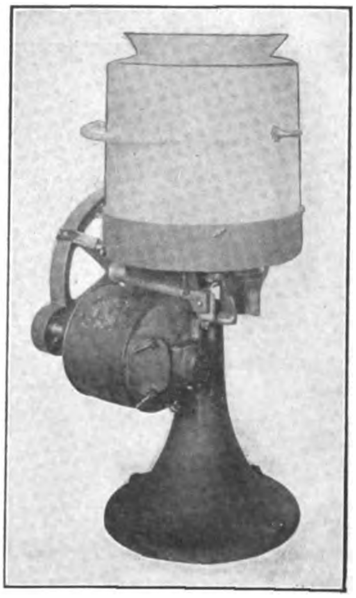
Motor-Driven Vegetable-Paring Machine.

The illustration herewith shows a motor-driven machine made for paring potatoes, etc., with the smallest waste and in the shortest time. This machine removes by friction the whole of the refuse or outer skin of potatoes, turnips, carrots, parsnips, etc., and turns them out perfectly peeled, smooth and clean in their natural shape and ready for use.

The machine is built in accordance with United States Navy specifications and is driven by an inclosed watertight, shunt-wound motor rated at one horsepower, 120 volts, 1,800 revolutions per minute. This machine has a capacity of from 10 to 25 bushels of vegetables daily. It is especially adapted for hotels, hospitals, sanitariums and shipboard use. Forty pounds of potatoes or other vegetables can be placed at one time in the hopper. The heights of the machine is 49 inches and it requires very little floor space, the base being but 19 inches in diameter.

Operation of the motor-driven paring machine is as follows: Start the motor, turn on the water, empty into the cylinder at one time sufficient potatoes (not washed or assorted) to almost fill it up.

The friction disk will at once cause the contents to take a rotary motion and come in contact with the diverter fastened to the cylinder, which will immediately cause the return of the potatoes, etc., to the center of the disk, whence they are again taken to the side of the cylinder, and so the movement of the contents repeats itself. During the whole time by gentle friction and rubbing contact with the disk, the outer skins only are being


Vegetable-Paring Machine.

removed without tearing, pounding or bruising the vegetables in any way, thereby retaining the greatest percentage of the most nutritious part of the vegetables. Water is constantly sprayed over them, which thoroughly washes and cleans them, and also carries off the parings, dirt, etc., from the machine through the waste outlet to the sewer.

When the vegetables are sufficiently pared, the door is opened without stopping the machine and it immediately empties the vegetables into the receptacle placed to catch them without throwing them all over the floor. The door is then closed and the operation repeated.

This machine is made by the American Paring Machine Company, Philadelphia, Pa. The motor illustrated is manufactured by the Diehl Manufacturing Company, Elizabeth, N. J.

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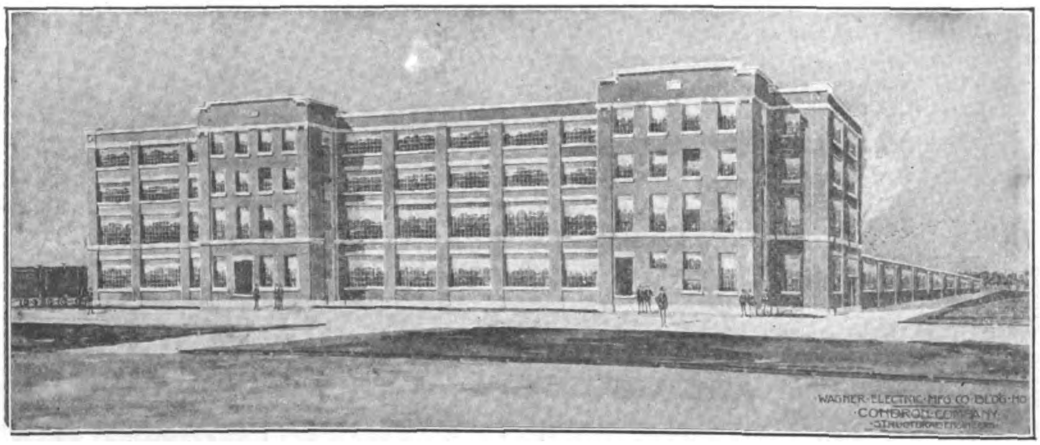
New Building for Wagner Company.

The accompanying illustration is the architect's drawing of a new building to be erected at the Hillside Plant of the Wagner Electric Manufacturing Company, 6400 Plymouth Avenue, St. Louis, Mo., at a cost of $150,000.

This building is to be of reinforced concrete throughout. It will be four stories high, and cover an area of 272 feet by 45 feet. The building is to be used chiefly for the manufacture of the smaller products produced by this company.

When the building is completed about 400 people will be added to the pay roll of the company, which now employs, at its two plants, over 1,800 persons.



New Wagner Factory.

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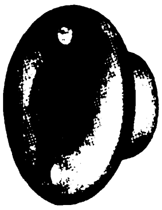
Anglo-Spanish Wireless.

The British Postmaster General has consented to a license being granted to Marconi's Poldhu station for the purpose of conducting a commercial telegraph service between England and Spain.

New Paiste Separable Attachment Plug.

Neatness and small size were made the features in designing a new separable attachment plug by the H. T. Paiste Company, of Philadelphia, Pa. An entirely new idea is the fiber washer which slips down the shaft and fits into a shoulder in the edge of the cap. This completely hides the ragged wire ends and is a protection from the dirt which collects there. When wiring the plug this washer is slipped off, leaving the contact screws exposed and easy of access. A strain relief makes an Underwriters' knot unnecessary.

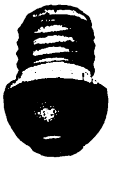


Paiste Round, Flush Receptacle.

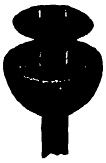
Strength in the shaft is secured by the heavy brass contact bars which are molded into the cap. A firm grip and good contact are secured by using folded bronze springs in the base. Nibs on these springs catch on recesses in the brass bars of the cap.

A complete line of brass flush receptacles, pipe-taplet receptacles, current taps, chandelier receptacles, porcelain conduit-box and wall receptacles are manufactured to take this attachment plug.

An entirely new fitting is the canopy receptacle, a neat and attractive receptacle which gives an extra outlet at any wall or ceiling fixture which has a canopy.



Paiste Plug—Complete.



Paiste Fiber Washer Raised for Wiring.

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The construction of a hydroelectric station on the River Mendoza in the Argentine Republic has been approved by the government authorities. It will have an initial capacity of 16,000 horsepower.

Demand for Electric Plants in Many Chinese Cities.

At a recent meeting in Shanghai of the Saturday Club, T. H. U. Aldridge, the Shanghai municipal electrical engineer, made an address which deals with the equipping of Chinese cities, large and small, with electric power and lighting plants, and which may be of live interest to American electric supply houses. Mr. Aldridge tells how the Chinese, especially in the interior, desiring a plant go to work to get it. Within a few years some hundreds of communities will take on electric plants —a score have already done so—and electric equipment houses of a number of nations have elaborate showrooms in Shanghai and other treaty ports, and their agents, who are trained electrical engineers are busy traveling from community to community to secure orders. A printed copy of the address in question will be loaned on application to the Bureau of Foreign and Domestic Commerce, Washington, D. C.

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New England Power Operations.

The New England Power Company, which has recently constructed three hydroelectric stations on the Deerfield River in Western Massachusetts, has closed contracts for the supply of energy to the Amherst Power Company, the Fitchburg Gas & Electric Company, the Central Massachusetts Electric, Marlboro, Gardner and Worcester Electric Light companies, and the Worcester Suburban Electric Company. The company, together with the allied Connecticut River Power and Transmission companies, has installed capacity of about 50,000 horsepower in its several generating plants, and the development of 200,000 horsepower is contemplated. The transmission system is 200 miles in extent, and reaches from Southern Vermont through central Massachusetts to Rhode Island. Power from the generating stations operates the newly electrified Hoosac Tunnel supplies, a half dozen towns and supplements local power plants of five street-railway companies. A transmission line has been completed to North Adams, and within a short time the company will supply current for operating the extensive system of the Berkshire Street Railway in western Massachusetts. A storage reservoir with a capacity of 23 billion gallons, at Somerset, Vt., constructed for the impounding of water to be drawn upon in seasons of drought, is reported to be filling rapidly, one-half of the 100-foot depth of the basin having filled. A new station, near the eastern end of Hoosac Tunnel, will be equipped with generating apparatus, and a second storage basin at Davis Bridge, near the Vermont-Massachusetts line, is projected.

Merger of Electric-Vehicle Manufacturers.

The formation of a $1,500,000 corporation, the American Electric Car Company, to manufacture and market the product heretofore made by three electric vehicle firms, has just been announced. The three firms are the Argo Electric Vehicle Company, of Saginaw, Mich.; the Borland-Grannis Company, of Chicago, and the Broc Electric Vehicle Company of Cleveland.

The three makes of cars will be marketed under their present names by the new company, and the existing agencies probably will be continued. The assets of the three companies are free of incumbrance as taken over by the American Electric, and in addition a large amount of new capital has been acquired. Considerable expansion of the business heretofore carried on by the three firms is announced for the near future.

A great saving in material and manufacturing expenses is predicted for the merger, and an even greater economy in selling cost, as the entire product will be marketed through one organization.

The president of the American Electric Car Company is F. A. Brand; the vice-presidents are Fred Buck, Bruce Borland and U. B. Grannis. Theodore Huss is secretary and treasurer. All of the three original firms are represented on the board of directors.

Latest Approved Fittings

BRAKE SOLENOIDS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Solenoids for operating mechanical brakes.

Bulletin Nos. 7710, 7720, 9865.

Approved December 6, 1913.

CUTOUT BASES, Cartridge Fuse.—The Connecticut Electric Manufacturing Company, Connecticut and Florence Avenues, Bridgeport, Conn.

Porcelain-base cutouts for National Electrical Code inclosed fuses, 0-30, 31-60 and 61-100 amperes, 250 and 600 volts.

Approved December 27, 1913.

CUTOUT BASES, Plug Fuse.—George Heinemann & Company, Girard Avenue and Fifth Street, Philadelphia, Pa.

"G. H. Co." porcelain cutout bases for Edison plug fuses; 0-30 amperes, 125 volts; catalog Nos. 1,935, 2,135, 2,165, 2,199, 2,587, 2,965, 8,042.

Approved December 27, 1913.

FIXTURES.—The Dale Company, Ninth Avenue, Thirteenth and Hudson Streets, New York, N. Y.

Dale ceiling one-light fixture, catalog No. 23,735. A metal canopy and shade-holder to which is fastened by two screws a one-piece porcelain receptacle having No. 14 flexible rubber-covered wire leads.

Approved December 27, 1913.

MOLDING FITTINGS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Fittings for use with "National" metal molding.

Couplings, catalogs Nos. 401a, 402a, 403a, 414, 417a.

Outlet bushings with covers, catalog Nos. 367, 368.

Tees, catalog Nos. 405a, 411a.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Junction boxes, catalog Nos. 363, with cover 363a, 375, with cover 383, 376.

Outlet boxes, catalog Nos. 339, 342R, 343, 363, with cover 363b; 375, with covers 378-381 inclusive; 365, 366.

Straps, catalog No. 425.

Rosettes, fuseless, catalog No. 431.

Approved December 22, 1913.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant" porcelain shell.

Keyless, 660 volts, 250 volts.

Sign, catalog No. 4057-Special, when installed so that both the porcelain base and metal rings are held by means of solder so that they cannot turn in the sign face.

Approved December 27, 1913.

ROSETTES, Fuseless.—The Trumbull Electric Manufacturing Company, Plainsville, Conn.

"Circle T," three amperes, 250 volts.

Cleat, catalog No. 758.

Approved December 27, 1913.

SIGNALING SYSTEM. — Electro-Call Signal Company, 1591 Columbus Road, Cleveland, Ohio.

This system is designed for use in supplementing a private telephone exchange, or for signaling persons at a number of places simultaneously from a central point. The system comprises, in its essentials, a sending station, a motor-driven automatic transmitter and a number of gongs mounted in series.

Approved December 27, 1913.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." mogul base, 1,500 watts, 600 volts, catalog Nos. 243 and 445.

Approved December 27, 1913.

SOCKETS, Weatherproof. — Connecticut Electric Manufacturing Company, Connecticut and Florence Avenues, Bridgeport, Conn.

"C. E. M. Co." 660 watts, 600 volts.

Porcelain, catalog No. 9,366.

Also catalog No. 27 for decorative work when wires are properly soldered to terminals and sealed with an approved insulating compound which does not melt below 200 degress Fahrenheit. Catalog No. 11,001 ready wired for decorative work.

Approved December 27, 1913.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

Chandelier Switches.

"New Wrinkle" pull switches, three amperes, 125 volts; one ampere, 250 volts; catalog Nos. 406, 406-Special.

Approved December 27, 1913.

TRANSFORMERS.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

Bell-ringing transformers, designed for connection to 110-volt alternating-current circuits:

Catalog No. 97,207; secondary, 4, 8 and 12 volts.

Catalog No. 97,299; secondary, 10 volts.

"Wayne;" secondary, 12 volts.

Approved December 18, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

KINGSTON, OKLA.—This place has granted a franchise for an electric-lighting system.

PULASKI, TENN.—$15,000 will be expended to complete the lighting plant. Address the city clerk.

BUDA, ILL.—The Council is planning ways and means to secure electric lighting. Address the city clerk.

ROCK ISLAND, ILL.—The Council is planning to secure additional street lights. Address the city clerk.

PECOS, TEX.—The City Council has decided to erect a system of ornamental lights in the business district. D.

ASHLAND, ILL.—The Council is planning ways and means to secure electric lighting. Address the city clerk.

RUNGE, TEX.—$25,000 will be expended for a light and water system. Address the mayor for information.

HAZELTON, PA. — The Council is planning to erect municipal electric light plant here. Address the city clerk.

STEWARTVILLE, MINN.—A movement has started for issuing bonds for $15,000 for the electric light plant. C.

RICHLAND, MO. — The construction of a municipal light plant will be considered at once. Address the city clerk.

HUNTINGTON BEACH, CAL. — The Pacific Light & Power Company has been granted a 40-year franchise in this city.

WINFRED, S. D.—The Council is planning to establish a municipal lighting plant. Address the city clerk for particulars.

HYATTSVILLE, MD.—$10,000 will be expended installing an electric light plant here. Address the city clerk for particulars.

DECATUR, NEB.—Electric light bonds have been voted, plans and specifications have been prepared and contracts will soon be let. C.

WINCHESTER, ILL.—A company has been organized to build an independent electric plant. Address F. H. Allen, for information.

PLEASANTON, TEX.—The Pleasanton Ice & Light Company, is planning to install equipment and improve the light and power plant.

CLEVELAND, O.—The Konery Electric Company has been incorporated with a capital stock of $10,000 by C. F. Schultz, and others.

WAUKEGAN, ILL.—Estimates are being received for installing ornamental lighting. Address Mayor Bidinger for further particulars.

ESBON, KANS.—The Council is planning ways and means to install a municipal lighting plant. Address the city clerk for particulars.

RED LAKE FALLS, MINN.—E. F. Wheeler is preparing plans and securing data as to cost of construction for a "White Way" lighting system. C.

DUVALL, WASH.—Duvall Light & Power Company has been incorporated with a capital stock of $16,000 by E. Milton and Stephens B. F. Bird.

CALEXICO, CAL.—Plans are under way for the city to operate its own electric light plant for street lighting in conjunction with its water system.

NEEPAW, MAN.—A bylaw authorizing the expenditure of $18,000 on a municipal electric light and power plant was voted on and passed. C.

HALLS, TENN.—The city will improve the electric light and water plant. Electrical equipment will be installed. Address B. M. Archer for further facts.

INDIANAPOLIS, IND.—The Park Board plans to light the boulevards with electricity. Address James H. Lowey, secretary of board for desired information. [illegible]

FORDVILLE, N. D.—This village is planning the installation of a combined electric light and fire-protection system. Address the secretary of the Commercial Club.

PORTLAND, ORE.—Garibaldo Power Company has been incorporated with a capital of $15,000. The incorporators are: Charles J. Schnabel, Newton C. Smith and J. B. Ofner.

MINNEAPOLIS, MINN.—Architects Long, Lamoreaux and Long, 830 Hennepin avenue, are preparing plans for a 14-story hotel, the specifications including an electric plant.

ROCK FALLS, ILL.—$8,000 in bonds has been voted for improving and extending the municipal electric-light system. Address O. M. Aarvig, superintendent.

SHERMAN, TEX.—An election will be held to decide the question of issuing $5,000 in bonds for street lighting. Address Joseph P. Cox, city attorney, in regard to this project.

OTTUMWA, IOWA.—The Ottumwa Railway & Light Company, is considering the building of a transmission line to Bloomfield to provide electric light and power service for that city.

SAN ANTONIO, TEX.—J. D. Sug, owner of the San Angelo street railway system, is planning to extend the car lines here and to erect a power plant. He also promises the opening of a park.

SYDNEY, N. S., CAN.—Electric Lights are to be installed at Westmount, a suburb of Sydney across the harbor. Details can be obtained from John Midgley, McVey Block, Sydney, Nova Scotia.

SYRACUSE, N. Y.—The Mayor and City Council have passed an ordinance providing for the installation of 378 additional lamps in the ornamental lighting district. Address Henry C. Allen, city engineer.

LOS ANGELES, CAL.—The Board of Supervisors of Los Angles County will receive sealed bids up to February 2 for installing and operating a street lighting system in the Idylwild lighting district.

YOUNGSTOWN, O.—Mayor F. A. Hartenstein states that the Council of this city is now seriously considering a municipal lighting system and that at the proper time he will make some recommendations on this subject. R.

RAVENNA, MICH.—Business men here are considering the organization of a company to develop water supply in Crockery Creek, a stream from which it is figured 30 horsepower can be secured. Address J. E. Kline, for desired information.

ST. CLOUD, MINN.—The Power Distribution Company has settled its financial difficulties and construction will go forward. Power will be generated here with auxiliary stations at Howard Lake and Eden Valley. W. Baer Ewing, Minneapolis, is president. C.

DASSEL, MINN.—W. R. Rutledge, Howard Lake and Ernest Johnson, of this city, have formed an electrical construction company, with headquarters here, and will have charge of all wiring and building service lines for the Power Distribution Company. C.

MADISON, IND. — The Madison Light & Railway Company has asked the permission of the State Public Service Commission to issue $25,000 of mortgage bonds to be used for adding to the capacity of its power plant and extending its lighting service to Hanover, Ind. G.

LYONS, N. Y.—L. C. Reynolds, general superintendent of the Central Gas & Electric Company, is at work upon a set of plans for improving and enlarging the power house in this village, which when completed will enable the company to double the amount of power now generated here.

LA CROSSE, WIS.—The Railroad Commission has ordered the Neshonic Light & Power Company to furnish to the Commission complete plans and specifications for a hydroelectric power plant to be built on the site of the present plant. When the plans are approved it is required that the plant shall be built and completed within six months.

VANCOUVER, B. C.—The Western Canada Power Company, with offices in Vancouver, intends to add two 13,000-horepower hydroelectric generating units to its present plant. One of the new turbines will be installed next spring and the other early in 1915. The present plant of the company, consisting of two units, is capable of generating more than 25,000 horsepower. The additional plant and equipment of the new unit, including installation, will involve an expenditure of $500,000.

CENTRAL CITY, KY.—Dr. W. H. Netherland, a well-known banker of Louisville, is one of those interested in the construction of a large power plant and a traction system in the Western

Kentucky coal fields, with the principal work in this city. Dr. Netherland states that full details of the project, which involves an ultimate expenditure of $3,000,000, will be given out in the near future. G.

ZANESVILLE, O.—A plan which is intended to solve the light and power problem of this city has been offered by the Civic Government Association and will probably be presented to the Council. It recommends the purchase of the Hook Brothers and Aston Mill and that firm's water power rights, and proposes to utilize the property for the erection of a municipal power plant, contemplating the generating of sufficient electricity to light and furnish power to the city for the operation of the pumps at the water works station. R.

WOODLAND, CAL. — The State Water Commission has decided that the Yolo Water & Power Company is entitled to the use of the surplus water of Clear Lake, which will be employed to develop electric power to be distributed throughout Central California and for the irrigation of more than 150,000 acres in Yolo County. It is announced that the company has already expended $1,500,000 in construction of a dam and acquisition of water rights, and that $7,000,000 will be spent to perfect the system and erect two power houses with a combined capacity of 50,000 horsepower. It is proposed to offer electric service to San Francisco and other bay cities within the next five years.

URICHSVILLE, O.—Manager Stilgenbauer, of the County Electric Company, states that the details of the merger of the Twin City Traction Company, the Midland Power & Traction Company of Cambridge, the Coshocton Light & Heat Company and the LaFayette Light & Power Company has been completed and one of the results will be an immediate improvement in the light and power for consumers here and in Dennison. He states that the Ohio Service Company will begin the construction in the spring of a transmission line from Coshocton to this city and Dennison, so that electricity both for light and power may be obtained from the plant here as well as from the plant at New Philadelphia. R.

STATESVILLE, N. C.—The Southern Power Company may not be alone in the development of additional waterpower on the Catawba River in the proximity of Statesville. It is learned that plans are now being considered by the Long Island Cotton Mills, which, should they materialize, will mean the erection of a mammoth power plant on the Iredell side of the River. In addition to its Long Island property the mill company owns valuable undeveloped waterpower at Buffalo Shoals, just above Long Island, which combined with Long Island power would be capable, according to engineers, of developing from 1,500 to 2,000 horsepower. Three years ago, the Long Island company acquired water rights on the Iredell side of the River opposite its present dam, and it now has options on sufficient property for a large power and mill plant. These valuable options also include the rights of way for a power line. Other parties who own undeveloped power at Buffalo Shoals, include Statesville people, are considering a proposition to join with the Long Island company in the erection of a mammoth concrete dam at Long Island 15 to 18 feet in height.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SPOONER, MINN.—A co-operative telephone line will be built along the state road to Loman. V. E. Lindholm is interested. C.

HUNTLEY, MONT.—The Farmers Telephone Company has set poles for a line to Worden and will make connection with the Ballantine line. C.

GRAVE LAKE, MINN.—The Grave Lake Telephone Company has been organized by farmers in this vicinity and will build a line into Brainerd. C.

MACEDONIA, ILL.—Macedonia Telephone Company has been incorporated with a capital of $2,500 by H. C. Vise, J. M. Lee, and Lewis W. Fisher. C.

NEW BRUNSWICK, N. J.—The New York Telephone Company has been granted permission to extend its system in Woodbridge and Piscataway Townships. A.

NASEL, WASH.—Nasel Farmers' Telephone Company has been incorporated with a capital of $1,000 by F. G. W. O'Conner, B. W. Higgins, and N. A. Johnson.

NARY, MINN.—The Malvig Rural Telephone Company will construct a line from Nary to Bemidji, work to commence in the spring. J. O. Smustad is president.

HARRISBURG, PA.—Plans for the construction of the underground fire-alarm cables have been prepared and are now in the hands of City Electrician Clarke E. Diehl.

FRUITVALE, CAL.—The Pacific Telephone & Telegraph Company will erect a three-story telephone building here and apparatus necessary to operate the switchboard will be installed.

VIRGINIA, MINN.—Engineers of the Mesaba Telephone Company are preparing estimates of cost of a new building here, to be modern throughout. Mr. Holcomb is local manager. C.

MORRISVILLE, N. J.—The installation of a new fire-alarm system is being considered by the Borough Council. The Fire Protection Committee is in charge of the improvement. A.

TYRONE, IOWA.—A line is being built from here to Staceyville to connect with lines of the Iowa Telephone Company, and an exchange will be operated at Tyrone. C.

KENYON, MINN.—Dr. J. A. Gates, owner of the telephone exchange, together with the Northwestern Telephone Company, is making plans for rebuilding all the lines here, work to begin in spring. C.

GRASS RANGE, MONT.—Preliminary steps have been taken for construction of a telephone line between here and Minnesota Beach. Dr. P. H. Brown is interested. Other branches will be built this year. C.

CHEYENNE, OKLA.—The Board of Trustees of Cheyenne has called a special election for February 16 on the question of granting a franchise for 25 years to the Roger Mills Telephone Company to operate a telephone system in the town. P.

ROCK ISLAND, ILL.—Members of the Commission have been handed by Commissioner Hart tentative plans for the installation of a complete police-call system for this city. Bonds to the extent of $10,000 for this purpose have been voted. Address Mayor H. M. Schriver.

ELECTRIC RAILWAYS.

(Special Correspondence.)

SYDNEY, N. D.—The Cape Breton Electric Railway Company is planning the extension of its line from Sydney to New Waterford. Address Earl L. Millikan, local manager.

PADUCAH, KY. — The Kentucky Southwestern Electric Railway Light & Power Company is planning to construct an interurban railroad here. Address H. C. Rhodes, president, for particulars.

OSWEGO, ORE. — The Portland Eugene & Eastern Railway Company has been granted a franchise to construct and operate an electric railway here. Address E. A. Hutchinson, of Portland, for information.

CLARKSTON, WASH.—The Committee recently appointed to solicit subscriptions for the Sturm Electric Railway report that $6,200 of the desired $10,000 has been secured for the project. O.

TEMPLE, TEX.—Preliminary surveys are being made by County Surveyor S. D. Hanna, of Bell County, for the proposed Temple-Marlin interurban line, 30 miles in length. The project is being backed by Temple capitalists. D.

CLEVELAND, O. — The Cleveland Railway Company has submitted to Traction Commissioner Witt a request to relay 12 miles of track this year, at a cost of $682,000. Address the general manager of the Cleveland Railway Company.

BOWLING GREEN, KY.—J. S. Lewis, who recently purchased the street railway system of this town at a receiver's sale, has taken charge of the property and is planning a number of improvements, as well as various extensions. G.

SANDY, ORE. — A company of prominent business men has been formed for the purpose of constructing an interurban line from this city to Boring, seven miles distant. The matter has been presented to the Clackamas County Court. O.

BEACH, N. D.—Plans have materialized which will result in the construction of the first electric railway in the state to be financed and operated by farmers. The line will run from Baker, Mont., through Dennis, N. D., Carlyle, Alpha, Williams to Beach. The proposition is meeting with enthusiastic endorsement throughout the entire community.

POCATELLO, IDAHO. — J. D. Browning and associates recently made application to the City Council for the construction, maintenance and operation of an electric street railroad in this city. Under its terms, the company proposes to construct at least one mile of electric line the first year, another mile the second year, and three miles the third year. Fifty years is the life of the franchise. O.

LAWTON, OKLA.—The Lawton Railway & Light Company has asked the City Commissioners of Lawton to call an election on the proposition of granting it a street-railway franchise. The company asking the franchise now holds a lighting franchise for Lawton and is understood to be prepared to purchase the holdings of the old company, which owns the now unused tracks. If the deal goes through the line will be extended to Fort Sill.

NEW INCORPORATIONS.

DETROIT, MICH.—Detroit Battery Company has been incorporated with a capital stock of $10,000 to deal in electric batteries.

NEW YORK, N. Y.—Curtis & Carhart Electric Appliance Company has been incorporated with a capital stock of $10,000 by W. F. Curtis, Percy Murlet and B. I. Carhart.

CANTON, O.—The Lincoln Electric Manufacturing Company has been incorporated with a capital stock of $50,000 by William Rossiter, Al Schram, C. C. Howe and others.

LOGAN, W. VA.—Guyan Machine Shops have been incorporated to manufacture machinery and electrical apparatus. The capital stock is $25,000 and the incorporators are W. E. Oliver, Jr., Bernard Shell, J. J. Rose, A. C. McConoghey, W. T. Woolcock.

CHICAGO, ILL.—Royal Electric Heater Company has been incorporated with a capital of $10,000 to deal in electrical heaters, appliances, automobile accessories. William V. Brothers, David M. Brothers and George A. McCarkle are the incorporators.

MANHATTAN, N. Y.—A. & T. Storage Battery Company, Incorporated, has been incorporated with a capital stock of $1,000,000 to manufacture and deal in storage batteries, generators, dynamos for heat, light, power, etc. The incorporators are J. Splitdorf, D. B. Nally and A. L. Kuii, all of New York City.

CLEVELAND, OHIO.—The Industrial Electric Company has been incorporated by men connected with the Samuel Austin & Son Company, construction engineers. The company will handle electrical equipment for installation in factories and buildings as designed by the Austin offices.

WILMINGTON, DEL.—International Engineering & Development Company has been incorporated with a capital stock of $200,000 to engage in the business of mechanical, mining, civil and electrical engineering. The incorporators are W. L. Maloney and N. P. Coffin, of this city. of incorporation have been filed here for the California Electric Supply Company with a capital stock of $25,000 by J. Hepburn, J. F. Walters and H. Hepburn.

WILMINGTON, N. C.—A certificate of incorporation for the Belfast Land Company, of this city has been filed. Messrs. Samuel R. Maxwell, William B. Herring and C. F. Davis are given as the incorporators. It is set forth that the company is to own, develop and deal in real estate, both as principal and agent, to negotiate loans, issue bonds, etc., to build, construct and repair bridges, wharves, piers, hotels, water, gas and electric works and to own and sell such utilities. The total authorized capital stock is $100,000.

MONTREAL, QUEBEC. — Letters patent incorporating the Northern Electric Company, Ltd., with a capital stock of $10,000,000 have been issued by the Secretary of State. The company is empowered to manufacture every kind of electrical machinery, to carry on the business of mechanical and electrical engineers, to mine, smelter, refine and deal in ores, metals, ingots, billets and other products of ores, acquire title to telephone, telegraph, light, heat, power and hydraulic plants, and to amalgamate with any other company or individual engaged in the same or similar lines of business.

PROPOSALS.

STORAGE BATTERY.—Bids will be received by W. H. Harrison, city clerk, Great Falls, Mont., until February 2 for furnishing and installing a storage battery with all accessories for a fire-alarm system. Check for two per cent must accompany bids. C.

COPPER AND TROLLEY WIRE.—February 2 bids will be received, for furnishing and delivering to the city of Chicago at its water works shops, 2304 South Ashland Avenue, eight tons of ingot copper and seven tons of old copper trolley wire. Address L. E. McGann, Commissioner of Public Works, Chicago.

ELECTRIC CONDUIT, WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 11, for a conduit and wiring system for the post office at Bay City, Mich.; until February 28 for the electric conduit, wiring and interior lighting fixtures of a two-story building for the post office at Big Rapids, Mich.; and for a one-story building for the post office at Searcy Ark.; and until March 9 of a two-story building for the post office at Williston, N. D., as per drawings and specifications, copies of which may be obtained from the office of the Supervising Architect or the custodians of the sites named.

ELECTRICAL FITTINGS. — Bids will be received at the office of Sanitary District, Room 700, 900 South Michigan Avenue, Chicago, Ill., for Division A: 4.1-ampere 60-cycle oil-immersed manhole-type impedance coils. Division B: tubular steel poles. Division C: malleable iron cross arms. Division D: porcelain line insulators. Division E: circuit-break insulators. Division F: round-pattern manhole frame covers. Division G: underground conduit. Division H: paper-insulated eight-conductor lead-covered cable. Division J: single-conductor armored cable. Division K: multiple-conductor 12,000-volt varnished-cloth insulated lead-covered cable. Division L: weatherproof wire. Division M: combination pole, doors and pulleys. Division N: arc-lamp counterweights. Division O: cast-iron postheads with series receptacles and equipment. Address Thomas A. Smyth, president of the Board of Trustees. Bids close on February 5.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing the following for delivery at Navy Yards named, until February 17 for furnishing one electrically heated oil-tempering bath, Schedule 6321, Boston, Mass.; seven electrically operated ice-cream freezers, Schedule 6319, Brooklyn, N. Y.; until February 24 for one electrically operated meat and food chopper, Schedule 6325. Puget Sound, Wash.; six electrically operated air compressors, complete, f. o. b. works, Schedule 6338; 2,000 duct feet of four-way terra-cotta conduit, Schedule 6334, Key West, Fla.; 44 converting turbogenerating sets from five to ten kilowatts, f. o. b. works, Schedule 6339; miscellaneous electrical equipment, Schedule 6336, Newport News, Va., and Brooklyn, N. Y.; one electric traveling monorail hoist, 1.5 tons lifting capacity, Schedule 6329, Washington, D. C.; and one electrically operated dough-mixing machine, Schedule 6325, Puget Sound, Wash.

NEW PUBLICATIONS.

MINERAL RESOURCES. — The United States Geological Survey has published Part 2 of the "Mineral Resources of the United States" for the year ending 1912. It deals with the nonmetals.

TELEPHONE PROBLEMS.—The address delivered by Alonzo Burt before the Ways and Means Committee of the Chicago Association of Commerce, on November 26, 1913, entitled "Some of the Problems of the Telephone Business," has been printed in pamphlet form.

SOUTH HADLEY REPORT.—The report made by the special committee appointed to investigate the question of municipal lighting for the town of South Hadley, Mass., has been published in pamphlet form. It consists principally of the report made to the committee by William Plattner, consulting engineer. The report favors municipal ownership and operation.

WAVE-FORM ANALYSIS.—Technical Paper No. 203 of the Bureau of Standards, Washington, D. C., is entitled "Analysis of Alternating-Current Waves by the Method of Fourier With Special Reference to Methods of Facilitating Computations," by Frederick W. Grover. It includes derivation of the necessary equations, formulas and short-cuts for computation, and examples of application.

PHILADELPHIA ELECTRICAL REPORT.—The annual report of the Chief of the Electrical Bureau of Philadelphia, Pa., for the year 1912 has been issued in the form of a printed pamphlet by Clayton W. Pike, chief. This department has charge of public lighting, the police and fire alarm signals, the municipal telephone system, electrical equipment in the City Hall, and inspection of electrical work outdoors and in the city buildings.

ELECTROLYSIS MITIGATION.—Technologic Paper No. 27, issued by the Bureau of Standards, Washington, D. C., is entitled "Special Studies in Electrolysis Mitigation," by E. B. Rosa and Burton McCullum. This deals particularly with the conditions in Springfield, O., and the recommendations made for improving the conditions there. The principal recommendation is the use by the electric street railway of insulated negative-return feeders and electrical connections at all crossings of different systems. The investment required for this purpose is warranted by the saving in power.

COAL WASHING.—"Coal Washing in Illinois," by F. C. Lincoln of the Department of Mining Engineering, has just been issued as Bulletin No. 69 by the Engineering Experiment Station of the University of Illinois. A great amount of data, gathered from experiments made in the Mining Laboratory of the University, personal visits to the various coal washeries in the State, and a thorough search of the scattered literature on the subject, have been compiled and tabulated in this Bulletin. The Bulletin also contains an article by S. W. Parr, which considers "Moisture in Washed Coals," and is a summary of tests made at the Experiment Station on carload lots of various washed coals. Copies of Bulletin No. 69 may be obtained upon application to C. R. Richards, acting dean, University of Illinois, Urbana, Ill.

FINANCIAL NOTES.

The Puget Sound Traction, Light & Power Company has sold to Lee, Higginson & Company and Harris, Forbes & Company $7,000,000 five-year six-per-cent mortgage bonds.

At the annual meeting of the Washington Railway & Electric Company former officers and directors were re-elected. At the annual meeting of the subsidiaries of Washington Railway & Electric former officers and directors were re-elected.

Lee, Higginson & Company, Harris, Forbes & Company and Kissel, Kinnicutt & Company, New York syndicate managers, announce that the $30,000,000 Interborough Rapid Transit Company first- and refunding mortgage five-per-cent bonds purchased by them have all been sold and the syndicate is closed.

Harris, Forbes & Company have purchased $222,000 first-lien and refunding five-per-cent gold bonds from the Consumers' Power Company. The company will spend this amount the current year in additions and betterments.

In the six months ended December 31 the Interborough Rapid Transit Company's surplus for dividends was $3,272,574, equal to 9.3 per cent on the company's $35,000,000 capital stock. The dividend surplus showed an increase of $445,602 over the corresponding period last year.

The Tampa Electric Company is offering subscription rights to stockholders, for the $374,000 of stock recently authorized, at par in the ratio of one share of the new stock for each six shares now held. Subscription rights accrue to stock of record January 17 and subscriptions are payable on or before February 25. With this issue of stock the capitalization of Tampa Electric will be $2,618,000.

All electric properties operated by H. M. Byllesby & Company reporting for the week ended January 10, show a net gain in connected electric load of 227 consumers with 190 kilowatts of lighting capacity. New business contracted for but not connected for the week aggregated 787 customers with 767 kilowatts of lightning and 455 horsepower in motors. The output of the properties for the week was 7,081,848 kilowatt-hours, a gain of 6.8 per cent over the corresponding week of 1913.

A merger of electrical properties in Newport News and Hampton, under the name of the Newport News & Hampton Railway, Gas & Electric Company, with a capital stock of $2,500,000, has been authorized by the Virginia Corporation Commission. It will include what were formerly the Citizens' Railway, Light & Power Company, the Hampton Roads Traction Company and the Newport News & Old Point Railway & Electric Company. The present operating officials will continue in charge of the property.

Dividends.

American District Telegraph Company of New Jersey; regular quarterly dividend of one per cent, payable January 29 to stock of record January 17.

American Railways Company; the regular quarterly dividend of 1.75 per cent on the preferred stock, payable February 14, to stock of record January 31.

Binghamton Railway Company; a dividend of two per cent, payable February 28 to stock of record February 14.

Bristol Tramway Company; regular semi-annual of three per cent, payable February 2 to stock of record January 28.

Cities Service Company; regular monthly of 0.5 per cent on preferred and common, payable March 1 to stock of record February 15.

Galveston-Houston Electric Company; a semi-annual common dividend of $3.50 per share, payable March 16 to stock of record March 5.

Harrisburg Traction Company; a dividend of three per cent, payable February 1.

Illinois Traction Company; regular quarterly of 0.75 per cent on common, payable February 15 to stock of record January 31.

International Traction Company; supplementary of two per cent on account of accumulated back dividends on preferred, payable February 2.

Kellogg Switchboard & Supply Company; stock dividend of 25 per cent and quarterly of three per cent, payable February 3. The stock dividend is payable January 26.

Monongahela Valley Traction Company; semi-annual of 2.5 per cent on preferred, payable February 1 to stock of record January 27.

Sierra-Pacific Electric Company; the regular quarterly dividend of $1.50 a share on its preferred stock, payable February 2, to stock of record of January 22.

Southern California Edison Company; quarterly of $1.50 on common, payable February 15 to stock of record January 31.

Reports of Earnings.

DAYTON POWER & LIGHT COMPANY.

Preliminary report of the Dayton Power & Light Co., for the year ended December 31, 1913, shows:

	1913.	1912.
Gross earnings	$ 734,900	$ 681,440
Operating expenses	447,750	357,715
Net earnings	287,150	323,725
Other income	18,000	27,060
Total income	305,150	350,785
Fixed charges	202,750	190,890
Balance	102,400	159,895
Preferred dividend	92,250	85,500
Surplus	10,150	74,395

CHATTANOOGA RAILWAY & LIGHT.

November gross	$ 97,032	$ 91,293
Net after taxes	37,608	35,931
Surplus after charges	11,536	13,253
Twelve months' gross	1,200,004	1,053,047
Net after taxes	486,067	425,282
Surplus after charges	190,137	162,187
Balance after preferred dividends	90,137	62,187

CUMBERLAND COUNTY POWER & LIGHT.

November gross	$ 195,100	$ 176,866
Net after taxes	84,470	78,798
Surplus after charges	20,894	22,288
Twelve months' gross	2,324,384	2,123,117
Net after taxes	1,025,562	897,242
Surplus after charges	318,355	259,311
Balance after preferred dividends*	188,355	184,311

*Equivalent to 7 per cent on common stock.

CONSUMERS POWER OF MICHIGAN.

November gross	$ 291,035	$ 263,903
Net after taxes	155,483	143,185
Surplus after charges	84,655	88,140
Twelve months' gross	3,114,297	2,730,280
Net after taxes	1,451,623	1,277,693
Surplus after charges	697,228	653,984
Balance after preferred dividends	383,728	387,734

AUTOMATIC ELECTRIC, CHICAGO.

The Automatic Electric Co. (Chicago), has issued its annual report for the year ended December 31, 1913. The income account compares as follows:

	1913.	1912.
Gross income	$ 903,382	$ 855,999
Net profits	478,009	596,731
Surplus for year	293,641	298,025

BELL TELEPHONE SYSTEM.

The report of the American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sub-licensed companies, for eleven months ended November 30, 1913, was issued yesterday. It shows the following results from operations:

	1913.	1912.
Gross earnings	$197,452,138	$181,411,083
Net	$ 53,858,152	$ 52,811,083
Deductions	15,203,199	12,854,833
Balance	$ 38,654,953	$ 39,956,647
Dividends	27,773,640	26,958,413
Surplus	$ 10,881,313	$ 12,998,234

WESTERN UNION TELEGRAPH.

The Western Union Telegraph Company has issued its estimated statement of earnings for the quarter ended Dec. 31, 1913, which compares with the same period of 1912 as follows:

	1913.	1912.
Gross income	$11,932,200	$11,835,000
*Expenses	10,824,820	10,713,300
Net revenue	1,107,380	1,121,700
Bond interest	334,307	334,310
Balance	773,073	787,390
Dividends	748,073	748,040
Surplus	25,000	39,350

*Includes rent of leased lines, current maintenance, depreciation and taxes.

The company has also issued a more detailed statement covering the eleven months ended Nov. 30, which compares as follows:

	1913.	1912.
Gross earnings	$41,985,832	$40,890,221
Operating expenses, including rent of leased lines	31,191,512	29,637,409
Maintenance	3,440,227	3,386,569
Depreciation and reconstruction	3,126,283	3,259,283
Taxes	1,057,500	853,414
Total expenses	38,815,523	37,136,674
Balance	3,170,309	3,253,546
Other income	918,035	984,391
Total income	4,088,344	4,237,938
Interest	1,225,793	1,359,105
Surplus	2,862,551	2,878,832
Dividends	2,742,889	2,742,698
Surplus	119,662	136,135

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 26.	Jan. 19.
American Tel. & Tel. (New York)	123½	120¼
Commonwealth Edison (Chicago)	133½	134
Edison Electric Illuminating (Boston)	257½	251½
Electric Storage Battery common (Philadelphia)	50	49½
Electric Storage Battery preferred (Philadelphia)	50	49½
General Electric (New York)	147¼	144
Kings County Electric (New York)	120	119
Manhattan Transit (New York)	1	1⅛
Massachusetts Electric common (Boston)	14	12½
Massachusetts Electric preferred (Boston)	65¾	64½
National Carbon common (Chicago)	155	135
National Carbon preferred (Chicago)	116¾	119
New England Telephone (Boston)	139½	134
Philadelphia Electric (Philadelphia)	26⅝	26⅝
Postal Telegraph and Cables common (New York)	82	78½
Postal Telegraph and Cables preferred (New York)	67½	66½
Western Union (New York)	63¾	59
Westinghouse common (New York)	70¾	67⅝
Westinghouse preferred (New York)	116½	115¼

PERSONAL MENTION.

DR. ERNEST RUTHERFORD, Langworthy professor of physics in the University of Manchester, has been made a knight.

MR. EDWIN N. SANDERSON, of Sanderson & Porter, engineers and contractors, has been elected president of the Federal Light & Traction Company, New York.

MR. CHARLES WIRT, president of Wirt Company, Philadelphia, will sail on the *Berlin* today for Naples. He will be absent for about two months on business connected with European sales.

MR. FRANK L. PERRY, Baltimore, Md., delivered an illustrated lecture on "Curious Things Electrical," at the Hotel Belvidere, Baltimore, Md., before the Accountants' Club on Thursday evening, January 15.

MR. H. B. WILLIFORD, electrical inspector of the Oklahoma Inspection Bureau, will take the position of chief electrical inspector on February 1, of the Arkansas Actuarial Bureau at Little Rock, Ark.

MR. H. H. ROBERTSON, president of the Asbestos Protected Metal Company, of Beaver Falls, Pa., has been elected vice-president of the Pittsburgh Branch of the National Council for Industrial Safety.

MR. R. H. HARPER has been appointed sales manager of the Barnes & Kobert Manufacturing Company, manufacturers of pole line hardware and pressed-steel construction specialties, New Haven, Conn. Mr. Harper was for several years sales department manager with the Western Electric Company, at New York.

MR. JOHN S. KENNEDY, formerly secretary of the New York Public Service Commission for the Second District, has been made secretary of the Employees' Benefit Fund Committee of the associated Bell companies, including the New York Telephone Company, the Bell Telephone Company of Pennsylvania and the Chesapeake & Potomac Telephone Company.

MR. WILLIAM H. GRAY, hitherto sales manager of Gray and Davis, Incorporated, Boston, manufacturers of electric starting and lighting apparatus for automobiles, has become general manager of that company. Besides having general supervision of the organization, Mr. Gray will still be in close touch with the selling department and will direct its policy.

MR. E. C. BATES has resigned as district manager of the Bell Telephone Company at Pittsburgh, Pa., after a continuous service of 10 years. He becomes secretary of the Pittsburgh Athletic Association. During his service for the telephone company Mr. Bates was special agent, local manager, contract agent, and lastly filling the position from which he has just resigned.

MR. C. A. TUPPER, for many years publicity manager and confidential representative of the Allis-Chalmers Manufacturing Company, and more recently secretary-treasurer of the Penton Publishing Company of Cleveland, O., has returned to the west and is now connected with the Mining World Company, publishers of the *Mining World*. Mr. Tupper has been elected secretary-treasurer of the company, and will devote most of his time to this business from February 1.

MR. ROBERT MONTGOMERY, for the past three years new business manager of the Fort Worth (Tex.) Power & Light Company, will on February 1 assume the position of commercial manager of the Louisville Gas & Electric Company. Before going to Fort Worth, Mr. Montgomery was with the Chicago, Lake Shore & South Bend Railway, engaged in commercial work, and previous to that was for five years connected with the Cincinnati office of the General Electric Company. During the past two years of Mr. Montgomery's connection with the Fort Worth Power & Light Company, its power load has been more than doubled.

Robert Montgomery.

MR. McKEW PARR has been appointed general sales manager of the Hart & Hegeman Manufacturing Company. "McKew" is one of the most popular, enterprising and energetic young men in the electrical field, and a host of friends and acquaintances will congratulate him upon his appointment and wish for him a distinguished success. He is a native of Baltimore, and became associated with the Hart & Hegeman Manufacturing Company as its Southern representative in 1909. He was graduated in the class of 1906 at the United States Military Academy at West Point. Before entering the electrical field he was connected with the Baltimore *Herald* and the Merchants National Bank of Baltimore. He then became connected with the Maryland Telephone Company, of Baltimore, and later with the Cataract Electrical Supply Company of Buffalo. He represented the Hart & Hegeman Company in its Southern territory for two years and was then appointed advertising manager, continuing in that capacity until his recent promotion. He is a member of the Baltimore Club, of the Maryland Society of the Sons of the American Revolution and a Statesman of the Jovian Order.

McKew Parr.

MR. G. WILBUR HUBLEY, chief engineer of the Louisville (Ky.) Gas & Electric Company, and MR. LOUIS S. STRONG, assistant engineer of the same company, have been elected directors of the Louisville Engineers' and Architects' Club. MR. FRANK H. MILLER, superintendent of motive power of the Louisville Railway Company, is also a director, as the result of the recent annual election.

MR. L. N. WHITNEY, general manager of the Central Union Telephone Company of Indiana, has been appointed general commercial superintendent of the New England Telephone & Telegraph Company, Boston, in place of Carl T. Keller, resigned. He will take up his duties in New England on February 1. Mr. Whitney is a native of Council Bluffs, Iowa, and is 41 years of age. Most of his early life was spent in the neighborhood of Boston and he was educated at Massachusetts Institute of Technology. Immediately after graduating, in 1896, he entered the service of the American Telephone & Telegraph Company at New York.

MR. A. J. SHORT, manager of the electric light plant of the Kentucky Public Service Company at Frankfort, Ky., has been appointed superintendent of the plant, MR. H. C. MOORE, formerly with the auditor's office of the company at Bowling Green, Ky., being given the position of manager in charge of the commercial end of the business. MR. EDWIN L. SELLERS, of Bowling Green, has been appointed manager of the new business department of the whole company, which operates plants in four Kentucky and one Tennessee city. MR. R. A. FIELD, formerly general manager of the company, has retired, MR. H. D. FITCH, as heretofore announced, succeeding to the position.

MR. WILBUR B. FOSHAY has opened offices in the Wilcox Building, Portland, Ore., where he will do general consulting engineering in addition to overseeing his interests in the Washington Public Service Company, of Olympia, Wash. Mr. Foshay has severed his connection with the Northwestern Electric Company, of Portland. He was manager of the company from October, 1912, until January 1 of the present year. Before going with the Northwestern Electric Company Mr. Foshay was for about two years district manager of the Washington-Oregon Corporation, operating plants in Oregon and Washington. Prior to this he was with the Pacific Power & Light Company, as manager, at Walla Walla, Wash. His earlier connection was with the Fort Dodge Light & Power Company, as general manager at Fort Dodge, Iowa, going there from Hutchison, Kans. Mr. Foshay has operated plants of every type of known prime mover and has been connected with operating hydroelectric plants, water works and gas and street-railway properties.

MR. SHIRAS MORRIS, secretary and treasurer of the Hart & Hegeman Manufacturing Company, Hartford, Conn., for several years, was elected president and treasurer of the company at the annual meeting last week, succeeding the late MR. ALFRED H. PEASE, who died on Thanksgiving Day. Mr. Morris was graduated from Trinity College in 1896. In that year he entered the cost department of the Pope Manufacturing Company, a year later being promoted to the position of assistant advertising manager. After a year as advertising agent for the Pope Company he became associated with the Hart & Hegeman Manufacturing Company. Two years later he was elected secretary of the company, and two years thereafter, when he was re-elected secretary, the duties of treasurer were also voted to him. His promotion to the post of president is a recognition upon the part of the stockholders of his ability not only in the financial department of the company, but as an organizer and executive as well. Mr. Morris is secretary and treasurer of the Kinsler-Bennett Company, vice-president of the Hartford Chapter of the National Association of Credit Men, treasurer of the Manufacturers' Association of Connecticut, and a member of the directorates of the American Industrial Bank & Trust Company, Industrial Realty & Title Guarantee Company, New England Sherardizing Company, New Haven Sherardizing Company and the Hartford Young Men's Christian Association. He is a member of the board of fellows of Trinity College, Hartford Board of Trade, Hartford Business Men's Association, Hartford Club, University Club, Hartford Golf Club, Republican Club of Hartford, and the Jovian Order.

Shiras Morris.

MR. R. W. REYNOLDS, has been appointed manager of the Springfield Street Railway, Springfield, Mass., succeeding the late MR. GEORGE F. REED, who died suddenly January 10. Mr. Reynolds has been secretary and general manager of the Hartford & Springfield Street Railway Company since August 1, 1912. Prior to that he was vice-president of the American Light & Water Company, Chicago, in charge of the construction of electric lighting plants and waterworks systems. He is a native of Mattoon, Ill., where he was born February 8, 1882, and graduated from Armour Institute, Chicago, in 1900. He spent two years in Purdue University, in the electrical engineering department, and then entered the traction business with the Indianapolis Northern Railway Company, now a part of the Terre Haute, Indianapolis & Eastern Traction Company. He became superintendent in 1905, and later became head of the operating department of the Chicago, South Bend & Northern Indiana Railway, being also in charge of the Southern Michigan Railway.

MR. W. CAMERON FORBES, former governor-general of the Philippine Islands, and a grandson of Ralph Waldo Emerson, has been elected a director of the New England Telephone & Telegraph Company. Mr. Forbes resides in Milton, Mass., where he was born in 1870. After graduating from Harvard he entered the importing firm of J. M. Forbes & Company, Boston. He was a member of the Philippine Commission and Secretary of Commerce and Police in the Islands, 1904-8. In 1908, he became Vice-Governor of the Philippines, later being appointed Governor by President Taft.

OBITUARY.

MR. WILLIAM HENDERSON WOOLVERTON, president of the Gamewell Fire Alarm Telegraph Company, New York, died on January 22, in Augusta, Ga. He was 73 years old.

DR. BENJAMIN OSGOOD PIERCE, since 1888 Hollis professor of mathematics and natural philosophy in Harvard University, died from disease of the heart at his home in Cambridge, on January 14.

MR. GEORGE H. BABBITT, a former member of the Vermont Public Service Commission, died at his home in Bellows Falls, Vt., on January 24, after a brief illness of acute indigestion. He was 59 years of age. Mr. Babbitt was appointed to the Commission about a year ago, but resigned in December owing to a disagreement with Governor Fletcher.

MR. CHARLES F. PRITCHARD, vice-president and general manager of the Lynn (Mass.) Gas & Electric Company, died at his home in that city January 21, at the age of 57 years, six months. Acute indigestion was the cause, resulting from an attack while attending sessions of the American Gas Lighting Association in New York last March. For a few months past, however, Mr. Pritchard had partially recovered, enough to be able to attend to his business until very recently. The deceased was born in Marblehead, Mass., and was graduated from the Massachusetts Institute of Technology in 1876. After a brief experience in the West he became superintendent of the Dedham Gas Works, in 1883, going to Lynn as superintendent of the gas company there. He became general manager in 1901, and in 1908 was elected to the position of manager of the Combined Lighting companies. Other lighting interests with which Mr. Pritchard was connected as director were the Fall River Gas Works Company, Gloucester Gas & Electric Company, Beverly Gas & Electric Company, Salem Gas Light Company and Boston Consolidated Gas Company. He was a member of the Lynn Chamber of Commerce, the Corinthian Yacht Club, and the Oxford Club of Lynn.

MR. WILLIAM COOPER, director of Buildings and Equipment of the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company, died from peritonitis at his home in Wilkinsburg, Pa., on Friday, January 23. Mr. Cooper was born near Watertown, N. Y., November 24, 1861. He was married on Christmas Day, 1895, to Ida J. Arnold, of Rockford, Ill., who survives him. He attended Cornell University and later went to Ottumwa, Iowa. Soon after he started a machine shop in Minneapolis for himself, undertaking at this time the development of a system of traction using compressed air. This work led to the investigation of the hydraulic speed-changing gear. Following this period, Mr. Cooper entered the employ of the Twin City Rapid Transit Company of Minneapolis as master mechanic and chief engineer. During the four years he spent in this position, he redesigned and practically rebuilt the entire electrical equipment. In 1894 he entered the employ of the General Electric Company in railway work. During three years at Schenectady he was a leading spirit in the work which resulted in the revolution of the design of railway motors. The principles of the design established at that time remained almost unchanged until the introduction of the commutating-pole motor. During his stay in Schenectady, he also supervised the manufacture of the locomotives for the Baltimore & Ohio Tunnel at Baltimore, being detailed to put them into service after their erection. After the completion of this work, Mr. Cooper became associated with the firm of Blood & Hale, consulting engineers, Boston, Mass. While with them he designed a line of railway motors for the Steel Motor Company of Johnstown, Pa., which were remarkable for their light weight. On September 1, 1897, Mr. Cooper entered the employ of the Bullock Electric & Manufacturing Company, Cincinnati, O., as general superintendent, in charge of engineering and manufacturing. In 1904 he entered the employ of the Westinghouse Electric & Manufacturing Company in the railway engineering department. His unit switch control led to the development of the type of control now being used by the Westinghouse Company. His work in the railway field consisted of an active participation in the design and manufacture of the equipment furnished the New York, New Haven & Hartford Railroad, the St. Clair Tunnel, the Pennsylvania Railroad, and other roads which have been electrified by the Westinghouse Company. Following the completion of the development in control system, Mr.

William Cooper.

Cooper was appointed engineering inspector. Two years ago, when the works department was organized, Mr. Cooper was made director of buildings and equipment. In this capacity he did some excellent work in remodelling the power plant at East Pittsburgh, leaving it in excellent condition. Mr. Cooper was a man of rather rough exterior and apt to be misunderstood by people who did not know him thoroughly. His warm heart, however, and the generous disposition made him universally loved and respected by those fortunate enough to know him intimately.

DATES AHEAD.

Iowa Electrical Contractors' Association. Organziation meeting, Waterloo, Iowa, February 2.

Wisconsin State Telephone Association, Madison, Wis., February 11-12. Secretary, P. J. Weirich, Monroe, Wis.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20. Secretary, Bradley Stoughton, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Supply Jobbers' Association. New Willard Hotel, Washington, D. C., February 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

Peoria Electric Show. Peoria, Ill., March 9-15. Director, T. D. Buckwell, Central Illinois Light Company, Peoria, Ill.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Dyer Flaming Arc Company, Incorporated, Philadelphia, Pa., announces its removal from 225 North Tenth Street to 1714 Sansom Street.

The Beck Electrical Construction Company, 204 Andrus Building, Minneapolis, Minn., has been appointed representative for the American-Ball engine and the Rice & Sargent Corliss engine for the Minnesota territory adjacent to Minneapolis.

Benjamin Electric Manufacturing Company, Chicago, Ill., maker of electric lighting specialties, was awarded a gold medal for its electric lamp grip and its punch-press safety device by the jury of award of the first International Exposition of Safety and Sanitation held in New York recently under the auspices of the American Museum of Safety.

Rome Wire Company, Rome, N. Y., has issued its annual "Copper History." This gives in tabular form the monthly and average yearly cost of copper from January, 1884, to January, 1914. This shows strikingly the ups and downs of the copper industry for the past 30 years. A copy of the pamphlet will be sent to anyone interested on request to the company.

Ward Leonard Electric Company, Bronxville, N. Y., has issued a circular calling attention to the merits of its electrically operated Nodaz device, which, as its name indicates, is a means of reducing the glare or dazzle of powerful automobile headlights so as to make them safe for city streets. By merely pushing a button the full power of the light can be instantly obtained for country driving.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., announces that H. B. Squires Company, of San Francisco and Portland, its Pacific Coast agent, has taken over the additional territory of Southern California, establishing a branch office in the San Fernando Building, Los Angeles. C. W. Yerger, who has been connected with the engineering department of the Cutler-Hammer Manufacturing Company at Milwaukee for several years, will be in charge of the Los Angeles office.

The Kerr Turbine Company, Wellsville, N. Y., announces that on January 1 its Southern interests were placed in the hands of the International Steam Engineering Company, with main office in the Grant Building, Atlanta, Ga., and branches in Realty Trust Building, Charlotte, N. C., and Brown-Marx Building, Birmingham, Ala. James E. Weinbold will give personal attention to new business in territory including North and South Carolina and eastern Tennessee; Robert Stevens to Mississippi and Alabama and W. R. Jennison to all other Southern territory.

Orr & Lockett Hardware Company, Chicago, has just issued a bulletin describing its new Drilhammer. This device can be used for drilling in concrete, stone, brick marble, etc., in walls, floors, ceilings or corners. It is especially adapted for use where electric or pneumatic power is not available, or where the amount of work to be done is small. It can be carried in any ordinary tool kit. This device will undoubtedly be found indispensable by contractors, electricians and others. The new bulletin mentioned above will be mailed on request.

The National Reinforced Concrete Pole, Pile & Pipe Company, Denver, Colo., has issued a large and attractively prepared prospectus describing the manufacture of reinforced-concrete poles, piles, etc., according to the process invented by R. M. Jones. The prospectus contains an article showing the economy and reliability of reinforced-concrete poles for use in building overhead electric lines. A description of the Jones process is given in considerable detail and with the aid of numerous illustrations. The process is equally serviceable for making solid or hollow poles and piles.

The Lombard Governor Company, Ashland, Mass., has adopted as its trade mark a replica of the original iron crown of Lombardy. This was a symbol of the early Lombard supremacy. The company states that it has adopted the trade mark inasmuch as the Lombard governor has the virtues of rugged strength and refinement, and combines these for supremacy in the field of governing water wheels as successfully as did the Lombard race in government of the political and military sort. The company is distributing a series of interesting cards showing famous plants which are Lombard-governed.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the recent shipment to a large railway company in the Middle West of a 26-panel switchboard in record-breaking time. On November 28 the contract for the board was signed, calling for delivery in 26 days, with a bonus and penalty clause. On December 10, or 12 days later, the entire switchboard was shipped complete from the works, and it was done without employing any overtime. The board is designed to control one 800-kilowatt 250-volt direct-current generator; two 275-kilowatt 250-volt direct-current generators; two exciters; two 850-kilowatt 480-volt three-phase generators; the remainder of the panels are devoted to alternating-current and direct-current feeders.

The Terry Steam Turbine Company, Hartford, Conn., in a recent publication (Bulletin 17) calls attention to its return-flow turbine. This type of turbine, which is being generally adopted abroad for condensing turbines where maximum economy is sought, is a combination of a multi-velocity stage element for the high-pressure end with a series of multi-pressure stage elements in the low-pressure end. Ferry steam turbines were the first to make use of this design in this country. The company feels gratified at the indorsement of its choice of design, since so many other turbine builders are now adopting it. The bulletin sets forth the advantages of this construction, which is described in considerable detail with the aid of illustrations.

The Dubilier Electric Company, Incorporated, 63 Fifth Avenue, New York, has published a catalog devoted to the Dubilier electric specialties. This refers particularly to resistance units, heating material, high-frequency apparatus and devices for medical and therapeutic and dental purposes. The Dubilier resistance elements are of a definite type and are designed especially to provide a simple, inexpensive resistance of an indestructible, compact, non-inductive character. Special information is available respecting the company's cord resistance. This is particularly suitable for certain heating appliances, as it possesses advantages of being unbreakable, jointless, unaffected by continual heating and cooling, compact and easily, quickly and inexpensively mounted.

Record of Electrical Patents.

Issued by the United States Patent Office, January 20, 1914.

1,084,595. Booster Regulation. C. Ambruster and H. M. Beck, Chicago, Ill. Has means for continually applying electromotive forces of alternating polarity to the field coil of the regulating armature.

1,084,603. Lighting Attachment for Alarm Clocks. A. T. Britt, Kansas City, Mo. Includes a battery, electric lamp and means for lighting the lamp when the alarm rings.

1,084,610. Railway Signaling System. W. J. Cook and S. Deutsch, assignors to Cook Railway Signal Co., Denver, Colo. A relay-controlled electric motor raises the semaphore arm to "safe" position.

1,084,611. Accounting Device. W. J. Crumpton, assignor to W. R. Heath, Buffalo, N. Y. Consists of a number of individual registers each with a separate electromagnetic actuating mechanism, and means for totalizing the actuation of all the registers.

1,084,613 to 1,084,615. Accounting System. W. J. Crumpton, assignor to W. R. Heath. These three patents cover various features of an electromagnet register-actuating device.

1,084,629. Zirconium Lamp-Filament. C. A. Hansen, assignor to General Electric Co. Produced by mixing gelatinous zirconium oxalate with finely powdered carbon, shaping the mixture into threads and heating to produce pure zirconium.

1,084,633. Actuating Mechanism for Accounting Registers. F. O. Heuser, assignor to W. R. Heath, Buffalo, N. Y. Electromagnetically operated and time-governed.

1,084,634. Two-Way Register-Actuating Mechanism. F. O. Heuser, assignor to W. H. Heath. A modification of the foregoing.

1,084,641. Advertising Device. H. J. Keating, Chicago, Ill. Includes a solenoid-operated cam for moving the arm of the figure.

1,084,645. Electrical Appliance. J. H. Lehman, New York, N. Y. Relates to details of a circuit-breaker.

1,084,651. Automatic Control and Safety Device for Moving-Picture Machines. J. McFeely, assignor of three-fourths to M. E. Petty and H. E. Petty, Chicago, Ill. The motor-driven film machine and arc lamp are provided with speed-governed circuit-breaker to extinguish the lamp and stop the motor when the film speed becomes abnormal.

1,084,657. Cover for Telephonic Apparatus. G. H. Nash, assignor to Western Electric Co. Consists of two cylindrical parts fastened by a helical groove and a projection.

1,084,660. Accounting System. A. F. Poole, assignor to W. R. Heath. Includes a number of individual registers, each adapted to be actuated by electric current impulses, and a totalizing register actuated at a rate proportionate to the sum of the rates of all the individual registers.

1,084,661. Accounting System. A. F. Poole, assignor to L. A. Williams, Evanston, Ill. A modification in which each individual register is electromagnetically actuated by a current of different frequency.

1,084,669. Accounting System. C. H. Tallmadge, assignor to W. R. Heath. Includes a number of electrically operated burden registers.

1,084,670. Piecework - Accounting System. C. H. Tallmadge, assignor to W. R. Heath. Includes an electrically operated wage register and a piece-rate register.

1,084,672. Automatic Time-Accounting Device. A. A. Thomas, assignor to W. H. Heath. An electrically operated mechanism for periodically actuating a ratchet wheel.

1,084,673. Stop-Welding Machine. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. One transformer secondary terminal is fixed and the other connects with a laminated conductor looped around the work to the welding gap.

1,084,674. Maintaining a Constant Power Factor in a System of Distribution. A. A. Tirrill, assignor to General Electric Co. An automatic regulator for the field circuit of a polyphase synchronous condenser.

1,084,678. Picture-Projecting Machine. A. F. Victor, Davenport, Iowa. Has specially adjustable carbons to arc at a fixed point between the lens and slides.

1,084,684 and 1,084,685. Accounting System. L. A. Williams, assignor to W. R. Heath. The first patent provides a number of electromagnetically operated registers, each having a wage and a time indicator. The second patent provides a number of electrically operated waste-wage registers and job registers.

1,084,698. Controlled for Electric Motors. J. H. Hall, assignor to Electric Controlled & Mfg. Co., Cleveland, O. Electromagnetic starting switch for connecting an induction motor to an autotransformer and a similar running switch to connect the motor direct to line.

1,084,703. Electric Cutout. A. V. A. McHarg, assignor to T. E. Murray, New York, N. Y. On a base block through which busbars pass are contacts for a multipolar switch lever with fuse plugs.

1,084,706. Fuse Plug. T. E. Murray, New York, N. Y. A fuse strip is doubled over one end of an elongated plug and metallic contact plates are screwed on opposite sides of the plug and cover the end edges of the fuse strip.

1,084,713. Lamp Reflector. J. C. Stearns, Worcester, Mass. An automobile lamp, the central portion of whose reflector is removably secured to the outer portion to permit insertion of an electric lamp from the rear.

1,084,714. Electrical Connection. J. C. Stearns. For connecting a cable to an automobile lamp.

1,084,720. Electric Meter. G. M. Willis, assignor to Chicago Electric Co., Chicago, Ill. Has a cover adapted to retain the field coil in position and to protect the armature.

1,084,721. Shunt for Measuring Instruments. G. M. Willis, assignor to Chicago Electric Meter Co. Comprises a thin flat element of resistance metal formed into a split ring having a predetermined resistance and coefficient of self-induction.

1,084,722. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. The division of load between a generator and a storage battery is controlled by a regulator for the booster field.

1,084,723. Dynamo-Electric Machine. J. L. Woodbridge. A separately excited commutator machine with a conducting squirrel-cagke structure surrounding the armature close to its periphery.

1,084,726. Safety Appliance for Elevators. J. A. Butkus, Baltimore, Md. An electric signal associated with the controller rope.

1,084,741. Electrical System of Distribution. R. C. Hull, assignor to Electric Storage Battery Co., Philadelphia, Pa. Two resistances of different temperature coefficients are connected to the extreme terminals of a dynamo, which has two short-circuited brushes to which one side of the field is connected, the other being connected between the two resistances.

1,084,745. Electric Primer. C. F. Lindsay, assignor to Union Metallic Cartridge Co., Bridgeport, Conn. A plug containing an explosive has electric ignition contacts.

1,084,759. Carrier-Dispatch System. F. L. Soule, assignor to Lamson Co., Boston, Mass. A timing mechanism lights an electric lamp when a carrier remains in a repository beyond a certain time limit.

1,084,765. Signaling System for Railways. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. A polarized signal-controlling relay is connected to the track rails.

1,084,780. Signaling System. C. E. Beach and H. W. Doughty, assignors to G. O. Knapp, New York, N. Y. An electromagnet governs the starting and stopping of the signal.

1,084,800. Electric Alarm. A. Hoge, New York, N. Y. Attached to an ordinary alarm clock.

1,084,809. Light-Reflecting Device. E. C. McKinnie, assignor to National X-Ray Reflector Co., Chicago, Ill. An illuminated-bowl indirect unit, with a diffusing portion in the bottom of an opaque deflector that fits within a glass bowl. (See cut.)

1,084,813. Chain Support. W. H. Murray, Harrison, N. Y. A wire with a loop about the pull socket extends out and has a hook to engage the chain; a pull cord hangs from the hook. (See cut.)

1,084,822. Loud-Speaking Attachment for Telephones. H. W. Prance, London, England. A trumpet is placed near the telephone receiver.

1,084,838. Spark Plug. C. W. Beck, assignor to Michigan Motor Specialties Co., Detroit, Mich. Is provided at its inner end with a movable expansion device and means for indicating the movements of the device.

1,084,863. Trolley.. C. D. Larrabee, Syracuse, N. Y., assignor of one-half to S. Hubbell. Has a special spring to restrict swiveling of the harp.

1,084,877. Electric Heating Table or Counter. E. C. Cary, Baltimore, Md. Countersunk recess for flat-bottom vessels are provided with heating ele- Countersunk recesses in the table for flat-bottom vessels are provided with heating elements.

1,084,903. Insulated Rail-Joint. E. F. Schermerhorn, assignor to Rail Joint Co., New York, N. Y. The rail ends are insulated from each other; one rail head and all the flanges are insulated from the joint bars.

1,084,905. Sight Illuminator. E. Schwarz, Lincoln, Min. An electric light for a firearm.

1,084,907. Tactical Naval Tracer. F. Spalazzi, Rome, Italy. Electrically operated automatic tracing device.

1,084,910. Method for Localizing Faults in Cables and Circuits. J. H. J. A. Stephenson, Hamburg, Germany. A voltmeter is used similarly to an ohmmeter.

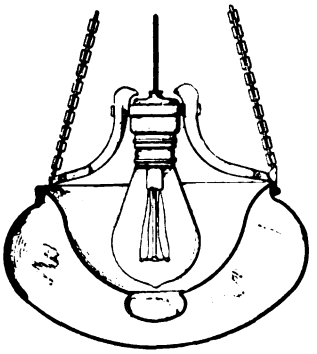
1,084,924. Magneto-Electric Generator. M. C. Brenot, assignor to firm Robert Bosch, Stuttgart, Germany. Includes an interrupter with a number of cams to move the interrupter contacts at the irregular intervals of ignition required by the engine.

1,084,926. Hand Lamp.. C. F. Burgess, Madison, Wis. A tubular battery lamp with telescopically adjustable lens.

1,084,931. Starter and Ignition Control. J. B. Entz, assignor to White Co., Cleveland, O. A switch for changing the starting motor into a battery-charging generator and also controlling ignition circuit.

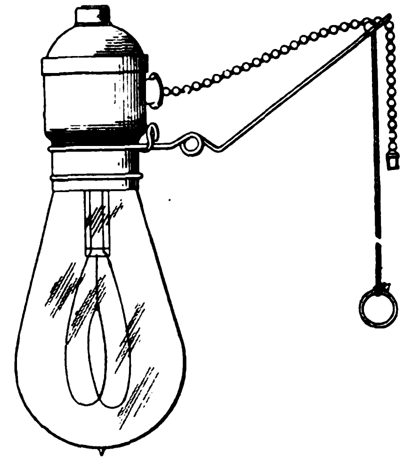
1,084,932. Testing Device for Jump-Spark Ignition Systems. T. H. Estes, Texarkana, Tex. An insulated handle with a concentric contact and an integral offset bridging contact.

1,084,936. Electric Ground-Clamp. R. R. Forbes, Mount Holly, N. J. Consists of a two-part strap far passing around a ground pipe, a clamp and a terminal for the ground wire.



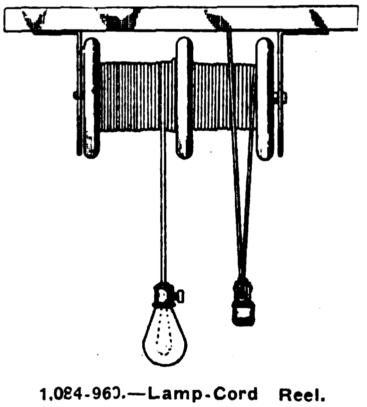
1,084,809.—Illuminated-Bowl Indirect Unit.

1,084,960. Lamp-Cord Reel. M. I. Randall, Bellingham, Wash. A spring drum in two sections has the cord wound around one part in one direction and on the other part in the opposite direction. (See cut.)



1,084,813.—Chain Support and Extension.

1,084,966. Telephone Stand. J. W. Rodes, University, Va. The two parts of the stand are vertically adjustable and the upper part has a U-shaped yoke for the purpose of holding the receiver to the ear.



1,084-960.—Lamp-Cord Reel.

1,084,988. Trolley Wheel. C. C. Williams and W. E. Fry, Anderson, Ind. Has a spiral replacer wheel on each side of the trolley wheel.

1,085,011. Equipment for Locomotives. C. L. Bopp, Waterloo, Iowa. A bracket and brush contact for an inverted third rail or similar conductor.

1,085,012. Electric Time-Release Air-Valve. C. L. Bopp. Includes an electromagnetically controlled ratchet wheel.

1,085,023. Electric Insett-Trap. S. A. Craig, El Paso, Tex. Adjacent wires of opposite polarity are spirally wound around the periphery of the revolving drum.

1,085,024. Spark Plug. A. de Clairmont, assignor to Toledo Automobile Devices Co., Toledo, O. A ball on an adjustable rod constitutes the central electrode.

1,085,036. Selective Apparatus. G. H. Groce, assignor to General Railway Signal Co., Gates, N. Y. A selective electric signaling system.

1,085,069. Telautographic Apparatus. G. S. Tiffany, assignor to Gray National Telautograph Co., New York, N. Y. Covers details of a telautographic register.

1,085,089. Process of Electric Welding. L. S. Lachman, assignor to Universal Electric Welding Co., New York, N. Y. For producing an open frame; consists in preparing primary and secondary members; placing them together with an edge of one in contact with the surface of the other, and passing a welding current through the junction.

Patents Expired.

The following United States electrical patents expired January 26, 1914.

575,699. Electromechanical Movement. E. D. Chaplin, Cambridge, and H. G. Halloran, Boston, Mass.

575,724. Gearing for Electric-Car Motors. A. C. Mather, Chicago, Ill.

575,733. System for Electric Signaling. W. M. Ramsey, Allegheny, Pa.

575,767. Apparatus for Determining Electrical Resistances Containing Electromotive Forces. O. Frolich, Charlottenburg, Germany.

575,772. Roentgen-Ray Tube. E. Thomson, Swampscott, Mass.

575,777. Electric Meter. W. C. Fish, Lynn, Mass.

575,782. Rail Support. W. B. Potter, Schenectady, N. Y.

575,785. Closed-Conduit Electric Railway. E. W. Rick, Jr., Schenectady, N. Y.

575,805. Electrical Signal System. P. Freeman, New York, and R. E. Slater, Montrose, N. Y.

575,826. Electric Furnace. J. A. Deuther, Boston, Mass.

575,829. Electric Furnace. J. Joyce, Andover, and J. A. Deuther, Boston, Mass.

575,830. Printing Telegraph. O. L. Kleber, Pittsburgh, Pa.

575,869. Telephone Transmitter. R. S. Barnum, Chicago, Ill.

575,887. Microphone. P. Hardegen, Berlin, Germany.

575,896. Telephonic Transmitter. M. Katyra, London, England.

575,908. Switch and Signal Apparatus. J. G. Schreuder, Edgewood Park, Pa.

575,918. Brush-Carrier for Dynamo-Electric Machines. S. S. Wheeler, New York, N. Y.

575,952. Insulator. F. Hoover, Paducah, Ky.

576,053. Electric Appliance for Horses. L. A. Gray, Arlington, Md.

575,788. Electric Smelting. T. L. Willson, New York, N. Y.

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CLINCHING POWER PROPOSITIONS.

In extending central-station power service it is an excellent plan to be able to add convincing arguments to an original proposition involving the introduction of motor service in factories long accustomed to the use of the steam-engine drive. These supplementary points usually do not affect the soundness of the first estimate of comparative operating cost under the old and the proposed methods, but they are sometimes of the utmost value in helping to turn the scale of the manufacturer's judgment in favor of the central-station man.

In a representative instance where the cost of electric cooking by central-station energy was being compared with the expense of manufacturing the food product by coal cooking, it happened that the latter appeared to be more economical under the local conditions, and the consulting engineer so informed the owner of the factory. The latter, however, was a broad-minded man; none other, in fact, than the late Mr. Henry D. Perky, inventor of various shredded-wheat products; and upon the presentation to his consideration of the advantages of electric cooking on the score of convenience and above all, of cleanliness, he decided at once to cook a new product then coming forward by electric stoves. The decision was a wise one, as events proved, and it illustrated the importance of taking all factors into account in cases where net operating cost may be against the central station.

In a recent power report, which is still under consideration, the local central station estimated a saving of about $300 a month to the factory by the use of its service. The negotiations indicated, however, that a supplementary report upon various features of the proposed change from mechanical drive to motors would be wise, and in this presentation a number of matters were included which in many cases could be turned to account elsewhere. It was shown that duplicate cables would be available to the factory from the central station, removing the owner's fears of the cost of a shutdown in case of a failure on one three-phase line; and it was pointed out that by suitable switchboard apparatus of low cost, a loss of power on one cable with the other alive would require the factory to be without service only a fraction of a minute, if, indeed, the slow-down of the motors were continued long enough to bring them to a stand-still. Again, it was shown that the local power company was keenly interested in making the installation of its service at the least cost consistent with reliability. It was found that by tapping a passing 2300-volt, three-phase line on a street bordering on a distant part of the property, the cost of running a long cable to a 200-horsepower motor driving an air compressor would be saved. It was also figured that by throwing two sets of busbars in the mill substation in multiple, in ordinary operation, losses could be saved which would be reflected in the meter records and consequently in the monthly bills. Finally, the supplementary report included a complete list of the salvage value of all shafting and its auxiliary equipment which would have to be removed in installing an efficient drive, with a totalization of the number of vertical belts, idlers, hangers, quarter-turn pulleys, and shafting length which would be eliminated by the adoption of electricity. Another helpful feature was a list of new shafting parts which would have to be purchased.

Data of this character, if presented in a clean-cut manner, convince the hard-headed man to whom the central station is trying to sell its service that the latter does not carry on its work by guess, and unquestionably go a long way toward clinching the power contract in difficult cases.

ENGINEERING AS A POST-GRADUATE STUDY.

The announcement that beginning next fall the engineering courses at Columbia University will be put on a post-graduate basis marks an important tendency in higher education which is full of significance to the close observer of industrial conditions in America. Such a step means that preparation for real professional work is becoming more thorough than in the past; that the higher responsibilities of the engineer must, on the whole, be met by men of a broader training than is afforded by the ordinary four years' technical curriculum; and that the ultimate result of such a policy will go far to place the engineer upon his true plane in the estimation of society. The man of exceptional ability will, of course, continue to make a name for himself and carry unique responsibilities as at present; but in general, the effect of such a change will be to supply the world with picked men capable, so far as education can insure it, of doing work of the most advanced grade and standing on precisely the same basis of professional regard as the lawyer, the physician and the clergyman.

Such a stiffening of the requirements for an engineering degree in a school which for half a century has existed as an undergraduate department should lead to the engineer's taking a larger place in public affairs than in the past, through his wider knowledge of affairs and broader culture. It should fit him more intelligently to advise executives in many fields, besides better qualifying him for administrative duties on his own account. Obviously, however, the cost of the proposed six years' course leading to a degree in one of the great engineering branches is likely to deter a great many men from its completion; but fortunately the engineering industries are large enough to need men of very diversified training, and the young man with a genuine interest in technical matters and a keen ambition to work his way forward should not be discouraged by any such action as is planned at Columbia.

In the electrical field, for example, there are needed under normal conditions of development men of an immense range of abilities and tastes. The industry needs the substation operator studying in a correspondence or Young Men's Christian Association electrical course no less than it needs the designer of motors; it needs the salesman of lamps and the canvasser of power prospects even as it needs the university instructor and the consulting specialist in hydroelectric development. The range of the engineering occupations is certainly far beyond that of the medical profession, which has one central responsibility, and which must be safeguarded against the entrance of men with partial preparation. Such a limitation does not apply to the engineering industry, and it is a cause for congratulation that its catholicity permits at one and the same time the modest training of humble workers for better positions and the advanced education of the graduate student to fit him to grapple with the larger scientific and business problems of this wonderful age.

THE ENGINEER AND PUBLIC AFFAIRS.

The discussion last month by Stevens Institute alumni, which is abstracted in this issue, serves to focus attention upon the relation which the engineer should bear not only to regulation by public utility commissions but to governmental administration in general. The need was there pointed out for administrative ability as well as engineering knowledge by those who are to have charge of such matters.

The remarks above point out how Columbia University is making a step towards meeting this need by turning out engineering graduates who will have a general knowledge of economics, political science, history and other subjects which are essential to a grasp of large problems connected with government administration. Stevens, Harvard and other engineering schools are also attempting to give their students a wider preparation for after life than is included in a curriculum made up solely of such engineering subjects as can be crowded into four years of study.

It is not alone, however, in preparation for duties of a broad administrative nature that the engineer is lacking, but even more in the disposition to familiarize himself with public affairs, to take a direct hand in politics or even to take sufficient interest in local affairs to make himself generally known in his own community and become a leader of public opinion in regard to engineering matters of a public nature. The criticisms leveled at public utility commissioners at the Stevens alumni meeting are equally applicable to other public officials in all walks of public life, whether elective or appointive. So long as engineers in general fail to take an active interest in public affairs they must not be surprised if the men put into public office display not only a lack of engineering knowledge but a lack of appreciation of its importance. The fault of present conditions lies mainly with the engineers themselves. As a class they have not kept in touch with public affairs and consequently public officials have generally not kept in touch with them. Nevertheless in matters essentially engineering in their nature engineers are of course always called in. It is in cases where the engineering relations are not so evident, as in the public utility commissions, that engineers do not receive the recognition which their profession deserves. However, New York is not the only state in which the need of an engineer upon the public utility commission has been recognized. Missouri and Illinois present examples of recent recognition of the desirability of having an engineer as a member of the state utility commission. As Dr. Humphreys so well emphasized, however, such an appointment upon utility commissions should not be restricted to a single member, but should represent rather a majority of the commission; or at least outnumber any other particular class represented in such appointments.

In no political body is the need for engineers more urgent than in the varied service of our large cities. More than half of the activities of a city are essentially of an engineering character. The problems connected with street paving, street lighting, street cleaning and refuse disposal, traffic regulation, local transportation, improved housing, water supply, sewerage, city planning and other similar municipal projects are problems which should be handled by engineers rather than by professional politicians. Unfortunately, engineers are usually no more conversant with such important subjects as the law, economics and business administration than are the representatives of these classes with engineering. Latterly, there has been evident, to be sure, a merging of engineering and financial interests, as represented in the large holding and operating companies in control of chains of public utility properties, with the result that executives of large administrative capacity have been and are being developed along lines represented by such a combination. Such men are, however, as yet but few in number and their services are in demand under conditions which do not invite them to enter the public service.

To change the conditions which are today so much deplored by engineers, it is necessary that engineers enter intensively into public affairs, at least to the extent of taking an active interest and letting this interest be felt in their local communities. The man who does not take the trouble to vote, and never attends public meetings to participate in discussions of local community questions, is not likely to be recognized as an important element in the solution of government problems, whether engineering or otherwise, and his profession will not be looked upon as such a necessary element in their solution. When we have more engineers known for their ability and interest in public matters in their own communities; when we find them representing the public in city councils and upon village boards of trustees; we will find them also receiving more recognition from state and federal administrations, and their voices will be exercising a greater influence in their proper sphere, such as the regulation of public utilities.

ANOTHER ADVANTAGE OF ELECTRIC COOKING.

Aside from the question of cost, it has been generally recognized that electric cooking has the advantages of cleanliness, lack of odor, and the saving in weight of such meats as are roasted or baked. Another advantage has been brought out in the operation of a large electric grill connected with a restaurant in the city of London, England. This grill has been operated for over three months, and is generally in use about 12 hours a day. Only broiling operations are carried on upon it and it is provided with a drip pan, so that all of the fat which drips from the meat is collected in a vessel below. It turns out that this fat, which is wasted in ordinary forms of cooking, can be sold at a price which more than pays for all of the electric energy used in the cooking process. The cost of electricity, which is usually raised as the insurmountable obstacle to its use for this purpose, turns out in this case a negative quantity, and there is an actual saving over and above the price of fuel which was consumed in the previous installation. The amount of fat which was collected in this way amounted to about six pounds per day.

This installation is said to have given complete satisfaction from the cooking standpoint and in addition to the economic advantage pointed out above it is found that 40 to 50 per cent more can be accomplished upon a grill than was the case when coke or gas was used for fuel. This means a greatly increased catering capacity with the same equipment.

This point should be kept in mind when the question of electric cooking is being considered and should remove the principal obstacle to its introduction in large restaurants. The combination of good cooking, which is also more hygienic, with the quick service made possible by the electrical method, should result in increased popularity for any restaurant using this method. Considering the load-factor which should prevail in such use, central stations should find it possible to quote a rate which would enable restaurants to install equipment of this type. In the case above considered, electrical energy was purchased at two cents per kilowatt-hour. Considering the saving from fat, this could be doubled without imposing as great a burden upon the proprietor as was represented by the former cost of gas.

Mid-Winter Meeting and Banquet of the American Electric Railway Association.

The mid-winter meeting and banquet of the American Electric Railway Association and the Electric Railway Manufacturers' Association were held at the Waldorf-Astoria Hotel, New York City, on January 29 and 30. Nearly 800 of the leading electric railway men of the country were present at the banquet which was held on the evening of January 29. In charge of the dinner was C. Loomis Allen, chairman, and the speakers of the evening were Charles N. Black, president of the American Electric Railway Association; Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company and the Hon. Henry W. Anderson, vice-president of the Virginia Railway & Power Company. Others at the speakers' table were Cornell S. Hawley, Thomas N. McCarter, James H. McGraw, Arthur W. Brady, D. M. Brady, H. H. Vreeland, C. C. Castle, C. S. Sergeant, W. L. Cornwell, General George H. Harries, W. H. Heulings, Jr., C. D. Goodrich, and Halford Erickson, of the Railroad Commission of Wisconsin.

Chicago Jovian League.

"Co-operation" was the subject of an interesting address delivered by Martin J. Wolf before the Jovian League of Chicago on February 2. The fact that the company or individual, when purchasing, wants unrestricted competition, but, when selling, wants restricted competition, is an elementary condition, but co-operation will improve this situation and make for constructive rather than destructive competition.

L. C. Leonard, Jovian statesman from Tennessee, spoke briefly regarding Jovianism in the South.

Prizes for members securing candidates for the last rejuvenation were awarded by F. W. Harvey, Jr., alternate statesman, at the close of the meeting.

Activities of the Western Society of Engineers.

At a general meeting of the Western Society of Engineers held in its rooms in the Monadnock Block, Chicago, on the evening of February 2, E. J. Mehren, editor of the *Engineering Record,* made an illustrated address on "The Making of a Technical Journal." He touched on nearly all the departments of such a publication, particularly the editorial, and urged a broadening out of the publicity work through co-operation with the editors of newspapers.

Directly after Mr. Mehren's talk the meeting resolved itself into the first of a series of regular monthly social gatherings enlivened by music, stories, poetry and refreshments. The Western Society of Engineers is composed of civil, electrical and mechanical engineers, who as a rule, have attended chiefly the meetings of the particular sections they were interested in. It is the aim of President E. H. Lee and the present administration, by making the general meeting on the first Monday of each month include largely entertainment and social features, to make the members of the three sections better acquainted with each other and with their several points of view. It is also hoped to make the Society's rooms more than ever the center of co-operative engineering activity in Chicago and contiguous territory.

Pennsylvania Telephone Meetings.

The convention of the Western Pennsylvania Telephone Association was held in Pittsburgh, Pa., on January 23 and 24. J. Walter Barnes, president of the Association, presided. At the opening session speeches were made by H. E. Webb, of Pittsburgh; and C. Phillips Hall, of the Doubleday-Hill Electric Company, of Pittsburgh. Delegates to the recent national convention of independents read reports. A number of girl operators invited to the convention, led in the discussion of "Handling the Service." Other speakers during the two days' session were: H. L. Lamb, California, Pa., "The Value of Publicity;" J. C. Core, Jr., of Uniontown, "The Toll Business;" T. J. Shuflin, of Butler, "Building Good Toll Lines;" W. S. Paca, Oil City, "Proper Maintenance;" W. H. Wilson, Erie, "Rural Lines;" and E. D. Schade, Johnstown, "The Pennsylvania Public Service Commission."

The fifth annual convention of the Western Pennsylvania Independent Telephone Association opened in the Hotel Antler, Pittsburgh, on January 22, with nearly 100 representatives present. President J. Walter Barnes, of Fairmont, W. Va., presided. H. E. Bradley, of Philadelphia, gave a short talk on "The New Female Labor Law;" J. C. Core, Jr., of Uniontown, talked on "The Toll Business" and T. J. Shufflin advised as to the manner in which toll lines should be built.

Galveston Jovian League.

At a meeting of the Galveston Jovian League on January 19, at Harmony Hall, there was a large attendance and arrangements were made to prepare for a big Jovian day during the convention of the Southwestern Gas and Electric Association, which is to be held at Galveston in May. A big rejuvenation will be held at that time and the Galveston degree team will make especial preparations for the event. Statesman W. R. Phipps was named chairman of a committee to handle the matter.

Following the business session there was a banquet and smoker. W. D. Masterson, city electrical engineer, gave a talk on wireless telegraphy, accompanied with demonstrations, a receiving and a sending station being placed in operation in the room.

A number of visitors were present, including A. J. Binz, B. S. Craig, Henry Albrecht, Jr., and M. T. Mason, all of Houston, Tex.

Electric Shows Planned.

Cleveland is to have an electrical exposition, with exhibits embracing every branch in the trade, to be held under the auspices of the Electrical League in May. The exact dates of the exposition have not been decided. Representatives of nearly 50 concerns agreed to take space at the show.

M. T. Turner, of the Cleveland Electric Illuminating Company; N. H. Boynton, of the National Electric Lamp Works; and T. P. Cagwin, of the Cleveland Telephone Company, were appointed members of a committee to investigate the project.

The Electric Show Association of Utah will hold its annual show at Salt Lake City during the first week of April. A large building has been secured for the occasion. The officers for 1914 have been elected as follows: B. W. Mendenhall, president; C. B. Hawley, vice-president; W. W. Torrence, secretary; and J. C. Gleeson, treasurer.

Organization of International Electrical Congress.

A dinner will be held at the Engineers' Club, New York City, on the evening of Wednesday, February 25, to discuss plans for the organization of the International Electrical Congress to be held at San Francisco in September, 1915. Invitations will be issued to members of the General Congress Committee of 150, to the officers of the American Institute of Electrical Engineers and its sections, and to members of its committees. The Executive Committee will make a report. The secretary of the Committee on Organization is Preston S. Millar, Eightieth Street and East End Avenue, New York City.

Chicago Electric Club.

Charles W. Peters, chief deputy sheriff of Cook County, was the principal speaker at the meeting of the Electric Club of Chicago on January 29. Mr. Peters presented statistics on crimes and criminals for the past year, and made several pertinent suggestions relative to the needs of the state in properly handling the situation.

William S. Boyd.

The popularity of modern electric service is in no small measure due to the well-known fact that electricity is now one of the safest forms of energy. When circuits and apparatus are properly installed, and fittings and materials of suitable design and correct construction are employed, the hazard attending the use of electricity for any proper purpose whatsoever is a quantity that is neglibly small. Where the conditions mentioned are not fulfilled, however, there is frequently danger of fire and liability of loss of life. That they are so generally fulfilled now is very largely the result of the efforts of a small group of men who, in the earlier days of the electrical industry, undertook to teach the public and the manufacturer of electrical appliances the importance of safe wiring, and who have continued in work of this kind. One of these men is William S. Boyd, of Chicago.

Mr. Boyd was born in Aurora, Ill., moving to Hyde Park—which is now a part of Chicago—in 1876. After graduating from the Hyde Park High School in 1889, he entered the employ of the Thomson-Houston Electric Company, taking the "Expert Course" in the Chicago repair shops of the company to fit himself for the work of installing electric light and power plants.

During the next two years his work included the repairing, testing and installing of electrical wiring and apparatus in and about Chicago, later going with the electrical department of Armour & Company, at the Chicago Stock Yards. Leaving this position in 1891, Mr. Boyd associated himself with the Home Electric Company, of Seattle, and here, during a period of about two years, he had a broad experience in engineering and construction practice.

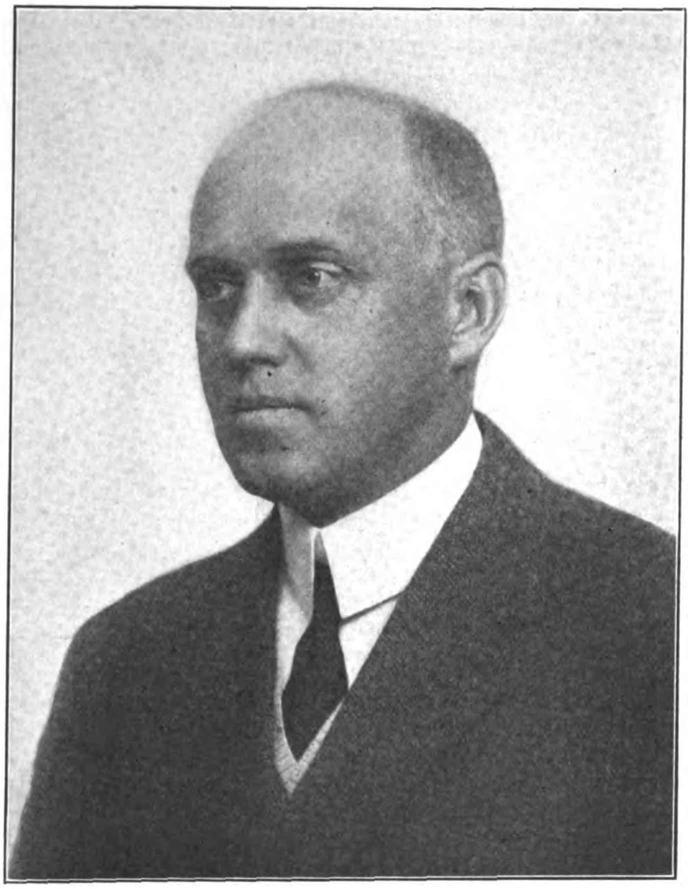
Mr. Boyd's next work was with what was then known as the Chicago Underwriters' Association, under the direction of W. H. Merrill, now the manager of the Underwriters' Laboratories, Inc. Mr. Boyd is proud of the honor of being the first man employed by Mr. Merrill in making laboratory tests on electrical materials. Here he divided his time equally between laboratory testing and the inspection of wiring and the rating of electrical power plants. From 1901 to 1903 he was in charge of the insurance department of the Western Electric Company, and in 1903 he joined the forces of "The (Western Insurance) Union," to extend and improve the municipal supervision of electrical wiring, and to advise Fire Insurance Companies in regard to electrical installation hazards and the proper safeguards.

In 1905 Mr. Boyd organized the Western Association of Electrical Inspectors, of which he is the very popular and very efficient secretary-treasurer. This association has grown to be one of the largest of the electrical societies, and, withal, one of the most useful. Its membership is drawn mainly from electrical inspectors throughout the central western section of the United States. Mr. Boyd has recently been elected to the office of secretary-treasurer of the Chicago Chapter of the National Fire Protection Association.

Mr. Boyd is a member of the Electrical Committee of the National Fire Protection Association which has in charge the preparation of the National Electrical Code and in the central West he is regarded as an authority upon its proper interpretation, being daily requested to settle disputes regarding the application of Code rules.

In addition to the activities already enumerated, Mr. Boyd has frequently been employed as an expert witness in law suits where the question of electrical fire hazard was involved, and as an expert in patent cases. He has sometimes been employed, too, to advise municipalities with reference to the electrical fire hazard and its proper regulation.

While, as the foregoing notes show, William S. Boyd is a man of fine training and splendid experience, his personality has unquestionably contributed in an unusual degree to his success in his chosen vocation. He is a quiet, unassuming, even-tempered sort of fellow, with a prevailing disposition to be accommodating whenever he can serve those among whom he lives and works. He is essentially a diplomat, but never shrinks from "calling a spade a spade" when occasion requires. There are few people who know him who are not his friends. He deserves that it should be so.



William S. Boyd,
Secretary of the Western Association of Electrical Inspectors.

Banquet of Lynn Section.

The banquet of the Lynn Section, American Institute of Electrical Engineers, held at the American House, Boston, Saturday evening, January 24, was attended by 240 men, and marked another successful effort of this live organization.

The principal speaker was Thomas D. Lockwood, manager of the Patent Department of the American Telephone and Telegraph Company, whose address on general topics was greatly enjoyed.

President C. O. Maillox was a welcome visitor and complimented the Lynn Section upon its progress; also expressed the hope that the section would be fittingly represented at the International Electrical Congress to be held at San Francisco in September, 1915.

Walter C. Fish, manager of the Lynn General Electric factories; D. B. Rushmore, of Schenectady, and H. E. Clifford, of Harvard University, were each in turn introduced by Toastmaster W. A. Hall and spoke.

The decorations were in charge of C. A. B. Halvorson and S. C. Rogers, and the entertainment committee consisted of George Alton, J. Allan Dalzell and S. C. Rogers.

The membership of the Lynn Section is now larger than that of any other section, being 640, of whom nearly 100 belong to the national body.

Western Alumni Meet.

A very enthusiastic meeting of the Western Alumni Association of the Worcester (Mass.) Polytechnic Institute, in the form of a dinner to Dr. Ira N. Hollis, who has this year taken the presidency of the Massachusetts school, was held Wednesday evening, January 28, at the University Club, Chicago. Dr. Hollis is well known to the engineering profession and is remembered to all Harvard men as the Harvard Director of Athletics and the father of the Harvard stadium.

Dr. Hollis was the principal speaker at the dinner and brought good news of the eastern institute. About $500,000 has recently been added to the endowment, part of which is available in the form of a free scholarship to men from Illinois and other parts of the country. The W. P. I. is in no way a local institution, but draws its students from all over the world.

Elwood Haynes, the father of the automobile, and a graduate of the class of 1881, was present and was listened to with great interest. The announcement that the Alumni athletic field, for which the Alumni recently raised $150,000, was nearly completed and ready for football, baseball and tennis next year; also that the large new gymnasium would be started in the spring, was greeted with cheers by the old grads. About 30 of the local alumni were present at the dinner, which was presided over by Albert P. Allen, class of 1889, the president of the local association.

During his western trip Dr. Hollis will visit the University of Illinois, the University of Wisconsin and other institutions of learning with special reference to seeing their engineering departments.

Pittsburgh Section Meeting.

At a meeting of the Duquesne Light Company Section of the National Electric Light Association at the Colonial Hotel, Pittsburgh, Pa., on January 23, nearly 400 members attended. F. B. Patterson spoke on "The Inside Meter Department of the Laboratory;" H. S. Calderwood on "The Skilled and Schooled Workers," and W. A. Donkin on "Increase of the Sales Department."

Receivers Appointed for Central Union Telephone Company.

Receivers for the Central Union Telephone Company have been agreed upon by counsel in the suit against the company brought by minority stockholders. They are David R. Forgan, of the National City Bank, Chicago; Frank S. Fowle, consulting engineer of New York, and Edgar S. Bloom, vice-president of the Bell system in St. Louis.

Telephone Displacing the Telegraph.

At the meeting, in Washington, D. C., on November 13, 1913, of the Eastern Division of the Association of Railway Telegraph Superintendents, Theodore N. Vail, president of the Western Union Telegraph Company, and of the American Telephone & Telegraph Company, greeted the members present. A short discussion took place between Mr. Vail and some of the members. Among the remarks made by Mr. Vail, he said: "The first thing you know there will be no more railroad telegraphers; they will be railroad telephoners. It looks to me as though we were coming to that. I remember in the old days I used to be a railroad telegraph man myself, a pretty poor one at that. They would call and call and call, half an hour or so, and the operator called did not pay any attention to the call. There is something very curious about the telephone. It is the only thing that a man will drop everything to answer. A man comes to call on you; you tell him to wait outside, and, if you are busy, you take your time about seeing him, but the moment you hear the telephone bell ring it calls attention, and you answer it. It is a habit —that is all—people are accustomed to it."

New Wireless Stations.

The United States Navy Department will erect a wireless station at Point Isabel on the Texas Gulf Coast. This station will have three towers, each 300 feet high. An appropriation has already been made for the station and construction work is expected to begin within six months.

In a short time efforts will be made to establish communication between the new wireless station in Honolulu and the Marconi station at Clifden, Ireland. The distance is about 7,800 miles.

It has been announced that the Marconi Company will build the largest wireless station in the world at Marion, Mass.

Direct wireless communication between Germany and the United States has been established and on January 27 Kaiser Wilhelm sent a message by this means to President Wilson, which was received at the station at Tuckerton, N. J. The sending station is located at Eilvese, near Hanover, and is operated by the Goldschmidt company.

Boston Automobile Show Dates Announced.

The Boston Automobile Show of 1914 will be held in Mechanics Building March 7-21, the pleasure-car exhibit being held the first week and the truck exhibit the week following. Many electrics will be exhibited, as in former years.

Massachusetts Water Powers.

The commission on the investigation of water powers and water supply in Massachusetts, consisting of the chairman of the Gas and Electric Light Commission, the chairman of the Harbor and Land Commission and the Attorney-General, has issued a report to the Legislature in which it outlines some of the needs for a thorough investigation of the subject which it has not been able to make, owing to the small amount of money appropriated for the purpose, and asks the Legislature to decide on the question whether or not further work shall be done.

The report points out that the regulation of water powers in Massachusetts dates from the old mill act of more than a century ago, and that while dams of companies, both manufacturing and hydroelectric, are subject to the supervision of the county commissioners of the county in which the property is located, this authority is practically dormant. The larger bodies of water, known as "great ponds," are the property of the State, but there are few data available concerning them.

The subject of state investigation was brought about mainly through the project of a company to control water privileges in Miller's River and sell the water impounded to manufacturers located on the stream. It was noteworthy at the hearings that most of the manufacturing interests desired state control and even state ownership.

If the commission's suggestion for further investigation is adopted a tabulation of stream flow will be made for all important streams.

Air-Brake Tests.

Important improvements in the braking of heavy passenger cars will be described in a paper to be read before The American Society of Mechanical Engineers, at the Engineering Societies Building, New York City, on February 10, at 8:15 p. m., by S. W. Dudley, of Pittsburgh. These tests were conducted jointly by the Pennsylvania Railroad and the Westinghouse Air Brake Company. The results are considered the most important recent contribution to the subject of air brakes.

Commonwealth Edison Concert.

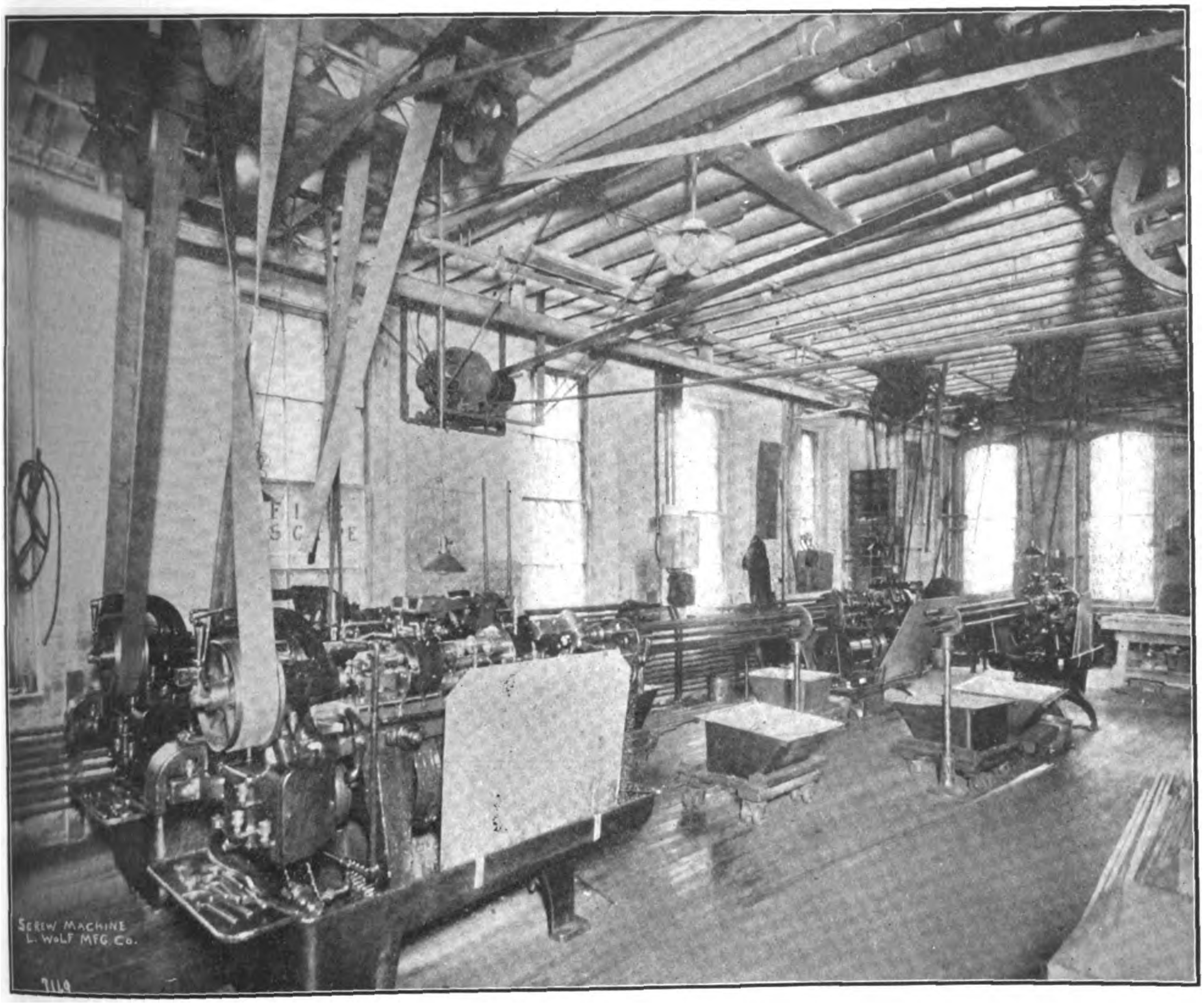
The Commonwealth Edison Orchestra, composed of 90 employees of the Commonwealth Edison Company, will give its second annual benefit concert in Orchestra Hall in that city on the evening of Thursday, February 12. The leader of the orchestra is Morgan L. Eastman. Miss Luella C. Ohrman, soprano soloist, will also have a place upon the program. Tickets for the concert are 50 cents each.

Electricity in Nut and Bolt Manufacturing.

In discussing the application of electric motor drive to factories engaged in the manufacture of nuts and bolts, comment is made on the numerous advantages and economies that have been demonstrated so forcibly in other metal-working establishments. Results of an exhaustive test conducted by A. E. Rickards in a bolt factory are presented, together with data on several typical plants.

The application of electric motor drive to plants engaged in the manufacture of nuts and bolts does not present problems that differ materially from the problems encountered in equipping general machine shops. There are, however, certain special conditions that apply specifically to the former that should be thoroughly understood by the central-station engineer before undertaking the equipping of such plants for electric drive.

As is true in all machine shops, motor drive has come to be recognized as the most efficient, flexible and economical form of power obtainable. As has been pointed out in these columns individual motors for the greater proportion of machine tools, and small group drive, have done much to better the general conditions in many factories, increasing the output and at the same time reducing the maintenance cost, eliminating not only the dangers attendant on the many rapidly moving belts and pulleys, but the enormous friction losses in the many bearings and slipping belts.



Group of Automatic Screw Machines Driven by Motors.

The removal of line and countershafting and belting means also better ventilation, better light and consequently better results in efficiency of both machines and operators. Economy of floor space is another very important factor to be considered, as with most machines it is possible to mount the motor in such a manner, either on or near the machine, as to take up practically no additional space, and allowing an arrangement of machines to conserve floor space that would be an impossibility with belt drive where the line shafting determines the position of the machine irrespective of light, accessibility or floor space.

It is said that the friction losses in ordinary belt-driven shop equipment average about 75 watts per horsepower for each hanger, and while this may seem to be excessive it is not at all improbable, taking into consideration the fact that hangers must be placed at frequent intervals on a line shaft and in many buildings become much displaced in alinement owing to the settling of floors from varying load strains placed on them and the side strain on the hangers from the countershafts, all of which naturally increase the friction losses.

With belt drive the speed of a machine must necessarily remain practically constant except in the case of lathes or other machines where gearing and cone pulleys are utilized to effect changes, while with motor drive a wide range of speed, suited to varying conditions, is quickly and easily obtained; this feature alone adds to the sum total of the efficiency of the machine and widens its scope of work, saves time in transferring and setting up work, and results in a general saving of time, power and cost.

Speed range in connection with many machine tools is all-important, as the machine is often subjected to rough and ill usage at the hands of the operative, which causes abnormal strains upon the controlling apparatus; this must be so constructed as to be able to withstand the severe conditions which are imposed on it through inexperienced or careless manipulation and yet be reliable of operation, easily accessible and of simple construction.

The necessity of reliable automatic starting and speed-controlling apparatus to meet the requirements of the present-day equipment has brought out some highly efficient types of starting and regulating controllers, automatic and manually operated reversing controllers, float switches, pneumatic-electric and mechanical-electrical devices suited to practically any conditions under which a motor can be used for power, and while the cost of automatic starting apparatus prevents its installation in some cases, usually it will be found that it would have been, in the end, really cheaper and likewise much more satisfactory.

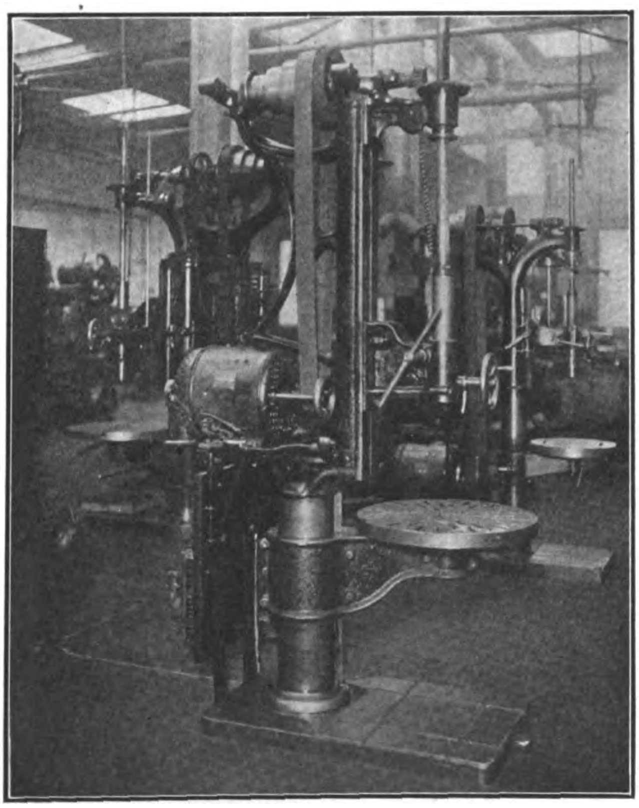
In selecting a motor for driving machine tools it is of great importance that the conditions affecting the machine it will drive are thoroughly understood and allowance must be made for abnormal conditions which may at times be imposed upon it. In the case of a machine which operates at very nearly the same load under all conditions a shunt motor may be used, but if the load varies at different periods, is light at one part of the operation and heavier at others a compound-wound motor is required.

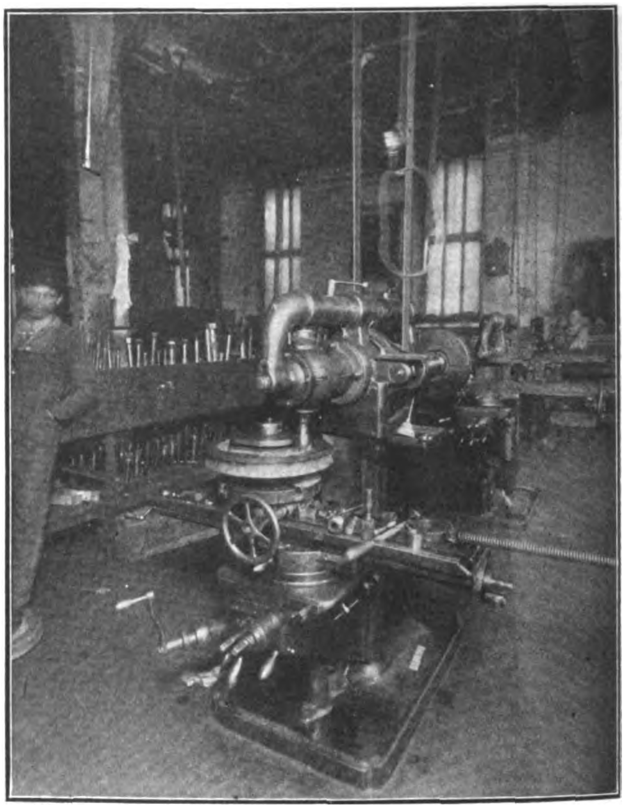
The results of an investigation made recently in a Pennsylvania nut and bolt factory will demonstrate how the advantages as well as the economy of central-station service can be capitalized by the power salesman. The factory in question, previous to the adoption of central-station service, was using a gas engine, driving the machinery in the plant by means of shafts and belts. The usual tests were made in the engine room to determine the quantity of power generated, friction losses, etc., and the cost per kilowatt-hour.

Then, to determine the speed fluctuation throughout the factory and how it affected the output, a graphic tachometer was connected to the main line shafts. It was found that the average fluctuations of speed throughout the entire period was six per cent. The output of the driven machines, of course, varied in a like proportion.

A study was made of the losses due to the upkeep and slippage of the belts. It was found that with correct motor applications, 48 belts could be eliminated and by doing so, this alone would increase the output 4.17 per cent. This percentage is calculated from data compiled by Frederick Winslow Taylor, who found from exhaustive tests, covering a period of nine years, that every belt gave an average of 26 interruptions to service during its life. On this basis each belt gave five interruptions to manufacture each year.

With the 48 belts, dispensed with in the plant in question, this would equal 240 interruptions per year. Assuming that two interruptions are equivalent to a complete rupture in the cycle of manufacture, and that the average time required to repair each belt is one hour, this would equal 120 hours loss to manufacture per year.

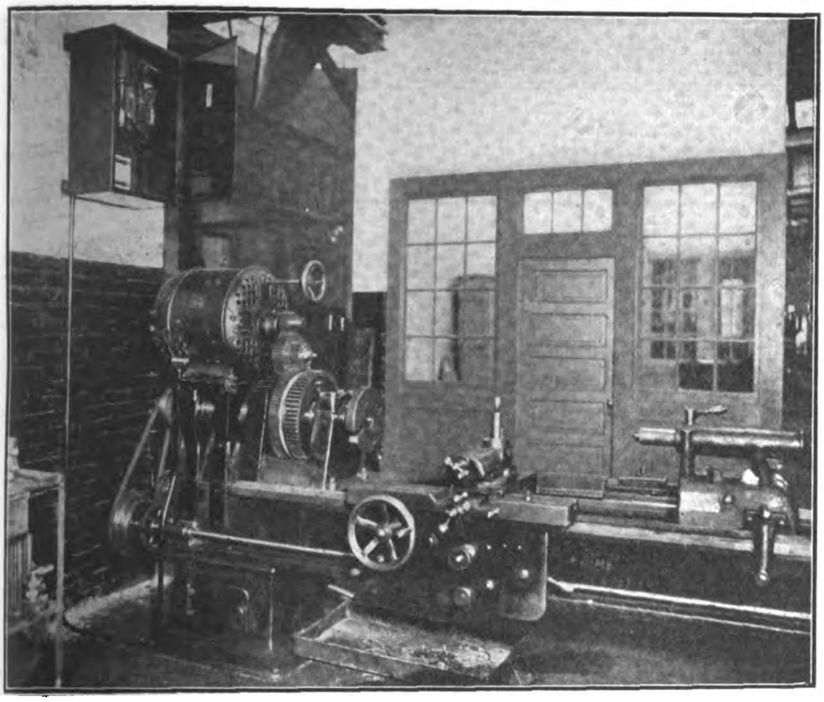

Group of Machines Driven by Individual Motors.


Motor-Driven Machines in Bolt Factory.

The total operating time was 2,880 hours per year; this divided into the loss of 120 hours equals 4.17 per cent.

Studies of the operating and cutting speeds of the individual machines were made. Graphic meters were connected to the machines whenever possible and blue prints of the charts were incorporated in the report made by the central station.

Conditions found in the bolt-threading department may be cited as typical of the characteristics of line-shaft drive. In this department 30 machines are employed and not one was found to be operating at its correct speed. The following table shows the per cent of increased speed necessary to operate the



Motor Geared Directly to Lathe.

threading machines at their correct cutting speed:

TABLE I.

No. of Machine	Size of Bolt	Per cent of Speed Increase
1	¼	81
2	¼	73
3	⅜	24
4	⅜	33
5	½	49
6	½	19
7	½	65
8	½	30
9	½	34
10	⅝	27
11	⅝	39
12	¾	04
13	¾	26
14	¾	79
15	¾	10
16	¾	91
17	¾	58
18	¾	21
19	⅞	46
20	⅞	71
21	⅞	37
22	⅞	24
23	⅞	32
24	⅞	56
25	1	52
26	1	32
27	1	41
28	1	18
29	1⅛	37
30	1½	06

It will be seen from this table that on some of the machines it was necessary to increase the speed 90 per cent in order to operate them at their correct cutting speeds; this means that their production was increased about 65 per cent. It is also worthy of note that with line-shaft drive only 8 of the 30 machines in this department were operating within 25 per cent of their proper cutting speeds. It is also significant that no two machines, even those working on the same size bolts, operated at the same speed. Of the seven machines threading three-quarter-inch bolts, for instance, the cutting speeds during the period of test were 25.5, 23.5, 21.5, 21.75, 16.5, 14.5 and 13.5 feet per minute, respectively. The correct cutting speed for this size bolt is 26 feet per minute.

On the nut-tapping machines it was found that by increasing the cutting speed on the machines tapping 1.25-inch nuts or larger, that an increase in their output was obtained, while on the machines tapping smaller sizes than 1.25-inch, increasing their cutting speed did not increase the output.

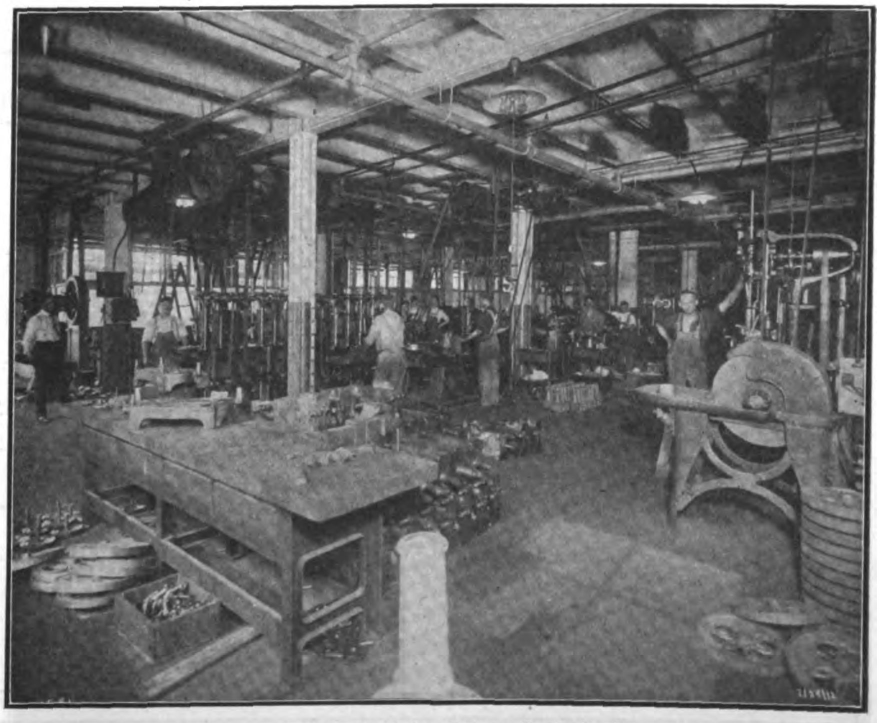
Nut-tapping machines are usually built in gangs of six spindles each. A time study shows that it required a man one minute and five seconds to put his foot upon the lever, raise the tap and place a nut in position. To place nuts under six spindles took nine seconds; to walk from the last spindle back to the starting point required five seconds, thus fourteen seconds have elapsed. By using the correct cutting speed, it required three seconds to tap a five-eighth inch nut. In other words each spindle ran idle eleven seconds. It is readily seen that one man cannot attend to six spindles and keep each cutting to its capacity. By placing two operators at each machine the output was increased 133 per cent.

Table II shows the cutting speeds at which the 17 machines in this department were found to be operating and the correct cutting speeds when the machines were equipped for motor drive.

TABLE II.

No. of Machine	Size of Nuts, Inches	Former Cutting Speed. Ft. per Minute	Correct Cutting Speed. Ft. per Minute
1	⅜	2.5	40
2	⅜	25	40
3	⅜	37.5	40
4	½	27	41
5	½	33.5	41
6	½	37.5	41
7	⅝	36	42
8	⅝	41	42
9	¾	21	48
10	¾	22	48
11	¾	23	43
12	¾	26	48
13	¾	34	43
14	⅞	21	44
15	⅞	23	44
16	1⅛	26	46
17	1¼	27	47

As was also true of the machines in the threading department, no two machines were operating at the same speed in the nut-tapping department, although the variation was not as great as in the former department. The same conditions were found in other departments. To make a long story short, through the increase obtained in the factory, this manufacturer increased his net profit from $20,000 to $32,000, or in other words, his net profit was increased 60 per cent.



Group of Motor-Driven Bolt Headers.

Nut and Bolt Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant in Muskogee, Okla., operating 54 hours per week.

Total connected horsepower, 17. Total number of motors installed, 5. Average kilowatt-hours per month, 740.

Kilowatt-hour consumption for 7 months:

January, 700; February, 715; March, 916; April, 791; May, 668; June, 655; July, 663.

Load-factor, 8 per cent; operating-time load-factor, 19 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	3	1,800	Belted direct to one Buffalo 36-inch blower.
1	2	1,200	Belted to short line shaft driving six bolt-threading machines; and six nut-tapping machines.
1	2	1,200	Belted to shafting driving three bolt headers; two threading machines; and one emery wheel.
1	5	1,200	Belted to shafting driving one shaper; one milling machine; and two 1.5-inch bolt-threading machines.
1	5	1,200	Belted to shafting driving one lathe; one double emery; and one bolt cutter.

Plant operating 60 hours per week.

Total connected horsepower, 58. Total number of motors installed, 6. Average kilowatt-hours per month, 1,435.

Kilowatt-hour consumption for 12 months:

January, 1,490; February, 1,670; March, 1,480; April, 1,360; May, 1,340; June, 1,380; July, 1,370; August, 1,430; September, 1,570; October, 1,260; November, 1,880; December, 980.

Load-factor, 4.5 per cent; operating-time load-factor, 9 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	15	1,200	Belted to line shaft driving five lathes; one milling machine; one shaper; one planer; one drill press; three bolt cutters; two emery wheels; one large punch press; one drill press; and one wheel press.
1	15	1,200	Direct-connected to one cupola fan.
1	7.5	900	Direct-connected to one Chicago Pneumatic Tool Company air compressor.
1	10	1,200	Belted to line shaft driving six bolt-threading machines; two emery wheels; and two nut-tapping machines.
1	10	1,200	Belted to three No 2 Putnam bolt machines; two National bolt cutters; four 1.5-inch bolt headers; and six 0.75-inch bolt headers.
1	0.5	1,600	Direct-connected to one jig saw.

Plant operating 54 hours per week.

Total connected horsepower, 47.5. Total number of motors installed, 5. Average kilowatt-hours per month, 5,450.

Kilowatt-hour consumption for 10 months:

January, 6,270; February, 5,570; March, 5,920; April, 5,440; May, 5,480; June, 5,340; July, 4,970; August, 5,270; September, 5,030; October, 5,210.

Load-factor, 24.5 per cent; operating-time load-factor, 49 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	5	1,200	Belted to line shaft driving one 1.5-inch drill press; one 2.5-inch drill press; three bolt drills; one No. 3 milling machine; one speed lathe; two grinders; two emery wheels; and one hack saw.
1	7.5	1,200	Belted to line shaft driving one 16-inch lathe; one five-inch boring mill; one 36-inch planer; 12 No. 2 Putnam bolt machines; six National bolt cutters; eight bolt-threading machines; and one three-inch pipe machine.
1	10	1,200	Belted to line shaft driving 12 bolt-threading machines; one 8 by 8 air compressor; one eight-inch hydraulic press; one two-inch radial drill; one automatic knife grinder; one emery wheel; and four Putnam bolt machines.
1	10	1,800	Belted direct to one No. 16 Sturtevant blower.
1	15	1,200	Belted to a line shaft driving two emery wheels; two grind stones; three rod cutters; four No. 2 Putnam bolt machines; for one-inch bolt headers; four 1.5-inch bolt headers; four 0.75-inch bolt headers; and one elevator.

Commercial Practice
Management, Rates, New Business

ELECTRIC DISTRIBUTION-SYSTEM EXTENSION POLICIES.

By H. G. D. Nutting.

One of the most important questions in public-utility management is, "How far can we afford to extend our lines to take on business?"

Many different policies are being pursued by the central stations of the United States. It was demonstrated by an investigation in New England, and a similar investigation in Wisconsin, that there are nearly as many different rules as to extension policy as there are central stations. In view of the fact that this problem has been with the central station from the beginning of the business it is difficult to see why the practice has not been standardized within closer limits.

The general practice at present is to state that the estimated yearly gross revenue for one or more years, from a proposed extension, must be equal to or greater than the cost of the extension, not including meters, transformers and service drops. The fallacy of this rule is evident from the fact that the cost of operating a new extension is not a function of the partial investment alone, as will be shown in what follows.

This problem is governed by a natural law which cannot be broken without loss to both the central station and the community served. The law is, that the extension policy should be such as to make the natural development of the business the maximum continuous and ultimate possible for the benefits of both the central station and the community served. This abstract statement means nothing to the central-station manager in this form.

The question is, "What rule can be formulated that will produce the results of the operation of this law for any particular central station?"

Fortunately (and contrary to the belief of those who have not given the matter deep study) the problem lends itself to scientific analysis. This analysis follows. To get the matter plainly in mind, the result of the writer's investigation is given first and the methods pursued and explanation of limitations discussed afterwards. The result of the analysis is crystallized into the formula:

$$R = aI + bL + cM + dT + frK$$

in which R = the gross yearly revenue in dollars that must be received from the new extension to make it pay;

I = the cost of the extension in dollars, including meters, transformers, poles, wires and all apparatus required;

L = actual length of wire used in feet regardless of size of wire;

M = number of prospective meters or consumers to be connected;

T = number of transformers that will be required, regardless of size;

r = cost of one kilowatt-hour at station switchboard (including, say, 10 per cent profit);

K = estimated kilowatt-hours which will be delivered to extension per year.

a, b, c, d and f are variables which become constant for any given central station, in accordance with the following details.

a = the sum of the rates of interest, profit, depreciation and taxes for the particular utility, expressed as a decimal, thus:

Rate of interest and profit.....0.075
Rate of depreciation on line...0.10
Rate of taxation..............0.025
$a = 0.200$

b = cost per year of operating and maintaining one foot of wire regardless of size. This includes miscellaneous distribution system operating labor, miscellaneous distribution system supplies and expenses, and maintenance of overhead.

The value of b for any particular utility is arrived at by dividing the above annual distribution system expenses by the number of feet of wire operated, both primary and secondary. The result is an average figure which is close enough for the results desired.

c = cost per consumer (or meter) per year for meter and miscellaneous expenses. It includes labor of removing and resetting meters; labor of inspecting and testing meters; meter department supplies and expenses; maintenance of meters; consumption expenses, such as lamp renewals, consumers' premise expenses, etc.; commercial expenses, such as cost of collecting, reading meters, promotion of business, etc.; general expenses, such as salaries of general officers, law expenses, maintenance of general office, etc.; undistributed expenses, such as injuries and damages, insurance, utility equipment expenses, etc.

The value of c for any utility is arrived at by dividing the sum of the above mentioned expenses by the present number of consumers. It will be found that this is one of the largest factors in the formula. Its effect and limitations will be discussed further.

d = cost per transformer per year and includes labor of inspecting, removing, and resetting transformers; and maintenance of transformers.

d is arrived at by dividing the above expenses by the number of transformers in use.

f = one plus the average percentage of loss and unaccounted for in the distribution system expressed as a constant. Thus, if the loss is 30 per cent, $f = 1 + 0.30 = 1.3$.

Applying the formula to a proposed extension in a specific utility in which it was found that

$a = 0.20$
$b = \$\ 0.003$
$c = \$10.00$
$d = \$\ 1.50$
$f = 1.3$
$r = \$\ 0.015$

it becomes

$$R = 0.2\,I + 0.003\,L + 10\,M + 1.5\,T + 0.0195\,K.$$

At first sight this formula will seem complicated. When it is realized that it is merely the sum of the various expenses contributing to the costs of operation of the new extension, its simplicity will be evident.

Application of the Formula.

A case is cited in which

I (the investment) = \$500.
L (the length of wire) = 5,000 feet.
M (the number of consumers) = 6.
T (the number of transformers) = 1.
K (the kilowatt-hours delivered) = 900 (estimated).

Then

$$\begin{aligned} R &= 0.2 \times 500 + 0.003 \times 5000 + 10 \times 6 + 1.5 + 0.0195 \times 900 \\ &= 100 + 15 + 60 + 1.50 + 17.55 \\ &= \$194.05. \end{aligned}$$

This means that, barring prospective further business from this extension, it cannot be made unless the six prospective customers will guarantee \$194 a year, or \$32.33 each.

How the Formula Was Developed.

Each new extension adds to the company's costs:

(1) Immediate Expenses—
  (a) Interest on investment in extension.
  (b) Depreciation on extension.
  (c) Maintenance costs of extension.
  (d) Operating costs of extension.
  (e) Consumption, commercial, general and undistributed expenses of extension.
  (f) Taxes on extension.
  (g) Cost of current delivered to extension, including operation and maintenance of power plant.
(2) Suspended Expenses—
  (a) Prorated interest on total plant.
  (b) Prorated depreciation on total plant.
  (c) Prorated taxes.

Interest, depreciation and taxes are functions of investment.

Maintenance and operating expenses are functions of length of line, number of consumers, and number of transformers.

General expenses are functions of the number of consumers.

Current cost is a constant (or practically so) for each individual plant.

In general the condition which determines whether or not an extension shall be made is, will the revenue pay the costs of service?

Let R = the estimated gross yearly revenue required from the extension at present rates.

E_i = the immediate expenses resulting from the extension.

E_s = the suspended expenses which go on whether the extension is made or not, except as a limiting condition.

Then $R = E_i + E_s$.

Some question arises as to whether or not it would be proper to drop the term E_s. While, in the long run, this is as much a part of the expense of serving the new consumers as the old, its inclusion will seriously interfere with the development of the property. Unless the power plant and lines are loaded up to the limit of the requirements of good service, these suspended expenses exist whether the new extension is made or not. Therefore, if their inclusion prevents the taking on of consumers, they never can be reduced and the entire growth of the property is retarded. The answer is that it is better to have the new consumers to divide into the suspended expenses than to have the same suspended expenses and a dearth of consumers.

A further argument in connection with this question comes out of the fact that R, the gross revenue, is estimated at present rates and these rates are supposed to be high enough to take care of the present suspended expenses whether any more consumers are added or not. Of course this cannot be true in a plant having a large over-capacity. In the immediate expenses are included all expenses that actually exist. They appear in the formula as averages of all the consumers now connected.

In view of the above facts, it is permissible and advisable to drop E_s from the extension-policy formula and in the formula as shown this has been done.

Significance of the Terms and Their Limitations.

The formula is made up of two kinds of terms:

(1) Those which immediately add expense to the operation of the property. This includes the fixed charge on the investment and the kilowatt-hour expense; i.e., the first and last terms.

(2) Those which do not immediately increase the operating expenses with the addition of a few new customers, but which eventually do, with the addition of several hundred new customers.

The first term (aI) is the most evident cost of furnishing service to the new extension. The investment (I) is estimated after laying the new construction out on a map and taking off the quantities of the various materials. The factor (a) will vary with the year and the locality, although it will not be far from 0.20 at any time and any place.

The second term (bL) varies considerably in different cities. The value of b will run close to $0.003 per foot. If it is 50 per cent above or 50 per cent below this figure it does not affect the results materially.

The third term (cM) is a large part of the estimated cost of operating the extension. An inspection of the expense accounts which make up the value of c will show that they do not actually increase by the addition of a few customers. The consumption, commercial, general and undistributed expenses remain practically the same as before the extension was made. The meter expenses increase almost in proportion to the number of meters added. Inasmuch as the meter expenses are only 10 per cent of the total value of (c) their part is small. It is evident that this term could legitimately be dropped out entirely, or at least reduced to one-tenth of its actual statistical value. There is some question as to the policy in permitting it to appear, on account of its effect on the development of the business. In order that the formula be practical it must meet the conditions laid down in the natural law, stated in the early part of this discussion. This provides for an active development of the business both from the standpoint of increased customers and increased consumption. An increase of customers will gradually decrease the value of (c) although it will never get below a certain minimum value, probably in the vicinity of $5. In view of the above facts (c) can usually be made equal to $1.00.

The fourth term (dT) will appear only when a new transformer is to be included in the prospective extension. It contributes only a small part of the total cost of operating the extension. The value of (d) may vary from 50 cents to $5.00. In any case it will not affect the results much.

The fifth term (frk) should be selected with care as, standing alone, it represents the absolute minimum rate at which electricity could be sold without a continuous loss. The value of f (the per cent loss) can be fairly closely found for most stations. Even though it varies from 10 to 50 per cent it does not affect the results much. It will usually run from 20 to 30 per cent. (r) includes all the costs of generation at the power house and is arrived at by dividing the total cost of generation by the number of kilowatt-hours generated.

If the plant is loaded nearly to its limit, the interest, taxes and depreciation of the power plant should be included in the value of r. If there is plenty of surplus capacity, these fixed expenses should not be included. The explanation of this statement lies in the fact that, if the load-factor of the plant is low, every possible effort should be made to increase it, and the value of r in the formula has some effect on it.

It is not difficult to estimate the value of K in any particular problem. Ordinarily, for average residences, it will be anywhere from 140 to 180 kilowatt-hours per year.

It is interesting to apply the formula to the simple case of a service drop from a secondary line.

In this case

I = $10.
L = 100 ft.
M = 1.
T = 0.
K = 150.

Using the formula:

$$R = 0.2I + 0.003L + M + 1.5T + 0.0195K$$

$$R = \$2 + \$0.30 + \$1 + \$2.92 = \$6.22$$

which is the minimum amount the customer must pay annually to permit of the extension meeting its cost, not including consumption, commercial, general and undistributed expenses. If these latter are included the cost will be about $15.

It is evident from the foregoing that the degree of conservatism a company wishes to pursue is contained in the value of c used; c will vary from 1 to 15 in different cities, depending on circumstances, as set forth previously.

How to Apply the Formula to the Future.

No one can predict accurately the future. Knowledge of statistics and tendencies in certain sections of cities enables a manager to pass fairly reliable judgment as to the number of customers that might be added in that territory in a certain number of years. The application of the formula to this condition will be illustrated by the following example.

Five applicants for service required the following conditions to be met in order to serve them:

$I = \$400.$
$L = 4{,}000.$
$M = 5.$
$T = 1.$
$K = 750.$

$$R = 0.2 \times 400 + 0.003 \times 4{,}000 + 1 \times 5 + 1.5 \times 1 + 0.0195 \times 750.$$
$$= 80 + 12 + 5 + 1.50 + 14.63.$$
$$= \$113.13.$$

Estimated income = $90.

This means that $23.13 a year would be lost on this extension.

If there is reason to believe that in three years, six more customers could be added without further line extensions, apply the formula to the extensions under these conditions as if they were immediate, thus:

$$R = 0.2 \times 472 + 0.003 \times 4{,}600 + 1 \times 11 + 1.5 \times 1 + 0.0195 \times 1{,}650.$$
$$= 94.40 + 13.80 + 11 + 1.50 + 32.18.$$
$$= \$152.88.$$

Estimated income = 11 × $18 = $198, which is $45.12 per year more than the cost of serving the eleven customers.

On the original extension for five customers the company would lose 3 × $23.13 = $69.40 in three years. Evidently from the above calculations, this loss (including interest) would be made up in approximately one and one-half years after the six additional customers came on. In view of this it is advisable to make the original extension for five customers notwithstanding the fact that the requirements of the first conditions are not satisfied.

The above formula is based on rational principles. It can be applied under almost every condition met with in central-station practice.

It should not be used indiscriminately. Any practical rule requires the exercise of fair judgment. The principal feature of a formula of this kind is that, if any changes or modifications are made in the terms, the conditions accompanying the change are completely known. Furthermore, the degree to which any factor may be changed is apparent, and the results can be anticipated.

◆

Dayton Company Co-operates With Contractors.

The Dayton Power & Light Company, Dayton, O., thoroughly believes in co-operation between the electrical contractors, district representatives of manufacturers of electrical apparatus and the central station that arrangements have been made to hold dinners and meetings at least once every three months throughout the year, when they can all get together, talk over the business that has been secured, and plan for the future.

The first of these dinners was held at the Phillips House, in Dayton, on January 3, and about 30 attended as guests of The Dayton Power & Light Company. Sales Manager Thomas F. Kelly, of the Dayton Power & Light Company, acted as chairman of the meeting which followed, and told of the very successful year that the company had enjoyed in spite of the flood. He reported that the company had made an increase of 36 per cent in customers during 1913, which was an advance of 73 per cent over the 1912 new business.

Predictions of a still greater increase for 1914 were made because of the arrangement that has just been completed with the electrical contractors, whereby old homes can be equipped for electricity and payment for same made in monthly installments.

◆

Suggestions for Courtesy to Customers.

The Edison Electric Illuminating Company of Boston has issued a booklet of "Things Worth Remembering," compiled by L. M. Wallace, auditor of the company. These booklets, from which the following valuable suggestions to employees are taken, have been distributed throughout the organization.

Always be courteous. Courtesy is an essential element in dealing with a customer—an asset worth acquiring.

Give the customer your whole attention; be as considerate with the small user of the Company's service as with the large one—accord just and equitable treatment to all.

Your promise to a customer is the Company's promise. A broken promise always hurts, and shows weakness and unreliability in the employee—every act should beget confidence.

Greet a customer pleasantly when he approaches, step aside and let him pass first through the door or into the elevator; if he asks for information, make your answers so clear that they will be of real help—from not being explicit come many misunderstandings.

That the customer may get a good impression, be dignified in deportment—don't be boisterous.

Because a thing was once so, do not assume that the fact has so remained just because you now think so; thus, when asked for information be sure you have it before you give it—investigate when in doubt, then report.

Having promised to do something by a certain time or in a certain way, do not start the thing a-going and trust to luck for the rest. Do your own part in full, then follow it up that you may know the rest is moving correctly—anything of importance needs attention.

It is a great mistake to give flippant answers even to stupid or insolent people.

From not listening intently to what is said, or not seeing correctly what is written, come nearly all inaccuracies—always be wide awake.

The finer the intellect you can rightly exercise, the more valuable will be your services to the Company; have the feeling of responsibility and endeavor to stand alone and complete your tasks effectively and lessen the necessity of being looked after—your reward will be in an exact ratio.

There are valuable positions always opening up in progressive concerns. Promotions go to the conscientious, intelligent worker. Responsibilities are imposed upon those who can "make good," and power comes to those who "know how"—be ready for a promotion.

◆

Electricity in Church Service.

A novel use of electricity in church services was recently undertaken in the Broadway Baptist Church, Cambridge, Mass. The pastor delivered a sermon on "The Rescue of a Sinking Ship by Wireless" and the pulpit was fitted to represent the captain's quarters of a steamer. The pastor himself wore a captain's uniform, with gold braid and brass buttons. Wireless sending apparatus, placed in a distant part of the auditorium, announced a disaster, at the proper moment in the discourse, whereupon the "captain" impersonated a commander driving his ship at forced speed to the rescue of the disabled craft. At the close of the sermon a huge anchor studded with colored electric lamps was gradually illuminated until it shone forth resplendent as a symbol of hope.

◆

Lomax Proposes Free Power for Manufacturers.

It is announced that the founders of the city of Lomax, Henderson County, Ill., in order to encourage the location of industrial plants, proposes furnishing power upon a unique basis. The city will give to each manufacturing plant free power for at least 90 years on the basis of one horsepower for each male employee, charging for additional power at the rate of $20 per horsepower per year.

◆

The United Electric Light Company, Springfield, Mass., is advertising the advantages of good lighting, particularly window lighting. The company carries Mazda lamps in sizes from 15 to 500 watts, and urges the merchants of the city to start a good-lighting campaign as a part of their plans for securing new business for 1914.

Electric Sign Data

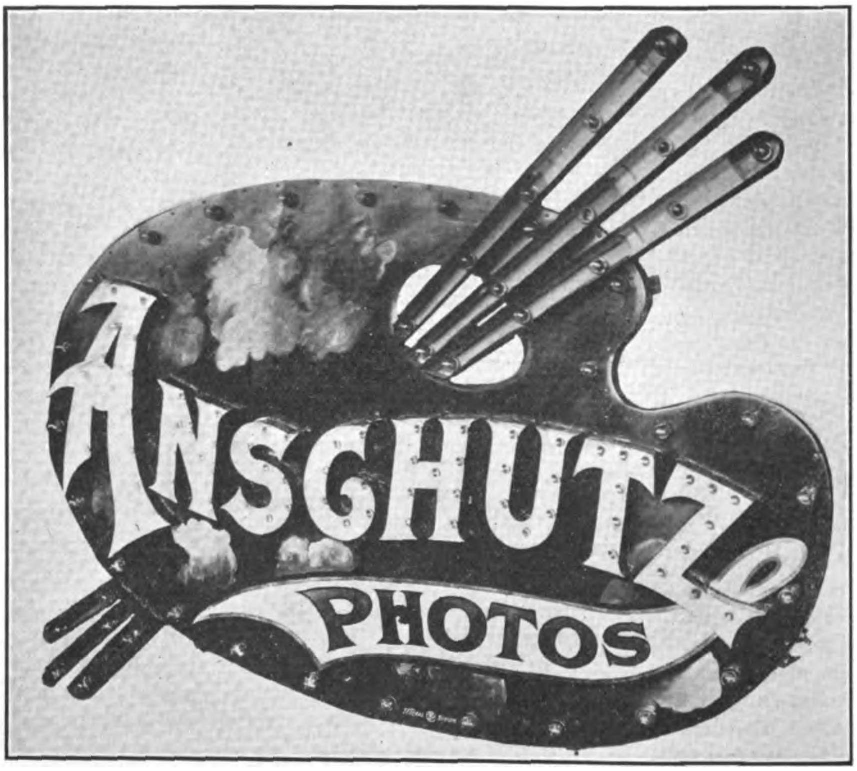
The Electric Sign as a Factor in Illumination.

When a merchant installs an electric sign he almost invariably confers a benefit on the public in addition to benefiting himself. An electric sign gives very good average illumination to the street in its immediate vicinity, and some figures on illumination from this source in Clark Street, Chicago, from Polk Street to the River, a distance of ten blocks, considerably less than a mile, show that the total number of lamps used in those ten blocks in signs in May, 1913, was 18,826; the wattage was 191,955, equivalent in 16-candlepower, 50-watt, carbon lamps to 3,260 lamps. If this equivalent was evenly distributed it would give nearly one 16-candlepower carbon lamp for every linear foot of street, or one for every two feet, counting each side of the street separately. The actual candlepower which went to increase the street illumination was, however, much greater, because a good many of the lamps were tungsten lamps, from which the light is more than twice as much for the same current consumption, even in the small sizes used in many signs. Consequently the street illumination from signs in these ten blocks of Clark Street, Chicago, was equivalent to an average of almost one 16-candlepower lamp to every linear foot on both sides of the street. The total candlepower of these signs alone would be equivalent to eight street arc lamps of 1,600 candlepower each per block, for nine blocks; and on the basis of 0.108 watts per square foot of street surface, which is equivalent to the average intensity derived from the eight 1,600-candlepower arc lamps, the wattage used in these signs would illuminate 33 blocks.

It was estimated that an equivalent illumination, if provided by lamps maintained by the city for that purpose, would cost the city more than $1,200 per month, for illumination in this part of this particular street.

These figures mean a great deal when applied on a larger scale, the whole city being considered. There is an enormous number of electric signs in Chicago, although the example cited above is not claimed to be the average for business streets throughout the entire city, as that portion of Clark Street is almost the center of the business district, but these facts should be considered by local authorities everywhere when regulating the size and location of electric signs. Artificial illumination is one of the greatest safeguards which any community can employ against crime and criminals, and is also one of the greatest general features of attractiveness and good repute which the modern city possesses.

Thus the electric sign is an all-around benefit, compelling trade for the proprietor, and directly benefiting the community at large.



Electric sign constructed for a photographer and art store in an Eastern city by the Federal Sign System (Electric), Chicago, Ill.

The sign is of enamel construction, colored to represent paint on the palette. The name "Anschutz" is studded with lamps and the palette and brushes are outlined. There are a total of 115 five-watt lamps used.

No flashing effect is used, the lamps burning continuously.

No color effects are used for the lamps.

The sign is inexpensive and offers a suggestion for interesting the many photographers and art stores found in any city.

◆

Electric Sign Progress in the South.

The Hotel Chisca, at Memphis, Tenn., the newest and largest hostelry in that city, and one of the finest in the entire South, has had the largest electric sign in Memphis erected on top of the building. The words indicated on the sign are "Hotel Chisca, Fireproof."

In Montgomery, Ala., the central-station company is selling on an average of six signs per month, and this without the aid of any special campaign or unusual sales effort. Special efforts will soon be made to interest billboard advertisers in illuminating their displays at night, using a new reflector which has recently been developed for this purpose.

At Beaumont, Texas, the central station has entered into a contract with the Beaumont Ad League covering the supply of current for a monster slogan sign to be installed at some conspicuous point in the city.

Electrical Construction

Planning Electric Lighting Installations.

The electrical contractor is frequently called upon not only to install the electric wiring in a new building, but also to determine what equipment will be necessary for the electric lighting of the rooms and the size of wires necessary for the purpose, and in some cases even the location of the outlets is left to his judgment. In fact, in many small installations he is called upon to act in the capacity of consulting engineer to the owner of the property, as the cost and importance of the installation are not sufficient to warrant calling in an expert engineer.

To give the best results to his customers and to build up a reputation for ability to do a satisfactory job under such conditions it is highly desirable that the electrical contractor should have good ideas as to appropriate methods for the electric lighting of the home, the small store, the factory and other common types of building. He should also know how to proceed to lay out a satisfactory installation and should have at hand the necessary facts and figures to determine upon the proper location and size of lighting units.

At the January meeting of the Chicago Section of the Illuminating Engineering Society a paper was presented by J. B. Jackson upon this subject, which should be of especial interest to both the electrical contractor and the architect. The material given below is taken from this paper:

It has not been uncommon in the past that provisions have been made for a certain number of outlets for an interior and the actual design of lighting equipment left until the building is practically completed. Very little consideration has been given in a great many instances to the factors which influence illumination results. This imposes conditions which are very hard to meet and the design usually becomes a matter of compromise. To obtain definite predetermined results it is necessary to know in advance the general scheme of decoration and the type of lighting equipment desired and provision made for its correct use.

Methods of planning lighting installations have scarcely kept abreast of recent developments. The high-power gas and the tungsten incandescent unit require somewhat different treatment than did the open-flame burner and the carbon incandescent units. Since the new sources have a very high intrinsic brilliancy, it is essential that they be removed as much as possible from the field of vision if we are to afford any protection to the human eye.

It is essential in considerations of light sources to have a clear conception of light as a quantity. It is unfortunate that the term candlepower has received such wide application, and every unit referred to in terms of its maximum candlepower, for this has given rise to some very erroneous conclusions. If we suppose a light source suspended in the center of a sphere in such a manner that all the light is intercepted by the interior surface and we make use of some method of either measuring or calculating the light inclosed within the sphere, we will then have a direct means of comparison of one light source with another. It is evident then that if light sources are expressed in terms of their average candlepower (otherwise called mean spherical) we may then make comparisons, since the last quantity always bears a definite relation to the total flux of light. A standard unit of luminous flux has been chosen, which is designated the lumen. It corresponds to 12.5 mean spherical candlepower.

TABLE I.—LAMP VALUES.

Kind of filament.	Horizontal or Nominal candlepower.	Watts.	Light units. (lumens)	Multiplying factor.
Carbon	2	10	21	4.59
Carbon	4	20	50	3.84
Carbon	8	30	96	3.02
Candelabra carbon	8	31.1	96	3.10
Gem	20	50	207	2.31
Gem	32	80	337	2.28
Tungsten	7.7	10	76	1.26
Tungsten	12.0	15	118	1.22
Tungsten	17.1	20	168	1.14
Tungsten	21.9	25	215	1.12
Tungsten	36.4	40	357	1.08
Tungsten	56.0	60	549	1.05
Tungsten	98.0	100	960	1.00
Tungsten	167.0	150	1637	0.88
Tungsten	278.0	250	2722	0.88
Tungsten	445.0	400	4535	0.85
Tungsten	556.0	500	5665	0.85

Table I is an evaluation of the different kinds of incandescent electric lamps which have been used or are in use at the present time. The first column gives the common designation as to kind of filament. The second gives the nominal candlepower taken in the horizontal direction. The tungsten or Mazda units have usually been expressed in terms of watts consumed, hence their horizontal candlepower values are not so commonly known. The third gives the power consumption expressed in watts. The fourth column contains the value of the lamps in terms of light units (lumens) as referred to above and may be taken as a measure of the illuminating value. In the last column is tabulated a multiplying factor to be used in connection with a later table, as will be explained. In the consideration of this table it should be remembered that these values apply to the quantity of light given off by the lamp when not equipped with reflectors, globe or other accessory.

The next question which naturally arises is, how are we to determine the amount of light on any surface, also how are we to obtain a measure of the light required for certain classes of service. If a standard be chosen which will represent a certain flux density, then it is possible to measure by means of photometric apparatus any flux value in terms of this standard. This standard has been given the name foot-candle and should be considered as being independent of the source of light and the distance from the source and as being only a measure of the density or intensity of the illumination produced.

The values of illumination intensity considered satisfactory vary in different observers as much as 5 to 1. Table II gives the values in foot-candles for different classes of service which are average values obtained in installations which have been classed as satisfactory. It has often been stated that one system of lighting requires less intensity than another, but there are not sufficient authoritative data along this line to warrant any such assertion. Regarding the most recent tests, the United States postal car specifications contain the requirement that the illumination shall be from 2.25 to 3.50 foot-candles, this value being comparable to the requirements for desk and office purposes. Relative to intensities required, there seems to be considerable tendency to require more and more

TABLE II.—FOCT-CANDLE INTENSITIES RECOMMENDED FOR VARIOUS CLASSES OF SERVICE.

Type of Building.	Foot-Candles
Armory	2.0
Art Gallery (walls)	5.0 to 10.0
Auditorium	1.0 to 3.0
Automobile Showroom	3.0 to 6.0
Bank (general)	2.0 to 3.0
Bank (desks)	4.0 to 6.0
Billiard Room (general)	0.8 to 1.5
Billiard Table	6.0 to 10.0
Cafe (general only)	2.0 to 4.0
Cafe (with table lamps)	1.0 to 2.0
Card room (tables)	2.0 to 3.0
Church	1.0 to 2.5
Drafting room	6.0 to 12.0
Desk	4.0 to 6.0
Engraving	10.0 to 12.0
Factory (general only)	0.8 to 1.5
Local Bench (fine work)	5.0 to 10.0
Local Bench (coarse work)	3.0 to 5.0
Gymnasium	1.0 to 3.0
Hotel—	
Bedroom	1.5 to 2.0
Corridor	0.6
Dining Room (general)	2.0 to 4.0
Dining room (lamps on tables)	1.0 to 2.0
Lobby	2.0 to 4.0
Library—	
Stack Room	1.6 to 2.0
Reading Room (general)	3.0 to 4.0
Reading Room (with local)	0.7 to 1.5
Offices—	
Small Office (private)	3.0 to 4.0
Small Cffice (general use)	3.0 to 6.0
Large Office (general illumination	3.5 to 5.0
Large Office (with desk lamps)	1.5 to 2.0
Residences—	
Hall	0.7 to 1.0
Parlor	1.0 to 3.0
Living Room	1.5 to 2.5
Library	2.0 to 4.0
Dining Room	2.5 to 5.0
Kitchen	2.0 to 3.0
Laundry	1.5 to 2.0
Bedroom	1.0 to 3.0
Bathroom	2.0 to 3.0
Store and Furnace Rooms	0.4 to 0.8
Stores—	
Clothing	4.0 to 7.0
Dry Goods	4.0 to 7.0
Furniture	2.0 to 4.0
Grocery	2.0 to 4.0
Hardware	2.0 to 4.0
Jewelry	4.0 to 6.0
Millinery	4.0 to 6.0
Shoes	2.0 to 4.0
Stationery	2.0 to 4.0
Warehouse	0.5 to 1.0

light. In other words our standards of illumination are rising gradually. It will be noted that the values given in the table are in ranges, such as 2 to 4 foot-candles, being given in this manner to allow some opportunity for the designer to make a choice according to his knowledge of the service required.

There are two classifications of fixtures in general use at the present time, namely ceiling and bracket. Of these the ceiling fixture is much more efficient as a lighting unit. With the spacing of ceiling outlets placed in the center of approximate squares we approach the nearest to the condition of uniform illumination, which is considered to be ideal. The use of bracket fixtures for general illumination is not to be recommended and these should be used only when some consideration is given to special or decorative features. In commercial work, it is safe to state that the bracket fixture has very limited application. Fixtures of this type have often been installed and the reason for doing so advanced that they can be used for connection for fans, portable lamps, etc. This is not to be encouraged, as baseboard and floor receptacles make a much more convenient and sightly connection and as a general rule a cheaper installation cost. If sufficient capacity were installed for bracket fixtures for general illumination the center of the room would be darker than near the walls. Under these conditions objectionable glare almost always is introduced, as the usual bracket is much too low for use under these conditions.

As stated above, the most even distribution of light is obtained by the use of ceiling units, spaced in the center of squares or rectangles approaching squares. The sizes of these squares is determined by the architectural features of the building, such as dimensions of bays and ceiling height. Table III shows desirable sizes of squares for location of ceiling outlets under different ceiling heights and for different classes of buildings. The collection of dirt and dust affects different reflectors in varying degrees. If we set 15 per cent as the allowable depreciation on lamps and reflectors, the cleaning period would be six weeks for indirect units, prismatic, light and medium-density opals; and 16 weeks for steel and heavy-density opals.

The contractor can accomplish a great deal by impressing upon his customer the necessity of regular cleaning periods. It is not uncommon that installations have been known to be allowed to go without cleaning for a period of more than a year. Such an installation might give about 25 to 50 per cent of its initial value.

The light which we obtain on the working plane is composed of three parts, the light received directly from the unit, plus a portion of that directed towards the walls, plus a portion of that directed toward the ceiling. It is evident therefore that color of walls and ceiling very materially affect the total illumination from a given lighting unit as color is an indication of the absorption of light, i. e., the darker the color sensation the higher the absorption value. An exception to this rule is afforded by units which direct practically all of the light toward the working plane.

TABLE III.—DESIRABLE SIZES OF SQUARES.

Kind of Room	Ceiling Height in Feet	Desirable Length of Side of Square
Armories	12 to 16	12 to 16
Auditoriums	12 to 16	12 to 16
Public halls	over 16	15 to 26
Rinks	over 16	15 to 26
Stores	8 to 11	8 to 11
Stores	11 to 15	10 to 16
Stores	over 15	14 to 22
Offices with desk lamps	10 to 20	12 to 18
Offices without desk lamps	9 to 12	7 to 11
Offices without desk lamps	12 to 16	9 to 14
Offices without desk lamps	over 16	11 to 18

In planning a lighting installation it is essential to consider all the quantities which affect the illumination results, namely, architectural features, intensity required, kind of lamp (such as tungsten incandescent), type of accessory equipment, decorations, etc. In order to simplify matters as much as possible a table has been made up containing all these variables excepting the intensity required for the service. In doing this it has been necessary to assume a lamp for general use for this purpose; the 100-watt tungsten lamp of the January, 1914, rating has been selected. In making calculations average lamp depreciation of 3.6 per cent has been allowed for; it may be stated, however, that the large sizes of lamps will give somewhat higher results while the smaller will give lower. For the exact values of other lamps multiply results in the table by the number given under multiplying factor in Table I.

Below Table IV are given three colors under each of the classifications, Light, Medium and Dark. These are given as a guide for classifying the different conditions of ceiling and walls.

As an example of the method of calculation, assume the following conditions:

Width of space	40 feet
Length of space	60 feet
Ceiling height	11 feet
Ceiling color	light
Wall color	medium

Service requirement, general office illumination without desk lamps.

Type of the equipment, medium-density opal.

Then proceed as follows:

TABLE IV.— WATTS PER SQUARE FOOT TO PRODUCE ONE FOOT-CANDLE ILLUMINATION (Watts per Lumen).

	—-Ceiling Light—-			Ceiling Medium			Ceiling —Dark—	
	Walls			Walls			Walls	
Type of Lighting Equipment	Light	Medium	Dark	Light	Medium	Dark	Medium	Dark
Mirror (bowl-type direct)	0.18	0.19	0.20	0.18	0.19	0.20	0.20	0.20
Prismatic (clear)	0.18	0.20	0.21	0.22	0.24	0.26	0.26	0.27
Prismatic (satin finish)	0.23	0.25	0.28	0.26	0.28	0.31	0.31	0.34
Prismatic (velvet finish)	0.20	0.22	0.24	0.22	0.24	0.25	0.28	0.28
Opal Inclosing Unit	0.30	0.33	0.36	0.38	0.37	0.42	0.49	0.54
Prismatic Inclosing Unit	0.22	0.23	0.24	0.24	0.25	0.28	0.30	0.31
Cpal Reflector (heavy density)	0.20	0.21	0.22	0.22	0.22	0.23	0.23	0.23
Opal Reflector (medium density)	0.22	0.23	0.25	0.24	0.25	0.28	0.29	0.30
Opal Reflector (light density)	0.23	0.25	0.28	0.26	0.28	0.31	0.31	0.33
Enameled Steel (dome-shaped)	0.20	0.22	0.22	0.21	0.22	0.22	0.22	0.22
Enameled Steel (bowl-shaped)	0.22	0.23	0.24	0.23	0.24	0.24	0.24	0.24
Semi-indirect	0.25	0.28	0.32	0.39	0.41	0.47	Not recommended	
Indirect (mirror reflector)	0 35	0.39	0.41	0.51	0.57	0.63	Not recommended	
Bare Lamp	0.27	0.31	0.37	0.31	0.37	0.43	0.45	0.51

COLOR CLASSIFICATION.

Light	Medium	Dark
White	Yellow	Green
Cream	Light Buff	Red
Light Gray	Light Blue	Brown.

Area 40x60 or......2,400 square feet.

From Table IV, the constant for medium-density opal with light ceiling and medium walls in 0.23 watt per square foot required to produce one foot-candle illumination.

From Table III, 10 feet spacing of units is the best adapted for the given ceiling height and dimensions of the space considered.

Number of units, 24.

Area per unit, 100 square feet.

From Table II, the intensity required for office purposes under the conditions named is 4.0 foot-candles.

Watts per square foot is given by 4.0x0.23 or 0.92.

Allowing for depreciation 15 per cent, 0.92x1.15=1.06 watts per square foot to be provided, or 106 watts per outlet.

As an example of the use of other types of incandescent units, if it were desirable to use candelabra carbon lamps, reference to Table I shows that the 100-watt value obtained when using tungsten lamps must be multiplied by a constant tabulated in the last column, namely 3.10, from which it is evident that to obtain the same illumination results it is necessary to use 310 watts in the lamps designated.

Relative to the final design of lighting fixtures the manufacturers of equipment have available very comprehensive publications showing in detail sizes, shapes, and designs of all their products. These will be found of great value in making distinctive designs and no difficulty should be expreienced in procuring fixtures to conform with any architectural treatment which is considered advisable.

To summarize, the steps to be taken in planning a lighting installation are as follows:

(1) Determination in a general way of the type of the lighting to be used, including decoration and kind of unit.

(2) Spacing of outlets from architectural considerations.

(3) Intensity required.

(4) Calculation of capacity of outlets from Tables II and IV.

(5) Necessary wiring installation.

(6) Final selection of fixtures with reference to mounting height, selection of accessories (glassware, etc.) and general design to conform with architectural treatment of buildings.

Co-operation in Louisville.

The Louisville Gas & Electric Company, of Louisville, Ky., is keeping the electrical contractors of that city busy during an unusually quiet period through its house-wiring campaign. The Louisville Gas & Electric Company is playing no favorites in this connection, but is distributing the work among the various contractors, so that each is feeling the benefits of the campaign. Large-size newspaper copy is being run by the company, and this, in connection with the active campaign of solicitation which is carried on, is producing results in the way of new business.

Show-Window and Display Lighting.

At the meeting of the Western Association of Electrical Inspectors held at Cincinnati, O., last week, the following report was made by the Committee on Show-Window and Display Lighting. This committee consisted of: J. Faucault, C. W. Francis, H. C. Henly, A. M. Paddon, W. E. Skead, E. J. Stewart and E. P. McGough, chairman.

Permanent Lighting in Show Windows.

It must be apparent to electrical inspectors that considerable progress has taken place in the methods of wiring and illuminating show windows since our Association, through its Commitee on Show-Window and Display Lighting, first began its investigation of this subject over eight years ago.

Important modifications in the design of show-window inclosures, advancement in the art of their illumination and the adoption of more permanent methods in the work of installing the necessary electrical equipment, have contributed their share in bringing about the improvement noted. The adoption of the "box" type of show window, by restricting the area of the inclosure to the actual needs of the situation, has simplified, to a great extent, the problem of its successful illumination. The removal of the lights from the sides to the ceiling of the window box has eliminated the danger incident to the presence of lamps and sockets in the immediate vicinity of inflammable material, and has demonstrated the superiority of hidden over exposed light sources, in the production of efficient and effective illumination, while the adoption of metal-armored construction in show windows has, by reason of its unobtrusive appearance and lasting qualities, improved the looks and added to the permanency of the installation.

As the safety of an installation is largely dependent on the proper installation of suitable and approved appliances, a brief analysis of the various systems of show-window lighting, which are now considered standard, will not be out of place. Approved devices, specially designed to meet the needs of show-window construction, are now available in a great variety, so there is no longer any necessity for using unapproved and ill adapted appurtenances for the purpose.

The lighting of show windows by means of trough reflectors placed in the upper portion of the inclosure, close to the glass and arranged to throw the light downwards, is one of the popular methods in vogue. In some trough reflectors the reflecting surface is of metal, but as a rule, silvered and enameled glass with a corrugated surface is used for this purpose. Trough reflectors are usually provided with twin or angle sockets, arranged so that the lamps will lie parallel with the surface of the reflector. The use of double-ended porcelain receptacles, which permit of the reflector being wired on the loop system, is preferable, as it does away with the necessity for taps and splices and allows conductors larger than No. 16, B. & S. gauge, to be used throughout. The use of such sockets derives a further advantage from the fact that, under the rules of the National Electrical Code, 32 sockets or receptacles, when connected directly to No. 14 B. & S. gauge, approved rubber-covered wire, may be installed on one circuit, provided the wattage does not exceed 1,320 watts. In some types of trough reflectors, the sockets are held in place by "socket fingers" attached to the surface of the reflector. This method is objectionable on account of the wires being exposed at each socket. The use of trough reflectors which provide for a complete inclosure of the wires will alone meet the requirements of the Code.

The use of tubular lamps affords an opportunity for more compact design in trough reflectors without decreasing their efficiency. One type of trough reflector contains specially designed tubular lamps arranged so that they can be operated in series on an incandescent lighting circuit or in multiple on a low-voltage transformer, the primary of which is connected to the lighting circuit.

On account of the heat developed in the trough reflector by reason of the close proximity of the lamps to the surface of the reflector, the life of the rubber insulating covering on the wires is considerably reduced. This is especially true of certain types of show-case reflectors which, however, are sometimes used to illuminate small show-window inclosures. In reflectors where the wires are subjected to a temperature in excess of 120 degrees Fahrenheit, from the heat of the lamps, slow-burning wire must be used in order to comply with the provisions of the Code.

In addition to trough reflectors there are various types of reflector shades which are specially adapted for show-window lighting. These reflectors are often made entirely of metal, but the more efficient types are constructed of silver-plated glass, or of metal with a silver-plated glass lining. Some of these reflectors can be readily attached to a socket or receptacle; others, on account of their weight, are designed to be supported independent of the socket shell. When the sockets and reflectors are combined in one device and provided with an extension of armored cord, care should be exercised to see that the proper connecting fittings are used where the cord enters the reflector and the attachment plug. Unsatisfactory lighting systems can very often, with little effort, be immensely improved by the use of such reflectors; hence their popularity.

The placing of lights in receptacles above the window box with apertures cut into the box to permit the light to shine down on the goods below, the lamps being located in reflector-type shades, is another method resorted to with success. The protection of the wiring above the window box and the affording of proper ventilation for the lamps, are matters that should not be overlooked in this type of installation.

The lighting of show windows by means of exposed lamps around the window border, is a method that is gradually going out of use. It is by far the most inefficient scheme for lighting a show window ever devised, for it actually accomplishes the reverse of that for which it is intended; it hinders rather than aids a prospective customer in seeing the goods on display. However, the most serious objection to this system of lighting arises from the fact that the lamps and sockets, by reason of their location, are subject to breakage and liable to come in contact with the inflammable merchandise on exhibition. To secure a measurable degree of safety with this system, sockets and receptacles of the most rigid type, in connection with metal-armored construction, should be used.

From the standpoint of efficiency or safety, show windows lighted by stem fixtures suspended from the ceiling have little advantage over those lighted around the border. A large chandelier in a show window will, as a rule, attract more attention from the onlooker than the merchandise displayed. Enterprising fixture establishments frequently take advantage of this fact to advertise their goods by arranging for the exhibition of sample fixtures, bearing their advertisement, in other men's show windows. It is needless to ask who reaps the greater advantage from this arrangement. As such fixtures are changed at intervals, it usually leads to the introduction of temporary connections, lamp cord, key sockets and other features objectionable in show windows. The ordinary brass fixture is not suitable for show-window lighting. Being composed of many parts, it is easily deranged and, therefore, subject to short-circuit and grounds. The socket is usually a weak point in such fixtures. This is especially true where heavy shades are used, the weight of the shade tending to force the socket shell loose from the cap. Notwithstanding this, contractors, through carelessness, frequently install key sockets which are sure to come loose and thereby introduce the danger of exposed live contacts. Shade holders, which are not dependent on the socket shell for support, are an indispensable adjunct in connection with fixtures designed for show windows, unless approved one-piece sockets or those of an equally rigid type are used.

The 1913 Code contains a modification of the rule prohibiting the use of lamp cord in show windows except when provided with an approved metal armor, by permitting an exception to be made in the case of chain fixtures when authorized by inspection departments under special permission in writing. The conditions that should determine the acceptance or rejection of such fixtures in show windows are, therefore, deserving of serious consideration at our hands.

Temporary Lighting in Show Windows.

The restricted area of the average show window, the highly inflammable character of the decorations and the carelessness and ignorance usually displayed by those entrusted with the work of installing the electric wiring, has impelled inspection departments in general to look with considerable disfavor on the introduction of temporary wiring and lights in show windows.

In view of the restrictive measures that are being generally adopted in respect to the use of electrical apparatus, in places where the life hazard is on a comparative equality, such as theaters, it would seem that a further realization of the dangers involved will result in the enactment of similar laws for the regulation and control of the hazard in question.

However, in the absence of any ordinance dealing specifically with such risk, much may be accomplished towards bettering conditions by well directed and persistent publicity. The furnishing of information on this subject in comprehensive and concise form, by means of press notices and letters addressed to the merchants (as practiced by our association in dealing with the "holiday-display" hazard), has already borne excellent fruit. The adoption of such methods is, therefore, strongly endorsed.

Ordinary Display Lighting.

The proper lighting of stores and show rooms, in which dry goods and similar inflammable merchandise is placed on display, is a matter of considerable importance to the merchant. Failure on his part to provide adequately for this important requisite is a serious handicap in many respects. For a poor system of lighting will not only detract from the appearance of his store and prevent him from exhibiting his goods to advantage, but it will also, according to competent authority, exert an injurious influence on the well being and, consequently, on the efficiency of his employees.

Here, as in show-window lighting, safety and efficiency are the prime considerations and here also, do we find that the means, necessary to the procuring of these important essentials, are in a great measure identical.

The use of low hanging fixtures, pendants and brackets over the aisles and counters, constitutes the prevailing cause for most of the trouble that arises on installations of this character. On account of their position, they are liable to injury and subject to all kinds of abuse. The effectiveness of the lights is largely counteracted by reason of their location. Being shaded by pyramids of merchandise, or intervening show cases, they contribute little to the general illumination of the store or show room. Moreover, as the lamps are situated in the line of vision, any attempt to improve the lighting conditions by raising their candlepower only increases the accompanying glare, thereby adding to the discomfort of the clerks and patrons.

The most effective remedy for these conditions consists in elevating the light sources to positions where they will be practically out of danger and, therefore, to a great extent out of view. Of course, this must not be regarded as a panacea for all of the evils that are liable to creep into the average display lighting installation. That it will dispose of the greater number of them, however, and conduce to a much higher degree of safety and efficiency, has been demonstrated by actual observation.

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Among the Contractors.

A voluntary petition in bankruptcy was filed last week in the United States District Court at Chicago by Nels O. Nelson and Noah Greening, electrical contractors of Aurora, Ill. The total liabilities amounted to $2,508 and the total assets are stated to be $1,565.

The Star Electric Supply Company, of Waco, Tex., has the contract for the rewiring of the Provident Building, which will henceforth be known as the Peerless Fire Insurance Building.

The Eugene Ashe Electric Company, of Fort Worth, Tex., has moved to its new store at 107 West Ninth Street.

A. S. Schulman, 417 South Dearborn Street, Chicago, has just completed the entire wiring of the new Hotel Gibson, in Cincinnati, O. The new hotel occupies the site of the old and favorably known Hotel Gibson, which was destroyed by fire last year. This magnificent hotel has 500 rooms and is thoroughly equipped in the most modern style in which electric lighting and auxiliary electrical devices are very liberally used. All of this installation was made by Mr. Schulman's firm.

The Grossman Electric Company, 1532 South Fourth Street, Philadelphia, Pa., is sending out to its friends a very attractive calendar for 1914, incidentally calling attention to the fact that it is a member of the Society for Electrical Development, and besides house wiring on the easy-payment plan it has a very extensive trade in electrical appliances and devices of all kinds.

D. R. Kerr has recently established an electrical contracting business at 724 Commercial Street, Emporia, Kans.

Among the contracts for electrical work recently completed by the Central Electric Company, of Waco, Tex., are the new four-story building of the Behrens Drug Company, the new Masonic Temple, and all the electrical work in connection with the new city filtration plant, including wiring for both lamps and motors.

The Newton Electric Shop of Newton, Kans., of which J. H. Warhurst is proprietor, has just completed the wiring installation in the new Newton High School. Another contract recently completed by this firm was that of wiring the new City Auditorium in Newton.

The National Electric Company, Baltimore, Md., has been awarded a contract for wiring the storage building of the Crown Cork & Seal Company, at Highlandtown, Md.

The Craig Electric Company, of Hillsboro, Tex., has recently completed the wiring of the new $65,000 First Methodist Church of Hillsboro.

M. W. Schottler, electrical contractor of Emporia, Kans., is doing the wiring on the remodeled Emporia State Bank Building.

The Vesey Electric Company, of Waco, Tex., is just completing the electrical installations in the new Pretorian Building, the new Waco Hotel, and the North Waco High School. This company also has under way the electrical work in the new Hill's Business College Building.

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John Mueller, Jr.

One of the most active and up-to-date contractors in the Electrical Contractor's Association of the State of Illinois is located in the city of Ottawa, and is president of the Mueller Electric Company doing business at 818 La Salle Street in that city. This man is John Mueller, Jr. He was born in Peru, Ill., on July 27, 1881, the son of John Mueller and Elizabeth Trost. His father is associated with him in business as vice-president of the company. The firm started in La Salle, in 1903, but discerning a broader field for business in Ottawa, the company moved to that city June 1, 1912, and since that date has been doing a thriving business. While electrical contracting is a specialty of this company, which is incorporated under the laws of Illinois, a considerable business is also carried on in handling electrical supplies and fixtures. The company originates its own designs of fixtures and a varied assortment of beautiful designs is always to be seen in the show-room of the store. A very attractive display is afforded by the line of fixtures and glassware which is constantly kept in stock.

John Mueller, Jr.

On September 19, 1905, Mr. Mueller married Bertha Henry, and Mrs. Mueller now acts as secretary and treasurer of the company. Mrs. Mueller was born in France. She shows her interest in electrical matters by accompanying her husband to the conventions of the State Association. Mr. and Mrs. Mueller reside in Eastwood, a suburb in the extreme eastern part of Ottawa.

Of the social and fraternal societies, Mr. Mueller is a member of the Knights of Columbus, the Elks and the Royal Arcanum. He is a member of the Committee on Liability Insurance of the Electrical Contractors' Association of the State of Illinois.

Iowa Contractors Form State Association.

The electrical contractors in the state of Iowa met to organize a state association at Waterloo on February 2. H. R. Plowman acted as temporary chairman of the meeting, and M. T. Humphrey as temporary secretary.

G. W. Hill, special representative of the National Electrical Contractors' Association, was sponser of the organization and much credit is due to him for the success of this organization movement. Mr. Hill has worked incessantly for the past month and was successful in bringing together a representative body of electrical contractors.

W. J. Collins, of Chicago, was appointed to take charge of routine matters of organization. The temporary chairman appointed at the morning session a Committee on Constitution and By-Laws consisting of George O. May, C. S. Abell and Edward Kunkel, with instructions to report at the afternoon session.

W. J. Collins pointed out the use, necessity and value of an organization. In outlining the work that such an association might accomplish, Mr. Collins took up and discussed in particular a state license for electrical contractors, local associations, business education and liability insurance.

The following officers were elected:

President, W. C. McCarten.

Vice-president, Floyd A. Wallace.

Secretary and treasurer, M. T. Humphrey.

Board of Directors: George O. May for one year, Edward Kunkel for two years, and Frank Sabin for three years.

The following committees were appointed: Legislative Committee: Floyd A. Wallace, G. A. Chaudoin, H. J. Ryan; on Liability Insurance: George O. May, C. H. Kellar, J. A. Hartlup; on Membership: Edward Kunkel, C. S. Abell, Charles Braman.

The following contractors became charter members of the Association: L. L. Cory; H. J. Ryan Electric Company; W. L. Fowler; Electric Supply Company; T. S. Ward; E. W. Lane; Martin Smedes; G. A. Chaudoin, Citizens' Electric Company; King Plumbing Company; Townsend Electric Company; C. G. Bosch; H. T. Schmidt; E. G. Brown; Iowa Electric Company; McCarten Plumbing Company; C. H. Kellar; C. E. Mackey; G. T. Western Electric Company; A. W. Carrol; Waterloo Electrical Supply Company; C. H. Braman; L. B. Talor; B. H. Electric Company; Hitchcock & Humphrey; Tri-City Electric Company.

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Until 10 years ago the electric street railway and electric light were unknown in China.

Public Service Commissions

CALIFORNIA.

The Pitt River Power Company, supplying electricity in and around Burney Falls, Shasta County, was authorized to issue $90,000 par value of preferred stock; $30,000 in payment for a hydroelectric site and $60,000 to cover the cost of constructing a hydroelectric plant. The latter amount of stock is to be issued only after applicant has filed a detailed statement of proposed construction expenditures approved by the Railroad Commission.

MARYLAND.

The Maryland Public Service Commission has submitted the annual report for the year 1913. The report contains a review of the important cases handled during the year, and an outline of prospective work. The most important case completed in the last year was the rate case of the Consolidated Gas Electric Light and Power Company of Baltimore. This investigation caused a total outlay of $24,129.57. The preliminary details for the valuation of the properties of the United Railways and Electric Company of Baltimore, and of the Chesapeake and Potomac Telephone Company of Baltimore are practically completed. These are very large and important matters, involving the question of just and reasonable rates. The telephone investigation covers the whole state. In view of the heavy cost of making such extensive investigations and the danger of crippling the other work of the Commission in attempting to push these urgent matters to completion, the Commission suggests that the Legislature make special appropriations for such investigations.

NEVADA.

The Public Service Commission has issued an explanatory statement setting forth the reason for issuing an amended order in the case, City of Ely vs. Ely Light and Power Company. In view of additional information received subsequent to the original order, the majority of the Commission concurred in the amended order, fixing rates higher than those prescribed by the original order. The majority of the Commission now affirm, in answer to the dissenting opinion prepared by their associate, that the rates in the original order would have reduced the earnings of the company to the very line of confiscation, if not actually crossing it. "Suit had been brought by the company in the First Judicial District Court of this State, and the enforcement of the order had been restrained. It was obvious, to the majority of the Commission at least, that, upon the showing made, neither that court, nor any other in the State of Nevada would sustain the order." The order was modified so as to prescribe a rate of 17 cents per kilowatt-hour for the first 50 kilowatt-hours per month; 16.5 cents per kilowatt-hour for the next 100 kilowatt-hours per month; 15 cents per kilowatt-hour for the next 100 kilowatt-hours per month; and 12.5 cents per kilowatt-hour for all in excess of 250 kilowatt-hours consumed per month. The minimum charge is $1.50, as in the original order.

NEW JERSEY.

The Board of Public Utility Commissioners has denied the petition of the New Jersey Power Company to issue $75,000 of its capital stock for the construction of transmission lines from Boonton to the vicinity of Dover, by way of Fox Hill and Denville, the electric energy in part to be used by the Morris County Traction Company. The Board points out that the power company is not itself a public utility as defined by the act regulating such companies, while furthermore, its charter expressly subjects its power to the limitation that none of its property shall be devoted to a public use. In its decision the Board says: "Without in any wise impugning the good faith of the petitioner, it appears clear that the arrangement in the furtherance of which they desire to use the proceeds of this stock is one that lends itself admirably to the purpose of those who might be bent on escaping the control which the law of this state seeks to throw around public utilities generally. Where the generating company is not a public utility and, therefore, is exempt from the regulation designed for such, and when the electric current transmitted by the transmission company is generated by a concern not under public regulation and control, how can this Board exercise the power conferred upon it by the statute?"

NEW YORK.

In recognition of the professional abilities of Alfred Craven, chief engineer of the Public Service Commission for the First District, and also in recognition of the immense amount of work he has to direct in the supervision of construction of the Dual System of Rapid Transit, the Commission has increased his salary from $15,000 to $20,000 a year. It also authorizes an increase in the salary of Robert Ridgway, engineer of subway construction, who is Mr. Craven's chief deputy in the Dual System work, from $10,000 to $12,000. It is interesting to note that this increase places the salary of the chief engineer $5,000 higher than the salary of a member of the Commission.

Frank H. Bethell, vice-president of the New York Telephone Company, has submitted a proposal to the Public Service Commission for the Second District, which allows the Commission to appraise the telephone company's property as a basis for rate making. The company will foot the expense bill, which may amount to $200,000.

The Commission is to have undisputed control of the undertaking. Chairman Decker regretted that the work could not be done without using money furnished by the telephone company, but neither the city nor the State would stand the expense.

OREGON.

The Oregon Railroad Commission is making a complete valuation of all property of the Portland Railway Light & Power Company, as a basis for a revision of its schedule of rates for street railway and power and light service.

WISCONSIN.

The Railroad Commission has determined the just compensation to be paid by the City of Manitowoc in taking over the Manitowoc electric light plant. After considering the valuation of the engineers in the light of the contentions of the interested parties, the Commission fixed the cost of reproducing the plant new, exclusive of materials and supplies, at about $166,668, and the present value, $127,-

301. In conclusion, the decision says that there are several elements besides the original cost, the original cost less depreciation, the cost of reproduction and the cost of reproduction less depreciation, that should be taken into consideration in arriving at a fair value of the property under appraisement. "These include among other things, the outstanding indebtedness, the gross and net earnings of the plant, and the cost or value of the business the plant has acquired, or its going value. Considering these elements and all other factors that must be considered under the law in arriving at a fair and just value, it seems that $137,500 would be a just compensation to be paid by the city of Manitowoc for the property in question."

A recent decision rendered by the Commission made certain changes in the telephone rates charged by the Farmers Telephone Company of Beetown. The order also contained service regulations and specified that the company's half of the trunk line between Platteville and Lancaster be made full metallic as soon as the Platteville, Rewey and Ellenboro Telephone Company agrees to build its half of the line. The rate schedule is not to be put in effect until such changes of management and organization, including changes in accounting, methods and procedure, are made as required by the Wisconsin Railroad Commission.

The Endeavor Electric Light and Power Company was granted authority to increase its rates. The rates authorized are 15 cents per kilowatt-hour for the first 30 kilowatt-hours per month and 10 cents per kilowatt-hour for the excess. The investigation showed that the utility is operated at a loss under the present rates, and that even the rates proposed by the utility will probably be insufficient to cover depreciation and other operating expenses. The plant is operated in connection with a creamery, and in fixing rates, the management underestimated the cost of conducting the business of its electric central station.

INTERSTATE COMMERCE COMMISSION.

The Commission has issued regulations to govern the destruction of records of telephone, telegraph, cable and wireless companies, effective February 1.

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Heats of Vaporization.

Experiments carried out at the University of Leiden in Holland, show the heat of vaporization of hydrogen to be about 109 calories at atmospheric pressure. The value found for oxygen is 50 calories.

LETTER TO THE EDITOR.

Refrigerating Apparatus for Cooling Dynamos.

To the Editor:

In your issue of November 15 an article on "The Use of Refrigerating Apparatus to Aid in Cooling Dynamos on Overload," by Mr. S. F. Walker, contains some statements of the size of refrigerating machines required for stated cases, which are so far from correct that I feel that they should not be passed without correction.

Under the heading "The Sizes of Refrigerating Machines Required" the author figures that with the air cooled from 62 degrees to 32 degrees by refrigeration, 20 tons refrigerating effect will be required to take care of 25 per cent overload on a 1,000-kilowatt generator, and 32 tons for 50 per cent overload.

As correctly stated, with a temperature rise in the cooling air of 80 degrees approximately 7,350 cubic feet of air per minute will be required to carry off 10,700 British thermal units, the total of the generator losses assumed for 25 per cent overload. This volume of air is to be cooled by refrigeration from 62 degrees to 32 degrees. In determining the refrigerating effect necessary to accomplish this, the author states that since this cooling of 30 degrees is three-eighths of the total of 80 degrees which the air will be raised by the generator losses, three-eighths of these losses, or 4,000 thermal units per minute must be taken care of by refrigeration. This would be correct if the air did not contain sufficient moisture to become saturated at a temperature above 32 degrees. At 32 degrees, air contains two grains of water vapor per cubic foot at saturation, or 32 degrees is the dew point corresponding to two grains—the temperature at which precipitation will occur with air containing this amount of water vapor. At 62 degrees it contains 6.1 grains when saturated.

Except in extremely arid regions the air always contains much more than two grains of moisture per cubic foot when at a temperature of 62 degrees. In this locality it seldom contains less than four grains at this temperature and increases to saturation during rain or fog.

Taking the condition of the air as saturated at 62 degrees, the refrigerating capacity required to reduce 7,350 cubic feet per minute to 32 degrees should be calculated as follows:

$$(7{,}350 \times 30)/55 = 4{,}000$$
$$7{,}350 \times 4.1 \times 0.189 = 5{,}696$$
$$4{,}000 + 5{,}696 = 9{,}696$$
$$9{,}696/197 = 49.2$$

Therefore 49.2 tons is the required capacity of refrigerating machine.

The first amount, 4,000 British thermal units, is the amount of heat which must be abstracted to cool the air only, and is obtained by multiplying the cubic feet of air by the number of degrees it is to be cooled, and dividing by 55, the approximate number of cubic feet of air changed one degree by one heat unit.

The second amount, 5,696 British thermal units, is the amount of heat which must be abstracted to condense the water vapor. As previously stated, saturated air at 32 degrees contains two grains of water vapor per cubic foot, and at 62 degrees, 6.1 grains. When it is cooled to the lower temperature, the excess vapor, 4.1 grains per cubic foot, must be condensed. This will require approximately 1,092 British thermal units per pound, or 0.189 units per grain.

The total of these two amounts divided by 197 gives the total refrigerating capacity required. Similarly the refrigeration required for 50 per cent overload will be 78.5 tons. These amounts are about 2.5 times those given in the article referred to.

The above figures are not exact, but are close approximations. For an exact calculation, allowance must be made for cooling the fixed gases constituting the air, for cooling the water vapor, for condensing the vapor to a liquid, and for cooling the liquid. Account must also be taken of the facts that from the time the dew point is reached, when condensation begins to take place, the amount of water vapor is constantly decreasing, and the amount of liquid increasing, and that the latent heat of vaporization is different for each temperature.

For more ready comparison we have used the temperatures given by the author of the article referred to, but if artificial cooling is to be depended upon it certainly must be calculated to care for a much higher outdoor air temperature. At summer temperatures in this locality it is not unusual for the air to contain as much as nine grains of water vapor per cubic foot, which would increase the refrigeration required to a much larger figure.

In another portion of the article the author refers correctly to methods in use in cold-storage warehouses for producing air temperatures below freezing, but overlooks again the item of the amount of water vapor which is condensed out when cooling a large volume of warm moist air. In cold-storage warehouses the air is recirculated and every precaution taken to reduce the amount of outside air admitted. The fact that the outside air contains moisture which will have to be condensed is actually of more importance than the fact that it is warm and will have to be cooled.

The method of passing air to be used for cooling generators through a water spray for the purpose of removing the dust and cooling, the water has been used to a limited extent. When the advantages of this method becomes more widely known we believe its application will become much more general.

The author refers to this method in the first paragraph of his article but his statement that "the temperature of the air will be lowered to that of the water employed" shows a misunderstanding of the method. While it is possible to accomplish approximately this result with a sufficiently large supply of cold water the practical method is based on a different principle.

Briefly, when air is brought into intimate contact with water, as by passing over wet surfaces or through a spray, both the water and the air assume the same temperature—that which would be shown by a wet-bulb thermometer in the entering air. This is independent of the original temperature of the water and remains constant without the supply of fresh water, except in sufficient amount to replace that evaporated. The lowering of the temperature is produced by the evaporation of the water to produce saturation of the air. The temperature reached is dependent upon the temperature and relative humidity of the entering air and will vary as either of these change.

For example, if the entering air is at a temperature of 75 degrees with 44 per cent relative humidity, it will be cooled to the corresponding wet-bulb temperature of 61 degrees by passing through a water spray.

This air possesses three distinct advantages for generator cooling—freedom from dust, lower temperature, and greater capacity for absorbing heat, due to the presence of the maximum quantity of water vapor.

Charles A. Tripp.

Indianapolis, Ind., January 29, 1914.

Jovian Rejuvenation in Kentucky.

James Clark, Jr., president of the James Clark, Jr., Electric Company, who is statesman for the Jovian Order in Kentucky, is planning a rejuvenation, to be held in the near future. It is expected that the affair will mark an era in organization work among the electrical interests of the state. It was intended to hold a rejuvenation in January, but an accident suffered by Mr. Clark prevented him from carrying out his plans. He has fully recovered, and is preparing to carry out the original idea. The rejuvenation will be held in Louisville.

COST SYSTEMS IN SMALL FACTORIES.

By P. S. Paganini.

In the devising, installing and operating of cost systems in small factories two important factors have in my opinion and from my experience, been slighted. I refer to the cost of operation and to what I would call the elasticity of the system; meaning thereby the ability of the cost department to take care of a sudden change in value in one of the elements of the cost of production without a complete change of the cost schedules and the possibility of furnishing accurate information of costs during the process of manufacturing and before completing the cycle of production; viz: the sale of the product.

The cost of operation is important, as in a small concern with low overhead expenses and low margin of profits, high cost means lowering of the net profit, and only the cost of operation is considered, as this is undoubtedly to be charged to the overhead expense account, while the cost of devising and installing the system could properly be charged to capital account.

Elasticity is important, for while the ideal cost system is the one that in furnishing a complete tabulation of costs, gives all the information required for an efficient study, its real and fundamental value consists in giving the correct cost for the determination of the sale price. This sale price cannot be determined unless the costs are known before the sale takes place and the cost of manufacturing must be controlled during all stages so as to produce at an actual cost less than a practical selling price, as established by demand and competition.

The two factors are somewhat related, as in many cases the operating cost is kept down by overloading the cost department with work, so as to destroy any possibility of quick operation, or by allowing the cost department to lag so with final results that its only usefulness is as a guide for future work. There is originated in the sales department a tendency to take chances on prices, a policy which may in the main be successful but it has too many of the qualities of the game of hazard to be satisfactory.

Among the most noticable defects of many systems now in operation, defects that tend to defeat the purposes of quickness and low cost, the following may be considered: Multiplicity of reports and forms and their overlapping and interlacing; the requiring of technical and theoretical information from people unable to furnish them by intellectual and educational limitations; the inaccurate and misleading distribution of labor changes; the assuming for working purposes of impossible relations between the different elements of the cost production.

It will serve better the purpose of this article if we analyze more minutely some of these defects, and furnish some examples from cost systems known to the author before attempting to indicate remedies.

One of the most common forms of cost systems requires the individual workman to fill in for every particular job a time form giving "name", "clock number," "machine-class-type" on which the job is done, "time of starting," "time of completion," "piece-work rate" if any, "hourly rate of wages." Those forms, in duplicate or triplicate, are collected and collated by the department clerk on a special time sheet. These with the original order for the job and a material sheet, are sent to the cost department for checking and figuring. The average workman being generally careless in regard to figures, a number of mistakes are made, especially in the filling in of the "machine-class" question; this at the best being a series of meaningless letters, very hard to memorize and hard to copy in a small place. If the department clerk does not catch the error the cost department must either send the report back, as no corrections are supposed to be made by the cost department clerks, or either send for the department clerk for consultation. The time lost is always very considerable, and the department clerk's temper is always on the ragged edge, not a very good condition for efficiency.

In another factory, where the output consists of a very special line of goods, made up in a general way of a soft inner center, coated with a widely different quantity, for different grades of goods of a slightly harder and costly material, and in which the cost of the coating has a very large influence on the final cost of the product and its handling requires a considerable amount of labor, material records and time records are kept by different persons for the same job. Moreover, there is kept by the different departments through which the goods pass in their completing stages a series of material sheets and time sheets. Comparison of those sheets generally disclose discrepancies both in regard to time and in regard to material, and the location of the error is more a matter of guess work than one of certainty and it is quite impossible to fix any responsibility. The foreman of the department where the coating is done, and who, swamped with work, is asked to do the figuring of all the percentage and averages which the determination of total cost naturally involves. He submits to the cost clerk the results of these calculations but not the data from which they are obtained. Apart from the main fact that the cost clerk would be more fitted to do this kind of work there is no way for him to check the foreman, so that he can guarantee the authenticity of the figures and feel that the reports he derived from them have any basis in facts.

In another case, where the hands belong to a very low class of labor—so poor that most of them are illiterate—the foreman is held responsible for the labor charge and distribution. What greater temptation for him than to overload with labor charged and increase the cost of that kind of work which is distasteful to him. It clogs his department and lowers the total amount of its output; it cannot be well done on account of the low mechanical ability of his help.

A last example of violation of the elementary laws of cost accounting is a large corporation made up of small factory units which determine its cost elements to be three—labor, material and manufacturing expenses. The last item includes rent, light, power, water, taxes, insurance, repairs, salaries, etc. Its cost instructions say "We have found after long experience that our labor amount is the one that varies less than any other," and "that our manufacturing expenses are a fixed percentage of this labor total;" consequently any time their cost schedules show a labor item, a certain fixed percentage is introduced into the formula to cover their overhead expenses. This would be an easy way out, if there was any truth in the theory, but there is not. While it is true to a certain extent that their total yearly wages do not vary much, the amount in pounds, and the quality as to telling prices and net profit of their output varied widely from year to year. That means that the cost per pound is consequently different, and that the percentage of rent, light, power, etc., which must bear on every pound of output, must be different. As a matter of fact, these percentages are changed from year to year, and do duty for the next year, when conditions may be so altogether different from the conditions originally, that all of the cost figures will not correspond, and by a wide margin be altogether unreliable and misleading.

The installation of a practical cost system in a small concern is quite easy, if patience, common sense and average intelligence are brought to bear on the task. It is not reasonable to introduce a set of multicolored forms and call them a system, and it cannot, either be pretended that a system will be in working order and give results from the day of its inception. Fundamentally factors for the particular case in hand must be carefully found out, tried and established in clear form. The study of greater efficiency had better be left alone in the beginning. As a matter of fact, efficiency can be better obtained in small concerns by the individual and collective efforts of superintendent, and foreman, who know conditions and workmen, than by the sporadic, violent labors of a cost accountant, projected into the works for a period of time, which must at best be short, and crowded with difficulties of different kinds.

After a thorough study of the practice of manufacturing in the particular factory, I would suggest that as clearly as it is possible all the separate elements of cost be defined and divided into two classifications—those that change and those that do not. Work the cost system so as to have continuous reports made daily of those factors that do change, or, to state it better, limit continuous checking of costs to those elements which by mutual reasons present a large percentage of variations, and limit the check on the others to stated periods only. Cost figures are not and never will be fit to put on a balance sheet, and by eliminating some work, one will be better able to take care and keep up with the really important items. It is better to control all the time part of the elements of cost than not to control any at all.

To do so split, the cost schedules in such a way that from the reports it may constantly be determined if too much material or labor is being used for a certain job. These two items are generally the important, widely changing elements. It will be possible to do so, if in the beginning all the other elements, such as power, water, light, have been by patient work standardized for whatever unit of production—pound, machine, inch, you choose for your own. If the system is to be made as useful as is possible it must be made so that it can control costs where costs are made; viz: in the production departments. It must not follow the fallacy that cost is practically the keeping of time, but the truism that cost is the controlling of time. To do so the ever human factor must be taken into consideration. In small concerns the department foreman is a much more important unit of production than in large factories. His responsibilities may be smaller in money and in men but his personality looms larger. Most of the time he is a working foreman and the best workman in the department, and his time and work are important factors in the total cost of its output. If the cost department requires him to use too much of his time to fill in reports the usefulness of which he does not see, or refuses to see, his value from a cost point of view is lessened. He will undoubtedly guess at figures and turn in a lot of trash, and his men will follow his example. If, instead, he is made to understand that the function of the cost department is not to catch his errors and show him up with the powers that be, but to help him out in avoiding errors and preposterous costs he will be the mainstay of the cost clerk. A plan which I found workable is to furnish the foremen with a list of all the operations of their departments. This list, besides the quality of material which it is permissible to use for each and every operation, contains the number and hourly wages and maximum time of the man and it can be used to keep the cost below or at par with the standard cost of production as given by the cost schedule. I obtained with this the control of cost at the origin and decreased my work very considerably, while at the same time I gave the foreman a chance to stand on his legs intellectually.

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Consolidation in Paris.

The Compagnie Parisienne de Distribution d'Électricité of Paris, France, has absorbed the six electrical central-station companies previously operating in the different districts of the city. The company which is effecting the consolidation is a syndicate of the existing companies. The merger was sanctioned by the municipal council and the new company will have a concession lasting until 1940. There will be a committee of control representing the municipal and public interests.

Paris will be divided up into three sections; western, central and eastern. The central district will be supplied with low-pressure direct current; the eastern district with two-phase alternating current, and the western district with single-phase alternating current. The new company will have a monopoly in electric lighting, but not in power. The municipality reserves the option of providing for future demands by taking on bulk supply from any hydroelectric plant, and consideration has already been given to the transmission of power from a station on the Rhone River.

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Half-Watt Lamps in England.

Lamp manufacturers in England are now offering half-watt tungsten lamps commercially in sizes from 600 to 3,000 candlepower, for voltages from 50 to 250. A life of 800 hours is guaranteed by the manufacturers. Prices range from $7.30 to $14.60.

Western Association of Electrical Inspectors.

Ninth Annual Convention, Cincinnati, O., January 27-29.

The most successful convention as yet held by the Western Association of Electrical Inspectors was the ninth annual meeting held on Tuesday, Wednesday and Thursday of last week at the new Hotel Gibson, Cincinnati, O. Considerably over 100 members and others interested in inspection work attended the convention. Close attention was given to the meetings, which brought out interesting discussions of the many inspection problems. The committees showed improved activity by most of their reports. The local convention committees, under the direction of William B. Hubbell, of Cincinnati, made every effort to promote the success of the convention and the welfare of the members. Another feature making for a fine meeting was the excellent spring weather enjoyed during midwinter.

The first session was opened at 11 a. m., on Tuesday by President Ben W. Clark, of Detroit. He introduced Mayor Frederick S. Spiegel, of Cincinnati, who delivered a very cordial address of welcome. He called attention to many features of interest in the city, referring particularly to the University of Cincinnati, which is the only municipal institution of the kind on this continent; he also asked the members to visit the new waterworks of the city, which has recently been built at considerable cost and has decidedly promoted the health and safety of the community. He lauded the work of electrical inspectors and referred to a case which had been brought before him while he was judge, in which defective wiring in a merchant's window, done by nonelectrical men, had resulted in serious injuries and a verdict of $10,000 against the merchant. This convinced him that electrical work must be done properly and by competent persons.

H. B. Long, of Nashville, Tenn., made an eloquent reply to the Mayor's address on behalf of the Association. He called attention to the aim of electrical inspection and its growing importance with the development in all the electrical industries. The Association is composed of municipal electrical inspectors and inspectors of insurance organizations and of other electrical interests. A study is made of all electrical hazards and how they can be minimized.

Following the roll call, President Clark delivered a brief presidential address. He said that the Association had held a most important place in electrical affairs. It has members in a majority of our states and also several in Canada. One of its aims is to promote consistent rulings through the country. The National Electrical Code forms a high standard of electrical construction but it needs revision from time to time in order to keep it abreast of the changes constantly occurring in conditions, and also of the development of new electrical apparatus. He urged the Association to take a more active part in the consideration of proposed amendments to the Code. Another matter that it is important to study and discuss is the improved management of inspection departments, particularly those of municipalities.

The report of the Executive Committee was read by W. S. Boyd, of Chicago, and briefly reviewed the various meetings and activities of this committee. Mr. Boyd then presented his report as secretary. During the year 15 new members had been elected. The membership at the time of the convention was 175 members. He was glad to report that committee work had been greatly improved and nearly all of the committees were active and deeply engrossed in their work. Many problems are not settled by reference to the National Electrical Code, especially such problems as arise in small communities where there is apt to be a scarcity of references that may be consulted on all kinds of electrical matters; therefore Mr. Boyd suggested that a small circulating library be provided by the Association to be loaned to members from time to time as an aid in working out various electrical problems.

On motion of Mr. Boyd it was decided to create a committee of five to consider a general revision of the articles of association and by-laws, so as to bring some features of the Association's organic law more abreast of present conditions. Through a motion by Mr. Boyd it was also decided to create a committee of three to consider the purchase of a small circulating reference library such as he had advocated in his report.

The question of the meeting place for the next annual meeting was brought up by F. G. Dustin, who cordially invited the Association to assemble at Minneapolis next year. R. J. Swain invited the convention to St. Boniface, Man., Canada. Other invitations were received to hold the next meeting on the Pacific Coast at San Francisco or Seattle. An invitation was also received from Indianapolis and one from Chicago. After some discussion, in which James Bennett, V. H. Tousley, F. H. Spears, F. G. Dustin, W. S. Boyd and others participated, it was decided to refer the matter to the Executive Committee to take its usual action thereon. Before the close of the session, President Clark appointed James Bennett, F. L. Lucas and F. G. Waldenfels as a Nominating Committee.

On reassembling in the afternoon there was announced the appointment of a committee to consider constitutional revision; this consists of V. H. Tousley, F. D. Varnam, H. M. Maxwell, H. B. Long and Ben W. Clark. The committee to consider the question of circulating library was appointed to consist of W. S. Boyd, F. R. Daniel and F. H. Moore. Secretary Boyd read letters of regret at their inability to be present at the convention from James E. Pole and Waldemar Michaelson.

A report of the Committee on National Electrical Code was presented by F. D. Varnam, chairman. It was very brief, since the Committee had received no suggestions from members as to further revisions. This was probably due to the fact that the recent edition of the Code has not been in the hands of the members long enough. He urged that future committees on this and similar topics be announced somewhat earlier in order that they may have more time for action. W. S. Boyd then presented his audited report as treasurer, which was accepted.

H. E. Bloomer, Milwaukee, Wis., introduced the subject of approving refillable fuses, which aroused a spirited discussion; participating in this were James Bennett, R. L. Daniel, R. J. Swain, B. H. Glover, V. H. Tousley, F. D. Varnam, H. B. Long, W. S. Boyd, F. R. Daniel and others. After a rather involved parliamentary tangle the matter was deferred until the Wednesday afternoon session.

Outside Wiring.

The Committee on Outside Wiring, of which M. E. Cheney, Chicago, was chairman, presented a report that was read by Guy W. See, Minneapolis. The best outside construction has been found to pay, not only because of decreased maintenance of the overhead lines, but because it insures continuity of service and reduces the liability of accidents to linemen and the public. Therefore the Committee urged more rigid rules on this matter, so as to reduce the hazards. One western state now has a specific law on the subject to minimize the life hazard. The Committee report brought up two main topics, of which the first was the question of whether 2,300-volt lines should have bare or insulated wire. The contention is frequently made that the insulation on such lines gives a false sense of security, and since it is of doubtful value it might as well be discarded entirely. The Committee thought, however, that although weatherproof insulation on such lines is often taken for more than it is worth and has a much shorter useful life than that of the copper conductor, nevertheless the Committee is convinced that weatherproof insulation on such lines offers considerable protection from crosses between the lines and the wires of signaling or other low-potential circuits that may come in contact therewith. Therefore, the Committee deems it unwise to recommend bare wire; in fact, it distinctly urges the use of insulated wire in all overhead construction from 50 to 2,300 volts.

The other question considered in the report is whether guy lines should be insulated, grounded or both. This must be considered from the standpoint of protection both of the linemen and of the public. The lineman must be thoroughly insulated from the ground, therefore, there must be no grounded lines or guys within his reach. The Committee recommended the rule of the National Electric Light Association Committee on Overhead Construction, that all guys for light and power poles be insulated by two strain insulators, the upper one being inserted in the guy so as to be at least six feet in a horizontal direction from the pole, or at least six feet below the lowest live wire; the second strain insulator to be inserted so as to be between six and eight feet from the lower end of the guy and at least eight feet from the ground. In short guys where the two insulators would be brought close together, they may be coupled in series. As to anchor guys and low guys, the Committee recommended that the former should run directly from pole to an anchor imbedded in the ground, or which is otherwise in contact with the ground, in addition to the strain insulators mentioned above. The grounded end of the anchor guy shall be permanently and effectively grounded, provided such guy be near the curb on a street with car tracks or in immediate vicinity of water or gas mains, hydrants or other grounded conducting structures. If not so located, then it must be surrounded by wooden boxing or other approved insulating protection from the ground to reach to a vertical height of at least eight feet. If the guy is secured to a stub wood pole so that any part of the guy is less than eight feet from the ground, or if it is guyed to a metal pole, then in addition to the strain insulators required the guy shall be permanently and effectively grounded. Where no such grounded structures exist and but little opportunity is given for a regional ground to result in injury, the wooden or similar boxing is considered ample.

Strain insulators provided for in the Committee's recommendations must be of material resisting the action of weather and have a strength at least twice the strength of the guy in which they are inserted. They shall preferably be constructed so as to have their metallic parts interlock. They must stand a flashover test four times the highest voltage of the line on which used and under a precipitation of water of one-fifth inch per minute at an inclination of 45 degrees to the axis of the insulators.

Edward J. McGann, Chicago, then presented a paper in which he gave the results of a series of tests made in the municipal electrical laboratory in Chicago on a number of samples of weatherproof insulated wire for 2,300-volt lines. Both dry and severe wet tests were made on new wire and on wire that had been in service continually for three, five and ten years. The object was to determine the value of such insulation after various periods of use. Some of the older samples were not up to present standards for thickness of weatherproof insulation. The new wire, of course, showed the best results, in the dry test withstanding about four times line voltage to ground; on the wet test the dielectric strength was greatly reduced. As the age of the sample increased the value of its insulation diminished. Nevertheless, where the sample was intact, that is, without bare spots where the insulation had rotted or worn off, even the ten-year wet sample showed that it had some value in preventing short-circuits from swinging contact of wires of opposed polarity. In no cases except with new wire can weatherproof insulation be relied upon to safeguard linemen on poles; they should in all cases use good rubber gloves, therefore, when working on 2,300-volt lines. The weatherproof insulation does serve, however, to prevent the trouble from line crosses, which would be quite frequent and serious were bare wires used; it thus promotes continuity of service. It also serves to prolong the life of copper wires in smoky places, such as adjoining railroads. Moreover, it reduces the fire hazard and diminishes the danger of accidental contact with dry wires.

The committee's report and Mr. McGann's paper were discussed together. W. J. Canada, Washington, D. C., said that the committee should consider how to improve weatherproof insulation for such lines. He thought it important to secure better insulation not only to protect the linemen but also to insure greater continuity of service. In the tests reported on by Mr. McGann he did not think that the second and third braid increased the life of the insulation more than 10 to 15 per cent. It is the inner layer of insulation that is the vital part of the entire insulated covering. Among others who discussed the matter briefly were W. S. Boyd and Guy W. See.

The report of the Committee on Show-Window and Display Lighting, F. P. McGough, chairman, was read by Secretary Boyd. This report is given practically in full in another part of this issue.

F. H. Spears, Springfield, Ill., cited a number of cases in which clerks or window trimmers had pinned display matter to exposed lamp cord and caused short-circuits, in one case resulting in a serious fire. F. G. Waldenfels, Chicago, said he had found some trouble from defective insulation of armored lamp cord in show windows. K. W. Adkins said that there is no excuse for improper installation of armored cord and that it is the best thing that can be used where rigid conduit is not suitable.

Incandescent Lamp and Its Circuit.

On Wednesday morning the session opened with the presentation by R. W. Shenton, of a paper entitled "The Incandescent Lamp and Its Circuit." Mr. Shenton referred to the extraordinary increases in the efficiency of incandescent lamps during the 30 odd years of their development. Beginning with a consumption of about seven watts per candlepower in the early eighties, this has now been reduced in the latest high-efficiency lamps to about one-half watt per candlepower. Throughout this extraordinary development the fundamental principle of the lamp construction has not been radically modified and progress has been achieved through steady improvements in manufacture and more intensive use. Mr. Shenton referred to recent improvements in filament lamps, such as the much greater strength of the tungsten filaments, the concentrated or helical filaments, the reduction of blackening in the bulb due to the use of vacuum-improving chemicals. These latter features were essential steps in order to bring about the development of the so-called half-watt tungsten lamp. The reduction of blackening of the bulb by the use of chemicals has alone improved the average efficiency of the lamp during life by about 15 per cent.

The new half-watt lamp is often improperly called the nitrogen lamp, though other gases can and have been used for filling the bulb. Mr. Shenton explained the construction of this type of lamp and showed one of 750-watt and 1,000-candlepower rating. He described its characteristics and its particular field of service.

Taking up the lamp circuit he called attention to the old limitation of 12 lamps for a 660-watt circuit as not being suitable for modern tungsten lamps and hoped to see a more flexible rule adopted. In all interior lighting circuits it is important to lay out and install the wiring so as to keep down the voltage drop between the service entrance and the actual lamp sockets. In those installations where long circuits are run there is a considerable drop in voltage which results in decided decrease in the candlepower and efficiency of the lamps that are run below their rated voltage. To run a 110-volt tungsten lamp at 2.5 volts below its rated voltage causes a drop in the efficiency of about nine per cent.

The discussion of this paper consisted chiefly of questions asked Mr. Shenton. As to whether the new nitrogen lamps diminish the danger of igniting gasoline if such lamps were broken in a garage, he replied that there probably was no effect one way or the other. As to whether the standard dimensions of the base and skirt of the lamps have been changed, F. A. Barron replied that the General Electric Company had adhered very rigidly to the standard dimensions for not only candelabra and medium but also mogul size lamps. Other questions brought out that the temperature of the glass bulb of the so-called nitrogen lamps is much hotter than that of the ordinary tungsten lamp. The heat of the latter does not increase with age to nearly so great an extent as does that of the carbon lamps. The heating in the latter was due to the exceptional amount of blackening which caused absorption of energy in its passage through the glass. In but very few cases are shock absorbers necessary. Some tests made with drawn-wire tungsten filaments indicated that the tungsten wire is stronger than the glass bulb.

Electric Traction Wiring.

The report of the Committee on Electric Traction Systems was presented by Frank Daniels, Chicago, chairman. The report of the Committee was confined entirely to the subject of car wiring. The existing regulations in Rule 40 of the Code cover 600-volt direct-current systems. There is an increasing number of traction systems using voltages within the cars above this point and even to as high as 7,200 volts. In order to make the existing rules cover these higher voltages and also cover the use of improved devices, the Committee submitted a draft of regulations deemed satisfactory to meet the existing conditions. The suggestions were drawn up as 15 sections to a completely revised rule No. 40, the titles of these being as follows: *a*—wires and cables; *b*—cabinets; *c*—cutouts and switches; *d*—circuit breakers and oil switches; *e*—conduit; *f*—molding; *g*—under car-body protection; *h*—power wiring; *i*—lightning arresters; *j*—air-pump motors; *k*—lighting circuits and fixtures; *l*—headlights; *m*—electric heaters; *n*—storage batteries; *o*—miscellaneous rules. Each of these sections were subdivided, in the case of power wiring to 11 distinct subclasses, some of which were further subdivided.

As the different rules were presented there was discussion of them. Among the points discussed were the various percentages of full-load current to be used in determining the size of motor, control, transformer and resistance leads, the rule requiring that cabinets shall have doors closing by gravity, the use of molding in cars, the specification of metal inclosures to be over 0.04-inch thick, the limiting of lighting circuits to 1,500 watts, etc. The Committee was continued and the report referred back to it for further consideration.

C. H. Anderson, of the Cincinnati Car Company, gave a short talk entitled "Practical Car Wiring." He traced the development of street-car construction from the very light and small horse cars to the somewhat larger cable cars and subsequently to the various stages of electric-car construction. The use of electric motors has permitted a very great increase in the size and power of the cars. The early builders of street cars were not adapted to building large cars, however, and many of the latter have been poorly designed. The increase in the length of haul in city service has reduced the profit and the very heavy construction of the long cars has necessitated carrying around a lot of dead weight, which has still further reduced the profit. Mr. Anderson said that it costs about $50 a year to haul 1,000 pounds of dead weight in a car; consequently in the last few years there has been a change toward building cars of lighter weight. Effort has also been made to bring the car floor nearer to the street surface, so as to make the car easier of ingress and egress; this is being accomplished by using smaller wheels. A difficulty is introduced at this point, however, because in order to provide for the elaborate wiring used for the motors and control gear there is scarcely enough room under the car for the conduit system and the various mechanical and electrical auxiliaries that must be installed. In order to reduce the dead weight it is becoming the practice to make every part of the car become not only an essential part of its strength but also, if feasible, to serve a dual purpose. Steel construction has permitted this to a large extent. Mr. Anderson suggested a type of floor construction of reinforced concrete or similar material in which channels would be provided on the underside of the floor for running the wires without having so much space and weight taken up by a separate layer of conduits. At the present time practically only steel cars are being built. The rules for wiring of street cars should be made elastic enough to meet these conditions.

Theater Wiring.

The report of the Committee on Theater Wiring was presented by F. L. Lucas, Toledo, O., chairman. The report recommended an addition to Rule 38*b*, requiring that all motors used in the theater be of inclosed type or inclosed in a fireproof compartment of standard construction to be used for this purpose only. The limitation on fuses should be changed from six to ten amperes. Advance notices should be given to traveling-show companies to have their electrical equipment up to certain standard conditions. Mr. Lucas pointed out that in Toledo it has been the custom to send out these notices a week or so in advance, the company being required to state what portable electrical equipment it wishes to use and at the same time being informed of the requirements for such equipment. When the company arrives it is usually found that the equipment has been put in pretty fair condition which simplifies its inspection before use.

There was a general discussion of this report in which James Bennett, W. J. Canada, B. H. Glover, F. H. Spears and others participated. Mr. Spears said that he has had no difficulty in Springfield, Ill., with theaters because jointly with the building department it has been arranged to have an inspection of all theaters at least once a week and all electrical equipment must be put in perfect order before being used. Mr. Bennett called attention to the fact that magazines are frequently not used for rewinding moving-picture films. The report of the committee was accepted but the feature dealing with the requirements for motors was referred back for further consideration.

Electric Inspection Problems.

A general discussion followed of various problems coming up in electrical inspection. R. L. Daniel, Minneapolis, Minn., asked as to the experience of inspectors with the approved types of motor-driven moving-picture machines. F. L. Lucas cited a case in which fire had resulted from failure of a safety device in such a motor-driven machine while the operator was absent. Mr. Daniel also referred to a case of fire resulting from an older type of machine. James Bennett said that the standard approved machines have been found very satisfactory; they have been subjected to the most severe tests and the safety devices found reliable. A. G. Sturdevant said that in Cincinnati the motor-driven machine is approved if it has an automatic release switch which opens the motor circuit if the operator releases his hand therefrom; this solves the difficulty from the operator leaving the machine. This additional requirement was caused by a fire where it had been shown conclusively that the operator had left the machine contrary to rules. V. H. Tousley urged that the lamp house be made of such size as to limit the temperature of the casing to 270 degrees on any exposed part; this would prevent the liability of any broken end of the film from igniting if it should come in contact with the lamp house, since this temperature is safe. F. D. Varnam and Ben W. Clark strongly advocated the approved motor-driven machine, which they have found safer than the old hand-operated machine. F. H. Spears said there is practically no trouble from the machines but much more trouble is due directly to careless or negligent operators. The weekly inspection made of moving-picture theaters in Springfield, Ill., has impressed on operators strict attention to duty, if they do not wish revocation of their licenses. O. M. Frykman, Minneapolis, said he had found that in small towns, because of the lack of inspection, operators tended to remove the safety fixtures of moving-picture machines. Among others who discussed the subject were R. J. Swain and Mr. Lucas.

James Bennett, Montreal, Canada, brought up the question of proper grounding of transformer secondaries. A proposal had been put up to him for approval of grounding by a galvanized-iron pipe of one-inch diameter and nine feet long driven into the ground. He had declared that this was not satisfactory because in the city in question (Quebec) the soil was too dry to make this an effective ground. Subsequently he had made a series of tests with such a type of ground and found that in the higher parts of the city its value was practically nil, but that its effectiveness as a ground improved as the lower levels were reached and that at the old river level it seemed to be perfectly reliable because the ground was permanently wet. Therefore, it must be remembered that the method of grounding referred to might be suitable in special conditions; but at any rate the method of grounding should be specified for the type of soil involved. F. D. Varnam cited a case of a pipe ground that was driven 12 feet deep that was entirely unsatisfactory; a man had been seriously shocked by coming in contact therewith and it was found that a difference of 2,000 volts existed between the pipe ground and a point only three feet therefrom. W. J. Canada said that what is required in grounding is not only a low-resistance ground but more particularly to have the voltage difference between the grounded structure and any adjacent point within a safe limit. He thought it was better to use a number of grounds instead of depending upon one only and to limit the voltage difference between grounded structures and grounds to 50 volts. B. W. Clark said that multiple pipe grounds had proved entirely satisfactory in Detroit and V. H. Tousley stated that pipe grounds have also been found satisfactory in Chicago.

W. E. Flickinger, Detroit, asked as to the requirements in Rule 59*e* about fastening loom in outlet boxes. A number of speakers said they had found a certain type of these devices now on the market including both clamps and bushings to be very satisfactory. Others thought that more specific requirements should be laid down in the Code. This matter was finally referred to the Code Committee with a suggestion that Rule 26*u* be added to by specifying installation rules on this point.

F. L. Lucas asked about the requirement in Rule 38 for an emergency service switch in theaters, and there was some discussion of this point, but it was deferred until the following day.

Refillable Fuses.

The subject of refillable fuses was again brought up from the preceding day's discussion, by Victor H. Tousley, Chicago, who moved that the Association recommend that Rule 68*d* be so revised as to permit the approval of refillable cartridge fuses. This motion was carried unanimously. Before this matter was dropped, however, H. E. Bloomer Milwaukee, Wis., asked as to the experience with refillable fuses. A number of speakers said that one type of these had proven very satisfactory; that these fuses had stood up under severe tests and seemed to meet all requirements. B. H. Glover said the Underwriters' Laboratories have not recommended any refillable fuse because Code requirements do not permit such approval. A certain type of refillable fuse had met all the requirements of rating and performance but could not be given formal approval on account of the restriction just mentioned. F. A. Barron said he regretted to see the Association apparently take a stand which meant really a lowering of standards in fuse requirements. There is no doubt abuse of standard cartridge fuses on account of the fallibility of the human element, but he doubted the wisdom of the proposal to approve any type of refillable fuse.

A. L. Eustice, Chicago, replied to Mr. Barron by pointing out that the best opinion in the inspection field seems to welcome a reliable form of renewable cartridge fuse as a solution of the vexatious fuse problem. He felt that the opposition to the use of renewable fuses was based entirely upon theoretical grounds; experience in the field with various types of renewable fuses has shown that renewable fuses can be built that will meet the performance requirements and solve the old difficulties of improper fusing. It has been conclusively shown that a proper type of renewable fuse can be and is being properly renewed and is therefore suitable for certain cases where there is evident need for a fuse of this type. In industrial plants, where unavoidable conditions cause frequent blowing of fuses, it is necessary that renewals of the fuse be made at moderate cost. If this is not done an improper fuse element will be inserted. A fuse is used for the very purpose of safeguarding the circuit and apparatus to which it is connected and it should blow when an abnormal load or other condition exists. Records of jobbers show that repeat orders for standard non-renewable fuses are not received to any extent after the first order, showing that the fuses are not being replaced by new units but are refilled on the premises, evidently in an improper manner in altogether too many cases. A properly constructed renewable fuse permits easy inspection of the fuse element and this insures that it is being properly refused. The denial of renewal results only in the temptation to improperly defeat the object of a fuse.

The question of service switch blades was brought up by Mr. Johnson, who said that he had been told by some contractors that it is impossible to make such switch blades dead according to the rule. V. H. Tousley and J. Bennett showed that the rule can be easily carried out in the case of service switches. B. H. Glover stated that switches are made by all manufacturers so as to have the fuses either at the hinge or at the clip end, and both these types are approved. Whether the one or the other type shall be used depends on local conditions. There really is some objection to both types and actual conditions must determine which shall be used. Several speakers approved the requirement of making switch blades dead apply only to service switches. On motion of J. Bennett this matter was referred to the Code Committee.

Defective Appliances

V. H. Tousley, Chicago, called attention to the sale of defective electrical appliances which has caused some difficulty in Chicago and other large cities. Many of these, such as improperly constructed flatirons, projecting lanterns or other devices with defective and cheap attachments, have been found on sale in department stores; the electrical features of such devices have frequently been found very unsatisfactory and of such character as to result both in life and fire hazard. An attempt is being made in Illinois to secure legislation empowering municipal inspectors to condemn such appliances. James H. Fenton, St. Louis, stated it was a very difficult problem because, if such devices are debarred in some places, they are likely to be shipped to other places. This has been found to apply not only to the appliances Mr. Tousley had mentioned but also to sockets and other wiring devices. Others who discussed the matter were Messrs. Bennett, Barron and Hunt. The latter stated that manufacturers of this cheap and defective class of goods claimed that they cannot use approved attachment plugs, wire, etc., because of supposed prohibitive price and efforts to sell approved supplies to such makers have frequently been unsuccessful. One speaker thought that this matter could be solved by having frequent reinspection of all electrical installations. The various fire-prevention associations should be urged to take up active propaganda to educate the public against improper electrical apparatus. He therefore suggested that fire-prevention bureaus be asked to take up in their bulletins efforts to reduce the hazard from such electrical equipment.

Installation of Induction Motors.

On Thursday morning the session opened with the presentation of the report of the Committee on Installation and Operation of Induction Motors, K. W. Adkins, chairman. This report dealt chiefly with the size of wire to be used for induction-motor circuits. Eight tables were given for recommended sizes of rubber-covered and other insulated wires for single-phase 110 and 220-volt motors, two-phase four-wire 110, 220 and 440-volt motors, and three-phase 110, 220 and 440-volt motors of various horsepower ratings; the full-load current and appropriate size of starting fuse were given for each size of motor. The tables were based on starting with 100 per cent load and on the assumption that starting devices be used for all motors larger than five horsepower. It was recommended that running fuses be provided on all motors of one horsepower and over.

V. H. Tousley, Chicago, criticised the tables as requiring excessive sizes of wire, particularly for large motors. He recommended wiring for an overload of 50 per cent, except in special cases. To use two sets of fuses (starting and running) is seldom necessary. J. E. Latta, Chicago, said he had noticed that inspectors usually require excessive sizes of induction motor leads.

F. A. Barron declared that the starting fuse should protect both the motor and line, while the running fuse is to protect the motor only. There are many classes of motors that do not correspond to the conditions assumed in the tables. A high-speed motor has a higher starting current than a low-speed motor of the same horsepower rating. Therefore, wiring tables for induction motors would have to be extremely numerous to provide for all the varied conditions of service. A series of tests of induction motors was made by the General Electric Company to ascertain starting currents; these indicate that under the worst conditions the starting fuses should provide for 150 per cent of full-load current in motors up to 15 horsepower, 100 per cent of full-load current in motors from 15 to 75 horsepower, and about 75 per cent in motors larger than 75 horsepower.

W. S. Boyd said he formerly was of the opinion that running fuses were not required, but several cases of fires due to their absence convinced him of their importance and he now insists on their use. Mr. Barron stated that when compensators are employed which are provided with no-load and overload release devices that absolutely disconnect the motor from the circuit then running fuses are superfluous.

Mr. Adkins, on behalf of the committee, protested against increasing the number of tables as tending to confusion. The rules for motor wiring should be made as simple as possible to meet the most prevailing conditions. Further discussion of the matter was continued by R. L. Daniel, V. H. Tousley, J. E. Latta and others and on motion the committee was continued and the subject referred back to it. The Code Committee was advised to consider regulations on the protection of induction motors while running.

Architects' Wiring Specifications.

The report of the Committee on Architects' Specifications, presented by F. H. Moore, chairman, dealt largely with the need of co-operation between electrical inspectors and architects and suggested means for furthering this end. A draft of 49 topics to be included in architects' specifications for electrical installation was submitted. Brief comment was made on many of these topics in the report. The general discussion which ensued was devoted to what should and what should not be included in such specifications. It was agreed that the actual size of the wire to be used should seldom be specified, except where the architect's engineer has laid out and calculated all of the details of the entire wiring system.

Rubber-Covered Wire.

At the last session of the convention, Thursday afternoon, V. H. Tousley, chairman of the Committee on Rubber-Covered Wire, presented a report dealing with the status of the old and new Code wire. The weakest link in our electrical wiring system, so far as materials and devices are concerned, has been the rubber-covered wire. There is no part of the country where new Code wire is not now required. Notwithstanding this, however, considerable old Code or substandard wire is to be found here and there. The report points out how some of this wire is surreptitiously thrown on the market and urges labeling of all standard wire or the withdrawal of approval from any manufacturer who is known to manufacture substandard wire. This important report will be published practically in full in a subsequent issue.

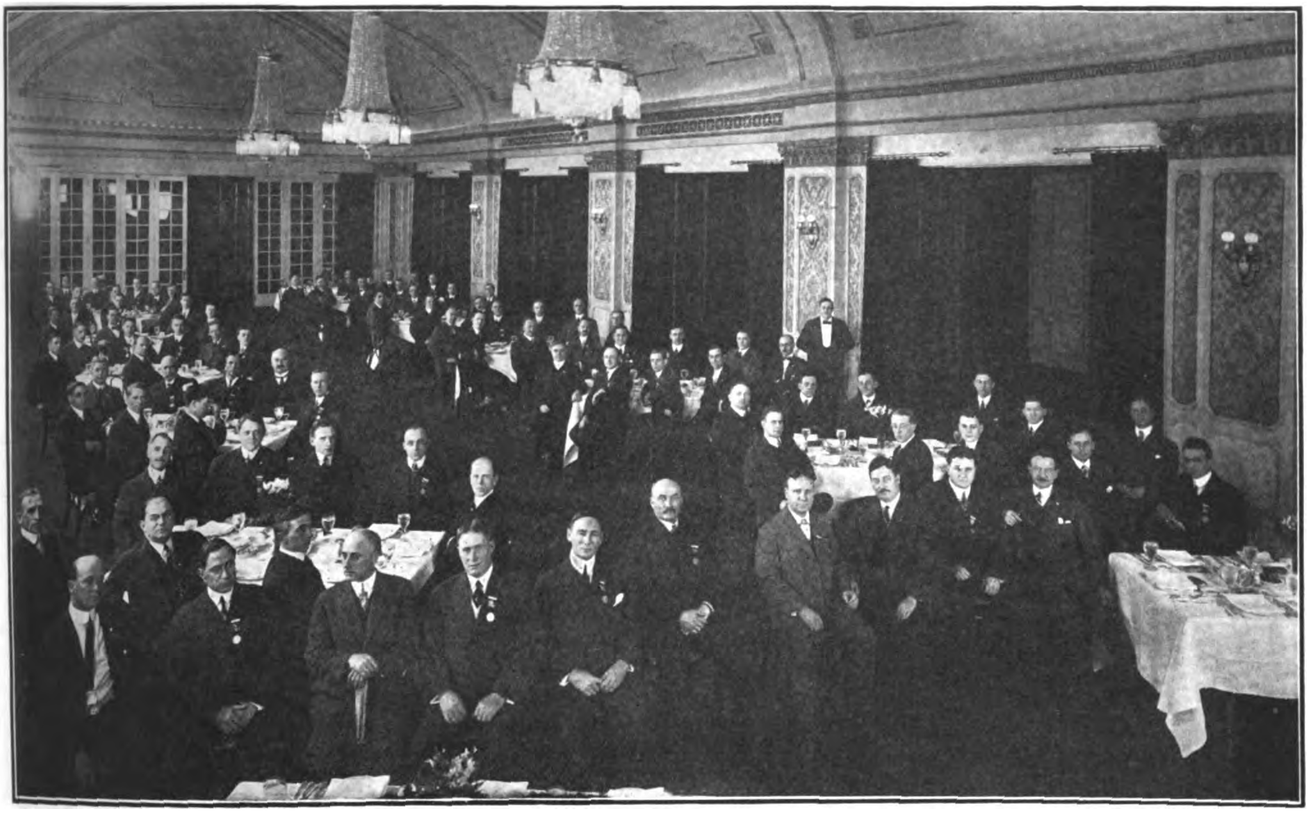
J. E. Latta, of the Underwriters' Laboratories, discussed the report at length. He said that in comparison with total output of copper wire the amount of old Code material that is being marketed is relatively small. In the towns and cities which do not have adequate inspection, however, the old Code product is still being rather extensively used. This condition is to be deplored. He explained the limitation of authority of the Laboratories in preventing the sale or use of substandard wire, since their function is to test samples and approve those found to be standard; however, there is no organization more anxious to see the old material discarded. He then explained the factory inspection service and showed that 100 per cent inspection, that is, of every coil made, is impracticable on account of the increase in the cost of the wire thereby involved. If substandard wire is found labeled as approved, a sample thereof should be sent for thorough test, a report of which will be returned promptly free of charge. Special tags are furnished to inspectors for sending in such samples. The simplest test for quickly detecting a doubtful rubber insulation, and which test is quite reliable, is the stretch test on the rubber of the insulation. Wire which shows up properly on this test might fail to meet some of the other new Code specifications, but one will hardly find any piece of old Code wire that would meet the stretch test. In closing, Mr. Latta offered the co-operation of the Laboratories to the Association and to the individual inspectors in weeding out defective wire.

F. A. Barron explained the check system used by the General Electric Company in very successfully verifying the quality of the product. B. H. Glover, of the Underwriters' Laboratories, corroborated Mr. Latta on the present lack of power to compel only new Code wire to be manufactured.

The report of the committee was accepted and on Mr. Tousley's motion the Underwriters' Laboratories were advised to withdraw after June 1, 1914, the label service from any manufacturer who is known to still make old Code rubber-covered wire.

A very brief report of the Committee on Signaling Systems was submitted by Frank S. Anderson, chairman. The chief point raised was on the advisability of grounding the boxes of fire and police alarm systems. J. H. Fenton, St. Louis, said it is imperative to ground the boxes thoroughly; be cited a case where several officers were killed by contact with a box which had become highly charged through a swinging ground on a power wire. Although fire-alarm manufacturers were inclined to oppose grounding the box, it is necessary to do this in order to protect the public. A vacuum type of low-potential lightning arrester now on the market protects the box satisfactorily from lightning. A number of other speakers agreed with Mr. Fenton on the need and practicability of grounding the boxes.

F. L. Lucas brought up again the modification to Rule 38 as to motors in theaters, and on his motion it was decided to recommend the insertion of a clause specifying that all motors used therein, except portable motors, must be of the protected type or inclosed in approved fireproof compartments used for that purpose only. This is supplementary to the rule that curtain motors always be of the inclosed type.



Western Association of Electrical Inspectors Assembled for Annual Banquet, Cincinnati, O., January 28, 1914.

A general discussion of other inspection problems followed. Among these considered briefly were the use of wood cabinets in electric traction systems, inclosure of sign flashers, emergency service for theaters, etc.

The Committee on Constitutional Revision reported that this subject was too important to be passed on hurriedly and recommended that this matter be deferred until the next convention.

Election of Officers.

The Nominating Committee, through James Bennett, chairman, submitted a list of nominees for officers for the ensuing year; these were unanimously elected as follows:

President, Ben W. Clark, Detroit, Mich.

First vice-president, H. M. Maxwell, Dayton, O.

Second vice-president, F. H. Moore, Indianapolis, Ind.

Secretary-treasurer, W. S. Boyd, Chicago, Ill. (re-elected).'

Executive committee, H. B. Long, chairman, R. J. Swain, G. W. Strachan, T. D. McColl, James H. Fenton, B. W. Clark, H. M. Maxwell, F. H. Moore, W. S. Boyd.

A resolution was adopted thanking the retiring officers and those who had been active in promoting the success of the convention. A beautiful floral gift was made to Mrs. W. B. Hubbell as a special mark of appreciation of the valued services rendered by the chairman of the general arrangements committee. By resolution the standing committees were requested to send their reports to the secretary at least 30 days before the next annual convention. The Executive Committee has decided that this shall be held in Minneapolis, Minn., in January, 1915.

Entertainment.

The chief entertainment features of the convention were a smoker on Tuesday evening and the annual banquet given by the manufacturers on Wednesday evening. L. T. Milnor, of Cincinnati, acted as toastmaster. The speakers were Messrs. Cleveland, Clark, Bennett, Bloomer, Long, Canada, Flickinger, Tousley, Beattie, Maxwell, Gilsdorf, Dustin, Hornsby, Hubbell, Glover, Nelson, Boyd and Healy. Good fellowship and co-operation were the key notes of the speeches. On Friday those members remaining in Cincinnati made an inspection tour of prominent points of interest, especially the new waterworks and filtration plant of the city.

Exhibits.

During the convention exhibits were made by a number of manufacturers as follows:

Cincinnati Clock & Instument Company, Cincinnati, O.; Nelson mechanical sprinkler supervisory system.

R. J. Dotson, Highland Park, Mich.; illuminated low-voltage house number.

Economy Fuse & Manufacturing Company, Chicago, Ill.; renewable cartridge fuses.

Frank Adams Electric Company, St. Louis, Mo.; cutout cabinet and meter panel.

General Electric Company, Schenectady, N. Y.; sockets, receptacles and other wiring specialties and supplies.

National Metal Molding Company, Pittsburgh, Pa.; metal molding and fittings, flexible steel cable, fiber tubing.

New Process Specialty Company, Milwaukee, Wis.; clamps and bushings.

Pass & Seymour, Incorporated, Solvay, N. Y.; sockets, receptacles, and other wiring specialties.

Star Electric Company, Binghamton, N. Y.; fire and police alarm and signaling apparatus.

T. W. Manufacturing Company, Chicago, Ill.; bushings and clamps.

The Western Conduit Company, Youngstown, O.; rigid conduit, flexible steel conduit.

The Engineer and Utility Regulation.

At the alumni reunion at the Stevens Institute of Technology on January 9, already mentioned in these columns, a symposium was held on the subject "The Engineer's Part in the Regulation of Public Utilities." The subject was introduced by Alexander C. Humphreys, president of Stevens Institute. The subject was discussed by Newcomb Carlton, vice-president of the Western Union Telegraph Company; John W. Lieb, Jr., vice-president of the New York Edison Company; and James E. Sague, public service commissioner for the Second District of New York. Below is given an abstract of this discussion.

Alexander C. Humphreys.

The many questions involved in the management and regulation of public utilities are difficult to discuss without creating misunderstandings. Representatives of the public utilities can best meet the criticisms which are showered upon them today by showing the public that they have nothing to conceal; that they are conducting their business honestly; that they can give the maximum of service for a given rate of charge only by securing the confidence and good will of the public and that they intend to do all in their power honestly to gain that good will and co-operation. Theodore N. Vail, in a recent address, stated that the great bulk of the public are honest and will act honestly according to their lights. This does not prevent them from acting unjustly and even cruelly if they are uninformed, or still worse, if they are led astray by ignorant enthusiasts. Mr. Vail has shown his willingness to co-operate with the constituted authorities, even to the abandonment of his own matured plans. The speaker's personal relations with the members of our public service commissions have generally been most pleasant, but he has had experiences which have been nothing short of disgusting and disheartening. Several instances were mentioned. Many commissions have never established any definite policies and the corporations are left to flounder in a sea of uncertainty. The honest and capable manager is unable to determine even with the aid of the best legal advice obtainable what he should do and what he should not do to comply with the laws and commission requirements. This condition is also to be found wherever the Federal Government is in control. No commission or any other one government authority should be placed in office to exercise the three functions of government, legislative, executive and judicial, which should be kept separate and distinct from each other. There should be some measure of control of public utilities, particularly if these utilities are to be protected in monopoly. The monopoly argument is always advanced by advocates of control, but the utilities are not always protected in their monopoly. The arguments that can be advanced in favor of regulating public utilities do not serve to support the present tendency toward the regulation of all business. The speaker favors a proper measure of control and regulation such as will tend to insure to the public efficient and economical service and attention to complaints, together with a just and discriminating control over return on investment. The record of personnel of utility commissions is not good. Appointments are too often based upon political grounds and the men appointed are not qualified to exercise the great power placed in their hands. Many of the questions which the commissions are called upon to determine require for their solution the highest engineering training and experience, yet it is the exception when an engineer is appointed as a commissioner. The engineering profession is most often represented not as members of the commission but as employees without vote. Frequently the engineers so employed as subordinates are not qualified for an authoritative position in any of the companies over which they are indirectly given a large measure of authority. The engineering profession should be adequately represented on every one of these commissions by men educated in the science of engineering and later trained in the hard school of experience. These men should be voting commissioners. Because a man is an engineer does not mean that he is necessarily qualified for membership on such a commission any more than a man is qualified to be a judge because he is a lawyer. He should also be broadly trained, having had administrative experience. His character should be above reproach. He should be judicial in temperment and should be free from the temptation of playing to the gallery. There is no class less fitted to be commissioners than statisticians who have not had experience as administrators. All the productive processes of life have to do in one way or another with the science and practice of engineering and it seems extraordinary that the members of the engineering profession should have been permitted to enter to such a slight extent into this field of government control. The fault is, however, not entirely with the public and the appointive power. Engineers as a class are themselves in part to blame for not taking a more active part in the administrative side of life and deliberately equipping themselves for administrative responsibilities. There are, however, sufficient engineers in the country specifically and broadly trained to do their full share of work on the commissions of the country, but they should be selected with regard to their breadth of training quite as much as to their special training. The same rule should be applied in the selection from the ranks of other professions, particularly that of law. Every commission should have at least one engineer as a full member and it would be better if they were more fully represented than any other profession. The tendency has been to have lawyers largely in the majority. In the interest of efficiency that profession should be represented, but a lawyer is no more qualified for this duty because he is a lawyer than is an engineer because he is an engineer. A board composed of five broadly trained engineers with a competent lawyer to advise them would be superior to one made up of five well equipped lawyers as commissioners with one competent engineer to advise them. The best results would be obtained by selecting the majority of commissioners from the professions of law and engineering. In conclusion, two points should be emphasized: (1) the great corporations which are often thought to be a menace to the country have not won their successes by financial legerdemain. Great problems had to be solved by patient, persistent and determined work and were often accompanied by temporary failures; (2) legislation and regulation which will stand the test of time and create justice to both producer and consumer must take full account of the inherent physical and financial limitations within which utilities are forced to operate. To this end men technically trained must have their full share in the formulation of laws and their administration.

Newcomb Carlton.

The speaker agreed with Dr. Humphreys that the personnel of public service commissions in general is far from satisfactory and that the commissions would be more equitable, judicial and competent by the addition of technically trained and experienced engineers. He could not, however, conceive of engineers in any number that fulfilled Dr. Humphreys' requirements and were available. An engineer possessing them is much sought after and can secure positions and emoluments which place him beyond the call of public service commissions as now constituted. One great difficulty of the commissions lies in the fact that appointments are temporary and judicial, legislative and executive functions must be exercised almost without precedent, without familiar methods of procedure, without practical experience and with superficial hearings. To overcome this, commissions should be advanced as nearly as possible to the present status of a court. The question of control and regulation is on trial and commissions must be elevated above the status of a partisan political body, eliminating as far as possible popular clamor or the selfish demands of political or corporate interests, or else we are doomed to failure, and government ownership and socialism will be the result. He considered it an anomaly to have the law create a commission which makes the rules, prosecutes under them, acts as judge and imposes the penalty.

John W. Lieb, Jr.

Mr. Lieb sketched the origin of the idea of regulation by public service commissions and stated that to handle the important economic, commercial and engineering problems and matters of public policy which may come before them requires a personnel of a high order—far above the level of capacity of the ordinary office-seeking politician. Men of the highest personal integrity are required, with ability and capacity; minds capable of statistical analysis; judicial temperament; a wide knowledge of public affairs and a sufficient interest in the public service to devote the necessary time to the study of a mass of detail. No single individual can possess the wide knowledge of public affairs, the legal training, business experience, breadth of learning and scientific knowledge necessary to cover competently so vast a field. It is obvious that the presence of a technically educated and scientifically trained member on the commission should be of enormous assistance and value in its work, only second in importance to a representative of the legal profession. There is also a demand on the side of the utilities for broader knowledge, wide experience and high capability on the part of executives, managers and engineers. Technical graduates should be trained so that when called upon for facts or to present evidence or testimony in utility cases, their presentation shall be clear, convincing, to the point, and delivered with authority. The habit of clear statement should be cultivated, as well as clear thinking. Questions of physical valuation, depreciation, adequacy of equipment, etc., are all matters which must be approached from the engineering standpoint; while other matters, such as value of property, rate of return, formation of rate schedules, etc., require something more than engineering knowledge and experience. Many of the questions involved in commission regulation are the results of the operation of economic laws. To have effective supervision and regulation of utilities the public must recognize the inherent monopolistic character of public utilities and protect the corporation against competition. The engineer should assume his proper share of the responsibility of helping to mold public opinion along right lines and see that the public is furnished with correct and reliable information, for it is only through an intelligent public opinion that we can hope for justice and fair treatment. The progressive engineer should be a close student of public questions, of economics and political science, and should be in touch with the trend of public opinion.

James E. Sague.

The speaker was glad to see engineers taking an interest in this subject, as he had long wondered why they leave so much of the discussion of fundamental problems of government to lawyers and politicians. He pointed out the importance of engineers in utility and commission work and said that for efficient operation enthusism is very necessary. Regulation must finally fail if the enthusiasm of the employees of utilities is not preserved. It is doubtful if this is so at present. There is a feeling of misunderstanding between the two elements involved, especially on the side of the state. There is too much misunderstanding of the problems which public-service managers have to meet and the delicate nature of the work they must do. The legal profession is usually represented on state commissions, and should be. Able lawyers can better afford to accept appointments than can engineers of equal grade. The career of the former is but little interrupted, while with the latter there is a serious interruption. The work put upon a commission by the utility laws is enormous and it is very difficult for any commission to cover the field satisfactorily. The commissions should make an effort to become well informed as to the general condition of utility properties and should accomplish results less by the issuance of orders than by conferences with utility managers. Patient study of finances, general conditions and service of the corporations should be followed rather than the methods of the courts. The Interstate Commerce Commission has accomplished two great things: (1) a systematic tariff with publicity of rates and a system of accounts which enables corporations to be compared on the same basis and compels honesty in report. These alone would justify the maintenance of the Commission, even if it had done nothing else. This example has been followed by many state commissions with much success. In other respects the work of the average commission leaves much to be desired. Too much time is given to minor complaints and too little to large questions. Legislation involving details of operation should be a matter of last resort. The commission of which he is a member has been helped to an astounding degree by the information given by the officers of utility companies and the patience shown. Municipal administrations on the other hand often impose difficulties.

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Graduate School of Engineering at Columbia.

The School of Mines of Columbia University will in September institute a graduate school of engineering on the same footing as the other graduate schools of the university. This school will provide three years of specialized study in the various branches of engineering leading to technical degrees in mining engineering and chemistry.

The requirements for admission to these schools will be the completion of at least three years of a college or scientific school course, which shall include mathematics, chemistry, physics, drafting, shop works, surveying and mineralogy.

To prepare for this graduate course a new course has been prepared in the college leading to the degree of Bachelor of Science. A little more than one-half of the time of the student is given to required studies and the remainder may be selected from English, modern languages, history, philosophy and political sciences. No more undergraduate freshmen will be permitted to enter the engineering department.

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Amendment to Patent Laws.

Congressman Oldfield, chairman of the Committee on Patents of the House of Representatives, has received from Clarence L. Burger a suggestion to amend the patent laws so as to reduce the present labor, expense, injury and delay of interference suits by making it the duty and privilege of the inventor to record his inventions or design and all subsequent improvements thereof as evidence in the Patent Office as soon as conceived and to file satisfactory evidence of his diligent actual reduction to practice within a reasonable time thereafter. The Patent Office should grant the patent in the absence of fraud to the first of record who has thus proven diligence in reduction to practice.

Another amendment is suggested to prevent the present injury to legitimate inventors of operative patents by the issue of inoperative patents by providing that the inventor should be compelled to prove to the Commissioner actual reduction to practice and operativeness before the patent is issued.

New Power Station of United Electric Light & Power Company.

The large new $6,000,000 power station of the United Electric Light & Power Company, 201st Street. New York, was formally opened on Saturday last. There was an attendance of nearly 1,000 invited guests, and the plant was thoroughly inspected. A Delmonico collation was served on the top floor of the building, which will eventually be used for offices.

Vice-president F. W. Smith, of the United Company, spoke briefly to the assembled guests immediately before luncheon, and introduced George B. Cortelyou, president of the Consolidated Gas Company, who spoke at some length respecting the new station, stating that it was the most modern and one of the largest of its kind in the world, and that it had been made necessary by the press of population in Manhattan northward. The station had been built, he stated, with a view to substantial additions in the future.

Among those present were: Nicholas F. Brady, president of the New York Edison Company; Frank W. Smith, vice-president and general manager of the United Electric Light & Power Company; James A. Farrell, president of the United States Steel Corporation; W. R. Addicks, vice-president of the Consolidated Gas Company; John W. Lieb, Jr., vice-president and general manager of the New York Edison Company; Thomas E. Murray, vice-president of the New York Edison Company; Commissioner Henry S. Thompson of the water supply department; Edwin W. Rice, Jr., president of the General Electric Company. L. A. Osborne and C. A. Terry, vice-presidents of the Westinghouse Electric & Manufacturing Company; Charles W. Price, H. C. Cushing, and F. A. Stratton, president of the Westchester Lighting Company.

The officers of the United Electric Light & Power Company are: President, Nicholas F. Brady; vice-presidents, Thomas E. Murray and F. W. Smith; secretary, Lewis B. Gawtry; treasurer, Benjamin Whiteley; contract agent, Joseph F. Becker.

The building contains seven floors and basement. The structure's exterior is of red brick, with an artificial granite base and terra cotta trimming, and a tile roof. It contains 15,000 tons of steel and is set in the mud on 6,600 piles. A section tunnel, ten feet in diameter, takes water from the Harlem River and dumps it into Sherman Creek after it has been used in the pumps and turbines.

The large turbines were supplied by the Westinghouse Electric & Manufacturing Company, and the immense boiler equipment by the Babcock & Wilcox Company.

The building is seven stories high and the electrical gallery is on the top floor. The sixth floor contains the bus tie switches and reactance coils. The fifth floor contains the bus compartments, while the oil switches are on the fourth floor, and the feeder and generator switches on the third floor. The control gallery from which the plant is operated is on the second floor, all switches being remotely controlled from the panels here. A storage battery is located on the first floor.

There are three 15,000-kilowatt turbogenerators of the high-speed double-flow type. Space has been provided for five additional units. There are 32 boilers of 650 horsepower each, provided with automatic stokers.

Design Registration.

Congressman Oldfield, chairman of the Committee on Patents of the House of Representatives, introduced a bill on January 12 providing for the registration of designs.

The purpose of the bill is to protect a manufactured article embodying a particular design. It extends protection to citizens of the United States and citizens of such foreign countries as a matter of course, no examination for citizens of the United States. Certificates are to be granted and issued as a matter of course, no examination being required except as to matters of form. Registrations are to be granted for different terms of years for different fees; a three-year registration being issued for $1.00, and one for 20 years for $30. It will be sufficient to defeat a charge of infringement of a registration to show that the design was old, embodied in the particular product at the time it was registered to the complainant, or that the design was not new and original. The question of validity and other questions affecting the rights are thrown entirely into the courts and applications for registration cannot be held up pending the determination of such rights.

A similar bill was introduced on the same day in the Senate by Senator James, chairman of the Committee on Patents.

The bill has been indorsed by the National Design Registration League, which was organized for the protection of designs by a registration law. The secretary is S. M. Weatherly, 1309 Race Street, Philadelphia, Pa.

Copper Exports.

Exports of copper for the week ended January 29 totalled 8,473 tons. Since January 1 they were 33,690 tons, as compared with 23,048 for the same period last year.

The Electrical Sterilization of Milk.

A paper was read at a meeting of the Rontgen Society by W. G. Duffield on the sterilization of milk by means of electrified gases. Prof. Duffield referred to the work recently done on the subject by Thornton and others, and notably by Priestly and Lee, who brought before the British Association in 1911 some experiments in which they had applied weak currents of electricity upon the "sour milk" bacillus of Metchnikoff. In one respect the conclusions of Priestly and Lee differed from those which he had to bring forward, for under certain conditions they got an increase of acidity after electrification, whereas he had found that the acidity was greatly reduced or retarded. The apparatus used in his own experiments, in which he was assisted by T. Murray, was a 15-inch induction coil, with a fairly fat spark 4 centimeters in length. The poles were of brass. The spark discharge was passed through a closed glass tube, and air or nitrogen, which in certain of the experiments was filtered through cotton wool, was sucked in, and made to convey the products of the discharge into samples of milk. The acidity of the milk was then tested at intervals of hours, and compared with the acidity of a control sample, which had not been treated. The testing of the acidity was carried out by discovering the amount of alkali necessary to produce neutralization in a given number of cubic centimeters of milk. It was at once found that the acidity of the treated samples was retarded. The acidity in the former case appeared quickly to reach its maximum, and then to remain stationary, whereas in the latter case it ran up rapidly. In one instance in which the electrical discharge had run for 52 minutes, the relative acidities at the end of 64 hours (as expressed in cubic centimeters of alkali necessary to produce neutralization in 10 cubic centimeters of milk) were 9 in the case of the control and 5.9 in the case of the treated sample. The effect seemed to be more pronounced the longer the electrical discharge had been allowed to run, notably in one case, for 71 minutes, whereas very short exposures of one minute or five minutes gave little or no difference between the two samples. The cause of the reduction in acidity was still doubtful. Some tentative experiments seemed to show that it was chemical rather than electrical in nature. A bacteriological examination proved that when the samples were sown on plates of agar and of gelatine, the inhibitory action in the case of the electrified milk had been as pronounced as the acidity tests had suggested. There was a marked diminution in the germ colonies in the samples, and it even appeared that the germicidal or toxic effect remained for at least five days after the original discharge.—*Electrical Review* (London).

San Diego Exposition.

Exhibitors who are planning outdoor exhibits and buildings to contain individual exhibits, and all concessionaires at the San Diego Exposition have been notified by Director General H. O. Davis that all buildings for exhibits or concessions at this exposition must be ready for installation by July 1, 1914.

Another month will see the completion of the great re-inforced viaduct over Cabrillo canyon, at the west entrance to the San Diego Exposition, permitting the hauling of material for the remainder of the exposition construction work over a much shorter and easier route.

The plantations and ground work are eighty-five per cent complete. Recent rains are causing the plantations to show wonderful growth.

Commissioners of the San Diego Exposition are now scattered over the United States, Europe and Central and South America, securing industrial and commercial exhibits, the exhibits of the arts and crafts, archaeological and ethnological specimens, manufacturers, and horticultural and agricultural exhibits that will fill the great exhibit buildings.

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Unified Operation of Chicago Street-Car Lines.

On February 1 there went into effect the joint operation of all the street-railway lines in Chicago, this making the unified system the largest street-railway system in this country and probably in the world operated as a single unit. About 1,000 miles of electric street railway reaching all parts of the city are operated by the Chicago Surface Lines, which is the name of the new operating company. A universal system of transfers from any street-car line to any intersecting line, without doubling back, now prevails. The single five-cent fare limits have been extended to the remote southern city limits, thus making it possible to go from any point in the city to any other point for only one five-cent fare. The longest ride now possible for five cents is between the northern and southern city limits, a distance of about 28 miles. A number of additional through routes have been put in operation and these will be added to. Switchbacks and loops in the downtown district will be eliminated as far as possible.

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New England Section Convention.

The sixth annual convention of the New England Section of the National Electric Light Association will be held at the new Mathewson Hotel, Narragansett Pier, R. I., September 2 to 4.

Water Shortage in Kentucky.

Kentucky electric light companies, especially those in the western part of the state, are having a lot of trouble on account of a shortage of water. The drouth last summer was followed by an equally dry fall and winter, and sources of supply which had been regarded as permanent are drying up. As a result many of the smaller electric light companies in the interior towns are being hard pressed and have advised their patrons of the possibility that the service will have to be temporarily discontinued. The Hickman Electric, Ice & Water Company has built a new artesian well, with a capacity of 300 gallons a minute, as the result of the shortage caused by the exhaustion of the city supply, while the Marion Electric Light Company has been hauling water a considerable distance on account of the drying up of a lake upon which it is accustomed to depend.

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Prize for Non-Rubber Automobile Tire.

The Ministry of War of Austria-Hungary has offered $10,000 as a prize to be awarded to the person who will, with adherence to certain prescribed conditions, construct an elastic tire for motor freight wagons. Besides the specific attributes of pure rubber, such as elasticity and adhesiveness, the new material must possess (1) essentially greater durability, or (2) with equal durability the attribute of essentially smaller cost of construction than the rubber tires, thereby reducing the expense of operating motor freight wagons. Its weight must not exceed that of the pure rubber tire. Competitors should hand in a model of the fabric in natural or reduced size, together with drawing and description, at the latest by June 30, 1914, at the Automobil-Versuchsabteilung (Automobile Trial Division), VI. Gumpendorferstrasse 1, Vienna. Further details may be found in the Militärische Rundschau, published at I. Graben 23, Vienna, and to be had also on application in German of the K. K. Kriegsministerium, Vienna, Austria.

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Improving Telephone Service.

"When you telphone, smile. A frown has spoiled the satisfaction of many a call." In a publicity campaign intended to improve the telephone service in Pittsburgh, the Central District Telephone Company is using this, and the following advertisement, addressed to its subscribers through the daily newspapers.

"Are you interested in improved telephone service If you are, read this carefully. The service of 8,000 subscribers' lines in Pittsburgh was interrupted last month through the failure to replace telephone receivers securely on the hooks after completing conversations. Often the receivers were left off through thoughtlessness, but more frequently a book or some other obstruction directly beneath prevented the receiver from bringing the hook down firmly. Had our patrons exercised care in this respect 80 per cent of the service interruptions, with the enormous loss of communication to our subscribers, would have been prevented.

"Will you share our efforts to reduce the number of these service interruptions by watching closely your telephone receiver? Please remember that we are printing this advertisement because we want you to help us make our telephone service better."

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Water Power in New York.

Governor Glynn has announced a policy of state control of water power, especially that at Niagara Falls, and believes that through state control the revenues of the states may be increased from $1,200,000 to $1,800,000 a year. The scheme is predicated upon the state taking absolute charge of the 4,400 cubic feet of water per second soon to be available at Niagara Falls, under the treaty between the United States and Canada.

Governor Glynn's idea is that the state should either develop and sell this power itself or sell the water to companies for the generation of electric current. The estimate made by the governor of the revenue to be produced from this property does not appear to take into consideration the cost of development. He says that if 75,000 horsepower is sold by the state at the present wholesale rate in Buffalo of $16 a year a horsepower it would produce $1,200,000 a year, while if sold at the present Buffalo retail rate of $26 a horsepower it would produce revenue of $1,800,000 a year. But before this amount of energy could be sold there would have to be immense sums spent for plants for the generation of the power.

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Second Annual Meeting of National Chamber of Commerce.

The Chamber of Commerce of the United States will hold its second annual meeting at Washington, D. C., February 11 to 13. Two days will be given to the subject of anti-trust legislation and the maintenance of resale prices. Among the speakers on the latter subject will be Joseph E. Davies, commissioner of corporations; William H. Ingersoll, of New York City; and Donald Dey, of Syracuse, N. Y. A report will be made by James G. Cutler, chairman of the Committee on Patents, Trademarks and Copyrights.

Depreciation of Power Plants.

In a paper presented before the American Society of Heating and Ventilating Engineers entitled "Life of Building Power Plants," C. M. Ripley has considered the proper percentages which should be applied for depreciation of electric power plants used for lighting buildings in New York City.

He cites a number of very old plants which are still in operation, one of which dates back 31 years, and others for lesser periods, indicating that the depreciation on these would not exceed values from 2 to 4.5 per cent per annum. The percentage of depreciation which should be charged off annually is based upon a sinking fund which earns 4.5 per cent compound interest. A plant which remains in service for as long as 15 years would consequently not require a depreciation of more than 5 per cent per annum.

The writer realizes that the above plants represent the survivors and that the values do not warrant any conclusions unless plants which have ceased operation during the same period are also considered. He consequently proceeds to consider all of the plants for which a certain New York firm acted as consulting engineers, the records covering a period from 1892 to the present time. Only plants started before 1900 are considered. Only one of these plants is now out of commission, owing to removal from the building; and only one other is in poor operating condition, owing to lack of proper maintenance. In none of them can a lower limit be set as yet to the actual depreciation, but the upper limits are set as follows: 34 show less than five per cent; of these, four show less than three per cent. Of plants started since 1900 only one is idle and that on account of change of policy of the owner.

The writer consequently considers the five per cent customarily allowed by engineers and architects for depreciation, as more than sufficient for this purpose.

Electric Poultices.

Some of the South Wales medical men are advising electric poultices for those suffering from stiff necks, colds and sprains. The poultice, which takes the place of the old-fashioned linseed, mustard and bread variety, consists of flexible electric wires covered with asbestos cloth, and when applied is connected with an ordinary lighting socket and it retains the correct temperature in a regular fashion. The highest heat is put at 160 degrees Fahrenheit.—*Electricity.*

Louisville Proposes City Testing Department.

An ordinance is now before the city council of Louisville, Ky., for establishing a department for the purpose of testing the meters and service of electric and gas companies. The chief company affected, the Louisville Gas & Electric Company, has asked for changes in the measure, on the ground that some of the provisions are unreasonable. The inspector will get a salary of $3,000 a year, while three deputies will receive $1,500 each. A clerk will be paid $1,200 a year. Rates of service will be examined and approved by the inspection department, which will receive and investigate all complaints, reporting the result to the complainant as well as the company whose service is complained of. Special reports to the mayor and the board of works will be made if the service falls below standard, while monthly reports of routine work are also to be made. Testing stations will be set up at the City Hall and at other points between one and two miles from the plants of the companies. The companies must run special service pipes and wires to these stations. Each meter must be approved by the inspectors before being installed. Detailed regulations for testing the meters and correcting overcharges, if any are discovered, are provided, and penalties are provided for failure to furnish the required voltage. The ordinance is now in the hands of the Grievance Committee.

Ordinance Governing Poles.

The City Council of Pauls Valley, Okla., has passed on ordinance requiring that all telephone and electric light poles shall be placed two feet inside the outer edge of parkings in residence districts, and inside and next to curb line of sidewalks in the business districts, and that all poles not so placed must be removed within ninety days. Failure to do so is punishable by a fine of $100 per day. The ordinance is directed primarily at the Pioneer Telephone and Telegraph Company, which will have to move all of its poles. Inasmuch as its franchise has expired it is understood that it will not be allowed to replace them except by express permission of the city. The company probably will take the matter into court.

Fire at Grandfield.

The electric light plant at Grandfield, Okla., owned by J. A. Branham, was totally destroyed by a fire which was started when a hot exhaust pipe set fire to one of the walls of the building in which it was housed. The plant was a new one, recently installed.

"Do It Electrically" Recognized by United States Post Office.

As an illustration of how thoroughly well recognized the slogan of the Society for Electrical Development, Incorporated, "Do It Electrically" has become, the following incident is of interest.

Recently in mailing a large number of booklets for the Society, the printers inadvertently let one envelope get into the mail without an address and without any contents. In other words, it was an empty envelope with a one-cent stamp on it. There was no return address printed on the envelope, but in the upper left-hand corner it read "Season's Greetings—Do It Electrically." The empty envelope was returned to the office of the Society for Electrical Development with annotation in pencil under the slogan "29 West 39th Street." This is certainly a very definite recognition upon the part of Uncle Sam of the identity of headquarters of the slogan.

Electric Iron Production on a Large Scale.

The well known Stora Kopparbergs Bergslag Company, in Dalecarlia, Sweden, has prepared plans, ready for being realized, intended greatly to increase the company's production of iron and steel. The plans comprise an increase from 100,000 tons to 300,000 tons annually, of which 200,000 tons are to be manufactured electrically. This imposing increase in the output (which means an increase of 25 per cent in the annual production of iron for all Sweden) will require 60,000 to 70,000 electric horsepower, obtained from an increased exploitation of the company's own waterfalls, besides an increased annual output of some 500,000 tons of ore from the company's own mines.—*Engineering.*

Tule River Plant Operating.

After eleven years of continuous work and the expenditure of millions of dollars, the Tule River plant of the San Joaquin Light & Power Company, in the foothills near Porterville, Cal., has just been put in actual operation. Over a double transmission line 35 miles in length current from the plant, representing 5,000 horsepower, is delivered to a substation north of Porterville, whence it is distributed to points throughout the oil fields and Kern County.

The Supreme Court of Pennsylvania will be asked to review the decision of Judge Josiah Cohen that gives the City of Pittsburgh the power to force the Duquesne Light Company to remove its poles and place its wires underground along Main Street and Wabash Avenue in the West End of that city.

Electric Power in Sweden.

United States Consul Douglas Jenkins, of Goteborg, Sweden, in a recent report states that the development of hydroelectric power in Sweden is being greatly extended. The city of Boras (Alsborg County) has under construction a power station of 5,000 horsepower. Lindesberg, a town in Crebro County, is building at Ringaby a power plant of 800 horsepower. The city of Filipstad is constructing a lighting plant of 400 horsepower.

A number of distribution plants are also being built. Director J. Nilsson is erecting a power station of 3,000 horsepower near Odensfors. It is to co-operate with the Lindkoping power and lighting station. The Eskilstuna Iron Manufactures Company is building a power plant of 2,400 horsepower at Tunafors, and the Huskvarna Arms Manufacturing Company, of Huskvarna, is building one of 3,650 horsepower. The plant at Dejefors is being enlarged so that it will have a capacity of about 5,000 horsepower instead of its present capacity of 3,000 horsepower. Besides the power plants mentioned, there are several smaller ones under construction in the country.

At many places extensions of electric plants have been made for the use of the wood-pulp paper, and iron industries. At the large power plant at Bullerfors, belonging to Stora Kopparbergs Aktiebolag, in 1913 the last machinery fixtures were installed, giving the station a capacity of 30,000 horsepower, of which the largest portion is used for iron smelting at Domnarfvet.

The Uddeholms Aktiebolag has also finished its power plant of 23,000 horsepower at Forshult on the River Klahalven. It is to be used for the same purpose as that at Bullerfors. The Uddeholm Company has also commenced the construction work on a power plant in the Uva-River, likewise intended for the electric production of pig iron. Kockums Jarnverks Aktiebolag is extending its hydroelectric power plant in the Ronneby River so that the stations at Kallinge and Ronneby will have increased capacity. The Jaders Iron Works is building a power plant of 600 horsepower on the Arboga River, partly for factory use and partly for distribution, and a large enterprise in this line is being planned by the Arboga machine shops (Arboga Mekaniska Verkstader).

The power plants for the mining industry were increased considerably during 1913. The Guldsmedshytte Aktiebolag is building two power stations at Blankafors and Rockesholm, on the River Svartalfven, each of 2,100 horsepower, and Riddarhytte Aktiebolag is building one at Gislarbo (Wastmanland County) with a capacity of 1,500 horsepower. In the neighborhood of Ludvika two power stations of 650 and 220 horsepower are under construction for Aktiebolaget Ludvika Bruksagare. Nora Bergslags Grufvor are building dams at Rastalfskvarn to secure 550 horsepower from the waterfall there. Finally, it may be mentioned that the Norberg mines received power from the Kolback River, and Virsbo Aktiebolag from Norsbo. These stations are of 900 horsepower, as is also that of Ramnas Aktiebolag at Seglingsberg.

The paper and pulp mills have been compelled to make new arrangements by reason of increased demand for power. The Klippan Paper Mills is rebuilding its power plants so that the station at Klippan will have a capacity of 875 horsepower, and that at Forsmollan 500 horsepower. In the same manner the power plant at Havrestrom is enlarged by 2,000 horsepower. In Norrland a new power station is under construction for this industry. The Gidea and Husum companies built a station of 2,500 horsepower in Gide River, at Gidea, which is to furnish power to the Hornefors pulp mill.

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Large Electric Steel Furnace Plant in England.

The first English plant devoted exclusively to making steel by the electrical process is being erected by the Stobie Steel Company, of Sheffield, on the banks of the River Tyne at Dunston near Newcastle. Ample property has been secured to provide for future extensions to the works. The plant will have the advantage of both rail and water transportation and seagoing vessels will dock at the company's wharves and be unloaded by modern wharf machinery. The railway sidings are all to be electrically operated.

The furnace room is a steel structure 250 feet long, 60 feet wide, and 50 feet high, with a bay 26 feet wide running the whole length. A testing laboratory for determining the thermal behavior of the steels and still another for the micrographic research so necessary to the steel industry will occupy a portion of the same building.

The furnace installation consists of one 15-ton electric furnace operating on three-phase current, which will be used for melting; one five-ton furnace, which will be operated on two-phase current and be used for refining; and one 300-pound furnace for ferroalloys, to be operated on single phase. The furnaces are to be operated from a steel platform.

Electric power will be generated as three-phase, 40-cycle current at 6,000 volts and the transmission line will be in duplicate from the supply station. The furnace switch house is of reinforced concrete, 25 by 25 feet, located adjacent to the furnace room and contains 11 panels of high-tension feed and switch gear. Access to this building is direct from the furnace platform as well as from the floor level. The transformers serving the cranes, auxiliary motors, and the lighting service are also located in this building. The current supply to the furnace is regulated automatically, which prevents the heavy fluctuations that would otherwise take place. The tilting is done by electric power.

A track runs down the center of the shop, and pig iron, scrap, and other heavy raw materials are unloaded from the cars by crane service and an electromagnet. Other such materials as lime, sand, dolomite, and magnesite will be delivered into the bay that parallels the furnace platform.

The furnace room is served with a 15-ton electric traveling crane, with an auxiliary hoist of five tons capacity. A 20-ton track scale is provided for the convenient weighing of heavy materials, including ladles with molten material. A 300-pound electrically driven hammer has been installed for testing samples of steel, while the main body is still in a molten state. The latter may also be used for work on furnace tools. A blacksmith shop and a few miscellaneous tools complete the mechanical equipment. The samples of steel are sent direct from the furnace platform to the sample driller, who passes the drillings through to the chemists in the laboratory for analysis.

The operation of this plant is expected to produce especially economical results. The melting loss from cold charges is not to exceed five per cent and the yield on ingots into billets is to exceed 92.5 per cent.

The important improvements claimed in the Stobie furnace over other types are enumerated as follows: Electrode hoists, controllers, and instruments are isolated from the heat and dust of the furnace. They may be placed in any convenient position in the furnace room or in a separate room if desired. Any electrode with its holder and connections can be removed from the furnace and replaced in a few minutes without the necessity of workmen mounting to the top of the furnace. This feature prevents shutdowns due to electrode faults. The furnaces are also supplied with an oil or gas burner for the purpose of burning in the lining, heating up the furnace after a shutdown, and for preheating steel, thus effecting a saving in the cost of current. The plant will be in full operation in February, 1914.

The above description of this interesting plant was prepared by United States Commercial Agent F. G. Bolles for Daily Consular and Trade Reports.

New Electrical and Mechanical Appliances

The Lyhne Floor Lamp.

There is frequent demand for a pedestal or floor lamp which may be placed adjacent to a reclining or easy chair so as to make reading, knitting or similar occupation comfortable at leisure hours. This demand has been met by the Beers Sales Company, 1005 Broad Street, Bridgeport, Conn., which has recently placed on the market the Lyhne floor lamp. This lamp is an adaptation of the well known Lyhne portable lamp which has come into extensive use for desk, table and piano lighting. Like the latter, it has an adjustable reflector and an adjustable shade so that the light may be directed in any desired direction and confined thereto. The present floor lamp has a telescopically adjustable standard, by means of which the height of the lamp can be changed from 36 to 65 inches. The base of the stand is massive, so as to prevent tipping over the outfit; its diameter is 8.5 inches. The reflector is of the parabolic type, and the shade is opaque. This type of lamp has been found serviceable also for use by dentists, draftsmen, musicians, etc.

Lyhne Floor Lamp.

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High-Pressure Electric Pumping Equipment for the City of Boston, Mass.

The Westinghouse Electric & Manufacturing Company has entered into a contract with the City of Boston, Mass., for all the machinery and equipment for a central high-pressure fire pumping station. This contract includes six 3,000-gallon-per-minute six-stage centrifugal pumps; six 700-horsepower, 6,000-volt, 60-cycle motors; six 800-horsepower, 13,200-volt, 25-cycle motors; also the complete switchboard and controlling apparatus, the necessary traveling cranes, and all heavy piping and large valves for the complete equipment of the pumping station.

Each pump will be connected by a magnetic coupling on one end to a 700-horsepower, 60-cycle motor and at the other end to an 800-horsepower, 25-cycle motor. Under normal operation each pump is driven by its 60-cycle motor furnished with current from the lines of the Edison Electric Illuminating Company of Boston.

However, should in any case a mishap occur to the 60-cycle supply, the pump can be instantly operated by its 25-cycle motor fed from the lines of the Boston Elevated Railroad Company. The increased size of the 25-cycle motor is due to its speed being 732 revolutions per minute, while that of the 60-cycle motor is 702 revolutions, these speeds of course being determined by the respective frequencies of the circuits.

The motors have wound secondaries, and they do not start until the first point of the automatic controller has been passed. At this point the circuit of the magnetic clutch between the motor and the pump is completed. The 800-horsepower motors will be the highest voltage wound-secondary motors ever built—13,200 volts being the potential for which it is designed. The high-pressure station is to be located between the Boston Commons and the Public Gardens.

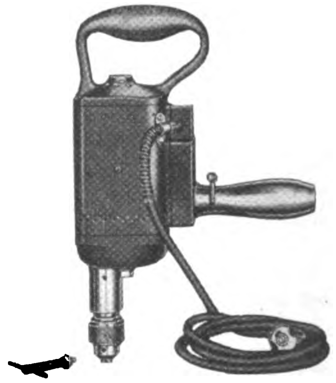
The business district is to be underlaid with special high-pressure water mains to be used for fire service only, and in case of fire within this district, the alarm is sounded in the pumping station, and in the fire houses simultaneously. This permits the electrically operated pumps being started at once, and the pressure raised in not more than 45 seconds, to 300 pounds per square inch all over the system of high-pressure mains. Upon arrival of the fire hose at the point of the fire, the hose can be connected directly to the special high-pressure hydrants, and water taken directly from the mains at sufficient pressure to render the use of steam fire engines unnecessary.

This is a system which is rapidly coming into favor in congested business districts, as it gives increased protection for high buildings and makes it entirely unnecessary to run through the dense traffic of such districts with heavy engines.

Willey Single-Phase Portable Drill.

Many drilling operations cannot, or at least cannot conveniently, be performed by bringing the work to the tool; therefore tools have been developed which can be brought to the work. Along the line of such portable tools, the James Clark, Jr., Electric Company, of Louisville, Ky., has been directing much attention in recent years and has orginated and developed an extensive line of electrically driven portable semiportable and stationary tools on the Willey designs. Among these tools are drills, reamers, grinders and buffers.

In the accompanying illustration is shown a portable electric drill designed particularly for use on single-phase alternating current; it can also be used on direct current as well. This tool is of light and compact construction, but is so built as to be able to withstand all of the hard knocks attendant on such service. The thumb switch is so located in the handle as to be very convenient for the operator to start and stop the drill without appreciable effort; moreover, he can work with the tool from either the side or the end. These portable drills are made in many different sizes and types.



Willey Portable Drill.

As soon as the operator becomes accustomed to a power-driven drill, he is soon enabled to do about ten times as much work as a man operating a hand-driven drill. The latter has not only to operate the drill, but must also direct it. This causes much unnecessary breakage of drills. The electrically driven drill, on the other hand, needs merely to be directed, and therefore results in a very large saving of time.

labor and cost in drill renewals, etc.

The drill shown is designed for 110 volts. Slightly larger drills are made for 110 and for 220 volts. The maximum horsepower of the motor in the type illustrated is one-eighth horsepower, and the approximate spindle speed is 1,000 revolutions per minute. The weight of the machine, including the chuck, is six pounds; its total length 11 inches. The motor frame is three by three inches. An interesting feature of the drill is that the spindle is offset $\frac{11}{16}$ of an inch. This feature is valuable in making the drills serviceable in many places, such as corners, where a central spindle would limit its use. The drill shown can be used for holes up to three-eighths of an inch in hard wood, or up to one-quarter inch in metal. It is provided with a durable flexible cord and attachment plug and can be connected to any convenient lamp socket or receptacle. The drill is entirely self-contained and is ready to run when unpacked and connected.

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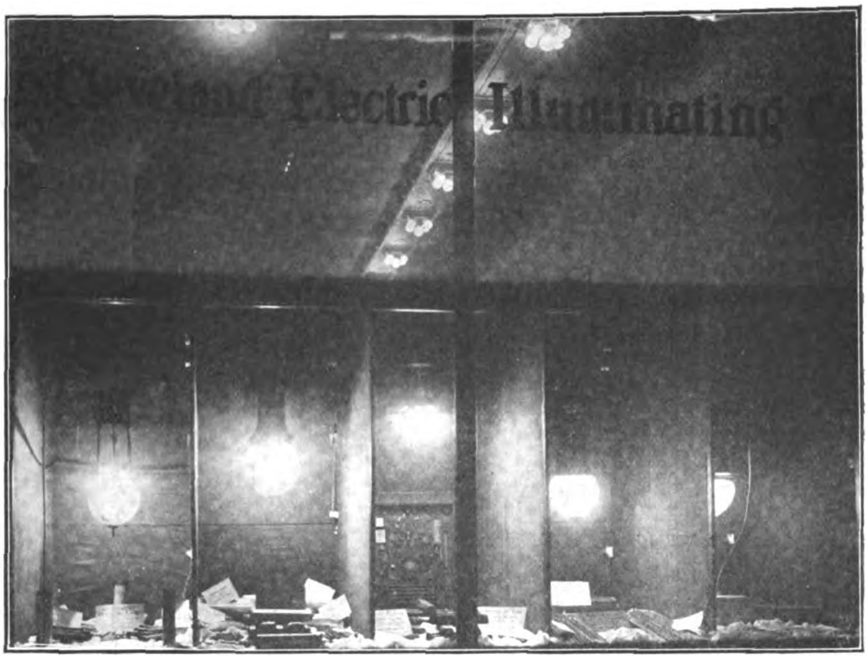


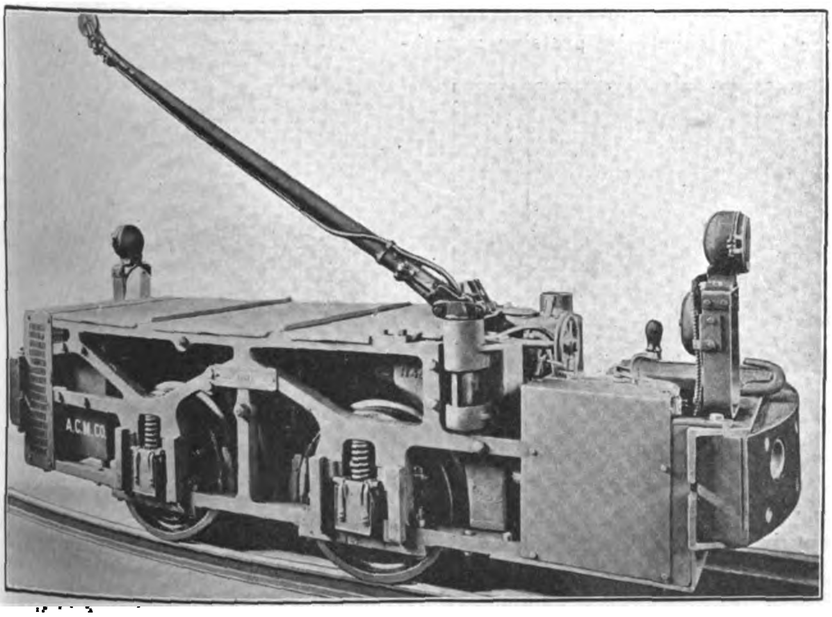
Historical Exhibit of Arc Lamps.

Anaconda Electric Mining Locomotives.

The Anaconda Copper Mining Company, Butte, Mont., has recently ordered 17 3.5 and 4-ton electric locomotives for underground haulage. The locomotives will be of the open bar-steel frame type of construction, each equipped with two 11-horsepower commutating-pole motors representing the latest advance in mining locomotives for narrow-gauge haulage. The Anaconda Company and its subsidiaries probably use more locomotives underground than any other metal mining company in the United States. This company has in the past preferred the standard steel-plate construction of locomotive, sometimes referred to as the armor-plate design. However, about a year and a half ago one of the associate companies purchased, somewhat in the nature of an experiment, three open-frame bar-steel mine locomotives.

These machines have been in constant service ever since they were installed, not requiring any mechanical or electrical repairs with the exception of the renewal of the brake shoes.

On the strength of this performance, the Anaconda Copper Mining Company decided last summer to purchase five four-ton bar-steel frame locomotives with commutating-pole motor equipment for certain surface haulage, and the operators found this type of construction so satisfactory that this type of construction was specified on the recent order referred to.



Baldwin-Westinghouse Locomotive for Anaconda Copper Mines.

Progress in Arc Lighting and Lighting Carbons.

A public exhibit of more than passing interest has been shown recently by the National Carbon Company at the show rooms of the Cleveland Electric Illuminating Company, in Cleveland, O. The progress of arc lighting and arc-lamp carbons is brought out in an interesting manner. The accompanying photograph shows the arrangement of the lamps and carbons.

The open arc lamp on exhibition is of the type invented by Charles F. Brush, of Cleveland. This lamp is one of the first commercial arc lamps to be used in this country. The first demonstration of arc lamps for which the current was furnished by mechanical means, was held in the Public Square in the city of Cleveland in the summer of 1876, and afterwards in the fall of the same year, the apparatus was set up at the Centennial Exposition at Philadelphia. The exhibition in Cleveland was extensively advertised in the newspapers, and on the evening it took place there were thousands of people assembled, nearly everyone carrying pieces of smoked or colored glass to protect the eyes from rays expected to rival those of the sun.

The following general classification of arc lamps can be made in the order of their development: (1) the open arc lamp; (2) the inclosed arc lamp, including the miniature or intensified arc; (3) the inclined-trim flaming-arc lamp; (4) the long-burning vertical-trim flaming-arc lamp. The first two types of lamps mentioned burn electrodes of pure carbon and are often called pure-carbon arc lamps. The light from the pure-carbon arc comes almost entirely from the incandescent points of the carbons, but very little coming from the arc stream itself. In distinction we have what is known as the flaming arc. Electrodes of this class contain chemical compounds which vaporize in the arc and give their characteristic color to the light. There are two general types of these electrodes, the cored and the solid impregnated electrode. In the former type the flaming material is placed in the core, while in the latter type the flaming material is incorporated in the carbon body. The light and color-giving materials used are essentially the same in either case, although the service demands that they be used in different amounts and relations to each other. The greatest part of the light from the flaming arc comes from the arc stream itself, rather than from the carbon tips as in the pure carbon arc.

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Testing Air-Break High-Tension Switches Under Ice Conditions.

To check the series of tests conducted last winter as to the effect of ice formations on pole-top switches, the Delta-Star Electric Company, Chicago, Ill., has mounted switches on its factory roof and is continuing the series of tests.

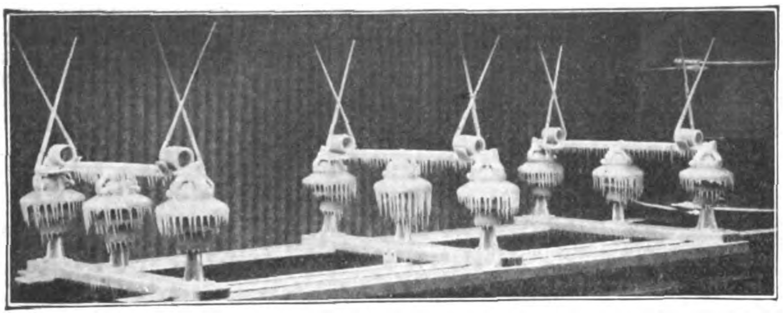
Fig. 1—33,000-Volt Switch Undergoing Ice Test.

Fig. 1 shows a 33,000-volt three-pole switch in closed position after being subjected to a heavy spray of water for several hours. Fig. 2 shows the same switch in open position.

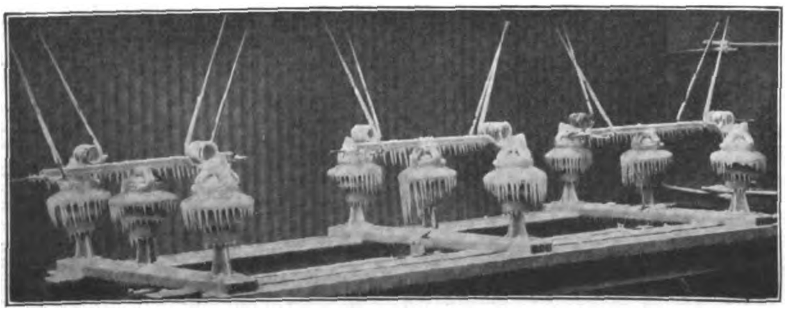
Fig. 2—Same Switch Opened Despite Ice.

The fact that these heavy ice formations did not prevent operation of the switch is most interesting, showing as it does the progress made in commercial forms of pole-top switches. As transmission systems increase, the importance of having switching devices whose operation cannot be affected by severe winter conditions is beginning to be appreciated by operating engineers. The series of Delta-Star tests, of which this is but one, form an interesting chapter in the history of outdoor substation developments.

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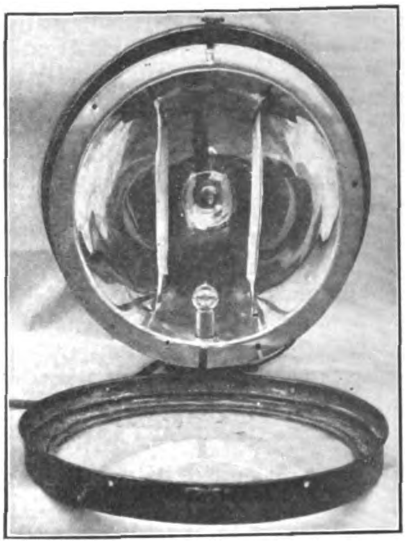
Nodaz—A Headlight Glare Reducer.

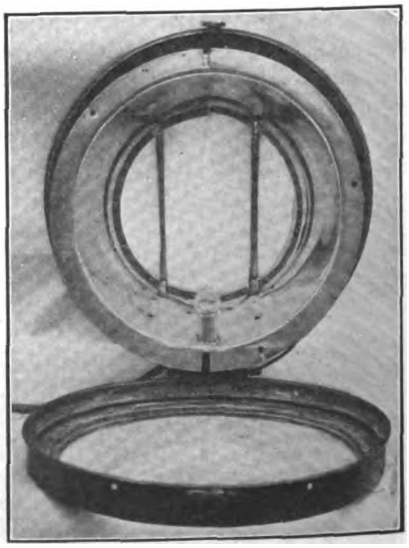
One of the most ingenious of the automobile accessories recently exhibited at the New York Automobile Show was the Nodaz lamp manufactured by the Ward Leonard Electric Company, Bronxville, N. Y. This lamp is a device invented by H. Ward Leonard, which satisfactorily meets the conflicting demands of the motor-car drivers and city authorities in regard to headlights. The illustrations shown herewith indicate the general design of the apparatus. It consists of two pairs of translucent wings mounted on pivots or bearings fastened in the headlight reflector. These wings are made to open and close by electromagnets situated inside the cover of the lamp itself.

When running in the city, where it is necessary to use reduced light in the headlights and avoid glare, the wings are closed simply by pressing a push-button conveniently situated on the dash, or other part of the car. When the wings are closed there is no glare, but the road near the car is flooded with strong, diffused light, a fact which makes the Nodaz device particularly valuable when rounding sharp curves. At any moment when it is desired to use the full illumination of the lamp it is only necessary to push another button which opens the wings, and the concentrated searchlight beam is at once available.

When in the folded or open position, the wings do not perceptibly affect the light given off by the lamps, as they are very thin and are so placed that when folded they do not appreciably obstruct the rays of the headlights.


Nodaz Lamp with Vanes Open.

The elctromagnetic control is extremely convenient, and it takes only a small current from the battery just at the moment when the wings are either opening or closing. That is, there is no continuous drain on the battery, and the power required for operating the electromagnet is less than half that required by the average electric horn.


Nodaz Lamp with Vanes Closed.

A great advantage of the Nodaz device is that it may be attached to practically any headlight now in use at small cost, and requires no knowledge of electricity to assure its constant use.

The Mazda Show-Case Lamp and Reflector.

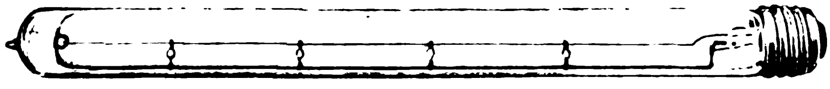
One of the most interesting developments in incandescent lighting is the Mazda show-case lamp, an illustration of which is shown herewith. There is always a demand for an efficient show-case lighting unit and there has been a very consistent demand for a long lamp unit which could be operated on multiple circuits. Considerable difficulty has been experienced in mounting the length of filament necessary for a 100 to 130-volt lamp without sagging or short-circuiting. In this case the new type of concentrated filament afforded a very satisfactory solution, since with this style of filament the over-all length can be greatly reduced. The mounting of the filament consists of a piece of iron wire lying against the glass and running lengthwise in the bulb. At intervals along the length of the filament are supports attached to but insulated from the iron wire. The iron wire forms the return circuit. The new lamp is one inch in diameter and 13 inches in over-all length. It has a medium sized screw base, so that it fits into an ordinary lamp socket. The lamp is made both in 25 and 40-watt sizes.

A special reflector has been designed to go with this lamp, the complete unit giving a measure of satisfaction that approaches very nearly to perfection.

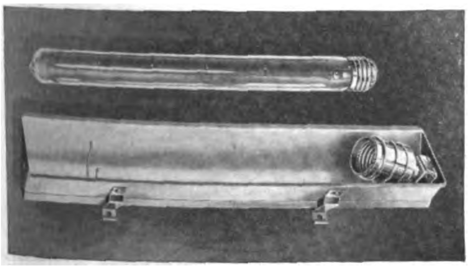
The reflector when in position in the upper front angle of a show case, occupies a space 14 inches long, 2.5 inches wide and 2 inches deep. It has a new interior finish of what is known as Cleanezy aluminum, giving it a very efficient reflecting surface. The design of the reflector is such as to present a neat appearance, give an effective distribution of the light and to shield the eye from the high brilliancy of the filament.

The new unit can be readily installed by raising the top of the show case, supporting the reflector from the upper edge of the upright glass front by means of two brass brackets, then replacing the upper glass plate. The brass brackets just fit the thickness of plate glass ordinarily used in show cases. By mounting the lamp socket on a hinge, removal or insertion of the lamp is readily provided for even when the reflector is in place. To prevent the lamp from swinging out from its proper position in the reflector, it is rigidly held by a wire clasp situated on the reflector near the tip of the lamp. A row of these reflectors can be used along the upper front edge of the show case close enough together so that no open gaps are left; if desired, however, the units may be placed at intervals along the case. If the reflectors are placed close together a sliding brass molding on the back of the reflector protects and conceals all the wire. If the units are placed at intervals, short lengths of round brass tubing may be used to conceal the wire between the units.

This new unit is being placed on the market by the Holophane Works of General Electric Company, Cleveland, O.



New Tubular Mazda Lamp for Show Cases.



Trough Reflector for Tubular Show-Case Lamp.

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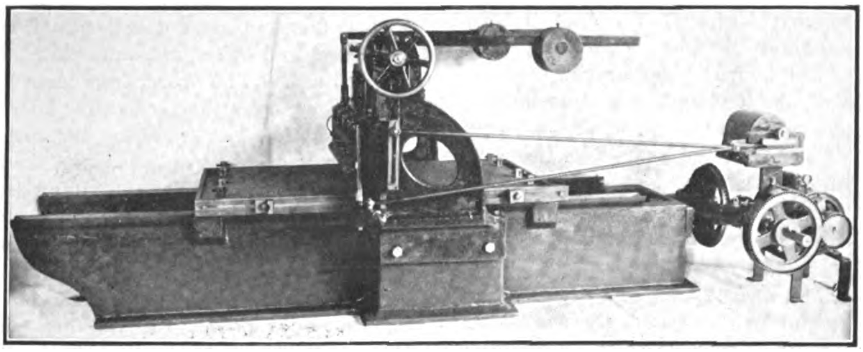
Westinghouse Employees Organized.

The American Federation of Labor began on January 26 an organization campaign among the 12,000 employees of the Westinghouse Electric & Manufacturing Company, following a reduction in working hours from 9.5 to 8 hours, with a corresponding cut in wages. Mass meetings were held every night during the week. The company is making no effort to check the union movement, which has resulted in the organization of an independent union with 9,000 members. Employees of other Westinghouse shops will join.

Motor-Driven Lithographic-Stone Planer.

The illustration herewith shows the Litho stone planer manufactured by the Fuchs & Lang Manufacturing Company and driven by a Diehl motor. This machine planes lithographers' stones absolutely true. It works automatically and when started requires no further attention. The drive, which was designed by the Diehl Manufacturing Company, was devised to overcome a serious objection, this being the use of the ordinary flat-bed stone planer with the double belting from overhead shaft, and consequent noise when the belt is shifted at each reversal of the planer bed. These difficulties have been overcome with the installation of a commutating-pole, reversible motor, operated by a self-starter and reversing switch, the latter controlled by a rod attached to the bed of the machine. Motor operates at approximately one and three-fourths times as fast in the reverse direction when not cutting as in the forward direction when cutting. The power transmission is from motor to machine by rawhide pinion and cast iron gear and thence through worm drive, this feature making it unnecessary to use a dynamic brake for quick stopping.



Motor-Driven Lithographic-Stone Planer.

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"Exide" Dinner.

The Electric Storage Battery Company gave its annual "Exide" dinner to the electric vehicle manufacturers, dealers and "Exide" distributors, on Wednesday evening, January 28, at the Mid Day Club in Chicago, in accordance with its custom for the past six years.

Herbert Lloyd, the president and general manager of the company, presided. In accordance with the custom of this dinner there were no speeches, the guests being entertained with an attractive and spirited vaudeville and cabaret show, which was thoroughly enjoyed by the 250 guests present. The guests of the company included prominent officials of the Baker, Rauch and Lang, Chicago Electric, Borland-Grannis, Ohio Electric, Broc, Waverley, Walker, Argo and General Vehicle Companies.

Electric Automatic Railway Signaling System Used in England.

Considerable attention has been directed to a system of automatic signaling that has been successfully tested by the Great Western Railway. Although this device has been experimentally used on a short branch line for some few years, its installation on a larger scale has only recently received public attention.

The Great Western Railway Company possesses a larger mileage than any other railroad in the United Kingdom, the total length at the close of 1912 exceeding 3,000 miles, or, including sidings, 6,853 miles in equivalent of single track. The total train mileage worked during 1912 was 49,831,504, of which passenger trains accounted for 30,191,356 and freight and minerals traffic for 19,640,148.

The audible cab-signaling apparatus was first installed on the Henley branch in 1906 (6 ramps); this was followed later by its adoption on the Fairford branch (14 ramps); the main line from London to Reading (190 ramps); and the Lambourn Valley branch (4 ramps). In all, about 140 miles of main-line track have been fitted with the apparatus. The question of installing the invention throughout the entire system is under consideration, and it is not improbable that other companies may adopt the system.

The following is a slightly condensed description furnished by the general manager, Great Western Railway.

The apparatus consists essentially of a switch at the signal cabin, a ramp fixed in the center of the running rails, a shoe, a switch operated by the shoe, an electromagnet, an automatic steam switch, a polarized relay, a bell, a whistle or siren, a push, a resetting lever, and a four-volt accumulator on the engine.

The switch at the signal cabin is for connecting a battery to the ramp when the "all right" signal is to be given. Eighteen sac cells are used. The ramp is fixed in the center of the running rails, but not parallel thereto, being staggered three inches out of center at each end. This is to insure an even wear of the shoe. The ramps now used on main line are 39 feet long; some of the earlier ones are 60 feet. The shoe in its normal position is 2.5 inches above rail level, and in passing over a ramp which is four inches above rail level is lifted 15 inches, which interrupts the electromagnet circuit by means of the shoe switch. Providing no current is received through the ramp from the signal box, the armature of the electromagnet drops and opens the whistle valve or siren and vacuum-brake valve, whichever is provided on the engine.

Normally the electromagnet is in a closed circuit, the armature of which forms a lever which controls the whistle valve or siren and vacuum valve. The electromagnet has been constructed so as to hold its armature for maximum boiler pressure. The automatic steam switch is in the closed circuit of its electromagnet and is retained automatically by steam pressure until the pressure becomes less than 40 pounds. This device is to save battery power while the engine is not in running order.

The polarized relay has two armatures; when the "all-right" signal is given, a negative current to ramp is picked up that deflects the armatures to the right and completes two circuits; one rings the bell and the other bridges the shoe switch, thereby retaining the permanent current through the electromagnet and thus suppressing the danger signal.

The push is used to stop the bell ringing. The push returns the bell armature of the polarized relay to its normal position after a bell signal has been received, this disconnecting the bell circuit. The resetting lever is used to restore the armature of the electromagnet, which closes the valve of whistle or valve of vacuum brake and siren after the danger signal has been received. The accumulator is in the closed circuit, energizing the electromagnet to hold up the armature against the poles. This accumulator also provides power for the bell circuit.

On single lines the distant signals generally are fixed at danger and the ramp in these cases is not normally energized, the danger signal being received on the engine when the shoe passed over the dead ramp. In the case of an uptrain passing over the ramp of a down distant signal, and vice versa, the driver receives no signal at all. This is accomplished by connecting a positive or neutralizing current to a down distant ramp when an uptrain is in the section, or to an up distant ramp when a downtrain is in the section.

Where the electric tablet system is in use the neutralizing current is connected to the ramp by a contact in the tablet instrument brought into operation when the tablet slide is fully drawn out. Thus when a tablet is out for an uptrain from station A to B, A's down distant ramp receives a positive current. When the engine passes over the ramp the armatures of the polarized relay on the engine are deflected to the left, which does not close the bell circuit but bridges the shoe switch retaining the closed circuit through the electromagnet, the armature of which consequently is not dropped and the whistle valve remains closed.

Where the electric train staff system is in use the neutralizing current is connected to the ramp by means of a contact on a lever interlocked with the electric train staff instrument. This lever must be reversed for a staff to be withdrawn, and if, for instance, a staff is drawn at station A for an uptrain, the lever having previously been reversed, A's down distant ramp is neutralized by the contact operated by this lever.

In case of the failure of battery at signal box, or if the switch at signal box is not properly closed, or if there is a breakage of line wire, the enginemen would receive the danger signal when passing over the ramp, as no current would be received, and the shoe switch would not be bridged. The closed circuit would be interrupted by the raising of the shoe, allowing the armature of electromagnet to drop, thus opening the valve of whistle or vacuum and siren. The failure of the accumulator on engine or a disconnection or short-circuit in electromagnet coils would immediately release the armature on electromagnet and give danger signal. In case of the shoe sticking up, the closed circuit would be interrupted and the danger signal would be given.

Electric Drive for Rail Mills.

The United States Steel Corporation is building a new plant near Duluth, Minn., which will be known as the Minnesota Steel Company plant. It will produce rails and structural material in large quantities. It has been decided to install electric drive in this mill.

Eight stands of rolls attached to a 28-inch rail mill will be operated by a motor of 6,000 horsepower. It will have a bedplate 28 feet long by 22 feet wide, weighing 105,000 pounds. The motor itself weighs 235.5 tons. This motor is now completed and a second one of 3,000 horsepower is now undergoing construction. It will be direct-connected to three stands of rolls of a 12-inch merchant mill. In addition it will drive nine stands of rolls of a 16-inch mill by means of a drive of ropes and beveled gears. The motors are of Westinghouse make.

Westinghouse Foremen's Association.

Most of the officers of the Westinghouse Electric & Manufacturing Company attended the twelfth annual banquet of the Westinghouse Foremen's Association at the Fort Pitt Hotel on January 24. A. M. Allison was toastmaster. The speechmaking was informal. The officers elected for the year are: G. W. Jones, president; Charles Champlain, vice-president; W. Langhorst, treasurer; P. J. Shiring, secretary; H. Bowen and A. M. Allison, directors.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

JACKSON, TENN.—This place has decided on the issuance of $25,000 electric light bonds.

PILOT MOUND, IOWA.—It has been decided to establish a municipal lighting plant here. C.

PORTLAND, N. D.—A municipal light plant is proposed. Address P. M. Paulson for information.

LA CENTER, KY.—The City is planning to construct an electric light plant here. Address the city clerk.

KEARNEY, NEB.—The Council is planing ways and means to establish a $12,000 municipal light plant.

RED OAK, IOWA.—About 75 additional electroliers will be installed. The Commercial Club is interested. C.

BLOOMINGTON, NEB. — Bonds for an electric light plant, amounting to $8,500 have been decided upon.

VERMILLION, KANS.—This town is planning to establish an electric light plant here. Address the town clerk.

MOORE, MONT.—The Moore Empire, a weekly paper, has started an agitation for a street lighting system. C.

RICHMOND, IND.—The Council is planning to secure municipal lighting. Address Mayor Robbins for particulars.

LOWELL, WIS.—W. F. Pease of this place is promoting the establishment of an electric light plant here and at Reeseville. C.

GUELPH, N. D.—Plans are being considered for an electric light plant. Mr. Schwarting is back of the movement. C.

HARDIN, MONT.—J. W. Johnson and A. L. Mitchell are working in the interest of the proposed electric light plant. C.

WESTBROOK, MINN.—The Commercial Club is considering the erection of an electric light and power plant. C.

BALDWIN, WIS.—The Baldwin Electric Company will install a generator, build a power line and furnish 24-hour service. C.

ST. CLOUD, MINN.—Leon Wiley will erect a power plant at Oak Park to furnish light and power for that village. C.

OVERTON, NEB.—The Council is planning ways and means to establish a $5,000 lighting system. Address the city clerk.

ROGERS CITY, MICH.—Rogers City Electric Light & Power Company, has been incorporated with a capital of $10,000.

ELDON, MO.—The Eldon Light & Power Company is planning to construct a street lighting system here consisting of 100 lamps.

CALGARY, ALTA.—About $1,000,000 will be spent on the Calgary Power Company's plant at Kananaskis within the next year. C.

MALTA, ILL.—A committee has been appointed to look up a lighting system for Malta. Address the city clerk for particulars.

GEORGETOWN, MINN.—The Farmers Elevator Company is considering putting in an electric light plant and furnishing the town with lights. C.

RED LAKE FALLS, MINN.—E. F. Wheeler is preparing plans and securing data as to the cost of constructing an electric lighting system here.

NEW CONCORD, O.—The New Concord Water & Electric Company, will issue bonds to be used in improvements. Address the secretary.

CANTON, MINN. — Root River Power Company is desirous of furnishing this town with electric lights and a line may be built from Harmony. C.

GREENACRES, WASH. — Greenacres Light & Power Company has been incorporated, capitalized at $3,000, by G. L. Wheeler and E. O. Stauke.

PAWNEE CITY, NEB.—Money is being raised for the installation of an electrolier lighting system here. Address the city clerk for information.

GOWER, MO.—The Gower Light & Power Company, has been incorporated with a capital stock of $10,000 by Curtis Poe, Allen Groom and others.

CATASAUQUA, PA.—Plans are being prepared for a new lighting system to be constructed here. Address the borough clerk.

BARSTOW, CAL.—The distributing system of the Southern Sierra Power Company is to be extended at once to cover the entire city.

SUMAS, WASH.—The Sumas Electric Company will rebuild one line of its system in this city at once, following an order issued by the Public Service Commission. O.

ST. JOSEPH, MO.—The city is planning to extend the arc-lamp circuits and will purchase about 2,500 pounds No. 8 weather-proof wire. Address A. L. Utz, superintendent.

MEDICINE HAT, ALTA.—The bylaw for the extensions to the power plant calling for $150,000 has been passed. H. Baker is clerk and A. K. Grimer, engineer. C.

LOUISVILLE, KY.—Crutcher & Starke, clothiers, have leased the entire Equitable Building and will remodel it, the changes involving the installation of two electric elevators. G.

HERINGTON, KANS.—A bond issue of $49,000 has been voted for electric lights and waterworks. Benham Engineering Company, Oklahoma, Okla., has been retained as engineer. C.

WINNIPEG, MAN.—A by-law has been submitted providing for $1,000,000 for extensions and improvements to the hydroelectrical works and system of the city. C. J. Brown is city clerk. C.

PADUCAH, KY.—The Board of Public Works has asked for an appropriation of $16,500 for the construction of an electric light plant here. Address the Clerk of the Board of Public Works.

MELBOURNE, FLA.—An election will be held sometime in February to vote on the question of issuing $5,000 in bonds to construct an electric light plant. Address the town clerk for desired data.

MOUNTAIN HOME, IDAHO. — The Idaho Power & Light Company will soon begin work on a hydroelectric plant on the Malad River to have a total capacity of 15,000 horsepower. C.

MILWAUKEE, WIS.—The Council is asking for bids for a street-lighting survey by a firm of engineers, with a view to establishing an efficient modern lighting system. C. Corcoran is president. C.

NEW ULM, MINN.—J. F. Deuar, of the Oscar Claussen Engineering Company, Commercial Building, St. Paul, has about completed plans for modernizing the electric light plant here. C.

ELIZABETH, N. J.—The Broad Street Improvement Association has requested the City Council to install additional lights on Broad Street, to form a "White Way" of the main thoroughfare. A.

PORTLAND, ORE.—The City Commission has rejected all bids submitted for the installation of a new lighting system in the city hall, and Purchasing Agent Wood will re-advertise for bids at once. O.

LITTLE ROCK, IOWA.—Owing to the town being bonded to the limit for waterworks the citizens at a massmeeting subscribed $9,000 for an electric light plant. Address the town clerk for information.

BELLINGHAM, WASH.—J. P. De Mattos, mayor of this city, is investigating the cost of generating and distributing current and power with a view to establishing a municipal light and power plant. O.

OTTAWA, ILL.—A resolution was presented to the Council for the investigation of the cost of installing an electric plant at the pumping station for the purpose of lighting the city. Address the city clerk.

ARMOUR, S. D.—It has been suggested to build a dam on the Mississippi River at that point where Brule and Charles Mix counties join and create 25,000 horsepower of electricity to supply Sioux Falls. C.

VERGENNES, VT.—This city is considering the project of constructing a water filtration plant and a hydroelectric power plant to provide energy for the same and for street and other municipal lighting. W.

WARREN, MINN.—Earl D. Jackson, consulting engineer, St. Paul, has been employed to make plans and estimates of cost of improvements in the electric light and waterworks plant. Rasmus Hage is city recorder. C.

SACRAMENTO, CAL.—The Pitt River Power Company has been granted right of way by the Secretary of Agriculture for a power line approximately five miles long in the Shasta National Forest.

TROY, IND.—The town of Troy is to have an electric light plant. The Town Board has granted a franchise to DeHaven and McIntyre, of Hardinsburg, Ky., to install a plant for street and house illumination.

VANCOUVER, WASH.—The Pacific Power & Light Company recently filed a mortgage for $30,000,000 to United States Mortgage & Trust Company, New York City. It is understood that extensive improvements will be made. O.

COLUMBIA, TENN.—Dr. Otey J. Porter, secretary and general superintendent of the Citizens Telephone Company, has purchased a site to be used for a new addition to the present plant. Plans will be prepared at once and contracts let.

EUGENE, ORE.—The Oregon Power Company, A. Norman, local manager, contemplates increasing the capacity of its hydroelectric power plant in Albany, and the first step of the several improvements will be made early in the spring. About $10,000 will be spent immediately.

CITY OF MEXICO, MEX.— Antonio Villa Ahiji and Faustino E. Moranda have applied to the federal government for a concession for the use of the waters of the Rio Blanco and the Los Xuxchites waterfall, in the state of Vera Cruz, to develop electrical energy. D.

BANNING, CAL.—The Coachella Ice & Electric Company, and the Holton Power Company purpose jointly to spend $281,655 in carrying power from Banning to El Centro through the Coachella Valley. The distributing system in Coachella alone will cost $58,000. T.

KASLO, B. C.—This city has practically completed negotiations for the purchase of the electric light and power plant owned by the Kootenai Electric Company in this city. Extensive improvements and additions are planned. Address Mayor D. C. McGregor for information. O.

ORANGE, N. J.—The Common Council is considering the extension of the municipal electric lighting plant and system, at a cost of about $13,000, being based upon estimates formerly prepared by Chief Engineer Henry Berg. The improvement is estimated to effect a saving of about $1,500 per year. A.

DODGEVILLE, WIS.—Failure of the Dodgeville Electric Light Company to comply with orders of the Railroad Commission for improving service resulted in a supplementary order directing the overhauling of the entire system and the immediate employment of an engineer to take charge of the plant.

WEST SALEM, WIS.—The State Railroad Commission has ordered improvements to the Neshonoc plant and that the company shall submit plans to the Commission for a hydroelectric power and light plant to be built at the site of the present one in such a manner as to allow for additional units to be installed. C.

VAN NUYS, CAL.—Work on the final stretch of the San Fernando ornamental lighting system will start in the very near future. This stretch will include South Sherman Way and the state highway. B. F. Kierulff, Jr., & Company, are doing the work. When complete this system will be 25 miles in length. T.

ARTESIA, N. M.—It is proposed to construct an electric generating plant at the falls of the Penasco River between Elk and Lower Penasco to furnish power for the proposed Cloudcroft-Artesia interurban line being promoted by the General Electric Company of Kansas City, Mo. The water power is owned by Vernon L. Sullivan. D.

CITY OF MEXICO, MEX.—The Federal Government has received the following applications for water-right concessions to develop electric energy: Maria Guadalupe A. de Garcia, for the waters of the Rio de la San Jeronimo, state of Jalisco, to develop water power; and Jose Julian Mandez, for the waters of the Rio de San Jeronimo, state of Jalisco. D.

OMAK, WASH.—The installation of electric power stations on the Okanogan River, and an immense pumping plant just north of this city, to furnish an auxiliary supply of water for the orchards in the Robinson Flat section of the Okanogan Irrigation project, have been ordered by the Federal authorities and sufficient funds have been set aside to pay for the work, according to Project Manager Calvin Casteel, of this city.

VICTORIA, B. C.—The Stamp Falls Power Company has been incorporated with a capital stock of $150,000. Among its objects are to acquire the rights of the Ritchie Agnew Power Company in the Alberta district, an option to purchase all the interests of the British Columbia Hydraulic Power Company, including its water rights on Nanaimo River and the company's 40-year franchise for electric lights and power in Nanaimo.

POINT GREY, B. C.—DuCane-Dutcher Company, consulting engineers, this city, have completed a preliminary report covering the proposed power and light plant to cost $240,000. A hydroelectric plant and substation, also recommendations for a steam turbine plant, oil-fire boilers, the oil engines to be used for light loads, a pole-line system and a system of underground conduits is proposed. The report will be acted on by a new council, yet to be elected. South Vancouver is also considering a proposed municipal light and power plant.

TACOMA, WASH.—George H. Cecil, of the Department of Agriculture, announces that the Secretary of this department has issued a water-power permit to the Washington Railway & Electric Company, of Tacoma, authorizing this concern to use a site within the Snoqualmie National Forest for the purpose of generating hydroelectric power. The project covered by the permit involves erection of nine separate dams, water conduits and power houses. All but one of these dams will be for diversion purposes only, the exception being the storage dam. A transmission line approximately 55 miles long will be required to transport power to Everett, the nearest important market. Engineers of the Forest Service rate the capacity of the combined project at 32,600 horsepower. Construction of the first unit by the contract is required to start by June 1, 1915; the second unit must be started by January 1, 1917; and thereafter construction upon one unit annually, until the entire project is completed.

TELEPHONE AND TELEGRAPH.

(*Special Correspondence.*)

SEYMOUR, IOWA.—F. Dunn, of Milo, has purchased the Seymour Telephone Company property and will remodel the system.

STAFFORD SPRINGS, CONN.—This town is considering the installation of a modern fire-alarm telegraph system. W.

CLINTON, OKLA.—The German American Mutual Telephone Company has been incorporated by J. A. H. Werning, J. B. Thompson and others.

ODON, IND.—Flint Kyle Telephone Company has been incorporated with a capital of $10,000 by J. C. Flint, William T. Kyle and Rebecca Flint.

HICKMAN, KY.—A. W. Davis, manager of the Home Telephone Company, has completed arrangements for a new line to Cayce, a distance of ten miles from here.

GLASGOW, KY.—Barren & Monroe County Telephone Company has been incorporated with a capital of $3,500 by W. E. Taylor, C. B. Miller and L. C. Griffiths.

CHESTER, O.—The Chester Telephone Company has been incorporated with a capital of $15,000 by G. C. Quigley, C. H. Bond, H. O. Jacobs and H. S. Mills.

ATOKA, OKLA.—The Atoka Telephone Company has been incorporated with a capital of $1,000 by T. R. Williams, J. N. Roach, W. W. Betts and R. D. Lail.

SANDVILLE, W. VA.—The Citizens Telephone Company has been incorporated with a capital stock of $5,000 by S. K. Somerville, Dempsey Hawkins and others.

ASTORIA, ORE.—Representatives of the Marconi Wireless Telegraph Company were here recently negotiating for a site for the erection of a large wireless station.

CLINTON, OKLA.—German-American Mutucla Telephone Company has been incorporated with a capital of $550 by J. H. A. Werning, J. B. Thompson, W. E. Been.

BOTTINEAU, N. D.—The Turtle Mountain Farmers Telephone Company has been incorporated with a capital stock of $15,000 by John A. Frederickson and others.

HELENA, MONT.—Standard Engineering Company has petitioned for a franchise for an electric light and power plant here. H. G. Pickett, president of the Commercial Club, may be addressed.

BELVIDERE, ILL.—The Illinois Northern Utilities Company is negotiating for a site here for a plant to cost about $500,000 to be used as a central station for their system. Address the general manager.

GRASS VALLEY, CAL.—The Supervisors of Nevada County have granted permits to construct telephone lines along county roads to the Lime Kiln Grass Valley Rural Telephone Company, the American Hill Telephone Company and the Mariposa Rural Telephone Company.

MT. VERNON, WASH.—The stockholders of the Skagit Valley Rural Telephone Company, have decided to incorporate and unite several rural companies of the county into one system, and to make extensive improvements. J. H. Carlson, of this city, is president, and J. M. Shields, secretary. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

STOCKTON, CAL.—The Stockton Electric Railroad Company has been granted a franchise for the extension of its El Dorado Street line.

FOND DU LAC, WIS.—Wisconsin Southern Railway Company will build 23 miles of new track this year. Charles D. Smith is general manager. C.

BILLINGS, MONT.—Surveys for an electric railway proposed by Big Horn Canyon Irrigation & Power Company it is stated have been completed. C.

SAN ANGELO, TEX.—J. D. Sug, owner of the San Angelo Street Railway System, is contemplating the extension of the system and the erection of a power plant. D.

MANITOWOC, WIS.—Plans are being considered to increase the equipment at the Manitowoc & Northern Traction Company's power house. Thomas Higgins is manager. C.

FRESNO, CAL.—The State Railroad Commission has granted the Fresno Traction Company a certificate of public necessity and convenience to extend its line a distance of 9.5 miles.

NAPA, CAL.—The San Francisco, Napa & Calistoga Railway has been granted permission by the Railroad Commission to issue $33,000 in bonds, the bonds to be used as collateral security for notes.

KEOKUK, IOWA.—If the property owners will give the right of way the Keokuk Electric Company is planning to extend its street car lines several miles through an undeveloped territory to the new baseball grounds.

EVANSVILLE, IND.—The Evansville Public Service Company is considering extending its Bell Street line to Woodmere, the Northeast Side Development Club having agreed to pay part of the expense of construction. G.

TACOMA, WASH.—An ordinance has been passed authorizing the issuance of $75,000 in utility bonds for the construction and equipment of a municipal car line to extend from the business section of the city to the tide flats.

CHARLES CITY, IOWA. — Work will begin soon on preliminary plans for the electric road to Creso. A. L. Dodd, manager of the electric light plant, and A. A. Ruste, chairman of the Commercial Club are interested in this proposition. C.

SAN FRANCISCO, CAL. — Engineers for the Crocker Estate Company are engaged in laying out an electric railroad tapping the holdings of the company in the South Hill district of this city. The new line will be 3.5 miles in length.

FRONTENAC, KANS.—A company has been organized here for the purpose of building an electric railroad from Frontenac to Arcadia, a distance of 15 miles. J. S. Patton is president. The company will erect plants at each end of the line to furnish power.

CHATTANOOGA, TENN.—J. W. Adams, who is promoting the East Tennessee Traction Company, which is to build five interurban lines out of Chattanooga, has completed financing the proposition, it is stated, and will be in a position to let contracts in the near future. G.

EVANSVILLE, IND.—Frank C. Gore, attorney for interests which are planning the construction of a traction line from Evansville to Chrisney, Ind., states that litigation which has delayed construction work is practically settled, and that the line will be built during 1914. G.

SAN DIEGO, CAL.—An extension of the existing franchise of the Los Angeles and San Diego Beach Railroad in order that the road may be electrified as ordered by the Railroad Commission is asked in a petition filed in the office of the clerk of this city. It is understood that much new electrical material will be used on this road. T.

EVANSVILLE, IND.—The Evansville Railways Company will build a seven-mile traction line from a point in Indiana north of Owensboro, Ky., to connect with its Evansville and Rockport line, now in operation. A substation will be erected. The cost of the work it is estimated will be $250,000. G.

MISSOULA, MONT. — Plans for electrification of the Milwaukee from Deer Lodge to Three Forks have been completed and work will begin early in the spring. It is said that the Milwaukee will build one engine district of electric line each year until the road from Harlewton to Avery is entirely equipped with electricity. A.

DALLAS, TEX.—A charter has been granted to the Dallas Northwestern Traction Company. The Company will construct and operate a line of interurban railways between Dallas and Wichita Falls. The capital stock is $500,000. The incorporators are E. P. Turner, Ben B. Cain, L. S. Thorne, John T. Witt, E. L. Sargent, R. Fenby, Otto H. Lang, S. P. Cochran and others.

MILL VALLEY, CAL.—The Marin County Electric Railway, which proposes to construct a street railway in Mill Valley with a branch from the Northwestern Pacific Depot to the Old Hill and Cascade Reservations, has applied for a certificate of public convenience and necessity and for authority to issue $50,000 in stock and $50,000 in bonds. The application is signed by B. F. Ames, as president, and W. W. Hicks, as treasurer and secretary of the company.

SEATTLE, WASH.—An ultimate expenditure of $3,000,000 for a combined elevated, surface and subway municipal street-car system for this city is proposed by William Pitt Trimble, president of the Seattle Rapid Transit Club. Councilman Max Wardall has introduced a bill in the Council appropriating $3,000 from the general fund, to be cared for in the next tax levy, to be used in defraying the expenses of a rapid-transit engineer to investigate and report the probable cost of the system. This bill for the appropriation has been referred to the Finance Committee. O.

VERNON, B. C.—Sir Donald Mann, vice-president of the Canadian Northern Railway Company, recently announced that his corporation will soon begin actual construction work on the branch railroad line from Kamloops to this city, and south into the Okanogan Valley; also that the Okanogan line will be electrified, as originally announced, which means that the Couteau Power project will be developed, and that besides cheap power for the valley, the not-distant future will witness the construction of electric railway lines radiating from Vernon to all parts of the Northern end of the Okanogan Valley. O.

FINANCIAL NOTES.

The Columbus Railway, Power & Light Company has filed notice of an increase in its capital stock from $1,000,000 to $11,550,000.

At the annual meeting of Northern Ohio Traction & Light Company, F. H. Goff, of Cleveland, was elected a director to succeed the late Louis Bielstein. Other directors and officers were reelected. Stockholders authorized the issue of $2,000,000 six-per cent preferred stock, making total authorized amount of this class of stock $5,000,000, of which $3,000,000 is outstanding. None of this new stock is to be issued now.

The Southern California Edison Company has sold to Harris, Forbes & Company, Perry, Coffin & Burr and E. H. Rollins & Sons $1,500,000 general-mortgage five-per cent bonds, due November 1, 1939. Bonds are part of an authorized issue of $30,000,000, of which, including the present block, $12,225,000 have been issued. Bonds will be offered at 95 and interest or a 5.35 per cent basis. Net earnings in 1913 were three times the annual interest charges.

The Minneapolis General Electric Company, a subsidiary of the Northern States Power Company, reports output for 1913 as 90,835,808 kilowatt-hours, an increase of 34 per cent over the output for 1912. The number of customers of the company increased 5,406 or 24.8 per cent, the power load increased 7,865 horsepower or 26.7 per cent and the lighting load increased 9,106 kilowatts or 27 per cent. The company on December 31, had 27,168 customers, with 29,433 horsepower of motors, and 29,988 kilowatts of lighting load.

The stockholders of the Galveston, Houston & Henderson Railway Company have authorized the issuance of $5,000,000 bonds, of which $2,000,000 will be used to meet outstanding obligations. The greater part of the remaining sum will be expended in improving the roadbed and bettering the system in other ways. No part of the bond issue will be used in double-tracking the line between Houston and Galveston, however, according to J. H. Hill, vice-president and general manager.

Negotiations are under way for the consolidation of the Oro Electric Corporation and the Northern California Power Company, which, if completed, will create a new electric-power factor in Northern California. Plans provide for a new corporation which, as a holding company, will take over the stocks of the operating companies, issuing its own stocks in exchange. The two corporations represent combined assets of more than $40,000,000, and operate in the same territory, largely in the Sacramento Valley and Northern California.

At the annual meeting of the Standard Underground Cable Company the stockholders unanimously approved the proposition in connection with the financing of their Canadian plant. The capitalization of the Canadian company is $1,000,000 divided into $500,000 common stock and $500,000 seven-per-cent preferred stock. The common stock will be placed in the treasury of the Pittsburgh company, and $350,000 of the preferred will be offered for subscription to holders of the parent company in proportion of one share of Canadian for each ten shares of Pittsburgh held, at $75 a share. The par value of the new Canadian preferred stock is $100 a share. The balance of $150,000 preferred stock will remain in the treasury of the new Canadian company to be utilized for future needs. It is understood that subscriptions to the new stock will not be offered until after April 1 next.

Dividends.

Boston Elevated Railway Company; a semi-annual dividend of two per cent, a reduction from six per cent to a four-per-cent annual basis. The six-per-cent rate had been in effect since 1902. In 1901, 5.75 per cent was paid; and in 1900, 4.5 per cent.

Central States Electric Corporation; initial of one per cent on common, payable February 19 to stock of record February 11.

Connecticut Power Company; the regular quarterly dividend of $1.50 a share on its preferred stock, payable March 2, to stock of record of February 17.

Twin City Rapid Transit Company; the regular quarterly dividends of 1.5 on the common and 1.75 on the preferred stocks, payable April 1 to stock of record March 14.

United Light & Railways Company, 0.75 per cent on second preferred, 1.5 per cent on first preferred, and one per cent on common, all payable April 1 to stock of record March 16.

Reports of Earnings.

MASSACHUSETTS ELECTRIC COMPANIES.

The Massachusetts Electric Companies report for the quarter ending December 31, 1913, as follows:

	1913.	1912.
Gross	$2,233,491	$2,178,723
Net	601,763	620,494
Surplus after charges	121,489	165,333
Six months' gross	5,167,436	5,000,330
Net	1,787,901	1,912,310
Surplus after charges	789,696	961,387

PHILADELPHIA RAPID TRANSIT.

	1913.	1912.
December gross	$2,141,522	$2,065,830
Net	892,661	844,300
Surplus after charges	83,999	81,660
Six months' gross	12,239,537	11,926,124
Net	4,839,349	4,796,160
Surplus after charges	307,342	278,428

AMERICAN RAILWAYS.

	1914.	1913.
December gross	$ 461,719	$ 431,492
July 1-Dec. 31	2,862,315	2,638,116

WASHINGTON RAILWAY & ELECTRIC.

The Washington Railway & Electric Company reports, for the year ended December 31, 1913, compared as follows:

	1913.	1912.
Gross	$4,953,536	$4,648,328
Net	2,283,565	2,133,337
Surplus	1,156,649	1,025,730
Dividends	847,500	685,000
Surplus	309,149	340,730

Out of surplus for year were charged to employees and depreciation and reserves, leaving a balance to profit and loss of $80,849. Profit and loss surplus, January 1, 1914, was $1,113,365.

VIRGINIA RAILWAY & POWER.

	1913.	1912.
December gross	$ 450,487	$ 417,817
Net	233,830	221,495
Surplus after charges	105,280	104,933
Six months' gross	2,619,118	2,444,010
Net	1,305,963	1,236,032
Surplus after charges	550,271	538,672

BRAZIL RAILWAY.

	1913.	1912.
November gross	$ 249,733	$ 216,269
Net	90,267	81,824
11 months' gross	2,591,600	2,356,876
Net	950,600	1,006,377

UTAH SECURITIES CORPORATION.

(Utah Power & Light and Subsidiaries.)

December gross	$ 159,866	$ 126,519
Net after taxes	96,741	67,420
Six months' gross	906,723	728,501
Net after taxes	539,599	387,438
Twelve months' gross	1,739,828	1,462,298
Net after taxes	1,035,835	793,807

MONONGAHELA VALLEY TRACTION.

	1913.	1912.
December gross	$ 87,790	$ 71,731
Net after taxes	53,524	46,539
Surplus after charges	27,350	22,085
Twelve months' gross	960,261	847,896
Net after taxes	613,549	516,369
Surplus after charges	315,501	255,592

Equivalent to 4.25 per cent on common stock after preferred dividends.

THIRD AVENUE RAILWAY.

Earnings of the Third Avenue Railway, New York City, for December and six months compare as follows:

	1913.	Increase.
December gross	$ 916,844	$ 121,549
Net after taxes	318,302	69,496
Total income	335,428	60,945
Surplus after charges	80,732	18,202
Six months' gross	5,653,864	670,622
Net after taxes	2,072,971	403,053
Total income	2,110,109	412,091
Surplus after charges	578,908	48,607

The earnings for the year ended December 31, 1913, after all charges and depreciation, totaled $970,241, equal to 5.9 per cent upon the $16,590,000 stock outstanding.

UTICA GAS & ELECTRIC.

Earnings of the Utica Gas & Electric Company for 1913, December figures partly estimated, show:

	1913.	1912.
Gross earnings	$1,205,100	$1,152,826
Net after taxes	598,112	615,754
Surplus after charges	332,112	364,535
Balance after dividends	142,112	204,535

KEYSTONE TELEGRAPH.

	1913.	1912.
December gross	$ 107,695	$ 106,480
Net after taxes	53,727	54,621
Surplus after charges	27,687	28,818
Twelve months' gross	1,265,779	1,217,429
Net after taxes	625,573	608,361
Surplus after charges	319,078	305,745

PORTLAND RAILWAY, LIGHT & POWER.

	1913.	1912.
November gross	$ 576,244	$ 570,863
Net after taxes	303,994	281,930
Surplus after charges	127,569	130,165
Twelve months' gross	6,703,123	6,611,848
*Surplus after charges	1,417,481	1,562,549

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*Equivalent to 5.7 per cent on capital stock.

NORTHERN OHIO TRACTION & LIGHT.

	1913	1912
December gross	$ 295,377	$ 259,881
Net	105,082	109,103
Surplus after charges	54,800	67,597
Twelve months gross	3,284,533	2,996,037
Net	1,264,879	1,293,271
Surplus after charges	703,063	770,203

PORTLAND RAILWAY, LIGHT & POWER.

	1913.	1912.
December gross	$ 607,476	$ 586,857
Net after taxes	331,604	308,174
Surplus after charges	156,121	156,771
Twelve months gross	6,723,742	6,642,308
Net after taxes	3,425,432	3,313,397
*Surplus after charges	1,416,831	1,552,406

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*Equivalent to 5.7 per cent on the capital stock.

BANGOR RAILWAY & ELECTRIC.

November gross	$ 65,372	$ 61,681
Net after taxes	36,668	34,313
Surplus after charges	19,314	17,074
Twelve months' gross	758,775	704,076
Net after taxes	414,170	387,398
Surplus after charges	206,599	189,597
*Balance after preferred dividends	101,599	84,597

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*Equivalent to 5.1 per cent on common stock.

AMERICAN PUBLIC UTILITIES.

(Subsidiary Companies.)

	1913.	1912.
November gross	$ 230,352	$ 212,455
Net after taxes	114,681	113,789
Twelve months' gross	2,249,707	....
Twelve months' net	996,420	....

(Holding Company.)

	November.	12 Months.
Gross income	$ 118,251	$1,078,291
Net, less expense	114,777	1,030,639
*Surplus after charges	64,547	452,477
Balance after preferred dividends	44,977	217,637

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*Including interest on underlying bonds.

DETROIT EDISON.

	1913.	1912.
December gross	$ 583,174	$ 479,300
Net	275,097	230,358
Surplus after charges	178,392	118,723
12 months' gross	5,546,587	4,385,615
Net	2,324,361	1,858,435
Surplus after charges	1,118,659	685,509

REPUBLIC RAILWAY & LIGHT.

(Subsidiary Companies.)

	1913.	1912.
December gross	$ 282,300	$ 264,561
Net after taxes	105,452	99,778
Surplus after charges	62,153	55,693
Twelve months' gross	2,997,669	2,655,601
Net after taxes	1,153,705	1,045,030
Surplus after charges	617,441	516,095

EASTERN PENNSYLVANIA RAILWAYS COMPANY.

November gross	$ 70,405	$ 62,939
Net after taxes	31,335	28,996
Surplus after charges	12,780	11,124
Twelve months' gross	804,774	711,140
Net after taxes	338,085	277,745
Surplus after charges	119,291	63,154

EAST ST. LOUIS & SUBURBAN.

November gross	$ 245,851	$ 224,028
Net after taxes	99,702	105,171
Surplus after charges	49,762	56,573
Twelve months' gross	2,690,543	2,426,947
Net after taxes	1,118,206	1,099,200
Surplus after charges	527,755	523,132
Balance after preferred dividends*	177,755	173,132

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*Equivalent to 2.5 per cent common stock.

NASHVILLE RAILWAY & LIGHT.

November gross	$ 189,660	$ 181,156
Net after taxes	83,414	82,888
Surplus after charges	43,586	45,894
Twelve months' gross	2,198,392	2,068,622
Net after taxes	884,395	881,973
Surplus after charges	423,094	450,234
Balance after preferred dividends	298,094	325,234

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 2	Jan. 26
American Tel. & Tel. (New York)	123	123½
Commonwealth Edison (Chicago)	133½	183½
Edison Electric Illuminating (Boston)	257½	257½
Electric Storage Battery common (Philadelphia)	51¼	50
Electric Storage Battery preferred (Philadelphia)	51¼	50
General Electric (New York)	147	147¼
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1¼	1
Massachusetts Electric common (Boston)	12	14
Massachusetts Electric preferred (Boston)	63½	65¾
National Carbon common (Chicago)	155	155
National Carbon preferred (Chicago)	116¾	116¾
New England Telephone (Boston)	139½	139½
Philadelphia Electric (Philadelphia)	26¼	26⅝
Postal Telegraph and Cables common (New York)	82	82
Postal Telegraph and Cables preferred (New York)	69	67½
Western Union (New York)	63¼	63¾
Westinghouse common (New York)	71	70¾
Westinghouse preferred (New York)	116	116½

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*Last price quoted.

PERSONAL MENTION.

DR. H. O. TYLER, has been appointed to be research associate in the research laboratory of electrical engineering, Massachusetts Institute of Technology.

MR. M. S. SLOAN has been appointed manager of the railway and electric departments of the New Orleans Railway & Light Company, in place of MR. D. A. HEGARTY, resigned.

MR. JOSEPH GOODNOW has been appointed superintendent of the Hartford & Springfield Street Railway Company, Hartford, Conn., succeeding MR. R. W. REYNOLDS, who resigned to become manager of the Springfield Street Railway.

MR. CHARLES O. BOND, president of the Illuminating Engineering Society, presented a paper entitled "Light and How to Use It," before the Philadelphia Section at the Drexel Institute on Saturday evening, February 7.

MR. L. H. BROWN, superintendent of the Lynn power station of the Bay State Street Railway, was elected president of the New England Society of Superintendent Engineers at their annual meeting and banquet in Boston, January 28.

MR. EDWARD SCHILDHAUER was elected chairman, and CAPT. W. H. ROSE, secretary-treasurer of the newly created Panama Section of the American Institute of Electrical Engineers at a meeting of the Board of Directors held at the Hotel Tivoli, Canal Zone, in December.

MR. A. A. GRAY, general manager of the Electrical Review Publishing Company, gave a talk before the Milwaukee Electrical League on Tuesday, February 3. At this meeting Mr. Gray was made an honorary member of the League, being the first to receive this distinction.

MR. E. K. HALL, vice-president of the New England Telephone & Telegraph Company, was the principal speaker at the meeting of the Boston Plant Chapter of the Telephone and Telegraph Society of New England on Tuesday evening, January 27. The title of the address was "An Intimate Talk on Some of the Larger Problems of the Company."

MR. S. M. GREER, general commercial superintendent of the Chesapeake & Potomac Telephone Company, delivered an address, entitled "Looking Ahead," before the meeting of the Telephone Society of New York on Tuesday evening, January 27. Mr. Greer was formerly assistant general commercial manager and later Metropolitan manager of the New York Telephone Company.

MR. HUGH L. COOPER announces that he has completed the water-power development of the Mississippi River Power Company at Keokuk, Iowa, and that he has opened offices at 101 Park Avenue, New York City, where he will engage in the practice of general hydraulic engineering, including the design, construction and management of hydroelectric power plants.

MR. JOHN R. GRAHAM, president of the Bangor (Me.) Electric Railway Company, was given a complimentary dinner by the members of the transit committee of the Massachusetts Legislature of 1893, on which he served, at Young's Hotel, Boston, January 27. Others present were those who made a trip to Augusta, Me., last August as Mr. Graham's guests. A loving-cup was presented to Mr. Graham at the dinner.

CAPT. WILLARD L. CANDEE, president of the Okonite Company, accompanied by Mrs. Candee, returned on Wednesday of last week from a three months' tour in British Guiana and Europe, spending some time in London visiting Mr. and Mrs. E. Phillips Oppenheim, old-time friends. Captain Candee is much improved in health as a result of the trip, and has again resumed the active management of his large interests in the insulated-wire field.

MR. A. C. M. HERDLING, general sales manager of the Dubilier Electric Company, Incorporated, New York City, was for 12 years connected with the district engineering department of the American Telephone & Telegraph Company, conducting special laboratory tests and research. The Dubilier Electric Company manufactures special forms of electric heaters, resistance units, resistance wire and material for X-Ray, therapeutic and dental work.

MR. W. COVERT JONES has severed his connection as sales manager for the Union Electric Company, Pittsburgh, Pa., to become district sales manager of the Chicago office of the American Eveready Company, manufacturers of Eveready batteries and flashlights. Mr. Jones started with the Union Electric Company as salesman about seven and a half years ago; he was then given charge of the city store in Pittsburgh, and later was appointed sales manager of the company.

MR. DAVID F. TOBIAS has been appointed manager of the Electric Vehicle Bureau of the United Electric Light & Power Company, of New York City. This office has been created for the purpose of furthering the sale and use of electric vehicles in New York. The United Electric Light & Power Company intends co-operating with other companies in the distribution of vehicles and accessories, as well as with garages and owners of vehicles. A special effort will be made to interest the operators of horse-drawn vehicles in "Doing It Electrically."

MR. W. E. BOILEAU, who has been general manager of the Chattanooga (Tenn.) Railway & Light Company since its organization, has resigned, effective at once. He began his work in that city as manager of the Chattanooga Electric Company in 1907, and when a consolidation of corporations resulted in the formation of the present company, he became general manager of it. It is reported that he desires to retire in order to take a well-earned and much-needed rest. It is stated that he will probably be succeeded by MR. EDWARD D. REED, who is now superintendent of the company.

MR. E. T. MUNGER has been chosen general manager of the Cumberland Light & Power Company, the Lewiston, Augusta & Waterville Street Railway Company and the York Light & Heat Company, important Maine lighting and traction interests. He will assume his active duties February 15. Mr. Munger is a graduate of the University of Wisconsin, class of 1892, and is 44 years of age. He has engaged in electrical and mechanical engineering during his whole career, having been connected with leading traction companies throughout the eastern part of the United States. MR. HARRY B. IVERS, the retiring general manager, will remain with the companies until April 1, in an advisory capacity.

MR. JAMES PARMELEE, local capitalist and dominating spirit in the Cleveland Electric Illuminating Company since that corporation was formed, resigned as a director at the annual meeting and is succeeded by MR. HARRISON WILLIAMS, of New York. Mr. Parmelee's retirement forecasts his resignation also as president of the company at the first meeting of the Board of Directors. It is understood that MR. SAMUEL SCOVIL, vice-president and treasurer and the active executive official in Cleveland, will succeed Mr. Parmelee as president. The Parmelee-Herrick interests in the company were greatly reduced a year ago when a controlling interest was purchased by the Central States Electric Corporation, of which Mr. Williams is the head.

MR. KING G. KELLOGG, who has been chief engineer of the E. E. Brownell Engineering Company for the past four years, has tendered his resignation to take effect March 1, and will thereafter devote his entire time to consulting work, specializing in matters pertaining to the electrolytic corrosion of underground metallic structures from stray electrical currents. Mr. Kellog has had a wide experience in electrolysis work, as the installation of a number of electrolytic mitigation systems were completed while he was chief engineer, and he has made electrolysis examinations and tests in more than 50 different cities in this country. He held various positions in the engineering department of the Peoples Gas Light & Coke Company, Chicago, where he was employed for 16 years. He was educated in the Chicago Public schools and is an alumnus of the University of Illinois. He will retain his office at 1836 South Fifty-fifth Street, Philadelphia, Pa.

MR. HAROLD ALMERT, consulting engineer, for the past five years manager of the Department of Examinations and Reports of H. M. Byllesby & Company, has severed his connection with that firm to engage in consulting engineering practice, with offices in the Rookery, 209 South La Salle Street, Chicago. Mr. Almert is just completing his twentieth year of active work in the organization, financing, design, construction, operation and management of public utilities, and for several years past has valued or passed upon investments for new projects, consolidations, reorganizations or extensions to existing properties of from one hundred to two hundred million dollars, annually. In his practice before public utility commissions, which has extended from New York to California, he has handled many important rate cases, has served as arbitrator in a number of condemnations, and in these lines has established a new and important field of usefulness for the engineer with training in law and accounting, as well as technical training and experience. As assistants, Mr. Almert will have associated with him a staff of well seasoned specialists in mechanical, electrical, gas and hydraulic engineering, appraisals, rate investigations, accounting and efficiency work, who, by their training and years of experience, are experts in their lines.

OBITUARY.

MR. FERDINAND KUEHN, wireless telegraph operator on the steamship *Monroe*, lost his life early Friday morning when the former was rammed by the steamship *Nantucket*. Mr. Kuehn gave his life preserver to a woman aboard the sinking vessel who was not properly equipped, and when the ship went down he perished along with 46 others.

NEW INCORPORATIONS.

SYRACUSE, N. Y.—Syracuse Electric Razor Sharpening Company has been incorporated with a capital stock of $10.000 by J. F. Williams, C. M. Scott and E. E. Hare.

CLEVELAND, O. — The Konary Electric Company has been incorporated with a capitalization of $10,000 by C. F. Schultz, M. E. Evans, M. E. Schultz and H. M. Krause.

LONG BEACH, CAL.—Articles of incorporation have been filed here for the Towne-Lantz Electric Company, with a capital stock of $15,000, by A. A. Towne, F. O. Lantz and others.

AUGUSTA, ME.—Stromberg Electric Company has been incorporated to manufacture recording devices. The capital stock is $400,000 and the incorporators are I. S. Kearney and E. H. Thompson.

CLEVELAND, O.—The Industrial Electric Company has been incorporated with a captital stock of $25,000. The incorporators are W. J. Austin, Harold Ferguson, W. B. Stewart, C. W. Kinnison.

TOLEDO, O. — The Lighthouse Electric Company has been incorporated with a capital stock of $10,000. The incorporators are Samuel L. Allen, F. H. Farnsworth, George W. Fink, George H. Frank and S. M. Hegel.

PORTLAND, ME.—The American Electric Car Company has been incorporated to manufacture electrical devices. The capital stock is $1,500,000. The president of the company is A. F. Jones and the treasurer, T. L. Croteau, of this city.

ELIZABETH, N. J.—The Elizabeth Electrical Supply Company has been incorporated with a capital of $10,000 to deal in electrical supplies. G. V. Wier, C. K. Nelson, Elizabeth; and J. A. Donington, Roselle Park, N. J., are the incorporators.

LOUISVILLE, KY.—The Standard Lighting & Heating Company has been incorporated with $1,000 capital stock, and will establish a plant. Details regarding the project are not yet available. T. C. H. Vance, Inter-Southern Building, is in charge of the matter.

NEW YORK, N. Y.—Grannell, Nugent & Kranzer, Incorporated, has been incorporated to manufacture electrical appliances, etc. The capital stock of the company is $15,000 and the incorporators are Levi W. Grannell, Brooklyn, N. Y.; Frank L. Nugent and William J. Kranzer, of New York City.

LITTLE ROCK, ARK.—Articles of incorporation have been filed for the Seven Cities Company, of Russellville. This corporation is capitalized at $250,000. Henry Chouteau is president; D. R. Neiderlander, vice-president, and A. E. Hecker, secretary and treasurer. The company will operate electric plants.

WILMINGTON, DEL.—Removable Letter Sign Corporation has been incorporated with a capitalization of $250,000 to design, construct and deal in electrical advertising display signs. The incorporators are W. M. Pyle, George G. Steigler, Lawrence W. E. McCarthey all of this city.

NEW YORK, N. Y.—Quick Charge Storage Battery Company, Incorporated, has been granted articles of incorporation to manufacture storage batteries, electrical goods, motors, etc. The capital stock is $500,000 and the incorporators are Stanley C. Sabel, Russell Law and Leslie Reid, all of New York City.

GLEN RIDGE, N. J.—The Nitro Electrical Corporation has been incorporated with a capital of $50,000 to operate in electrical supplies. M. S. Powell, Harry D. King and Grattan Colvin, Glen Ridge, are the incorporators.

PROPOSALS.

ELECTRIC LIGHT PLANT.—Bids will be received on February 10 for the installation and equipment of an electric light plant. Address Clerk of the Board of Commissioners of Public Works, Lake City, S. C.

CONDUIT AND WIRE.—Bids will be received on February 9 for 100,000 feet No. 14 twine wire or its cost equivalent in other sizes; 40,000 feet of half-inch rigid conduit or its cost equivalent in other sizes; 1,000 feet of half-inch "T" type outlet boxes or their cost equivalent in other types and sizes. Address Ray Palmer, city electrician, Chicago, Ill.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 24 for furnishing 10,000 feet of rubber-insulated lead-covered single-conductor copper cable, as per Schedule 6340, for delivery at the Navy Yard, Brooklyn, N. Y.; and five electrically operated meat and food choppers, as per Schedule 6351, for delivery at the Navy Yard Brooklyn, N. Y.

WATERTIGHT LIGHTING FIXTURES.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until February 9 for furnishing watertight electric-lighting fixtures and accessories of special engineer department design, including 21 junction boxes, three snap switch boxes, 12 platform light fixtures and 69 type X outlet couplings. For further information address Joseph E. Kuhn, Lieutenant Colonel, Corps of Engineers, U. S. Army.

ELECTRICAL MATERIAL.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until February 17 for furnishing 120 receiver cords, for double-head receivers for wireless apparatus, and 140,000 feet of silicon bronze aerial wire, as per Schedule 6312, for delivery at the Navy Yard, Brooklyn, N. Y.; 1,250 pounds pure lead wire in 50-pound coils, as per Schedule 6318, for delivery at the Navy Yard, Washington, D. C.; and 103 fire-control telephones, as per Schedule 6322, for delivery at the Navy Yard, Boston, Mass.

RUBBER-INSULATED CABLE.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until February 7 for furnishing rubber-insulated cable as follows: 1,000 feet, 250,000 circular mils, stranded single-conductor rubber-insulated armored cable; 3,200 feet 212,000 circular mils, stranded single-conductor rubber-insulated armored and served cable; 1,500 feet 10,000 circular mils stranded duplex rubber-insulated armored and served cable and 2,000 feet 18 circular mils single-conductor, duplex, rubber-insulated armored cable. Detailed specifications and further information may be had upon application to Joseph E. Kuhn, Lieutenant Colonel, Corps of Engineers, U. S. Army.

NEW PUBLICATIONS.

MEASUREMENT OF WEAK CURRENTS.—We are in receipt of a reprint of the article by Bela Gati, published in *L'Industrie Electrique,* entitled "Measurement of the Intensity of Small High-Frequency Currents."

MOTOR STANDARDIZATION.—The Electric Power Club, an organization made up of representatives of many of the manufacturers of electric motors in the United States, has published the standardization rules adopted by the club for obtaining uniformity in sizes, voltage ratings, speed ratings and other important features of both direct and alternating-current motors. The secretary of the club is C. H. Roth, 1410 West Adams Street, Chicago, Ill.

DESTRUCTION OF TELEPHONE RECORDS.—Regulations to govern the destruction of records of telephone, telegraph and cable companies (including wireless companies), as prescribed by the Interstate Commerce Commission in accordance with Section 20 of the act to regulate commerce, have been published in pamphlet form. These regulations became effective on February 1, 1914, and supersede a previous order dated May 13, 1912. The order of the Commission putting the regulations into effect and the regulations themselves are given in full. There is also an index to the records.

DATES AHEAD.

Wisconsin State Telephone Association, Madison, Wis., February 11-12. Secretary, P. J. Weirich, Monroe Wis.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20. Secretary, Bradley Stoughton, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Supply Jobbers' Association. New Willard Hotel, Washington, D. C., February 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

Peoria Electric Show. Peoria, Ill., March 9-15. Director, T. D. Buckwell, Central Illinois Light Company, Peoria, Ill.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Hotpoint Electric Heating Company, Ontario, Cal., has placed on the market a new type of its ElPerco electric coffee percolator, which is made of aluminum. The company has prepared a number of these percolators made in glass for demonstration purposes by its selling agents throughout the country. A circular describing this new development will be sent upon application to the company.

Maschinenfabrik Oerlikon, Oerlikon, Switzerland, has prepared for distribution a 44-page well illustrated book dealing with the use of electric motors in the textile industry. This publication is very completely illustrated with views of motors suitable for this work and with typical interiors in motor-driven textile establishments. Every department of the textile industry in which power is used is described and the types of motor suitable therefor are pointed out.

Magnet-Schultz, Memmingen in Schwaben, Germany, one of the largest firms specializing in magnet manufacture, has published a 44-page illustrated catalog of its electromagnets. This catalog is replete with descriptions of numerous uses of magnetic clutches, magnetic plates, lifting magnets, electromagnetic separators, sand-sifting machines, portable and stationary electromagnets, magnetizing apparatus, equipment for removing iron particles from the eye, and many other electromagnetic devices.

Simplex Wire & Cable Company, 201 Devonshire Street, Boston Mass., has ready for free distribution the 1914 Simplex Manual. This contains in addition to full information regarding Simplex products, tables and other data about insulated conductors and other electrical matters for the ready reference of electrical engineers, contractors, wiremen and others interested in the calculation of wiring and cable requirements. The book contains 92 pages and is printed on fine, thin paper, with stiff covers, so as to conveniently fit the pocket.

Automatic Electric Washer Company, Newton, Iowa, has published a new and attractive book describing its electric washing machines. This book is copiously illustrated with views of the several types of washers made by the company and of the convenient way they can also be made to operate other devices, such as mangles, churns, ice-cream freezers, etc. Each washer is described in detail and its advantages pointed out. The economy and satisfaction of electric washing are emphasized. Each machine has a wringer attached. Simplicity and durability characterize the design.

Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago, Ill., has ready for distribution a booklet describing and illustrating its renewable cartridge fuses. The construction of these devices is explained in detail and the ease with which they may be renewed in the proper manner is emphasized. Detailed lists of a great variety of fuses of this type made by the firm are included. In a folder recently prepared by the company there is a discussion of fuse costs and it is stated that the Economy renewable fuses enable a saving of over 80 per cent of the annual fuse expense.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued a number of new publications, of which one having 48 pages deals with modern alternating-current watt-hour meters. The construction of these meters is described in great detail with the aid of numerous excellent illustrations of the entire instrument and its more important parts. There are also given many fine illustrated inserts showing views in the extensive meter department of the company's works. These give an idea of the extent of this department and of the high degree of specialization employed in the various stages of the manufacture. Testing curves are also given and diagrams of meter installation. In a similar manner another publication deals with ampere-hour meters. The latter publication has 24 pages and points out the details of construction and advantages of using this type of meter for many services. Other recent publications by this company deal with the new nitrogen lamp which it manufactures under the name of Nitralampe. This half-watt tungsten is made in sizes from 600 to 3,000 candlepower. A special mounting and reflector equipment has been provided for these lamps.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces receipt of the following orders: Southern Power Company, one 3,000-kilovolt-ampere portable substation consisting of a steel car, switching equipment, three 1,000-kilovolt-ampere, 100,000/13,200-volt, 60-cycle transformers, one 20-horsepower, three phase, 110-volt motor for driving a Sirocco blower. Fitzpatrick & Hoepfner, one 200-kilowatt and one 150-kilowatt three-wire, compound-wound, 240/130-volt generators, one 100-kilowatt, three-bearing motor-generator set consisting of a 240/120-volt three-wire, compound generator and a 550-volt, shunt motor; 16 direct-current, 230-volt, one half to five horsepower motors for use with the fans and blowers; one commutator-turning tool; one air-cooled portable electric blower. Leslie B. Grant, one 250-kilowatt 2,300-volt, three-phase, 60-cycle, generator with one exciter; three 85-kilowatt 2,200/6,600-volt transformers; three lightning arresters, 6,600-volt, indoor mounting, and switchboard. Public Service Electric Company, 1,000-kilovolt-ampere, 60-cycle, 13,200-volt, three phase to two phase duplex transformer. St. Clair County Gas & Electric Company, one 1,000-kilovolt-ampere frequency-changer set consisting of one 2,300-volt three phase, 62.5-cycle generator and one 2,300-volt, 25-cycle synchronous motor with exciter; one similar 250-kilovolt-ampere frequency-changer set; one 150-kilowatt, motor-generator set consisting of 220-volt, three-phase, induction motor and compound-wound generator; three 500-kilovolt-ampere 25-cycle, 13,200/2,300-volt transformers.

Record of Electrical Patents.

Issued by the United States Patent Office, January 27, 1914.

1,085,102. Insulating Compound. L. E. Barringer, assignor to General Electric Co. Contains linseed oil, sulphur, zinc, talc, asbestos and flint.

1,085,108. Pedal-Operator. J. C. Cake, Chester, Pa. Driven by an electric motor through a friction disk.

1,085,116. Dynamo-Electric Machine. F. H. Ford, assignor to Mechanical Appliance Co., Milwaukee, Wis. The stator core is secured in a special partly opened ring frame.

1,085,124. Printing-Telegraph Receiver. G. S. Hiltz, assignor to Stock Quotation Telegraph Co., New York, N. Y. Includes electromagnetically operated type disks.

1,085,142. Selective-Transmitter. M. Levison, assignor to Chicago Signal Co., Chicago, Ill. Includes a motor-driven contact device.

1,085,144 and 1,085,145. Lamp-Supporting Structure. C. F. Massey, Chicago, Ill., assignor to C. F. Massey Co., Chicago, Ill. A reinforced-concrete post with bracket arms for ornamental tungsten cluster lighting.

1,085,147. Portable Electric Lamp. W. A. McKay and M. Claussen, San Francisco, Cal. Includes a horizontally extending clamp having slidable vertical tubes.

1,085,151. Induction-Motor Control. M. Milch, assignor to General Electric Co. Includes an alternating-current commutator machine having its armature connected to the rotor of the induction motor, a driving motor therefor, a frequency changer driven by the induction motor, a transformer connected to the armature of the commutator machine whose exciting winding is alternately connected to the transformer or frequency changer.

1,085,163. Electric Meter. P. Rose, Berlin, Germany, assignor to General Electric Co. Comprises a fixed coil, an oscillating magnetic member having a remanent magnetization co-operating therewith, and means for intermittently demagnetizing the member. (See cut.)

1,085,213. Trolley Harp. C. D. Larrabee, Syracuse, N. Y., assignor of one-half to S. Hubbell. The fork base is vertically pivoted to the harp platform.

1,085,215. Push-Button. A. Lungen, assignor to Edwards & Co., New York, N. Y. Covers details of construction.

1,085,266. Switching Device for Electric Circuits. M. Kallmann; P. Kallmann, Berlin, Germany, administratrix of said M. Kallman, deceased. A circuit-breaker with a supplementary pilot switch.

1,085,282. Mower. F. D. Mercer, Toronto, Ont., Canada. Comprises an electric cutter, an insulated cutter bar with a number of flexible sections and means for electrically heating the cutter.

1,085,309. Leakage Indicator and Connections. E. B. Wedmore, assignor to General Electric Co. Relay indicator for a distribution system includes solenoids connected to the mains, a beam responsive to unbalanced action of the solenoids and a yielding means for its fulcrum. (See cut.)

1,085,316. Dynamo-Electric Machine. T. S. Allen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. A special commutator construction.

1,085,318. Trolley. D. E. Barton, Milwaukee, Wis.: J. H. Spence, administrator of said Barton, deceased. The wheel axle is supported on only one side.

1,085,340. Apparatus for Electric Ignition. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Provides two spark plugs in each cylinder and a special magneto, timer and control therefor.

1,085,347. Electromagnetic Lock. L. L. Leduc, assignor to L. Cadenel, Paris, France. The core of a solenoid constitutes the locking bolt. (See cut.)

1,085,375. Sectioning Means for Electric Stations. E. Brandenburg, Brussels, Belgium. A special automatic control for sectionalizing circuit-breakers.

1,085,393. Apparatus for Reducing Electric Currents. R. J. Ward, Dunton, N. Y. Includes condensers, a resistance and a relay switch.

1,085,398. Electric Switch. F. Barr, New York, N. Y. Includes a longitudinally moving spindle carrying spring switch contacts.

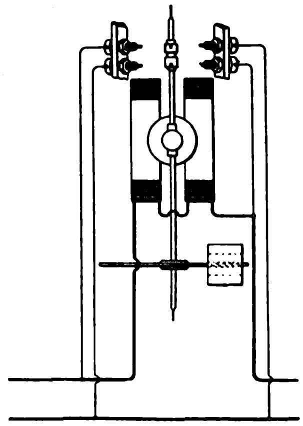
1,085,412. Electric Alarm - Clock. F. Goss, Millicent, S. A., Australia. The alarm circuit is closed through the hands of the clock.

1,085,425. Electrical Primer. J. M. Hobe and U. S. Traub, Yonkers, N. Y. Includes an electric heater for heating a hydrocarbon fuel.

1,085,433. Electrical Signal Apparatus. W. Kepler, Allenville, Ill. A spring-contact push-button.

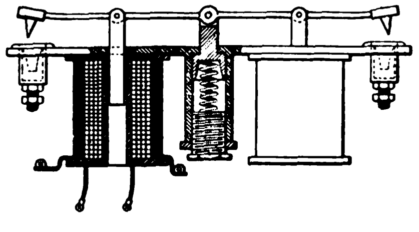
1,085,440. Method of and Furnace for Securing Products of Reaction by Electric Discharges in Gases. C. F. R. von Koch, Stockholm, Sweden, Consists in creating an arc flame extending from a heating chamber into a cooler and causing gases to pass from the chamber into the cooler.

1,085,441. Display Apparatus. K. Koike and G. L. Grant, assignors to K. Takahashy, Seattle, Wash. Includes an electric projecting lamp.


1,085,163—Meter.

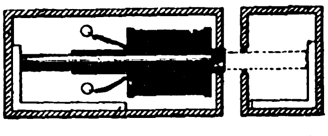
1,085,453. Locomotive Headlight. E. H. Marshall, Lawrence, Kans. Adjustable electric headlight.

1,085,454. Automatic Switch. F. R. McBerty, assignor to Western Electric Co. A selector has a rotary brush carriage, a number of contact arms pivotally mounted thereon, and corresponding terminals arranged to be successively traversed by the contact arms.


1,085,309—Leakage Indicator.

1,085,477. Electrically Driven Winding Apparatus for Spring Motors. W. P. Phillips, Bridgeport, Conn. An electric motor actuates the winding mechanism.

1,085,485. Automatic Switch for Traction Lines. F. Rice, Dayton, O. A switch-operating solenoid is mounted in a contact box located in the roadway.


1,085,347—Electromagnetic Lock.

1,085,496. Apparatus for Type-writing at a Distance. H. E. M. Schnürer, Grunewald, Germany. Includes an electric motor at each receiving and transmitting station. connected by a line circuit.

1,085,497. Connector for Electric-Current-Carrying Conductors. H. Schroeder. Sollitt, Ill. For connecting the electric cable between railway cars.

1,085,514. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co. Provides special ventilating passages through the stator core.

1,085,523. Heat Treatment of Metal Bodies. J. H. Barker, assignor to Birmingham Metal & Munitions Co., Birmingham, England. Provides for electric annealing of metal cartridge cases and includes a plain electrode movable in axial direction by the inner plunger and means actuated by the outer plunger whereby the circuit is closed and opened.

1,085,579. Ozone Generator. S. Held, assignor to Held Co., Chicago, Ill. Comprises concentric dielectric tubes, an electrode in contact with the outer surface of the outer tube and a continuous electrode concentric within the inner tube.

Patents Expired.

The following United States electrical patents expired February 2, 1914.

576,082. Automatic Switch. J. P. Alexander, Jackson, Tenn.

576,095. Battery. W. S. Doe, Brooklyn, N. Y.

576,103. Electric Arc Lamp. P. H. Fielding, New York, N. Y.

576,129. Electrical Advertising Device. L. Julig, San Francisco, Cal.

576,145. Method of and Apparatus for Electric Propulsion. L. H. Nash, South Norwalk, Conn.

576,163. Paste-Carrying Machine for Electric Accumulators. W. Schneider, Triberg, Germany.

576,164. Construction of Cells for Electric Accumulators. F. W. Schneider.

576,177. Electrode for Storage or Other Batteries. T. A. Willard, Norwalk, O.

576,178. Battery Plate. T. A. Willard.

576,202. Rheostat. H. W. Leonard, East Orange, N. J.

576,240. Electric Meter. J. R. Tucker and C. C. Hinckley, Aurora, Ill.

576,243. Contact Apparatus for Telegraphing. C. Vreede, Rotterdam, Netherlands.

576,268. Contact-Box for Depressible Conductor Rails. W. Grunow, Jr., Bridgeport, Conn.

576.332. Locking Device for Electric Controllers. G. Valley, Johnstown, Pa.

576,333. Electric Controller. G. Valley.

576.342. Electrically Operated Musical Instrument. G. H. Davis, New York, N. Y.

576.347. Electric Heater. F. A. Johnson, Binghamton, N. Y.

576,369. Automatic Electric Cutout. C. C. Kritzer, Newaygo, Mich.

576.372. Automatic Electric Cutout for Magneto Bells. J. Z. Miller, Baltimore, Md.

576.383. Alarm for Electric Circuits. C. B. Sterling, New York, N. Y.

576,384. Brake Mechanism and Controller for Electric Cars. W. D. Thomas and L. R. Gignilliat, Savannah, Ga.

576.392. Insulator. H. E. Billings, Hartford, Conn.

576,394. Trolley for Electric Cars. G. L. Campbell, Shunk, Pa.

576.472. Telephone Signal-Transmitter. E. C. Robes, Medford, Mass.

576,475. Electric Arc Lamp. D. A. Shesler, Toledo, O.

576.493. Electrical Circuit for Operating Automatic Railway Gates. J. S. Biggar Chicago, Ill.

Reissue No. 11,588. Electric Meter. J. Harris, Lynn, Mass.

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Electric Vehicle Section

Dr. Steinmetz on the Future of Electric Vehicles.

At the meeting of the Electric Vehicle Association of America, at New York on Wednesday evening, January 28, Colonel S. R. Bailey presented a recital of his experiences in driving a Bailey roadster from Boston to Chicago. Colonel Bailey's story, which has been published in full in recent issues of this publication, was thoroughly enjoyed by all present.

In discussing the subject of the evening, "The Electric Pleasure Car," Dr. C. P. Steinmetz declared that the great share of the automobile future belongs to the electric and he predicted that as the ultimate economy and efficiency of electrics are developed the gas car will necessarily recede in favor of the electric. Automobiling, he said, is still largely a creature of sporting proclivities, but is fast changing into a practical business utility. The owner today really uses his car more for business, or necessary traveling, than he does for purely recreation purposes, and will do so more in future. The Doctor believed that, just as the bicycle had its craze, then waned and became a practical machine of daily business—just as numerous as ever, but more practical—the automobile will stabilize itself and become a creature of daily necessity.

The car of the future, he said, is bound to be a car which everyone can own and run without effort. The large car will always require its chauffeur and when long journeys are wanted owners will prefer to use the comfortable Pullman train rather than undergo the strain of running and steering a large car amid the hardships of road travel. Already, he believed, that touring is waning and that the short drive of 50 or 60 miles is the average use of the automobile. The Ford car, with its cheapness, lightness and easy driving characteristics—a car which anyone can own and drive—he believed to point the future trend of autos. In his opinion, batteries will gradually be evolved to make such light, cheap cars driven by electricity possible and he strongly deplored the tendency toward over-luxuriousness in the average type of electric now offered to the public. For himself, he said he wanted a practical car and had bought a cheap second-hand one which he still drives.

Dr. Steinmetz discussed the development of the electric-vehicle storage battery and warmly endorsed the characteristics of the Edison nickel-iron cell. He also pointed out the fact that coincident with the improvement in dependability of the vehicle more adequate arrangements for charging and boosting were being provided all over the country.

The doctor believed that the need of the hour is co-operation between central stations and vehicle and battery makers, in an effort to bring about the more widespread distribution of charging stations. He deplored the popular idea of automobile shows which included both gas and electric cars. They no more belong together, he said, than do the horse wagon and the automobile, or the horse and the locomotive engine. He hoped the electric would keep to its own field and that by united effort it would be more and more practical for just such journeys as Colonel Bailey had taken and described.

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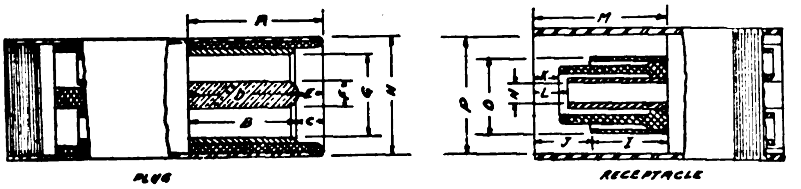
Standard Charging Plugs and Receptacles.

The Committee on Standards of the Electric Vehicle Association of America has recommended a standard charging plug for both the 50-ampere and 150-ampere size, the dimensions of which are given herewith together with an illustration showing the principle features of the plug. This recommendation was accepted by the Electric Vehicle Association of America at its October, 1912, meeting, and reaccepted at the annual convention in Chicago in October, 1913.



Contacts must be accurately concentric to insure interchangeability.

Capacity	A	B	C	D	E	F	G	H	I	J	K	L	M	Machined N	[illegible] N	Machined O	[illegible] O	P
50 amp	1 13/16	1 9/16	9/16	1 5/8	5/16	.373 .375	1.125 1.127	1.725	1 1/8	7/8	1/8	1/8	2	.375 .377	.360 .365	1.123 1.125	1.136 1.140	1 3/4
150 amp	2 3/8	1 9/16	13/16	2 1/16	5/16	.435 .437	1.406 1.408	2.100	1 13/32	1 5/16	5/16	7/16	2 3/32	.437 .439	.422 .427	1.404 1.406	1.416 1.421	2 1/8

Data on Standard Charging Plug and Receptacle Recommended by Electric Vehicle, Association.

The National Board of Fire Underwriters has approved plugs of these dimensions for 50-ampere and 150-ampere ratings, with an allowable overload of 50 per cent. An important feature of the plug is the polarity, the outside contact being positive, the inside contact negative. The terminals should be large enough to receive cable having a rating according to the Underwriters' Code, "Table B," at least equal to the normal rating of the plug. The terminals are to be marked "plus" and "minus" to correspond to the polarity of the contacts.

The Committee on Standards is composed of E. R. Whitney, chairman, Alexander Churchward, J. R. C. Armstrong, H. H. Rice, W. E. Holland, E. J. Ross, Jr., E. Fruenfelt, Charles Blizard, J. H. Hertner and Louis Burr.

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Boston Motor Club.

The January meeting of the Electric Motor Club of Boston was held at Hotel Thorndike on January 28. Plans for the Boston Auto Show in March were discussed and a committee of the club was chosen to co-operate with committees of other automobile organizations in forestalling unfavorable legislation affecting automobile interests. About 50 bills which are regarded as adverse to the business have been introduced at the legislative session which recently opened.

The February meeting of the club will be held at the American House, Boston. Governor Walsh, Mayor Curley of Boston, the State Highway Commission, the Street Commissioners of Boston, and other public officials will be invited. The meeting will be held under the auspices of the Boston Edison Company. The latest developments in the electric-vehicle field will be shown by lectures and lantern slides, for the benefit of the special guests.

Philadelphia Section — Electrical Vehicle Association of America.

The first public meeting of the Philadelphia Section of the Electric Vehicle Association of America was held in the Franklin Institute on Wednesday evening, January 14.

President Frank W. Smith and Secretary Harvey Robinson were present from New York representing the parent association. Mr. Smith addressed the meeting giving to a certain extent the history of the association, its aims, and outlined the work which was being accomplished by the activities of the officers and various committees. He called attention to the fact that during the two years—1913 and 1914—there would be spent for the advancement of the electric vehicle field, by this association, approximately $100,000. The largest part of this expenditure was in the shape of advertising in the national magazines, and is expected to benefit all manufactures alike. When inquiries are received in response to these advertisements a memoranda is sent to each of the vehicle manufacturers who are contributing toward the expense of this campaign.

In his opening remarks, the chairman, R. L. Lloyd, referred briefly to what was hoped to be accomplished by the formation of the Philadelphia section, saying:

"It is certainly gratifying to see on this occasion, the first meeting in Philadelphia of representatives of the Electric Vehicle Association of America, so numerous a gathering of persons all of whom are interested in some way in the electric vehicle. It has been our endeavor to bring together for mutual interest and benefit not only the manufacturer of cars and their users, but also garage men, battery makers and sellers of accessories and electric current.

"From the best source of information, there would appear to be 37,000 electric vehicles in this country today. Two-thirds of this number are stated to be of the passenger car type. This statement is very significant, for if one should take a toll of the cars in the large commercialized centers of the East, a very different proportion would be found to exist. In our own city there are approximately twice as many commercial cars as passenger cars. In New York the proportion is ten to one. In Brooklyn also, the commercial cars predominate, but as we move westward in the cities of Cleveland, Detroit and Chicago, the passenger cars are found to largely predominate, and when we reach as far as Denver there is found to be one passenger car for each 217 of the population. If this same proportion existed in Philadelphia, there would be some 7,000 more cars on our streets than there are today, so there seems to be plenty of room for growth before we approach the saturation point."

The paper of the evening was presented by Emlen S. Hare, vice-president of the Commercial Truck Company of America. The paper was illustrated with numerous lantern slides, and the field of the electric vehicles was very fully covered. From his varied experience in the sale of electric cars, Mr. Hare was enabled to intersperse among the actual data of numerous installations amusing anecdotes and peculiar phases sometimes met with. Mr. Hare stated that 90 per cent of the cases calling for motor trucks could be satisfactorily handled by the use of the electric car. The other 10 per cent are admittedly gas car propositions and no attempt should be made by electric truck salesmen to enter that restricted field. Many varieties of electric cars were illustrated and a number of adaptations of the electrics in special service were also exhibited.

The next meeting will be held on February 11, when it is expected papers will be read on the actual experience of the electric truck department store work.

The committees of the Philadelphia Section, Electric Vehicle Association of America, as at present constituted are as follows:

Papers and Publicity Committee—Chairman, Fred. B. Neely; George M. Graham, the *North American;* Mr. Foljambe, of the *Commercial Car Journal;* J. M. Skinner, Philadelphia Storage Battery Company; H. K. Mohr, Philadelphia Electric Company.

Membership Committee—Chairman, J. Crawford Bartlett, Bartlett Electric Garage; E. S. Hare, of the Commercial Truck Company; A. W. Young, Public Service Company, Camden, N. J.; Mr. Kalas, Electric Storage Battery Company.

Traffic and Good Roads Committee—Carroll A. Haines, Park Garage; John Meyer, Philadelphia Electric Company; A. W. Young, Public Service Company; E. S. Hare, Commercial Truck Company; Metcalf, Anderson Electric Carriage Company.

Garage Committee—F. E. Whitney, chairman, Commercial Truck Company; J. Crawford Bartlett, Carroll Haines, James M. Skinner, Malcolm L. Gross, W. A. Manwaring, Sydney L. Crawford.

The next meeting of the Philadelphia Section will be held on February 11 at 226 South Eleventh Street. "Some Experiences of Motor-Car Users" will be related by E. J. Hancock, of the Curtis Publishing Company, and others.

◆◆◆

Truck Standards in Card Form.

Sets of cards showing the various commercial-vehicle standards recommended in 1912 by the National Association of Automobile Manufacturers are being mailed to all manufacturers of commercial vehicles by the National Automobile Chamber of Commerce, Inc., successor to the National Association of Automobile Manufacturers and the Automobile Board of Trade.

There are seven cards in the set, all of uniform size, 8 x 10 inches, printed on one side only and scored in the middle so that they can be filed flat in an ordinary letter file or folded once and put in an eight by five inch card index file. Each card refers to a single subject so that the series can be separated and the cards distributed among the various departments in the factory to which they relate. The subjects are as follows:

"Standard Warranty," "Standard Speed Rating," "Standard Body Weight Allowance," "Overload Allowance Resolution," "Standard Caution Plate," "Standard Frame Widths and Lengths," and "Standard Demonstration Charges."

The "Warranty" is a new form approved December 3, 1913, and supersedes the motor-truck warranty recommended by the National Association of Automobile Manufacturers in 1912. It is a combination of this with the standard passenger-car warranty adopted in 1910, and covers both commercial and passenger vehicles.

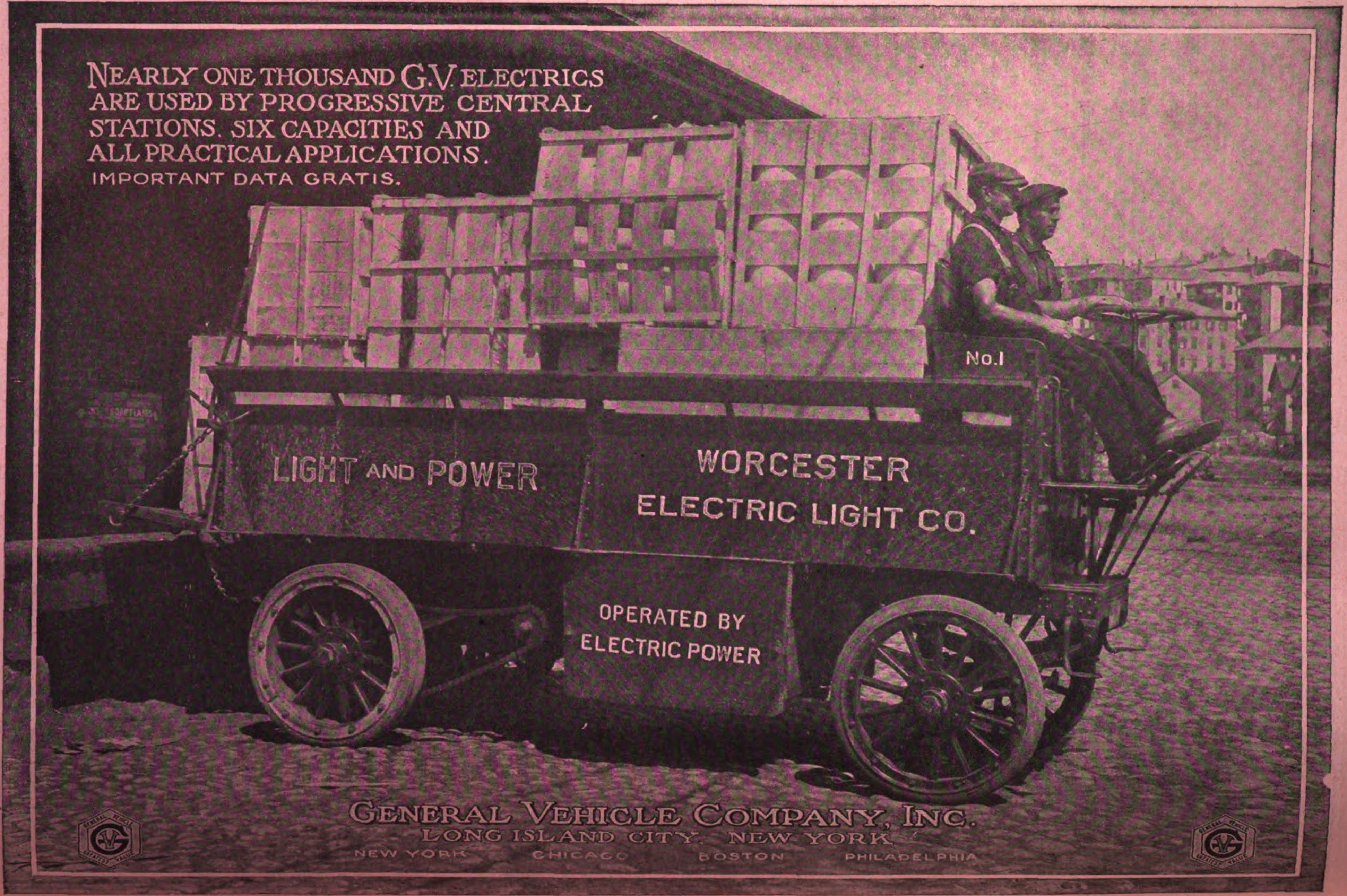
The tables of speeds, body weights, frame dimensions, and demonstration charges are accompanied by charts of curves corresponding with the figures. The caution plate against overloading and overspeeding and the new lithographed standard warranty are illustrated by half-tone engravings. Prices at which the plates and warranties can be obtained are given.

To encourage the prompt and general adoption of these standards for the best interests of the whole industry, the National Automobile Chamber of Commerce is sending sets of the cards to all companies whose names appear on its list of active manufacturers of commercial vehicles. Upon receipt of request, it will mail copies to any makers who fail to receive them, and to organizers of new companies who expect to come into the field with new products. Requests should be addressed to the secretary of the Commercial Vehicle Committee, National Automobile Chamber of Commerce, 7 East Forty-second Street, New York City.

◆◆◆

A New Light Electric Truck.

The Wagenhal's Motor Company, of Detroit, Mich., maker of the well known gasoline three-wheeler of 800 pounds carrying capacity, has a new electric commercial car out for test. The general plan of the truck is the same as the standard three-wheeler, and energy is furnished to a General Electric motor by a 24-cell "Exide" storage battery. The carrying capacity is the same as that of the gasoline type and the new car is to sell for $790.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I. T. Williams Co., Wholesale Lumber; New York.
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76

Books on Electric Vehicles

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IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
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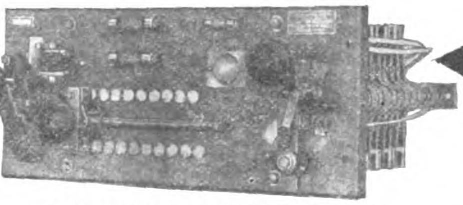

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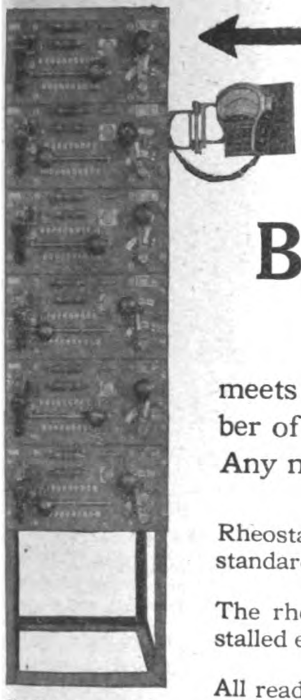

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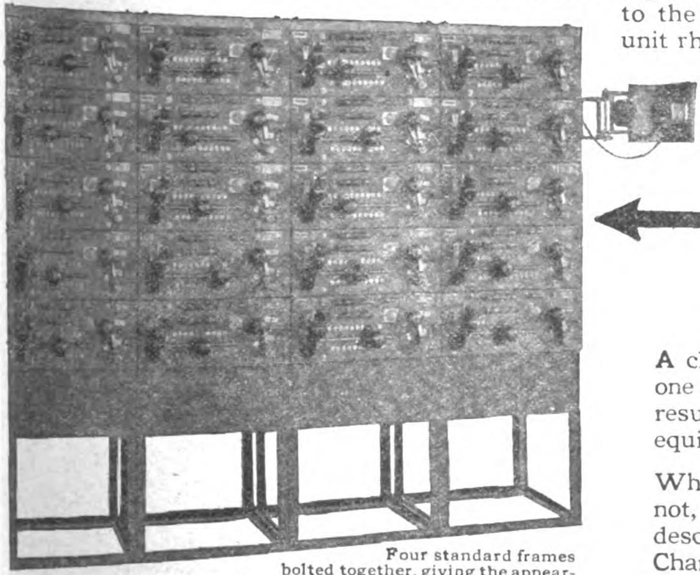

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and 1026 Chamber of Commerce Bldg., PORTLAND, ORE.

Massachusetts Electrical Research Division to Study Store Delivery.

Theodore N. Vail, president of the American Telephone & Telegraph Company, declared some time since that business firms would do well to endow scientific research and in line with this statement he has contributed liberally to the development of research organizations for looking into methods of efficiency for business corporations. Supplementing Mr. Vail's expression the firm of R. H. Macy & Company has contributed largely for an investigation to be made by the Massachusetts Institute of Technology. The object of the investigation will be the determination of the general economic laws underlying the operation of the delivery service of a large retail department store. The observations will be made by the Technology Institute's electrical research division upon the delivery system of the Macy store. It will be remembered that the electrical research division has already collected a great amount of data upon this subject. The delivery department of the Macy store constitutes in itself a business enterprise of large proportions. The goods purchased at the New York store are distributed without charge to the customer over an area equal to about one-third of the state of Massachusetts. To provide for quick deliveries a system of distributing depots has been developed, the packages being transferred in large vans from the store to the depots. The system means the employment of about 400 vehicles, together with the necessary attendants, and the expense of the delivery system is upward of $1,000,000 a year.

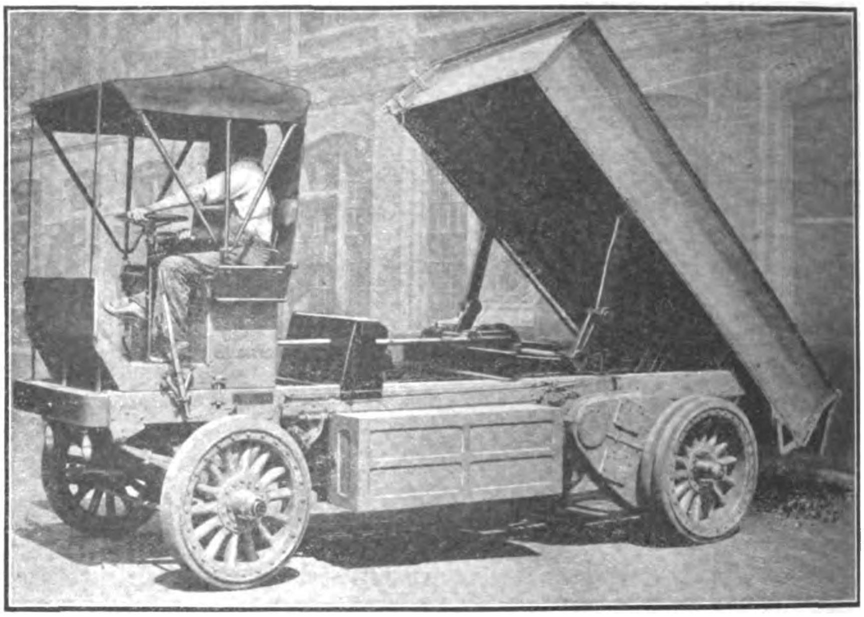
◆

Baker Exhibits New Dumping Truck and a New Brewery Truck.

The Baker Motor Vehicle Company has announced a new four-ton dumping body on their standard four-ton chassis.

This dumping body is made of sheet steel inforced with angle iron and is well riveted together. The floor is made of channel steel riveted together with a smooth steel plate on top for a floor. The tail gate is locked and unlocked by a lever at the side of the driver's seat. The body can be tipped to an angle of 45 degrees. The tipping is done by two arms, one on each side of the body, fastened to a large steel crank shaft which revolves in one direction only; two-thirds of the revolution to tip and one-third to lower. This allows the body to come down to its position on the chassis frame in half the time required to raise it for dumping. The body may be raised and lowered to its regular position in 50 seconds.

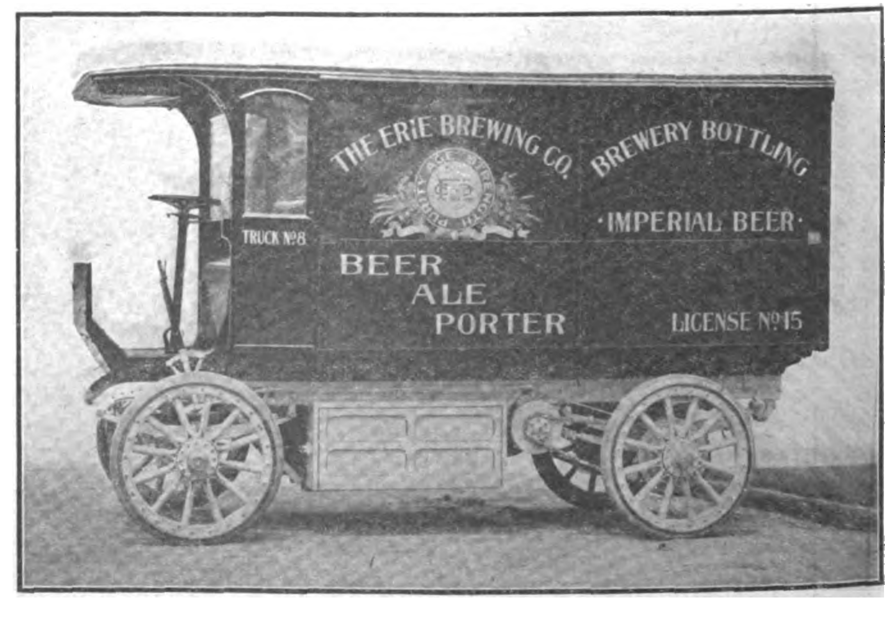
The dumping is done by either a hand crank or an auxiliary motor mounted under the seat and driving through a shaft and worm "eight" spur gear reduction on the crankshaft. This shaft runs in oil contained in a dust-proof housing.



Baker Four-Ton Dumping Body on Standard Four-Ton Chassis.

Owing to the growing demand among brewers for a light delivery truck to quickly handle their bottled goods in small towns and residence districts in larger cities, the Baker Motor Vehicle Company has perfected and is now announcing a new standard 3,000-pound truck for this service.

The body is neat in appearance, with loading space 106 inches long, 46 inches wide and 60 inches high, carrying 54 beer cases of 24 bottles each per load. The cases are arranged in two rows nine cases long by three tiers high. The side panels of the body are made of two sliding doors, each one-half the length of the body and no opening in the rear. Each door slides on roller bearings on an over-head track which is always free from dirt. Each door has a spring lock which cannot be opened without the key when closed.



Baker Light Delivery Truck.

By using this system of doors the driver can take out any case of bottles without disturbing the rest. This arrangement saves considerable time. As the truck is unloaded and filled with empty cases, there is no handling of empties to get at the full ones, as is the case when access is made through the rear.

This body construction has been pronounced unique, serviceable and very satisfactory. The Erie Brewery Company, of Erie, Pa., was the first to install this type of truck and is well pleased with the work it has done.

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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COST VERSUS SERVICE.

From figures presented in the article discussing the application of electric motor drive to shoe factories, appearing elsewhere in this issue, it is seen that the cost of power is but 0.5 per cent of the total cost of manufacturing a pair of shoes, while the labor cost is 20 per cent of the total. A similar relation exists in a large number of manufacturing industries, power representing but a small portion of the gross expense—frequently less than one per cent and rarely exceeding three per cent, even with the large power consumers.

Still, when opening a negotiation with a manufacturer for the use of central-station service, almost the first question asked is, "How much is it going to cost?", or, "What are your rates?" Many times the salesman will name him a rate, and thereafter he is on the defensive and must show the justification of the rate. He has only a slight opportunity to present the real benefits possible to be had from the service.

Successful power salesmen have found, however, that no mention should be made of rates, at least in the preliminary negotiations, but instead the manufacturer should be shown how central-station service has increased the net profit for others, and permission should be secured to conduct an investigation in the factory, to determine what benefit he would derive. By handling a prospect in this manner the subject of power cost becomes a detail, and when it is also shown, incidentally, that the central station can effect a saving on this item, the case is much strengthened.

Shoe manufacturing presents a striking example of the folly of comparing central-station power with other methods purely on a cost basis. In this industry, although live steam is required throughout the entire year, a saving of 25 per cent in favor of purchased power is possible, but this makes very little, if any, difference in the cost of manufacturing a pair of shoes. On the other hand, a factory with an average yearly business of $500,000 adopted central-station service and as a result increased its output 10 per cent, without additional labor or equipment. This additional output of $50,000 is obtained at practically the cost of the extra material, which is $20,000.

This is simply one of many cases that could be cited to emphasize the value of selling service and not making a question of rates the important item.

By selling service, also, the central station will eliminate the customer who compares his bill with the same month of the previous year and then complains if the former is higher. The manufacturer should know that the power consumed will be in proportion to his output.

IMPROVED RUBBER-COVERED WIRE.

Experience gained in the development of any art brings about a gradual raising of standards so as to overcome difficulties encountered and insure a carrying out of improved practice. In the extraordinarily rapid development of the electrical arts this rule has been manifested in almost numberless directions. One of these has been in the matter of insulation of apparatus and conductors. The importance of high-grade and permanent insulation is being forcibly demonstrated by an analysis of cases of fires of electrical origin and of fatal or serious shocks from contact with circuits of even moderate voltage. The subject has been given a great deal of study in recent years with the result that the shortcomings of various insulating materials are now better understood and means for improving these materials developed.

Rubber is one of the most important and extensively used insulating materials. Since pure rubber is unsuitable for insulation, a compound thereof with other ingredients must be used. Until a relatively few years ago not much attention was given to what was a reliable rubber compound and what the properties thereof should be. It then became known, however, that a large part of electrical fires and accidents were due to failure of rubber insulation. This brought about an effort to improve the quality of such insulation which culminated in the higher standards laid down in the 1911 edition of the National Electrical Code. Before the close of the year 1912 the new-Code rubber-covered wire was definitely required by electrical inspectors in practically all parts of the country. It was found that the new-Code rubber wire could be made at but a slightly higher cost than the old material.

Although more than a year has elapsed since nothing but new-Code wire was supposed to be used, electrical inspectors and others interested in improved electrical construction are still frequently finding the so-called old-Code wire being sold and used in wiring installations. The status of this situation was forcibly reported on by Mr. Victor H. Tousley, chairman of the Committee on Rubber-Covered Wire, at the Cincinnati convention of the Western Association of Electrical Inspectors. This journal has always stood and continues to stand strongly in favor of higher standards of electrical construction. Being heartily in sympathy with the aim of Mr. Tousley's report, we have reproduced it in full in another part of this issue, so that the importance of taking active measures to insure the use of only approved rubber-covered wire may be brought home to inspectors and contractors throughout the country.

It is interesting to note that several manufacturers are definitely known to still manufacture inferior wire, although they profess to turn out only high-class product and would not like the reputation of making shoddy goods. When it is realized that each case of shock or fire that can be traced to defective rubber insulation (and there are altogether too many of them) discredits the use of electricity and is therefore a blow at the entire electrical industry, there is brought home the need for more positive pressure than merely moral suasion on makers of and dealers in inferior wire. Neglect to see the trend of events may result in drastic or ill-advised legislation, as is too commonly the case where restraint of a few unscrupulous individuals brings hardships on many.

The specifications for rubber insulation laid down in the 1911 Code are such as to give a reasonably good quality of insulation. The present state of the art probably does not warrant the requirements for general use of still higher standards. However, there are many places in which a higher type of insulation is needed. As a result of prolonged study a committee composed of various interests seeking to improve rubber insulation has made a preliminary report and suggested a specification and tests for this higher product which will contain at least 30 per cent of pure rubber. A summary of this specification is also reproduced in this issue. It is of importance not only in those places where the best type of insulation is needed but also because it may be the basis for a standard higher than that now required by the Code to be generally adopted in the future for all rubber-covered wire.

APPEALING TO THE HOUSEKEEPER.

Many men in all branches of the electrical business realize that the typical residence is not so completely wired nor furnished with so many outlets as is necessary to supply the home with all the conveniences which a supply of electric current places at its disposal, and it is generally supposed that this feature of the situation is not recognized by others.

The correspondence which was presented at the recent meeting of the New Jersey Electrical Contractors' Association shows that this paucity of electrical facilities is recognized also by many housekeepers. The New Jersey Federation of Women's Clubs called upon the New Jersey contractors for the remedy for this difficulty, and fortunately the secretary of that association had an answer ready. He offered to furnish literature in any desired quantity to the women, showing them that their problem can be easily solved by giving the contractor orders to put in the appropriate outlets when wiring the home.

The incident suggests that the contractors should do more than this. It is always within the province of the contractor to suggest to the owner of a building plans, or changes in plans, that will make a more satisfactory installation and enable the occupant of the building to make a larger use of electrical facilities in the years to come. No contractor should fail to point out every case where he considers the design of the electrical installation inadequate. The above incident emphasizes that he might with advantage appeal to the future housekeeper of a residence building, and when she is properly informed in the matter her co-operation should carry great weight in securing a modification of the plans, which will usually mean a more extensive installation and more work for the contractor.

LOCAL ASSOCIATIONS AND GOOD CONSTRUCTION.

In his address before the New Jersey Contractors' Association, Mr. Arnold H. Moses made a suggestion which is worthy of the careful consideration of local associations of electrical contractors. This suggestion is that every such association shall appoint a committee which in any case of dispute shall pass upon the work of any of the members of that association and act as a board of arbitration between the member involved and the architect or owner of the building in which the work has been done. In case such work does not come up to the specifications or to the standard imposed by local requirements, such as a municipal or other code, the association should then discipline its member, and in an extreme case expel him from the organization. When the dishonest and unreliable contractors had thus been eliminated from such a local association, membership would become a greater asset to the electrical contractor and he would stand before the public as one who could be relied upon to properly fulfill a contract, even though the owner or other person in charge of the building was not sufficiently versed in the work to discover faults in the installation. An organization of this kind would be of great value to both the reputable contractors and to the public. Eventually such a condition of affairs would eliminate defective workmanship and material more completely than could any legal provision, such as the requirement for registration or license. This would apply especially in the smaller towns, where there is no regular corps of inspectors.

A proposition of this kind would have a great many of the advantages of the scheme for insuring the contractor's work without including the disadvantages of such a scheme. It merits the careful consideration of local associations of electrical contractors.

In every department of physical effort the most decided tendency of the times is to render adequate service and to compete not only in the matter of cost, but in the no less important matter of quality and ultimate satisfaction. The electrical contractor is worthy of emulation for his ready acceptance of this opportunity.

THE NATIONAL CHAMBER OF COMMERCE.

The annual convention of the National Chamber of Commerce, which was held at Washington, D. C., during the past week, brought together what was probably the greatest gathering of business men that the country has ever seen. The National Chamber, made up of the federated members of the chambers of commerce of the principal cities of the United States, represents the dominant business interests of the country. For the first time there has been made available a concrete answer upon the part of the commercial interests of the country to the proposed legislation within and without the Federal Cabinet, and within and without the House of Representatives and the Senate of the United States.

The work of the National Chamber of Commerce is to study the conditions from every angle, and prepare men in advance to discuss intelligently ways and means for arriving at the solution of problems confronting every commercial and social activity of the nation. Among the vital matters presented during the past week, the three most conspicuous were the report of the committee on patents, copyrights and trademarks, the symposium with respect to the so-called anti-trust legislation proposed by the present Congress, and the discussion of those things relating to the resale prices of manufactured goods.

On other pages of this issue there are given brief excerpts from several of the addresses made upon these topics. The nature of the organization of the Chamber is such that after analysis and study of conditions it can only recommend further ways and means for working toward the solution of the problems involved. It is well, however, that when we have arrived at a condition so fraught with immense possibilities that we have available this forum before which these questions may be debated, and it is inconceivable, when representing the highest intellectual development of the country in commerce and industry, that these recommendations can have other than a most potent influence upon the future course of the country whatever it may be. It seems to us that the keynote of the situation as enunciated by practically every speaker before the convention, is the determination to conserve that which we have so that our commercial prosperity remain unimpaired while we are working gradually to a conformity with modern conceptions of the way in which we should go. As Mr. Fish points out, "back of all the suggestions as to detailed legislation is the broad question of whether we are approaching the subject of the proper control and development of our industry in the right way. It would be greatly to our advantage if that underlying condition could be studied and we could be sure that it was settled on a sound basis before we advance further into the regions of the unknown by adopting speculative suggestions based on unproved or at least doubtful theories rather than on the facts and necessities of our business situation."

Electrical Advertising Discussed Before Chicago Jovian League.

Some of the basic principles of advertising were interestingly discussed at the meeting of the Chicago Jovian League on February 9, by A. N. Fox, advertising manager of the Benjamin Electric Manufacturing Company. Mr. Fox said that advertising copy should be the mouthpiece of the manufacturer and as such should present logical selling arguments and descriptions of the product advertised rather than a pictorial display of the product with screaming adjectives designed to stun the reader. Advertising must also be true as, in the words of Mr. Fox, "there is a time fuse on every false campaign." Advertising is not an exact science. Mr. Fox pointed out that good advertising is an asset to any company. Good printing is essential to good advertising. In considering advertising media, Mr. Fox stated that it is equally as important to give consideration to a publication's editorial policy as to its circulation statement.

A. A. Gray called attention to the action of the Federation of Trade Press Associations requiring a circulation statement from publications as a requisite of membership.

Attention was called to the rejuvenation of the Sons of Jove which will be held March 5, at the Hotel Sherman. Dinner at $1.50 per plate will be served at 6:30 p. m. and the rejuvenation will follow. Victor H. Tousley is chairman of the membership committee.

Program of Meeting of Tennessee Contractors.

The Tennessee Electrical Contractors' Association will hold its third annual convention at the Hotel Chisca, Memphis, Tenn., on February 16 and 17. Contractors, central-station men, street railway men, jobbers, manufacturers and electrical engineers from Arkansas and Mississippi, as well as Tennessee, are invited to attend this meeting.

At the opening session at 10 a. m., on Monday, February 16, there will be an address of welcome by C. O. Scholder, president of the Business Men's Club, and a response by J. P. Lawrence, president of the association. J. F. Ramier, Jovian statesman, will make an address on "Co-operation Between the Central Station and Contractor;" W. R. Herstein will speak on "Practical Jovianism," and J. A. Fowler on "Humor and Pathos of Electrical Contracting."

In the afternoon there will be a closed session devoted to legislative matters, architectural relations, business management and ethical relations.

At 11 a. m., on Tuesday there will be addresses by Ernest Freeman, president of the National Electrical Contractors' Association, and Ell C. Bennett, Mercury of the Jovian Order.

On Tuesday afternoon there will be a closed session with papers as follows: "The National Association," by Ernest Freeman; "Twists of the National Code," by Ernest McCleary; "Data and Sales Book," by G. M. Sanborn; "Why More Members," by J. T. Marron; "New Laws," by P. H. Jaehnig; "The Jovian Order," by Ell C. Bennett; "Labor Troubles," by J. A. Fowler; "The Journal," by G. H. Duffield; "Bookkeeping," by G. W. Hill. Mr. Duffield is secretary of the National Electrical Contractors' Association, and Mr. Hill is its special representative.

On Monday afternoon there will be a reception and tea for the ladies and the evening will be spent at the Automobile Show. On Tuesday morning, prior to the session, there will be a reception to President and Mrs. Freeman and the other visitors. In the afternoon there will be an automobile ride, and in the evening an electrical parade, a banquet and a Jovian rejuvenation.

Bion J. Arnold Talks on Subways to Chicago Electric Club.

At the meeting of the Electric Club, Chicago, held on February 5, nearly 250 members and guests were present to hear Bion J. Arnold give an illustrated talk on subways. Since the construction of passenger subways will probably form a referendum subject at the next municipal election in April, the closest attention was given to Mr. Arnold's discussion of the principles that should govern such construction and to the explanation of his plans for beginning and extending the work.

In introducing the speaker, President Bone called attention to some of Mr. Arnold's suggestions for increasing the capacity of the New York Interborough subways. Mr. Arnold began his talk by dwelling on these points: He said that by following his advice as to installing side doors in the cars, an automatic door-controlled system of signaling the motormen, increasing the length of the stations and trains, and developing an improved, automatic, speed-governed train stop, the capacity of the Interborough subway system was increased from 500,000 to 1,200,000 passengers a day. He cited this to show the importance of proper design in order to give maximum capacity for the very heavy investment involved in subway construction.

Taking up the Chicago situation, Mr. Arnold read from the report he presented in 1911, when he was chief subway engineer for the city of Chicago. Practically all of the principles then laid down still hold true; the various steps in the execution of the plans then proposed can be carried out with slight alterations due to recent changes in the ownership and operation of the traction systems. Practically all of the construction now planned by the Board of Supervising Engineers, of which Mr. Arnold is chairman, can be built so as to form parts of a comprehensive system of subways covering the entire city with a network of high-speed lines. The initial work contemplated is modest in scope and can be built within a few years with money in hand or in sight and without burdening the taxpayers with bond issues or guarantees of the securities of a construction company. With moneys coming into the traction fund from year to year, the initial bores can be extended and added to, so that gradually a comprehensive system will be developed to keep pace with the urgent traffic demands of the community.

Mr. Arnold stated that grade crossings should and can be avoided at intersecting points. He showed plans and elevations how this can be done, both in two-track and four-track subways by having, say, the north and south subways cross over the east and west subways. He showed how the utilities under the streets should be provided for as a feature of subway construction. He dwelt on the need for opening up additional through streets and explained the plans for beginning this work.

Early in the meeting President Bone referred to a communication from the Colorado Electric Club announcing that it now has passed the 900 mark in membership. Secretary Ehrlich read the names of several applicants. The Chicago Electric Club is now actively striving to increase its membership to 1,000 before the close of the present year.

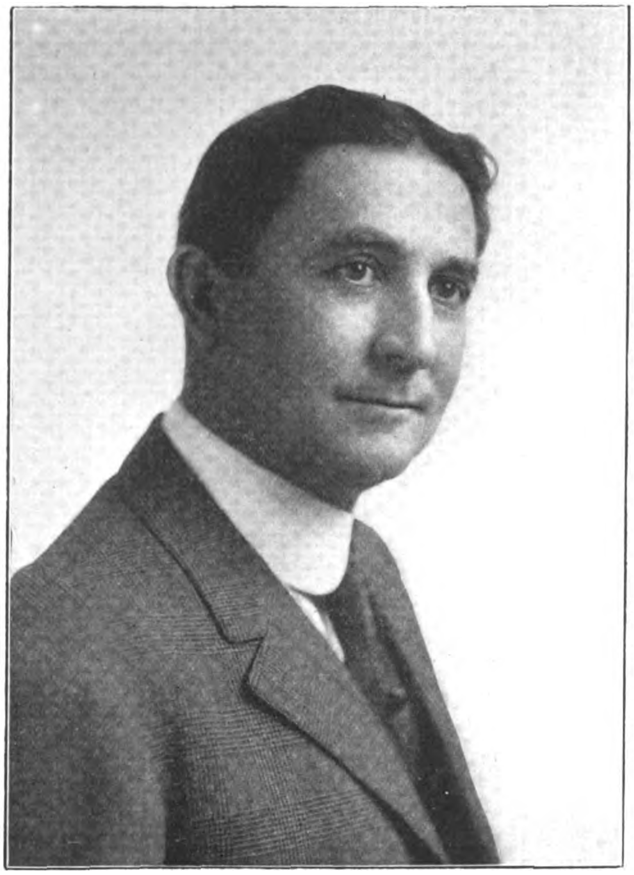
Voting Machine Favored for House of Representatives.

The scheme proposed by Representative Allan B. Walsh for recording votes in the House of Representatives at Washington has received a favorable report at the hands of the Subcommittee of the House of Commitee on Rules. This proposition was referred to in our issue of August 2, 1913 and consists of electrically recording the vote of each member when he presses a button at his desk. The scheme provides for visual signals of the votes by means of colored lamps and a permanent record by means of holes which will be punched in cards bearing the membership list of the house.

Not only has the Commitee reported in favor of the scheme, but it is understood to be supported by Speaker Clark, Representative Underwood, Elliott Woods, superintendent of the Capitol Building, and other prominent men.

J. W. Benham.

Very often in the development of an industry or of a business connected with an industry, there is evolved a man and his work between whom and which there is a striking similarity. In thinking about the lumber industry, and particularly that part of the industry which is related to the production of the giant poles which go into so much of the long-distance transmission lines of light and power companies, one is apt to think of rugged and virile characteristics. It is a fact also that in thinking about so many men connected with the lumber industry and particularly that part of the industry, which is devoted to the products familiar to the light and power industry, that men of rugged, virile charactertistics are considered. There is a striking similarity between the man and the business in the characteristics of J. W. Benham, recently elected president of the Northern White Cedar Association. For many years the Association was known as the Northwestern Cedarmen's Association. So that the products handled by the members of the Association might be more specified, a number of the prominent members of the organization have sought for some time to bring about a change in name. Consequent upon this effort, at the annual meeting held several weeks ago, the name was changed to that above announced, and among those who have taken a most conspicuous part in thus establishing a more specific name for the Association none is more prominent than the subject of this sketch.



J. W. Benham,
President, Northern White Cedar Association.

James W. Benham was born in Minneapolis, Minn., in 1866. Going to California when a baby he was educated at San Francisco, in his early youth going down into Arizona and becoming identified with the cattle industry. There he took an active interest in territorial politics and his aggressive, enterprising qualities of good citizenship established for him an early renown as a champion of better things in municipal and statewise affairs. He was in turn a member of the Legislature, one of the first and most active promoters for statehood rights for Arizona, was a member of the first live stock sanitary board of Arizona Territory and a member of the first forestry organization of the territory. Two members of this first commission are at the present time head men of the forestry service.

In 1901 Mr. Benham went into business in New York City. Coming to Chicago in 1906, having attracted the personal attention of the late Gilbert B. Shaw, he became a member of the firm, which was then a partnership, of Mr. Shaw and A. T. Naugle. When the firm of the Naugle Pole & Tie Company was incorporated in 1910, Mr. Benham became secretary and treasurer, the other officers being C. E. Maxwell, president, and A. T. Naugle, vice-president. Mr. Benham has since held this position, which carries with it the practical management and direction of the selling organization of the company. It is largely through Mr. Benham's efforts, therefore, that the company has assumed its position among the leaders of pole industry. Facilities have been increased, large yards established where big supplies of material are concentrated, and the company is in a fortunate position not only with respect to northern white cedar, but also with respect to western lumber as well.

Mr. Benham's first connection in association matters was in 1906, when he attended the annual meeting of the Northwestern Cedarmen's Association. From that time he has been an active worker for the interests of the Association, and has taken a leading part in developing the latent forces of associated effort, bringing about a better understanding of conditions throughout the entire industry and establishing the production and selling of white cedar upon a mutually satisfactory basis to both producer and consumer. Under the administration of Mr. Benham it is expected that the Northern White Cedar Association will go on to greater accomplishment. Among the things that Mr. Benham hopes to see materialize during the coming year is the establishment of a closer relationship of the Association with the railroads carrying its products, the advancement of the proposition of equitable rates, allowances for staking and a more equitable disposition with respect to minimum weights and other matters of this character. He is also devoted to the proposition of bringing to the attention of the public the value of white cedar for poles, posts and ties, to say nothing of its value as building construction material. He is of the opinion that if the general public is better informed with respect to the qualities of white cedar, that a very much improved market will be established. To this end a considerable sum of money has been subscribed to participate in an aggressive educational campaign of publicity.

Personally, Mr. Benham is more than popular with the other cedarmen in the business. He enjoys their confidence and esteem, and all this with due modesty and a desire only to be given the privilege of working full time for the development of a bigger and better business and social opportunity for his fellow cedar producers.

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Peoria Show Postponed.

The Peoria Electric Club held its regular meeting in the Garden Room of the Jefferson Hotel, Peoria, Ill., on February 7. It was decided to postpone the Electric Show that had been planned for March owing to failure to make satisfactory arrangements for a hall.

There was a large attendance at the meeting and several members spoke. Mr. Vance, of the Traction Company, gave a talk on "How to Skin a Salesman," saying that it could not be done. Mr. Wolgamott spoke on "The Easy Life of the City Electrician."

Philadelphia Section Activities.

At the January meeting of the Philadelphia Electric Company Section, National Electric Light Association, held on January 19, Prof. Robert H. Fernald, of the Towne Scientific School of the University of Pennsylvania, delivered a lecture upon the subject, "The Possible Central-Station Plant of the Near Future." The gist of his discourse was that the central-station plant of the near future would be located at or near the point where coal is mined, or actually in the mine itself. By charts he showed that the consumption of coal had increased to a remarkable, almost an alarming, extent in the last 50 years, and pointed out that unless some more economical method of using fuel was employed, the country would in a century or so find itself entirely out of coal. He described the use of the coal in producer-gas engines for the purpose of deriving energy with which to drive electrical machinery, as against the present method of generating steam to drive such apparatus, drawing his information from authoritative sources, and his discourse was not only interesting, but impressive, and the two hundred members of the Section who were present at the meeting were duly impressed with the seriousness of this phase of the electrical industry.

The Accounting Department Branch held its meeting on January 13. The paper of the evening was entitled "Depreciation as an Essential Factor in Determining Profits," and was presented by Elwood G. Walls, an employee in the consumers' accounts division. Mr. Walls showed by his paper that the boys of the department are giving their thoughts to other things than just those particular duties which come to their hands. The paper was masterful and was ably presented, and it is hoped to have more of such papers by the employees of the department at future meetings. A mock trial was the entertainment feature of the evening, and followed the discussion of the paper.

The Meter Department and the Engineering Department Branch held a combination meeting on January 5. This was the first joint meeting of any branches of the section and was a pronounced success. The Peconela orchestra opened the meeting by playing a delightful overture. Louis C. Smith spoke of the early days of the company's history, referring particularly to the old Meter Department. The Good and Welfare Committee, following the discourse of the evening, provided refreshments. During this part of the program, monologues, vocal and instrumental selections were offered by several members of the branches.

The Commercial Branch held its January meeting on Monday, January 26. The paper of the evening was "Selling Electric Power," and was read by Edwin Hulley, of the Power Department. The presentation of the paper was followed by an animated discussion.

The Special Prize Award Committee, in the contest for the John Meyer prize to the member naming the greatest number of electrical devices and the greatest number of practical uses to which the appliances could be put, announced the conclusion of the contest, with the following results: Winner, R. L. Lloyd, who enumerated 193 appliances, of which seven devices had 24 practical applications; honorable mention, R. B. Ely, who enumerated 116 appliances, of which ten devices had 20 practical uses; specially commended, Daniel A. Fitzgerald, who had a list of 175 appliances.

Lynn Section Meeting.

William B. Potter, engineer of the Railway Department of the General Electric Company, lectured on February 4, before the Lynn Section of the American Institute of Electrical Engineers, the subject being "Electrification of Railroads." The speaker was introduced by Elihu Thomson, who referred to the pioneer work in railway motors in 1887 at Lynn, and a little later when the West End road was electrified.

The first part of Mr. Potter's lecture was devoted to a historical survey of the evolution of the electric car, and he made interesting comments on European practice of today as compared with that obtaining in America. Accompanying the lecture a comprehensive series of lantern slides, covering almost every phase of railway equipment here and abroad was shown.

A social hour, when refreshments were served, followed the lecture.

The next meeting will be in Burdett Hall, when Elihu Thomson is to lecture on Color Photography.

Dinner of Brooklyn Contractors.

The eighth annual dinner given by the Edison Electric Illuminating Company, of Brooklyn, N. Y., to the electrical contractors of that city was held at the Academy of Music on February 7.

W. F. Wells, vice-president of the Edison Electric Illuminating Company, spoke of the development of the electric business in Brooklyn during the last decade. When the company gave a dinner to the electrical contractors of the city in 1892 there were so few of them that they all sat around a single table. The company had about 1,000 customers at that time; whereas during the past year it signed 23,000 contracts.

Theodore I. Jones, general sales agent of the company, acted as toastmaster, and the other speakers were: James R. Strong, former president of the National Electrical Contractors' Association; Joseph C. Forsythe, chief inspector of the New York Board of Underwriters; Louis Kalischer, president of the Electrical Contractors' Association of Long Island; Frank W. Conn, president of the Manufacturers' and Business Men's Association, and Lewis H. Pounds, borough president.

Vehicle Association Appoints Permanent Executive.

The increasing work of the Electric Vehicle Association of America in extending the Association's influences and efforts in demonstrating the value of electric wagons has made it extremely difficult tor the officers to properly administer its affairs without neglecting other business. It was, consequently, decided to establish the position of permanent executive secretary and inaugurate a system for the rapid dispatch of the Association's work. Albert Jackson Marshall has been appointed to the position of executive secretary and will carry on the work of the Association at 29 West Thirty-ninth Street, New York City. Mr. Jackson was well known in the field of illuminating engineering, having been connected at one time with the Holophane Company, and served as editor of the *Illuminating Engineer*. He is well known in the central-station field and has lately been associated with the General Motors Truck Company.

Boston Vehicle Notes.

At the next meeting of the New England section, Electric Vehicle Association of America, to be held on February 25, W. W. Scott, editor of *The Motor Truck*, will make an address on the goods-delivery system in Boston.

The second annual show of automobiles to be held by the Wollaston Center Garage, will occur on February 28 and March 2, 3, 4 and 5. A number of electrics will be on exhibition.

Edward S. Mansfield, Day Baker, O. G. Draper and E. A. Gilmore constitute a committee of electric-vehicle men who are working with other automobile organizations for legislation favorable to automobile interests. Mr. Gilmore is president and Mr. Draper secretary of the joint committee. One of the measures advocated is that which requires lights to be displayed on all vehicles on the public highways, and a proposed enactment that is opposed is one which aims to impose a registration fee of $5 a ton on all commercial automobiles.

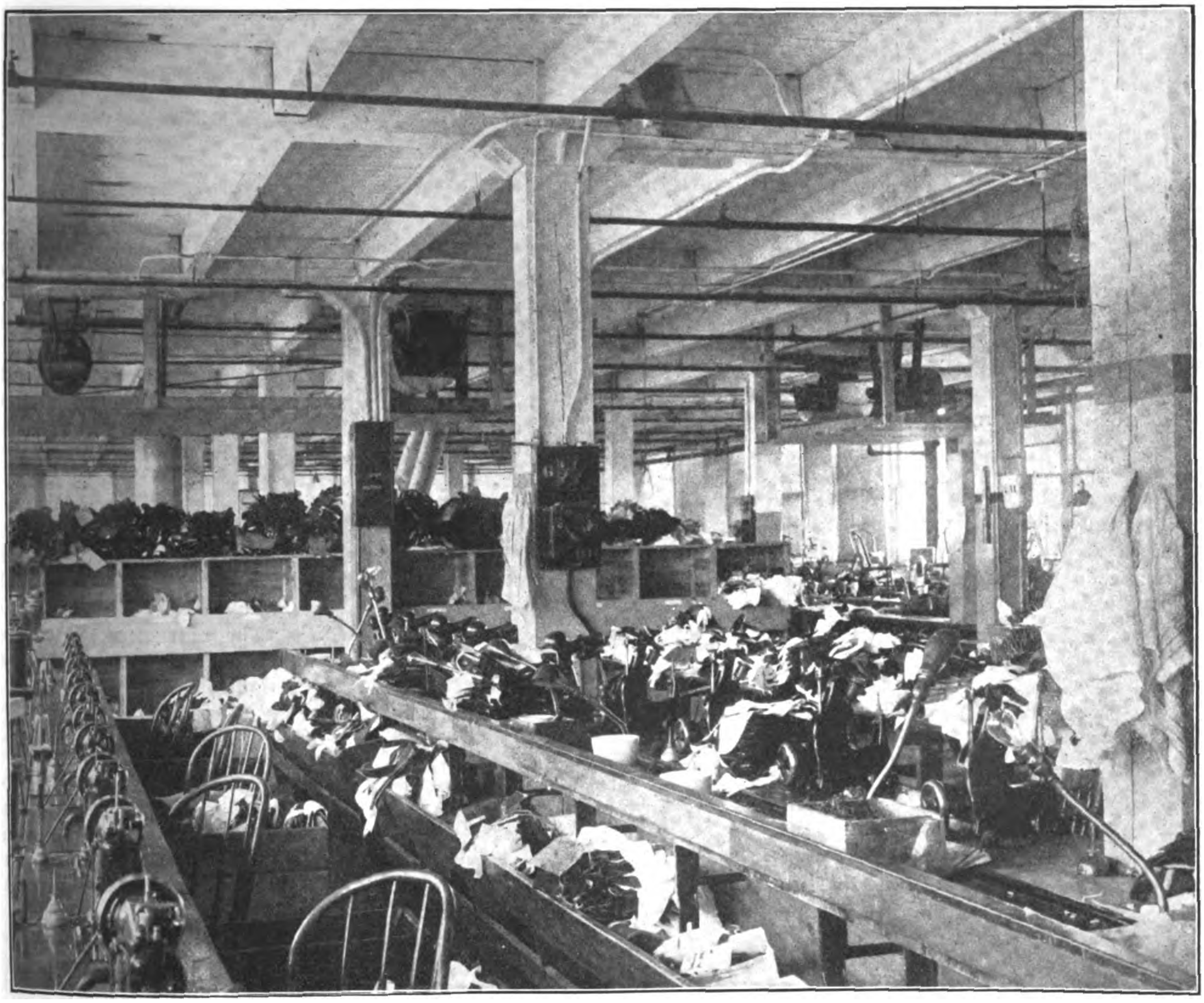
Discussion of National Code.

An electrical conference to discuss the National Electrical Code, will be held at 226 South Eleventh Street, Philadelphia, Pa., on Thursday, February 26, at 7:30 p. m. This is primarily for the benefit of local inspectors.

Electricity in Shoe Manufacturing.

The material decrease in unit cost of production is one of the principal advantages attending the use of central-station service in shoe factories. Reductions in operating costs, averaging 25 per cent are of little importance when compared with the increased production possible with the same labor and equipment. Data are given on several plants purchasing power.

In a previous discussion of the application of electric drive to shoe factories, by H. O. Stewart (see issue of December 7, 1912), it was pointed out that the most important advantage of central-station service to shoe factories is the material decrease in unit cost which results, or, in other words, an increase in output with present equipment and labor. This is due principally to the uniform speed of motor driven machines, whether driven by individual motors or in small groups, as is usually preferable in shoe factories.



Group of Eyelet Machines in Shoe Factory Driven from Floor Below by a Three-Horsepower Motor.

A reciprocating steam engine seems to give a steady speed when a speed indicator of the usual type is applied to its shaft. The rapid variations in angular velocity due to the change from linear to rotating motion, while too rapid to be seen, are usually great enough to cause wastage and to unduly shorten the useful life of shoe machinery.

A long shaft driven by reciprocating engines often shows 10 per cent speed variation at the end farthest from the prime mover. This variation is caused by the initial unsteadiness of the prime mover, accentuated by the slipping and crowning of belts partly due to glazed spots and by the jerks of the machines themselves.

The steadiness of electric drive with their constant angular velocity, increases the useful life of the driven machinery and greatly reduces wastage.

The slipping of belts between engine and driven machine frequently results in 10 to 20 per cent loss of speed in the latter. With group electric drive the number of belts and shafts is greatly reduced, while with individual-motor drive they are entirely eliminated and each machine is kept up to its maximum productive speed at all times.

Also, a careful study of the manufacturing processes often suggests a much better arrangement of the machinery. The proper machine layout, only possible with electric drive, means a minimum handling of material with the maximum facility for rapid work. It is often found that certain machines retard the entire factory output. Obsolete or worn-out machines should be discarded and replaced by modern machines of ample capacity. The addition of a machine or employee in a process which is

Fitting Room of Modern Shoe Factory. Machines Driven from Floor Below.

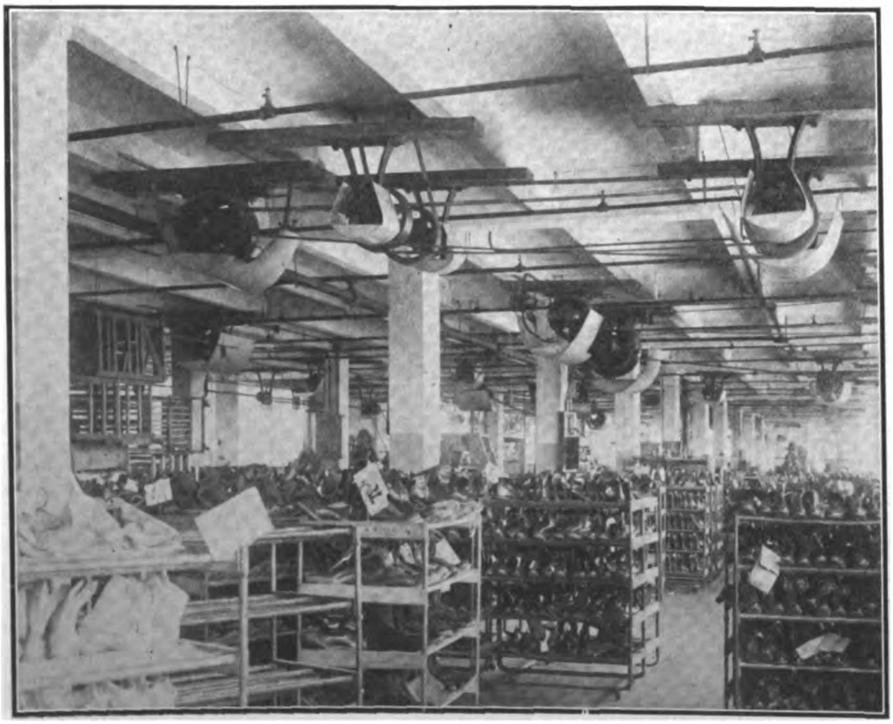
limiting the factory output will generally increase the output. The substitution of modern machinery to perform these processes carried on by hand not only lowers the cost of production, but also increases the output. This is strikingly true of shoe machinery.

Where electric drive is employed, the routing of material and the necessary light can be determining factors of location. Corners which could not be used with mechanical drives become productive with individual or small group drives.

These advantages result in more production and less wastage, conditions which are necessary for success in these days of curtailment and competition. As an example, consider a factory with an average yearly business of $500,000. By means of scientific methods, its output has been increased 10 per cent without additional equipment or labor. This additional output of $50,000 is obtained at practically the cost of the extra material, which is 40 per cent of this amount, or $20,000. The 10 per cent increased output brings a return of $30,000 profit for an investment of but $20,000 in material. The manufacturer actually earns 150 per cent profit on this additional output and only from 5 to 10 per cent on his average output. If the profit on his average output were 5 per cent, the 10 per cent increased output would more than double his average profit, his total profit, being $55,000 while his average profit is but $25,000.

Increased output can almost always be obtained by improving the mechanical and physical conditions and details, and by keeping accurate and continuous records of each machine, or, at least, of each group of machines.

The fact that increased production results from motor drive should, therefore, be given the greatest consideration by the central-station salesman when soliciting this class of business. As live steam is required throughout the entire year in shoe factories the margin, in favor of central-station power, when considered solely on a comparative-cost basis is usually not sufficiently attractive to induce the factory manager to discard his engine and lineshaft drive or his electric power plant, particularly if the investment in the existing installation is high.



Method of Mounting Motors on Ceiling for Driving Machines on Floor Above.

A reduction of 25 per cent in the cost of power by the use of central-station service, which is the usual economy effected, means but a very small reduction in the cost of manufacture, as the average energy consumption per pair of shoes is one-third of a kilowatt-hour. At a rate of three cents per kilowatt-hour, the power would cost one cent per pair of shoes. The cost of a pair of shoes manufactured for $2.00 could be itemized as follows:

Power	0.5 per cent
Labor	20 per cent
Material	40 per cent
All other charges	39.5 per cent

A 25-per cent decrease in the cost of power, therefore, does not materially reduce the cost of manufacture.

There are other important advantages of motor drive and central-station power that apply specifically to shoe factories, in addition to those already discussed. In addition to the arrangement of machinery for the best possible routing of material, it should be remembered that good illumination which is made possible by the removal of belts and shafting, increases the output and decreases the number of seconds.

In the foregoing table it was pointed out that the labor item in the cost of manufacturing a pair of shoes amounted to approximately 20 per cent of the total cost. As this item is such a large one it is obvious that reliable power is of the greatest im-

Shoe Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Shoe company, located in Sheboygan, Wis., manufacturing an average of 225 pairs of shoes per day. There are 35 men employed working 10 hours per day.

Total connected horsepower, 18.5. Total number of motors installed, 5. Average kilowatt-hours per month, 1,069. Average kilowatt-hours per month per horsepower connected, 57.8. Average kilowatt-hours per day, 42.5.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
July	623	November	1,170	March	343
August	926	December	1,019	April	2,164
September	1,018	January	965	May	1,062
October	1,093	February	1,185	June	1,263

Load-factor, 10.6 per cent; operating-time load-factor, 22.2 per cent.

Measured maximum demand, 6.85 kilowatts.

The average electrical energy consumption per pair of shoes manufactured is 0.188 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,800	Belted to line shaft, driving two dieing machines; one roller; one press; one Puritan stitching machine; one top skiver; and two tacking machines.
1	3	1,200	Belted direct to one dieing machine.
1	7.5	1,800	Belted to line shaft driving one leveling machine; one heeling machine; one McKay machine; one standard screw machine; one loose nailer; one heel trimmer; one edge trimmer; one edge setter; one edge brush; one heel waxer; one heel scourer; and one buffing machine.
1	1	1,800	Belted to line shaft driving two needle stayers; one trimmer; one needle-top machine; one single-top machine; one hook-top machine; and one eyelet machine.
1	2	1,800	Belted to line shaft driving two Puritan sewing machines; one waxing machine; one trimmer; two Post machines; one tip-punch machine; one skiver; one Zig Zag machine; one two-needle flat-back machine; one two-needle post-back machine; one single nail machine; and one eyelet machine.

Shoe manufacturing plant operating 54 hours per week. No figures are available concerning output and number of employees.

Total connected horsepower, 50.5. Total number of motors installed. 8. Average kilowatt-hours per month, 5,081. Average kilowatt-hours per month per horsepower connected, 100.6. Average kilowatt-hours per day, 195.4.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	6,988	May	4,692	September	5,082
February	5,800	June	5,092	October	4,404
March	5,720	July	3,236	November	4,684
April	5,820	August	5,372	December	4,080

Load-factor, 18.5; operating-time load-factor, 43 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	7.5	950	Direct-connected to a 40-inch Sturtevant fan.
1	0.5	1,800	Direct connected to small exhaust fan.
1	7.5	950	Belted direct to mechanism of 3,000-pound freight elevator.
1	5	1,200	Belted to line shafting driving 65 stitching machines.
1	10	1,200	Belted to a line shaft driving three lasting machines; two pulling machines; one stretcher; one Puritan stitching machine; three beveling machines; and three brushing machines.
1	5	1,800	Belted to a short line shaft driving two buffing machines.
1	10	1,200	Belted to a line shaft driving three edge setters; one heel burnisher; four edge trimmers; three heel scourers; one heel trimmer; two heeling machines; one emery wheel; and two sluggers.
1	5	1,200	Belted to a line shaft driving two finishing shafts; two Wheeler & Wilson sewing machines; two rounding machines; five channeling machines; and one molding machine.

All machines are manufactured by the United Shoe Machinery Company.

All motors installed are of the squirrel-cage induction type.

Shoe Manufacturing Data—Sheet No. 2.

Shoe manufacturing plant, located in Sheboygan, Wis., having an average daily output of 900 pairs of shoes. There are 100 men employed working 10 hours per day.

Total connected horsepower, 38. Total number of motors installed, 5. Average kilowatt-hours per month, 5,523. Average kilowatt-hours per month per connected horsepower, 145.3. Average kilowatt-hours per day, 212.5.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	4,820	May	5,350	September	5,420
February	5,510	June	5,320	October	6,090
March	4,990	July	4,710	November	6,850
April	5,410	August	5,060	December	6,750

Load-factor, 26.7 per cent; operating-time load-factor, 56 per cent.

The approximate electrical energy consumption per pair of shoes manufactured is 0.048 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 110 volts.

No.	Horse-power.	Speed. R. P. M.	Application.
1	5	1,800	Belted to a line shaft driving 10 Model C, Ideal, clicking machines, manufactured by the United Shoe Machinery Company.
1	3	1,800	Belted to line shaft driving one Amazon skiver; one tip punch; 20 Wheeler & Wilson sewing machines; three eyelet machines; two hook machines; and three Puritan wax-thread machines.
1	10	1,200	Extended-shaft motor belted to two 30-foot 7-hanger line shafts driving four gearless sole-cutting machines; one roller; one tip skiver; one counter skiver; one summit skiver; one wire-grip tacker; two Puritan stitchers; one sole molder; one toe-gouging machine; one heel compressor; and one Boston tacker.
1	5	1,800	Belted direct to one 40-inch dust-collecting fan.
1	15	1,800	Extended-shaft motor belted to one 60-foot 10-hanger line shaft and one 40-foot 7-hanger line shaft driving one freight elevator, two assembling machines; one pulling-over machine; four nigger-head lasters; one pounding machine; two wire-grip tackers; one Standard screw machine; three loose nailing machines; one leveling machine; one heeling machine; two buffing machines; one heel trimmer; one breaster; two edge trimmers; two heel scourers; one twin edge setter; and four finishing machines.

Shoe factory located in Sheboygan, Wis., having an average daily output of 600 pairs of shoes. There are 53 men employed, working 60 hours per week.

Total connected horsepower, 31. Total number of motors installed, 4. Average kilowatt-hours per month, 2,900. Average kilowatt-hours per month per horsepower connected, 93.5. Average kilowatt-hours per day, 111.5.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
December	3,029	April	2,770	August	2,899
January	2,972	May	2,635	September	3,253
February	2,949	June	2,917	October	2,246
March	3,113	July	1,943	November	4,078

Load-factor, 17 per cent; operating-time load-factor, 36 per cent.

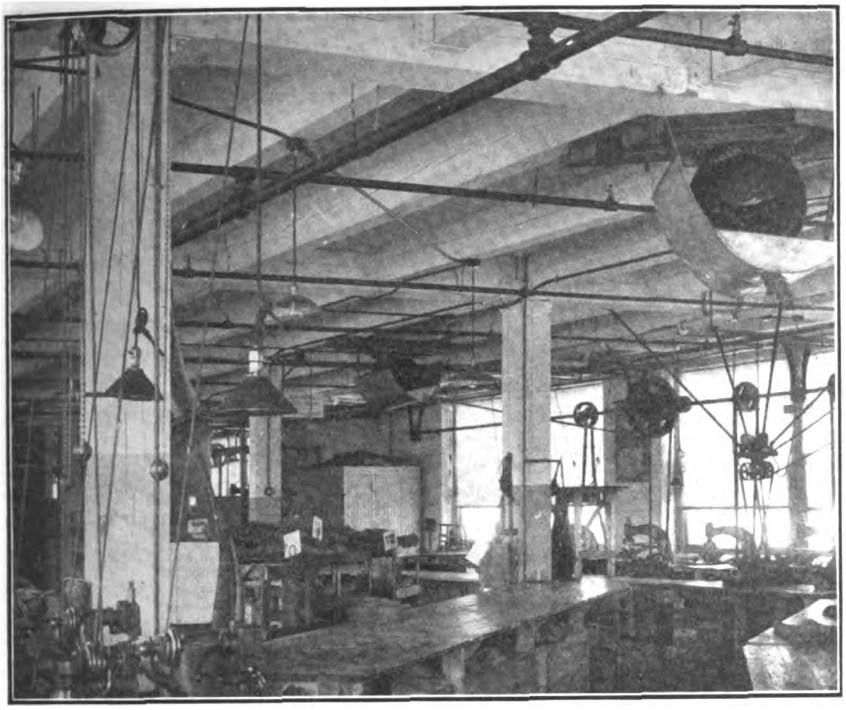
Measured maximum demand, 12.8 kilowatts.

The approximate electrical energy consumption per pair of shoes manufactured is 0.186 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 110 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	1,140	Belted to line shaft driving one model A leveling machine; one nailing machine; one auto. heel loader; one slugging machine; one heel trimmer; one knife grinder; one freight elevator; one heel breaster; two edge trimmers; one scouring wheel; one heel waxer; one edge waxer; one buffer; one bottom finisher; and one 20-inch blower.
1	7.5	1,140	Belted to line shaft driving one Standard screw machine; two loose nailers; one McKay sewing machine; one tacker; one pounder; one laster; one assembly machine; one pull-over machine; one laster; 13 sewing machines; one perforator; one skiving machine; one studding machine; two eyelet machines; and one pounder.
1	2	1,800	Belted to line shaft driving one emery•wheel; one splitting machine; two clicking machines; one lining machine; and one rubbing machine.
1	7.5	1,800	Belted to line shaft driving two cutting machines; one skiving machine; one heel compressing machine; one rolling machine; one splitting machine; one sole rounder; one tacker; one sewing machine; one heel trimmer; one heeling machine; one splitting machine; one skiver; one molder; one emery wheel; and two channel openers.



Group of Motor-Driven Die-Cutting Machines.

portance in shoe factories. There is no doubt but that the modern central station is better equipped and actually does give better service than an isolated plant. The central-station company's spare engines and boilers are ready to throw in in case of trouble, and an organized body of trained operators meet quickly any emergency. These facts usually do not prevail in a private plant.

A shutdown of any group of machines or department can be avoided by holding in reserve a motor of sufficient capacity to operate any department. This motor should be mounted on a truck and wired so that it can be quickly moved to any part of the factory, connected to the nearest panel box, and its pulley belted to the shafting.

Cycle of Operations.

On account of its complexity and the unusually large number of operations involved, shoe manufacture is less understood by the engineering profession than any other line of manufacturing which is so extensively carried on. For this reason a somewhat detailed description of shoe manufacture, in so far as it is related to power utilization, is given.

In general, shoe factories buy their patterns and lasts from manufacturers who devote their entire effort to the manufacture of either one or the other. Shoe manufacture, then, usually commences in the cutting department, where the leather is cut into uppers, outsoles, insoles, and so forth; and the linings, stays, facings, trimmings, and so on, are cut out. These parts then go to the fitting department where they are assembled. The completed upper now goes to the lasting department, where the last is inserted and the insole and outsole are fastened to the upper. The shoe now goes to the finishing department, where the sole is smoothed, the heel put on, and the shoe finished.

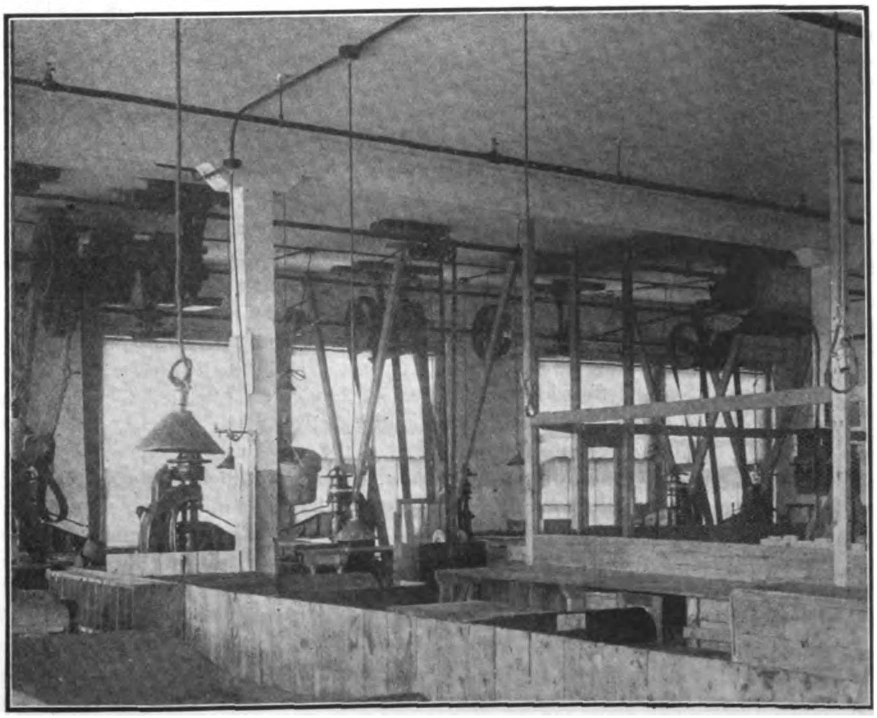
The leather for the uppers comes into the cutting department in large pieces, tanned and ready for use. The cutter selects that part of the skin best suited for each part of the upper and cuts it out either by hand or by a power-operated die. The trimming cutter cuts out the linings, stays, facings, and so forth. These are of cloth, and when a power-driven die is used, a great many are cut at a time. These parts are properly marked, tied up in bundles, and sent to the fitting department.

The assembling of the upper takes place in the fitting department. When the edges of the leather are to be turned, they are first beveled or skived, then cemented, turned, and pressed into shape with the folding machine. Leather and linings are assembled by stitching and pasting. Some of the sewing machines sew two pieces of lining together and stay the seam up with tape at the same time.

Eyelets are now inserted in the uppers of the laced shoes by eyelet machines. Buttonholes are cut and sewed by automatic buttonhole machinery. Another machine sews the buttons on.

The completed upper is sent to the lasting department, where the last is first inserted, and then the counter and insole. The shoe is steamed slightly and then put on a lasting machine, which pulls the bottom edges of the upper over the bottom of the insole and fastens it with tacks. The surplus leather which has been folded over on the insole is removed and the edges beveled on an emery wheel.

The outsoles are cut from large sheets of heavy leather with power-operated dies. They are fastened to the insole, either by the Goodyear welt process, or by the McKay process. The former process consists in sewing a strip of leather about two-thirds of an inch wide around the insole near its outer edge. The insole is so channeled



Three-Horsepower Motor Driving Six Clicking Machines.

and turned that the welt is sewed to the turned edge without the stitches going through to the inner side of the insole. The space on the insole inside of the welt is now filled with cement and cork, felt, or leather. The shank is inserted and tacked in place. The outsole is now cemented and pressed onto the insole. The sole then goes through the rounding machine, which trims and channels it for stitching. The outsole is now stitched to the welt. The edge of the outsole which was channeled and turned up for stitching is now cemented, turned down, and pressed in place with a power press.

By the McKay process the welt is cemented to the outsole, the space on the insole inside of the welt filled as in the other process, the shank inserted, and the outsole cemented and fastened with a few tacks to the insole by use of a tacking machine. The sole is trimmed, channeled, and stitched, the stitches going through the insole, upper, welt, and outsole.

The shoe is now placed in a leveling machine, which shapes the sole and thoroughly irons it.

Heels are made up of a number of shaped layers of leatherboard cemented and nailed together. Holes are punched in the built-up heels with a pricking machine. A heeling machine places nails in these holes, drives them through the sole of the shoe and rivets them on the inside of the insole. The top lift of the heel is cemented and nailed on.

The shoe now goes to the finishing department, where the heels and soles are carefully trimmed and shaped with an edging machine. A breasting machine is used to shape the concave end of the heel. The bottoms are now sandpapered, blackened, and burnished; the uppers are cleaned, ironed, blackened, inspected, and the shoe is ready to be packed for shipment.

Power Requirements.

The machinery in shoe factories is invariably driven in groups at constant speed. This is because of the fact that a large number of machines are used each taking a comparatively small amount of power. Also, the load on each machine fluctuates rapidly and at fairly regular periods. On account of the diversity-factor among the machines, group drive permits of the use of a fewer number of motors of much less aggregate horsepower than could be obtained with individual drive.

The accompanying table shows the approximate horsepower input to shoe machinery.

These figures will vary somewhat under different conditions but are sufficiently accurate for average conditions.

Horsepower Input to Shoe Machinery.

	Horsepower.
Consolidated hand laster	0.5
Lasting machine	0.3
Pulling-over machine	0.1
Adams sole cutter	2.0
Single sole molder	0.8
Counter molder	0.6
Twin molder	0.8
Crimping machine	0.5
Clicking machine	0.1
Cementing machine	0.1
Beating-out machine	0.2
Sole-laying machine	1.5
Slugging machine	0.5
Leather roller	0.2
Staple-fastening machine	0.2
Chicago wire fastener	0.3
Knox beam dinker	0.2
Goodyear welt machine	0.4
Welt beater	0.1
Goodyear rapid stitching, machine	0.4
Atlas stiching machine	1.3
Hercules stitching machine	0.8
Automatic stitching machine	0.9
McKay stitcher	0.2
Puritan stitcher	0.2
Sewing machines	0.1 to 0.2
Knox end splitter	0.6
Stanley leather splitter	0.6
Amazon No. 7 skiving machine	0.3
Tip skiver	0.3
Stiffening skiver	0.1
Goodyear channeling machine	0.1
McKay channeling machine	0.1
Welt and turn machine	0.1
Fisher channel turner	0.1
Goodyear channel turner	0.1
McKay leaf turner	0.1
Tip turner	0.1
Leveler	2.0
Four-foot die press	2.0
Sole trimmer	1.0 to 3.0
Edge trimmer	1.0
Edge pricker	0.1
Single-edge setting machine	0.4
Union twin-edge setting machine	0.4
Eyelet machine	0.2
Buttonhole machine	0.1
Lightning heel-nailing machine	2.0
Mayo heel-nailing machine	2.5
Heel-trueing machine	0.3
Heel scourer	0.4
Heel burnisher	0.3
McKay heel trimmer	2.0
Pricking machine	0.5
Heel shaver	1.5
Sandpaper machine	0.1
Buffing machine	0.2

The input to electrical heating devices suitable for use in shoe factories is shown in the following table. Cleanliness, flexibility of use, safety, exact control of temperature, have all contributed toward the increasing popularity of these electrical devices.

Input to Electrical Heating Devices

	Watts.
Double shoe ironing tool	200
Shoe stamping machine	500
Flatiron	500
Single shoe ironing tool	200
Glue and wax pots	100 to 300

In the accompanying data sheets detailed information concerning the motor equipment of several typical plants purchasing power, are given.

New Edison District Office.

On January 26 the New York Edison Company opened a new district office at 151 East Eighty-sixth Street, one door east of Lexington Avenue. The space is divided between the district office and one of the regular company co-operative show rooms, in which manufacturers of electrical lamps and appliances exhibit free of charge. The show windows have the now familiar Edison stained-glass panels across the top, while the usual company sign extends down the front of the building.

The territory covered by the new office takes in the East Side streets from 60th to 109th inclusive, and includes all the avenues east of Central Park. Central Park itself, as well as Blackwell's Island, come within the territory. It was on November 1 that the new office was organized, with H. B. Skinner as manager. At that time, however, temporary quarters were provided at the 125th Street office while the new building was being remodeled.

Another Argument for Electric Heating of Churches.

In our issue of January 10, 1914, there appeared an editorial pointing out the value of electric heating of church buildings as an off-peak load, since it would be confined almost entirely to Sunday's in winter when the load on any central station is usually very low. Another argument for electric heating, and this one showing its value to the church itself, has presented itself by the serious damage from fire caused by overheated furnaces of two churches in Chicago on Sunday, February 8.

A cold wave during the freezing night had brought the outside temperature down to about minus seven degrees, Fahrenheit. In order to make the churches reasonably comfortable for regular Sunday services, the furnaces by which most of them are heated were forced to their utmost early on Sunday morning. The overheating thereby produced resulted in fire suddenly breaking through the floor of the auditorium in St. Chrysostom's Church and in the Church of the Annunciation. The former church was damaged to the extent of about $25,000. An explosion of gas drove the firemen from the structure and permitted the flames to get considerable headway. In the smaller church the damage was about $3,000. Fortunately there were few people in either church at the time, and these escaped without difficulty.

Such a disaster is quite liable to result in any church heated by a furnace. Aside from the life hazard to the congregation, a church fire produces a heavy additional financial burden to its building fund, and particularly when occurring on the Sabbath, furnishes material for agnostics and iconoclasts. With electric heating, on the other hand, the danger is reduced to a minimum, and convenience as well as ease of control, are perfected to the utmost. In fact, it permits dispensing with a janitor in smaller churches, where members of the church will frequently volunteer to assist in dusting and cleaning the premises.

Motor Vehicles in London.

In London, England, only six per cent of the passenger vehicles on the streets are horse-drawn. For all kinds of traffic, the percentage is 88, but it is steadily decreasing.

Commercial Practice
Management, Rates, New Business

NEW-BUSINESS METHODS FOR CENTRAL STATIONS.

By H. G. D. Nutting.

Methods of selling anything, whether it be kilowatt-hours or physical products, are practically standardized, that is, there are certain methods of procedure that always produce results. Central stations are just beginning to wake up to this fact.

Manufacturers and sales agents have realized it long ago and have sold their wares in this way.

There are practically three methods to be followed, all of which should be used and at the right time:

(1) Advertising; (2) personal appeals by letter and circulars; (3) personal appeals by agent. A campaign would include the use of all of these agencies.

Advertising should consist of, (a) liberal use of the newspapers with carefully prepared display copy. A series of ads to cover a long period with a definite object in view should be prepared. Spontaneous and single efforts are of no value. Street cars, bill-boards and signs should also be used liberally. (b) Circular letters covering one and only one subject, and supplemented by printed circulars. To produce the desired result it is necessary to send out three letters on each subject. The first attracts attention, the second holds attention and creates desire, the third encourages decision and inquiry, rendered easy by the use of the return postal card. (c) Inquiry should be followed by personal call and oral sales effort.

The purchaser cannot resist this "battering ram" of sales force.

One phase of sales effort should be concentrated on at a time, to

(1) Stimulate new commercial consumers.

(2) Stimulate new residence consumers.

(3) Stimulate new power consumers.

(4) Stimulate increased use by commercial consumers.

(5) Stimulate increased use by residence consumers.

(6) Stimulate increased use by power consumers.

Each of the above forms of new business should be worked by special concentrated effort and each campaign completely organized before starting it.

Before a new consumer campaign can be started an analysis of existing conditions should be made. This analysis should include in a card system a record of each premise in town whether it is on the lines or not, divided as to (1) those on the present lines and available without line extensions, (a) now connected, (b) not connected but wired, and (c) not connected and not wired; and (2) those off the lines, (a) not wired, and (b) wired.

The analysis should also include a calculation of the kilowatt-hours that could be sold yearly (based on present use), if every premise in town were connected and every power user were purchasing electricity. This figure divided into the annual present sales will give the present commercial efficiency. Reference to this figure from year to year will show what results are being accomplished. Subordinate commercial efficiencies can also be found by calculating the ratios of (a) commercial light sold to total available; (b) residence light sold to total available; and (c) power sold to total available.

Reference to these factors will show to what extent progress is being made in each division of sales.

A comprehensive monthly report of results should be made. This report should show:

1. Increase of consumers (number).
   - (a) Commercial light.
   - (b) Residence light.
   - (c) Power.
2. Increase of connected load.
   - (a) Commercial light.
   - (b) Residence light.
   - (c) Power.
3. Increase of kilowatt-hour sales (estimated and actual).
   - (a) Commercial light.
   - (b) Residence light.
   - (c) Power.
4. Cost of advertising.
5. Salaries of commercial department.
6. Other costs of getting business.
7. Commercial efficiency of each kind of service.
8. Ratio of cost of getting new business to estimate gross business obtained.

The largest factor in getting new business (assuming service is good and rates are fair), is the personnel of the commercial department. The commercial department, besides looking after the increase of business, should look after complaints. Complaints should be adjusted promptly. It takes a good man, with broad experience, with human nature, an expert salesman, a good knowledge of the public-utility business, and a pleasing personality to keep the customers satisfied.

Every commercial department should be in charge of such a man. He should have enough help to plan and carry out the campaign above suggested. The cost of getting business is not so much the controlling factor as the ratio of the increased income to the cost. As many people should be employed in the department as the conditions warrant. When they stop producing results they do not have to be kept. It doesn't take long to determine when they stop producing.

Girls and young women make the best solicitors. They can get into houses and talk to the housewife where a man cannot. They can be hired for $25 to $45 a month and a commission. If each makes one sale or gets one connection contract a day, she pays for herself.

A campaign as suggested above, costs money. If the analysis of the field shows the business is there it is worth it. There is no use half doing it. The difference between the cost of getting business and the income from it may be greater in a "half hearted" campaign than in a strenuous one.

If houses are to be wired and connected some concessions on payments must be made. The new customer must be allowed a year to pay or some similar arrangements.

A contract can be made with some fixture house to furnish a group of good fixtures at a low price. The manufacturers will take care of part of the advertising and circularizing.

If new current-consuming devices are to be sold they must be placed on trial, and absolutely guaranteed.

If gasoline engines and other small power apparatus are to be replaced a fair trial proposition of a motor seldom fails.

Large motor business can be obtained only by careful engineering tests, and continuous diplomatic "hammering" on the prospect. It takes from six months to six years to get some of this business.

If the same methods are pursued in the central-station business as are pursued in other lines, a large amount of new business can be put on.

New "House of Edison Light."

As a means of demonstrating to the people of one of the older communities in Massachusetts served by the Edison Electric Illuminating Company of Boston the readiness with which an old house can be provided with electric appliances, that company has leased a house of this type, located on the main street in the suburban town of Arlington, seven miles from Boston, and has equipped it with electric lighting, heating, cooking, and other household apparatus.

Courtesy Edison Life

Electrical Equipment in Dining Room of House of Edison Light.

The company has restored the house to its original style by the removal of the modern, large-paned windows and the replacing of the many-squared sashes of the early days. Its exterior has been freshly painted in white, and a border of hedge placed around the narrow front lawn. An antique brick path and brick steps lead up to the fine old Colonial doorway. On the left of the path is the company's sign—"The House of Edison Light."

The interior has been renovated by the papering of the rooms with special old-time wall papers, and the furitnure and decorations are such as were in use a century or two ago.

The business office is at the left of the entrance, and here lamps may be exchanged, bills paid, and information secured by customers or prospective customers of the company. The drawing-room is on the right of the hallway, and back of this is the dining-room and in the rear the kitchen. These rooms are furnished with lighting, heat-radiating, cooking, sweeping, and other devices, appropriate to their use, in much the same manner as the company's other "houses of Edison light."

The bedrooms upstairs are equipped with electric radiators, warming-pans, curling irons, etc., and the model bathroom is furnished with all the electric health and comfort devices known.

Courtesy of Edison Life

Model Bedroom in House of Edison Light, Boston.

The rooms not open to the public are used by the man in charge and his family. The office is open from 8:30 a. m. to 6:30 p. m. daily, and until 9 p. m. Saturdays, while the remainder of the house used for display is open for inspection from 9 a. m. to 5 p. m. and on Saturdays until 9 p. m. A young woman is in attendance as demonstrator.

The residents of Arlington are showing great interest in the attractive display and its setting. About 350 people visited the house on the opening day.

◆

Safety-First Campaign in New Albany.

The United Gas & Electric Company of New Albany, Ind., has decided to take up a "Safety-First" campaign, and a meeting has been called for February 27 to consider the matter. James Harmon, safety agent of the Louisville & Southern Indiana Traction Company and the Louisville & Northern Railway & Light Company, will be in charge of the meeting. The two companies last named operate interurban lines and have greatly cut down accidents during the past year through a similar campaign.

◆

Guessing Contest.

The Rockingham County Light & Power Company, Portsmouth, N. H., is attracting the interest of the children of that city in electrical matters by displaying an enormous pile of incandescent lamps in its show window and offering to present a set of toys operated by electricity to the boy or girl who guesses nearest to the correct number of units.

◆

Reduced Rates on Coast.

The Southern California Edison Company has filed a schedule of the reduced rates with the state railroad commission in San Francisco, to become effective March 1, 1914.

Electric Sign Data

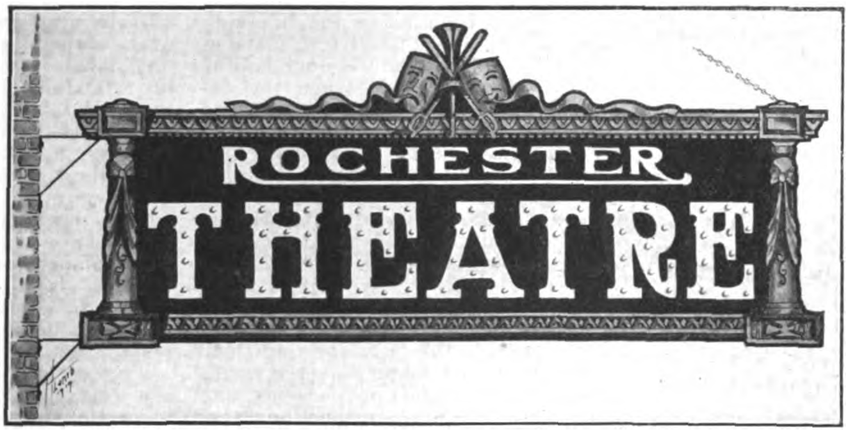
A Striking Transparent-Glass Electric Sign.

A most remarkable electric-sign effect has been recently introduced in Great Britain by the Diaphanad Patent Electric Signs firm, of London. Until the method of working is explained it produces an effect which is almost incomprehensible. This sign consists of a sheet of ordinary clear plate glass, mounted in a polished brass tubular frame, and with the exception of the lettering upon it, the glass is perfectly transparent. On the back of the glass is engraved the required lettering forming the advertisement, and this lettering is visible in ordinary daylight as frosted-glass lettering on a clear background.

At night, however, these letters appear to glow with light in an extraordinary manner, and at first the method of their illumination is difficult to understand, as no light-source whatever is visible. The secret of the sign is that in the upper and lower portions of the tubular frame, Striplite metal-filament lamps are concealed, from which the light passes out through the slits in the frame into which the glass fits. In this way the light is concentrated in the body of the glass alone, no light escaping the surface of the glass, but where the light encounters the inner surface of the frosted surface, an illumination effect is set up in the frosting which gives a most brilliant and remarkable appearance to the letters and by using colored lamps some very pleasing and effective gradations of tints can be produced.

Another advantage is that the glass can be very readily changed, giving a change of reading matter. Four outdoor service signs in water-tight frames can be constructed to read on both sides, if required. In the indoor sign its transparency is an advantage, as it does not in any way obstruct the view of goods exposed for sale in the window.

An illustration of the sign would fail to give an adequate idea of the effect produced, but it will be seen from the above that a very novel and original form of electric advertising has been developed.



Here is a suggestion for an electric sign for a theater originated by the Greenwood Advertising Company, of Knoxville, Tenn.

The sign as constructed for the Rochester Theater measures 12.5 feet long and 4.5 feet high. There are 114 receptacles, the sign being equipped with double-face 16-inch raised fancy, full-block electric letters.

Any color scheme desired can be provided for such design, the background in the particular sign illustrated being imported glass, smalt. A verde antique border with this sign makes a very attractive combination.

No flashing effect was provided for in the Rochester sign, but the addition of such equipment would not materially increase the cost of the sign.

The price of the sign is $129.50 double-faced; and $75 single-faced, complete with hanging rig.

Big Electrical Display for Seattle.

One of the most expensive electric signs on the Pacific Coast is now being erected on the Eitel Building, Seattle, for the United Advertising Sign & Novelty Company. It is a combination sign 60 feet by 36 feet, divided into sixteen spaces, for as many different advertisers, each paying $60 per month for the display.

The Federal Motograph is being used, and the frame was built by the San Francisco office of the Federal. Mr. Welling, of the Federal, is personally superintending the erection of the sign.

The sign blankets the busiest corner in Seattle, and the company operating it had no difficulty whatever to dispose of each one of the sixteen spaces.

It is pretty good evidence, says *Signs of the Times*, that electrical advertising is popular on the Coast.

In Colorado, the City of Trinidad has selected a slogan reading, "Trinidad, The Town To Tie To," which will be advertised by means of an attractive electric sign forming the letter T.

The sign will be 8 by 10 feet and 466 five-watt lamps will be used. It will be hung on an ornamental arch in the center of Commercial Street Bridge, showing North and South.

The color effect will be an old-gold rim, green background, white lights for letters and red lights for rim, with suitable flashing effect.

The sign is being constructed by the Trinidad Ad-Sign Company.

Electrical Construction

The Fight on Old-Code Rubber-Covered Wire.

The danger both to life and property from defective insulation of electrical wires has been known a long time. The movement for improving the standard of insulation was taken up many years ago and one of its most important steps was the laying down of higher specifications for rubber-covered wires that was announced in the 1911 edition of the National Electrical Code. The wire made in accordance with these new specifications is usually known as new-Code wire, as contrasted with the former material, which is known as old-Code wire and by many is even called no-Code wire because it does not even come up to older Code standards. Most of the electrical inspection departments throughout the country required that nothing but new-Code rubber-covered wire shall be installed after April 1, 1912, or at the latest July 1, 1912.

Although the cost of the new wire is but a trifle, usually not over five per cent. higher than that of the old-Code wire and despite the fact that manufacturers and dealers had ample time to dispose of old stocks, more or less of the old-Code wire is still being sold and it is believed is still being surreptitiously manufactured by some unscrupulous manufacturers, who are more intent on the quantity than the quality of their product. This condition is bringing about concerted efforts on the part of all interests seeking improved construction and minimization of hazards to debar effectively and drive out entirely the use of rubber-covered wire not up to the new Code standard.

At the convention of the Western Association of Electrical Inspectors held in Cincinnati two weeks ago, as narrated in our last issue, this matter came up in a forceful report of the Committee on Rubber-Covered Wire. This committee was composed of Victor H. Tousley, of Chicago, chairman, L. A. Barley, H. M. Maxwell, C. L. Reasoner, B. O. Boniface, W. I. Stone and F. D. Varnam. This important report was prepared by Chairman Tousley, who is chief electrical inspector of the City of Chicago. The report is reproduced in full below.

At the meeting of this Association held one year ago, the Committee on Rubber-Covered Wire did not make any formal report as many of the inspection departments were busily engaged in applying the new National Electrical Code specifications and the rubber-covered wire field had not settled down to a point where even a vague estimate of the actual conditions could be determined. However, during the past year practically every inspection department in the jurisdiction of this Association, which had not previously done so, took action, and, as far as I can ascertain, there is not a section of the country where new-Code wire is not now required.

I believe we are all to be congratulated on this condition and the only regret is that it did not occur ten years or more ago. A chain is only as strong as the weakest link and, in so far as materials and devices are concerned, I believe the rubber-covered wire has been the weakest link of our electrical wiring system. I look forward to the time when the breaking down of the older electrical installations will start, as there is bound to be an epidemic of trouble when the defective and—I know of no better word to describe it—rotten insulation of a few years ago begins to give way. If our stand today is correct, and an electrical installation to be safe requires a rubber-covered wire of the present standard, what about the old-Code installations?

However, today we are not so much concerned with what has gone by us, but the problem now is how to eliminate entirely the use of old-Code wire. Old-Code rubber-covered wires persist where inspections are lax and they persist where inspections are rigid. The market is flooded with inferior insulations, quality is eclipsed by price. Cheap contractors are easily urged by energetic salesmen to buy these goods, the main consideration being the extra discounts. There are rubber-covered wire factories that stand ready to manufacture and sell in any amounts old-Code rubber-covered wire. The public, however, expects a fair deal and is entitled to it.

In order to get information on the rubber-covered wire field today, I sent out a number of circular letters requesting information on the use of rubber-covered wire. In this letter the question was asked as to what per cent of the wire coming into the territory was new-Code. With few exceptions, the reply was 100 per cent. However, I have information that in one of these territories some thirty or more thousand feet of old-Code rubber wire had been recently shipped. I do not call attention to this in any spirit of criticism, but simply with a desire to bring to your attention the fact that as an Association we should make an added effort to entirely eliminate old-Code wire from the field of electrical installations.

I do not know what the experience has been in other cities, but in Chicago we have found that the principal offenders at the present time are among the fixture supply dealers and manufacturers. This especially applies to makers of portable lamps. It is somewhat surprising, when you come to consider the fact that the cost of the rubber on a standard fixture wire or flexible cord is so small a per cent of the total cost of the fixture, that there should be any trouble from this source, but it will show you that even the smallest profit is considered today; and, if a profit can be gained by the fixture manufacturer on this small investment, why should not the contractor, who uses a great amount of rubber-covered wire, attempt to get away with his share.

The case of the fixture man is still more important when the question of safety is considered. The wire he uses is of small insulation. It is pulled into fixtures around sharp bends and over corners and generally abused. Yet, what is more dangerous from a life standpoint than a grounded fixture. Deaths are occurring with great regularity from shocks from 110-volt systems.

Another cause for the use of old-Code wire is the great competition among the smllaer, or what are commonly known as grip-sack contractors. This competition is greatest among the smaller sizes of wires, for such are mostly in demand and the least capital and equipment is required for their installation.

The accepted standard is defined in the National Electrical Code, factory inspection is provided and the inspection tag must be supplied with every coil. Why then the low-standard product?

The defect in the system is that the factory-inspection service is not clothed with sufficient authority. Its main weakness is that it is incomplete. Tagged coils, below standard, do get shunted past the inspector. The manufacturer is advertised as a maker of approved wires and a definite market is listed for his product Now, the procedure in some factories, at least, is for the inspector to test that part of the product which is submitted to him and all that he rejects as unfit goes to market right along with the rest. But the inspector is not allowed to consider at all that part of the product which is not submitted for test and which is sent to market without the inspection tag, as "Not Code" and to be "bought on purchaser's responsibility."

For example, a manufacturer advertises in large capitals "(Jones) New Code Rubber-Covered Wires and Cables Meet Every Requirement—Prices and Quality Always Right."

When the inspector sees this factory's product on the job, it is the opposite of the material that is advertised. Why should the laboratory inspector at the factory not be allowed to test the entire product of that factory? Why should not this inspector be given authority to demand the destruction of all wire not meeting the specifications? Why should not the laboratory refuse inspection service to any manufacturer making wire which does not meet the new-Code specifications?

What becomes of this old-Code and this defective wire? Is not every foot of it used in wiring buildings throughout this country? Are not the insurance companies carrying risks on practically all of these buildings? Are not all the buildings inhabited by human beings whose lives are in constant jeopardy through possible fires? If these are not facts, why are we requiring new-Code wires today?

I believe this Association should go on record now as recommending to the Underwriters' Laboratories that label service be refused to any factory manufacturing old-Code wire, and I further believe that the large majority of the rubber-covered-wire manufacturers would welcome this action.

What excuse is there for the manufacturer of old-Code wire? It is a deception pure and simple and no legitimate excuse of any kind can be offered for its existence. A jobber when asked why he sold these goods replied: "Yes, we have to beat people, we need the money." This occurred in an interview when a contractor returned old-Code wire which had been billed as new-Code. This accidental mixing of stocks happens very often.

Another case of the kind was when on complaint the stock of a fixture shop was examined and found correct. The inspector on the job where the fixtures were installed insisted that he knew old-Code when he met it and the contractor declared that he had not bought or used old-Code, but was using the (Jones) new-Code, meets every requirement, etc. He objected to the inspector's decision and the wire tester, inspector and contractor went to the job together, when the contractor was the first to pronounce the wire in question to be old-Code.

Coils not supplied with genuine factory-inspection tag should not be accepted. The wireman will do well to examine a sample from every coil. The tiny marker bears its own story of character. The stretch tests are easily made and fortunately are often decisive. The entire insulation rather than a segment is best to use. In the field, tensile strength can be approximated by comparisons obtained by practice. Centering is essential and is easily noted at several points along the wire. A poorly centered wire after immersion often breaks down on test at service voltage. Decentralization becomes relatively more important with decreased thickness of wall.

The thickness may be accuratecly determined by the micrometer and the standard here as elsewhere should be the full required amount. Wires short on thickness are abundant. The conductor area should be checked; omission of one or two strands in cords is quite common.

Insulation resistance, voltage test, breakdown and chemical tests require equipment but results obtained well repay the expenditure and time.

Samples for check tests may be forwarded to the Underwriters' Laboratories and are reported free of charge. This service is not so well known and utilized as it deserves to be.

The Laboratories' factory-test-service bulletin contains a wealth of information on methods. Systematic testing and test records should be a part of the inspection service everywhere. Printed forms can be quickly filled out and when filed are of value for permanent reference.

In our own laboratory during the past year we have tested more than 600 samples of all sorts and sizes of wires and cables, with the result that many cases of wires below standard have been proven and the defective wires removed.

Is the standard for rubber-covered insulation too high? Not when the compound partly consists of only 20 per cent of rubber which may have already outlived many successive reincarnations in the form of hot-water bottles, overshoes and door-mats.

Louisville Contractors Meet.

The annual meeting of the Louisville Electrical Contractors' Association was held at the Henry Watterson Hotel on February 3, officers being elected as follows: C. C. Childers, Childers & Waters, president; Herbert Ottenheimer, Home Electric Company, vice-president; Gus Albrecht, Albrecht Hardware Company, secretary, and James Clark, Jr., James Clark Jr. Electric Company, treasurer. The retiring president was Frank Good, of F. A. Clegg & Company. The contractors are endeavoring to have an arrangement made whereby the Kentucky Actuarial Bureau, the fire underwriters' organization, will handle all inspections of electrical installations in Louisville. The work is at present done partly by the city and partly by the Bureau. The latter's operations are on a fee basis, but it is hoped to make a satisfactory arrangement which will enable the underwriters' service to be secured.

Among the Contractors.

The Harry I. Wood Company has the contract for the installation of 25 motors in the plant of the Lanham Hardwood Flooring Company, Louisville, Ky.

Herbert S. Potter, Boston, Mass., electrical engineer and contractor, has removed to 238-240 State street.

V. M. Nussbaum & Company is the new name of a concern doing electrical contracting in Fort Wayne, Ind. This company also deals in machinery. It formerly operated as the electrical department of the Hanna-Brackenridge Company, which is no longer in exisence.

The James Clark, Jr., Electric Company, Louisville, Ky., has the contract for the installation of electric wiring in the city workhouse of Louisville; also for the installation of 25 motors in the organ manufacturing plant of Henry Pilcher's Sons, which is changing from direct to alternating-current motors.

Specification for Rubber-Insulating Compound.

A demand for specifications which will enable purchasers of rubber insulation to secure good material on the basis of competitive bids has existed for many years.

In recent years, there has been no difficulty in securing insulation having the dielectric strength, specific resistance, elasticity and mechanical strength required in practice. Indeed, with the possible exception of dielectric strength, these qualities are often in excess of actual service requirements. There is another quality, namely, permanence, which although equally essential, has not been so easy to obtain.

While the physical properties of rubber insulation are susceptible of positive determination by tests which can be made before acceptance by the purchaser, the permanence of insulation can be ascertained only in practice, often at a great loss, inconvenience and danger. It should, therefore, be the aim of specifications to overcome this difficulty and by some direct means ensure that the manufacturers supply compounds having the required endurance.

This obviously presents a difficult problem, as it requires that some relation be established between permanence and one or more of the properties which are susceptible of test.

A committee was appointed by a group of manufacturers and users of rubber compounds in 1911 to draw up a set of standard specifications which would be acceptable, covering the requirements of rubber used for insulating conductors. The conference at which the committee was appointed and to which its report was submitted consisted of representatives of the following: United States Signal Corps, United States Bureau of Standards, American Chemical Society, Lederle Laboratories, New York Central Lines, Pennsylvania Railroad, General Electric Company, Hazard Manufacturing Company, Simplex Wire & Cable Company, Standard Underground Cable Company. This committee has submitted a report which has been published in the Proceedings of the American Institute of Electrical Engineers for January, 1914, from which report this excerpt is taken.

It is pointed out by the Committee that it is desirable, where the greatest durability is to be insured, that the grade of rubber should be a fine Para, or a plantation rubber of good grade which is practically indistinguishable from it by chemical tests when compounded. The specification is drawn up, however, for Hevea rubber, which may be specified to advantage since it includes Para rubber and will be generally satisfactory for most purposes.

Most high-grade rubber compounds for insulating wire are prepared by mixing rubber gum with sulphur and mineral or organic fillers, such as paraffine wax, ozokerite, ceresine, zinc oxide, talc, whiting, litharge, barium sulphate, and basic lead sulphate.

Among the qualities affected by the grade of rubber and said to be indications of the presence of Para rubber are the tensile strength, elasticity, and specific resistance. Experience has shown that specifications in which one or more of these qualities is specified in an exaggerated degree are ineffective. Specifications based on physical tests alone have fallen into disrepute and such tests should be only adjuncts to chemical tests. Three difficulties arise in the specification of chemical composition: chemical analysis cannot directly ascertain the quality or quantity of rubber in a compound; chemists have employed diverse methods of analysis which give inconsistent results; analytical results are not always interpreted uniformly.

The specification drawn up by the Committee is as follows:

(1) A 30-per-cent fine Para or smoked first-latex Hevea rubber compound with mineral base, shall be furnished. It shall contain only the following ingredients: rubber, sulphur, inorganic mineral matter, refined solid paraffine or ceresine.

(2) It shall not contain either red lead or carbon.

(3) The vulcanized compound shall conform to the following requirements, when tested by the procedure of the Joint Rubber Insulation Committee.

(a) Results to be expressed as percentages by weight of the whole sample:

	Maximum	Minimum
Rubber	33	30
Waxy hydrocarbons ..	4	..
Free sulphur	0.7	..

(b) Results to be taken between the limits given in proportion to the percentage by weight of rubber found:

LIMITS ALLOWED FOR 30-PER-CENT RUBBER COMPOUND.

	Maximum	Minimum
Saponifiable acetone extract	1.35.	0.55
Unsaponifiable resins.	0.45	....
Chloroform extract ..	0.90	....
Alcoholic potash extract	0.55	....
Total sulphur (see note 2)	2.10	....
Specific gravity	....	1.75

LIMITS ALLOWED FOR 33-PER-CENT RUBBER COMPOUND.

	Maximum	Minimum
Saponifiable acetone extract	1.50	0.60
Unsaponifiable resins.	0.50	....
Chloroform extract ..	1.00	....
Alcoholic potash extract	0.60	....
Total sulphur (see note 2)	2.30	....
Specific gravity	....	1.67

(4) The acetone solution shall not fluoresce.

(5) The acetone extract (60 cubic centimeters shall be not darker than a light straw color.

(6) Hydrocarbons shall be solid, waxy and not darker than a light brown.

(7) Chloroform extract (60 cubic centimeters) shall be not darker than a straw color.

(8) Failure to meet any requirement of this specification will be considered sufficient cause for rejection.

(9) Contamination of the compound, such as by the use of impregnated tapes, will not excuse the manufacturer from conforming to this specification.

Note 1. This specification shall be supplemented by appropriate clause relating to tensile strength, elesticity, insulation resistance and dielectric strength.

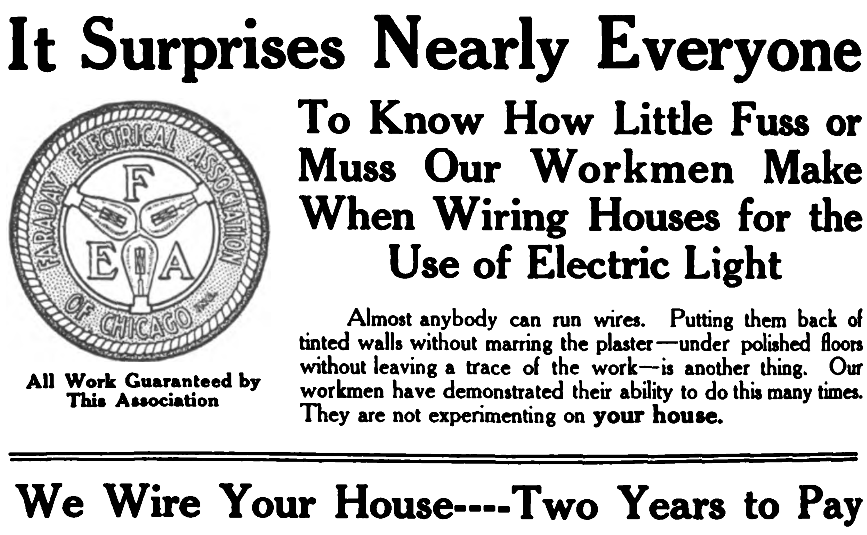
Note 2. The limit on total sulphur may be omitted at the option of the purchaser.

The report states that experience has shown that compounds which upon analysis show the characteristics of good Hevea rubber may be relied upon to be more permanent than those made of rubber of other grades.

This specification requires a much higher grade of product than the specifications of the National Board of Fire Underwriters, as revised in 1911.

In the above specification carbon is excluded because it is considered by some to be deleterious. Red lead is excluded because of possible deleterious effects on the rubber. An upper limit is placed upon the rubber in order to prevent the attainment of electrical and mechanical strength by the use of an extra quantity of inferior rubber whose lasting qualities might not be satisfactory. For further details the reader is refered to the full report, which gives the details of procedure in making a test.

This specification has already been adopted by the Association of Railway Electrical Engineers, and it has been recommended by the Power Distribution Committee of the American Electric Railway Association.


FARADAY ELECTRICAL ASSOCIATION OF CHICAGO
F
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A

It Surprises Nearly Everyone

To Know How Little Fuss or Muss Our Workmen Make When Wiring Houses for the Use of Electric Light

All Work Guaranteed by This Association

Almost anybody can run wires. Putting them back of tinted walls without marring the plaster—under polished floors without leaving a trace of the work—is another thing. Our workmen have demonstrated their ability to do this many times. They are not experimenting on **your house.**

We Wire Your House----Two Years to Pay

Fig. 1.—Portion of Folder for Wiring Old Houses.

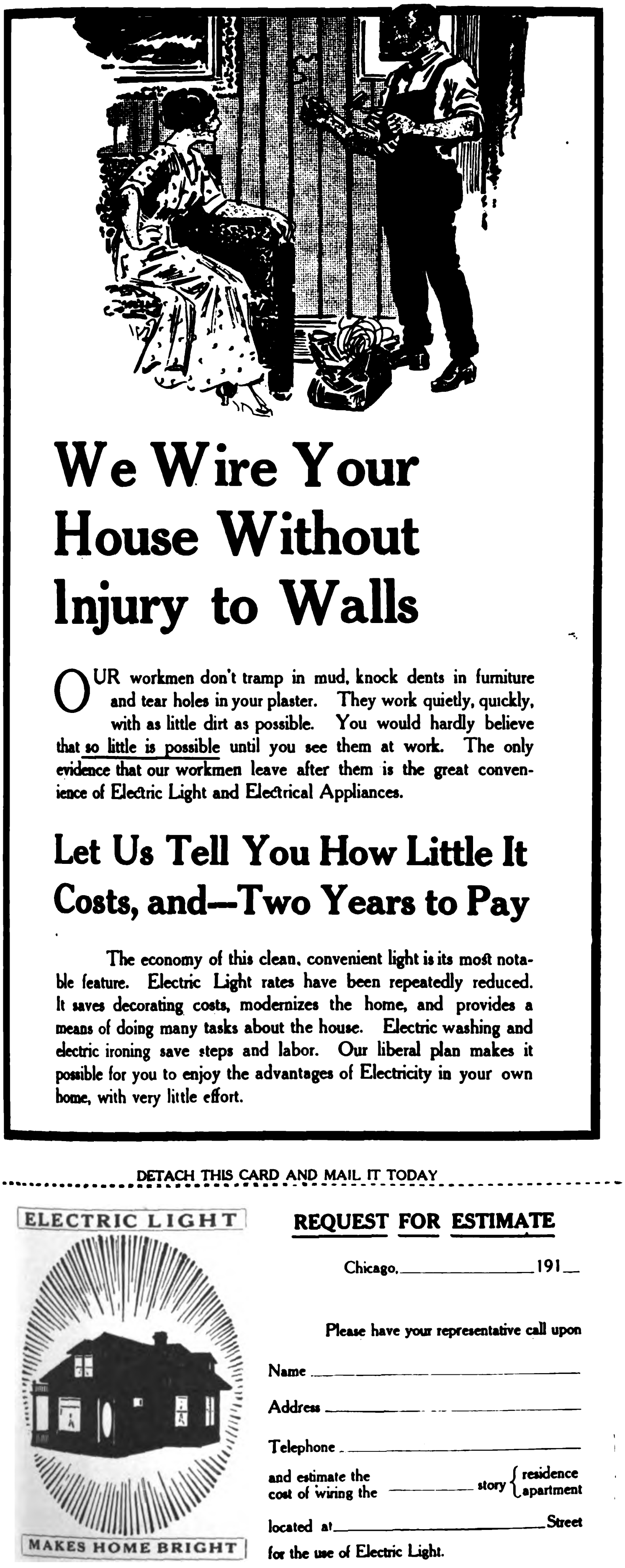
How the Faraday Association and the Edison Company Co-operate.

The spirit of co-operation between the electrical contractors and central stations, which has been growing rapidly in recent times, has been made evident between the Commonwealth Edison Company and the Faraday Electrical Association in Chicago.

The Faraday Electrical Association is made up largely of electrical contractors in Chicago who are engaged in the work of wiring apartment houses and residences. For many years the Commonwealth Edison Company has been offering the owners of old houses a proposition by which the house will be wired for electric lights and payment made in monthly installments, extending over a period of two years, these payments being included in the monthly bills for consumption of electricity.

An arrangement has been made by which similar wiring may be done by the contractors in the Faraday Electrical Association and the same terms offered to house owners as by the Edison Company. Prices for this work are computed by the contractors on the same basis as by the Edison Company, and when a contract is secured the work is done by the contractor, who is paid by the Edison Company, and the latter collects from the customer in monthly installments just as if the work had been done by its own wiremen.

Fig. 2 shows the folder which is mailed to prospects by the contractors coming within the scope of this arrangement. It includes at the bottom a detachable post card containing a request for further information and an estimate of the expense involved. The other side of this card has the printed name and address of the contractor



We Wire Your House Without Injury to Walls

OUR workmen don't tramp in mud, knock dents in furniture and tear holes in your plaster. They work quietly, quickly, with as little dirt as possible. You would hardly believe that so little is possible until you see them at work. The only evidence that our workmen leave after them is the great convenience of Electric Light and Electrical Appliances.

Let Us Tell You How Little It Costs, and—Two Years to Pay

The economy of this clean, convenient light is its most notable feature. Electric Light rates have been repeatedly reduced. It saves decorating costs, modernizes the home, and provides a means of doing many tasks about the house. Electric washing and electric ironing save steps and labor. Our liberal plan makes it possible for you to enjoy the advantages of Electricity in your own home, with very little effort.

DETACH THIS CARD AND MAIL IT TODAY

REQUEST FOR ESTIMATE

Chicago, ____________ 191__

Please have your representative call upon

Name ____________________

Address ____________________

Telephone ____________________

and estimate the cost of wiring the ________ story { residence / apartment

located at ________________ Street

for the use of Electric Light.

Fig. 2.—Folder Sent Out By Faraday Electrical Association.

sending out the folder. Another section of the rear of this folder contains the inscription shown in Fig. 1. A third section contains the name and address of the particular contractor who is sending out the folder, and the fourth is left blank for addressing to the prospect.

This campaign has been very fruitful and is bringing a great deal of work in the line of wiring old houses to the contractors at a time when work upon new buildings is especially dull. The prices are such that a fair profit is earned by the contractor. Business can be secured upon the same terms as by the central station and all friction with the latter has been eliminated.

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New Jersey Contractors Meet.

The annual meeting of the New Jersey Electrical Contractors' Association was held at the Ridgeway Hotel, Delaware Avenue and Market Street, Camden, N. J., on Saturday, January 24, and was one of the most successful meetings ever held by the Association, although the weather was unpropitious, there being a downpour of rain from morning until night.

The session was called to order by the president, E. P. Strang, of the Strang Electric Company, who stated in his address of welcome that the electrical contractor of today was not the electrical contractor of the past, who had his office in his hat, and every time his hat blew off he changed his place of business. Such contractors as those made it hard for the legitimate contractor, one who wished to do business on business principles, but had a hard time doing so on account of the methods employed. The contractor of today is one who wishes to get acquainted with the inspector, not run away from him, but to have confidence in him, so that the inspector will return the compliment. What is needed most today is a get-together plan, one that will bring all classes of electrical contractors together. As a rule an electrical contractor is afraid to get acquainted with his competitor and will not join associations, but wants to reap any benefit that may be derived from such associations. The National Electrical Contractors' Association has been of much benefit to its members; its committees have worked to perfect the salesbook and further numerous other points; and it is a benefit to the electrical trade in general. The electrical contractors of New Jersey should join the New Jersey Electrical Contractors' Association and get acacquainted with their competitors and become familiar with the work the Association is doing.

A communication was read from the New Jersey State Federation of Women's Clubs calling attention to the general complaint of housewives that their kitchens are inconveniently arranged, resulting in an unnecessary expenditure of energy and time in doing their work. The Federation was anxious to know whether the Electrical Contractors' Association gives any special attention to the convenience and ease of the woman worker in such matters as the placing of lights, location of outlets, etc.

Secretary J. Van Dyke had replied, stating that the Electrical Contractors' Association had taken up the question of the electrical equipment of the home with the idea of equipping same for the convenience of the inmates, and sending a booklet entitled "Electrical Equipment of the Home."

After the regular routine of business the president introduced Arnold H. Moses, architect, who gave an address on "The Architect and the Electrical Contractor."

Architect and Contractor.

Mr. Moses said that the question of how to get the best results is a vital one to the architect, for a good piece of work well done is the best advertisement he can have; so for his own protection, as well as for the owner's benefit, he must continually strive for the best in all the branches of construction with which he has to deal. It is common belief that the practice which until recently has been almost always followed, of having a general contractor and subcontractors for the different parts of the work is not conducive to the attainment of this ideal.

Now the work of the electrical contractor is of a special kind. It is necessary that the person installing it shall have some knowledge of the subject with which he is dealing and of the variety and kind of appliances available and suitable for the installation of his work, and, consequently, in his work the money consideration should never be the only matter considered.

The reasons which I think led to the grouping together of a number of subcontractors and making one contract with a general contractor was the desire to have some one contractor responsible for the whole work, who should engage to see that each part was executed properly and who should be able to control the craftsmen on the job and, on completion, deliver up a completed job to the architect and owner for a certain stipulated sum. The public is gradually realizing that better work can be had, at very little, if any, more expense, by having the architect in full control and making through him separate contracts for each part of the work and paying one contractor a little more money to take general oversight of the work under the architect and see that all details are completed.

It is obvious that an architect cannot master all the details of the electrical contractors' work, and the best practice is, when he has an important building to undertake, to consult with experts in every important branch, as by so doing he will get in touch with the latest appliances and will be able to prepare the drawings and specifications so that there will be no trouble in understanding them and getting reliable estimates; as it goes without saying that a carefully prepared set of plans and specifications in which nothing is left to the imagination will give the owner what he wants at a reasonable figure and the contractor will be able to figure a profit. The architect also will feel that the result of his labors has been attained in the best and most efficient manner.

The general contractor is not expected to know about electricity, so why should he employ the electrician, and why should the owner pay a profit to two parties, the electrical subcontractor and the general contractor, who is supposed to shoulder all responsibilities, but who generally only gets estimates for the wiring and sublets it for the smallest amount possible after the contract is awarded to him, leaving to the architect most of the trouble of seeing that the subcontractors live up to their contracts.

Since the work of the electrical contractor has assumed such importance, and since there are in many places associations of master electricians, it has been suggested that it would be wise for each association to have a committee of experts, upon whom the architects could call for advice, and to state in an impartial way whether the electrical contractor had fulfilled honorably and fairly the terms of the contract, or whether he had slighted the work. This committee should be composed of men who would render a fair and just decision in the various cases that might come before them for their action. Then in the event of the committee finding that the electrical contractor was doing "shoddy" work, he should be amenable to punishment in some way, and, if severe treatment was necessary, possibly expelled from the association. When the architects and good builders found that the association stood only for straight, honorable and efficient work and that the dishonest practitioner would have no place in its ranks, then a membership in such an association would be of great value to its members and to the public.

It has also been said that in a large city such an organization could save vast amounts in the following way: Almost every manufacturer sends out samples of the goods he has to sell to the architects, who, in a great many cases, promptly lose them; and when they find them again wonder what on earth they are for, as the literature that came with the samples has been relegated to the waste basket.

If the association could arrange to receive samples and to classify them, the architects would get in the habit of visiting its headquarters from time to time for the purpose of education. The manufacturers could be sure that their samples were not either stowed away in a cupboard where they could not be found, or lost entirely.

The time of the specialist has come in every walk of life, and the expert electrical contractor is a specialist, and in most cases it is better to have him do his work as a separate and independent contractor and not as a subcontractor.

After Mr. Moses' address a recess was declared and the manufacturers and jobbers were admitted. After the usual greeting the president introduced E. Ward Wilkins, of Patrick, Carter & Wilkins Company, who gave a very interesting talk on conditions as they were in time gone by and as they are today.

J. P. Alexander, of the General Electric Company, gave a descriptive talk on equipment of the Thomas Maddock Sons' Pottery, of Trenton, N. J., with motors for direct drive, which will make a saving over steam both in cost of operation and in labor.

After a number of manufacturers and jobbers had spoken upon the good the New Jersey Electrical Contractors were doing, the president introduced Farley Osgood, of the Public Service Company, of New Jersey, who gave an interesting talk upon the attitude of the Public Service Company toward the electrical contractors. Mr. Osgood was followed by Messrs. Vanderpool, Sawin, Pemberton, Harbison, Cox and Young, all of the Public Service Company.

Mr. Gaffrey gave a very interesting talk upon municipal inspection.

Mr. Dorris, of the Underwriters of the Middle Department, gave a very interesting talk upon the relation of the inspector toward the electrical contractor.

J. W. Kelley, chief of the Electrical Bureau of Camden, explained the law requiring electrical contractors to register and take out a license and pay a fee of $25 before doing work in Camden, N. J.

At 7 p. m. a banquet was served, after which the following officers were elected:

President, E. P. Strang, Camden, N. J.

Vice-president, Charles Newman, Passaic, N. J.

Secretary, J. Van Dyke, Asbury Park, N. J.

Treasurer, P. H. Jaehnig, Newark, N. J.

Board of Directors—J. T. Plaskett, Merchantville; S. H. Smith, Trenton; Carl F. Adams, Trenton; R. P. Ward, Dover; R. McGown, Newark.

The next semi-annual meeting will be held in Long Branch, N. J.

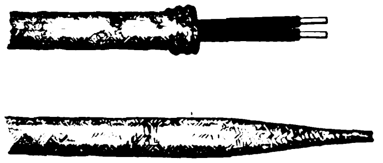
Library of the University of California

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Connecting Flat-Iron Cords.

It is sometimes difficult to replace an asbestos cord on a heating device when the cord has to pass through the spring so often used to prevent the cord from kinking at the connection. This is easily accomplished by working the outer cover back, as shown in Fig. 1, then cut off the individual wires at the outer covering and pull the braid forward again, as shown in Fig. 2. A string can now be tied and as the cord has a smooth tapering end it can be pulled through any type of fitting.


Figs. 1 and 2.—Asbestos Cord.

Charles E. Hanny.

Finding Concealed Boxes.

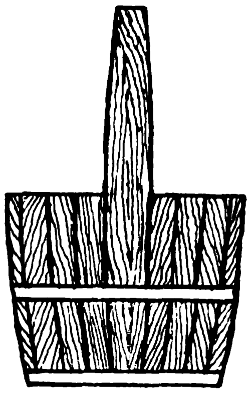
Having to install some flush switches in a new house that was wired with knobs and tubes, I found that the masons had pushed the wire into several of the boxes and filled them with plaster. The walls being prepared, of course, I had no way of knowing the location of the switches, but found them by taking a pocket compass and moving it along the wall about four feet from the floor. When the compass came near a switchbox the needle was moved toward the box, and I had no trouble in finding the switches in this way.

E. L. Ward.

Receptacles for Small Parts.

On most roughing-in jobs the wireman will find that to have his material segregated will not only save time but will enable him to keep track of his material and prevent a shortage of some item which might be neglected if not kept separately.

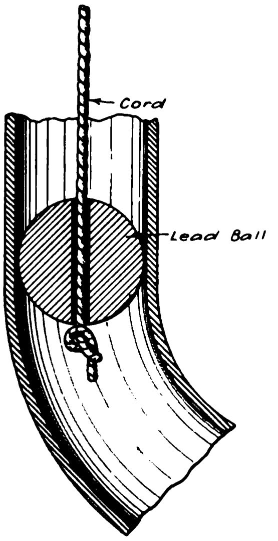
The best and most easily procured receptacle that I know of is a 100-pound nail keg sawed through the middle save for one stave, as shown in the accompanying figure. This one stave acts as a handle and makes it possible to carry considerable weight with one hand—more than would be possible if it were placed in a box. On large jobs I usually have four of these kegs; one for solid knobs, one for split knobs, one for three-inch bushings and one for four-inch and six-inch bushings.


Basket for Small Parts.

Robert Oster.

Pulling Wire Through Fixtures.

The best scheme I have ever used for pulling wire through fixtures is to start with a small thread or cord attached to a lead ball, as shown in the figure. The hole is easily made by drilling, or, if sufficient care is exercised, a steel needle can be driven through. Make the knot as small as possible so that the cord will not catch ahead of the ball. After the cord is pulled through, the remainder of the operation is easy.



Fishing Through Fixtures.

N. G. N.

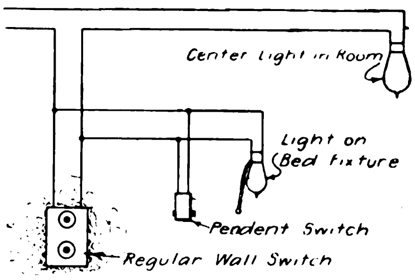
Fishing in Partitions.

Secure a small piece of sheet lead and cut it into strips about one-half inch in length. Roll these strips, eight or nine in number, around a string, leaving a space of about one-eighth inch between each piece of lead and the next, and you have as good a partition fishing tool as can be had. The spaces between the pieces of lead cause the entire affair to be very flexible and it will find its way through almost any opening in a partition.

William E. Rhodes.

A Bedroom Light.

It is often desired to have a dim light in a bedroom, and it can be arranged as follows: In multiple with the regular room switch on the wall is run a cord to any suitable form of bed bracket, upon which is mounted a lamp with a half-shade and pull socket. From this bracket is hung also a pendent switch, the operation being that when the pendent switch is "on," the ceiling light in the room is bright or up to full candlepower; when this switch is "off" and the pull socket on the bed bracket is "on" the two lamps will burn in series and give a nice soft light all over the room; when the pull socket is "off" all lamps are out. This arrangement is very handy as it places the switches right where wanted in bed. We use the dim light more than the bright. This rig can be easily applied to any existing installation. It cannot be quite appreciated until seen in operation, and it is something that can be readily gotten up in any contractor's shop. It is one of many little conveniences that find a sale when they are shown and demonstrated. We have sold a number of them and always have one on display in our show room.



Wiring for Bedroom Light.

E. M. Raetz.

How to Keep Hacksaw Blades.

Much unnecessary annoyance and breakage of blades can be avoided if a receptacle such as described in the following is made in which hacksaw blades may be kept. It is to take a piece of fixture tube of suitable diameter and in length about one inch longer than the blade it is desired to hold; then cut a disk of sheet metal which, soldered on one end, forms a bottom. To complete the device solder a disk of sheet metal on the end of a ((brass-tube) coupling; then, one end of the fixture tube being threaded, this may be used as a cover.

William A. Murray.

Public Service Commissions

CALIFORNIA.

The California-Oregon Power Company applied to the Commission for permission to establish its regular rates for electric service supplied in the town of Sisson and vicinity. A former order had granted the company permission to purchase the electric property subject to the provision that the transfer shall not be used to increase any of the rates charged to the patrons of George H. Johnson, the former owner. The rates proposed by the applicant have been accepted by the town of Sisson and the present order of the Commission accepts these rates, permitting the previous order to become effective.

ILLINOIS.

The Commission has appointed Everett Jennings counsel to the Commission. Mr. Jennings is a graduate of Central University, Danville, Ky., in 1896, and in that year was admitted to the bar and practiced in Kentucky until 1908. Since then he has practiced in Chicago. In 1912 he was assistant state's attorney of Cook County.

MASSACHUSETTS.

A hearing was held by the Massachusetts Legislature Commitee on Public Lighting, February 6, on a bill now before the Legislature which aims to put the control of rates for electric energy under the jurisdiction of the Gas and Electric Light Commissioners. Advocates of the measure urged that a flat rate be established for electricity throughout the State. W. R. Peabody, representing the Easthampton Gas Company, and the Turners Falls Company, and Everett W. Burdett, representing the Massachusetts Electric Light Association, opposed the bill.

NEVADA.

The State Public Service Commission has reduced electric light and power rates in southern Nevada from 5 to 50 per cent and cut the meter deposit from $10 to $5, effective March 5. The lines are owned by the Nevada-California Power Company.

NEW HAMPSHIRE.

The Public Service Commission has issued an order authorizing the Fall Mountain Electric Light Company, of Bellows Falls, Vt., to transfer to the Fall Mountain Electric Company, a Massachusetts corporation, the electric lighting properties located in the towns of Walpole, Charlestown, Alstead and Langdon, N. H., at the purchase price of $17,000. The transaction is a result of the Massachusetts law which taxes stock in foreign corporations, recently declared valid by the United States Supreme Court. The Fall Mountain Electric Light Company was a Vermont corporation having a generating plant at Bellows Falls which supplied current to towns outside that state as well as to Bellows Falls. The stockholders formed a new corporation in Massachusetts which acquired the Vermont property and is now authorized to take over the property located just across the Connecticut River in New Hampshire.

The Commission has granted the petition of the New England Telephone and Telegraph Company for pole rights over private lands in Rochester, Brookfield, Milton and Madison.

The Commission has authorized Robert A. Ware to operate an electric utility in West Wilton.

The Public Service Commission has refused to approve an issue, by the Grafton County Electric Light & Power Company, of $300,000 stock and bonds for the purpose of purchasing lighting companies in Lebanon, and Hanover, N. H., and Hartford, Vt., on the ground that the financial aspects of the proposed issue were contrary to the public welfare. The properties to be acquired have now a capitalization of $13,000, and the Commission holds that the profit which would accrue to individuals from the transaction would come ultimately out of the public. The case is one of the sort which the Legislature designed to prevent when it placed issues of capital by public utilities under Commission supervision.

NEW JERSEY.

The Board of Public Utility Commissioners has approved of an ordinance granting the Phillipsburg Light, Heat & Power Company permission to operate in Phillipsburg. This territory is at present served by the Eastern Pennsylvania Power Company of New Jersey, and in approving a franchise to a competing company the Board specifically defines the change in its position, which has generally been against establishing competition between public utilities, by pointing out that in all such previous cases the public utility in the field furnished safe, adequate and proper service at reasonable rates; while in the present instance the Board holds that the petitioners have proved that the Eastern Pennsylvania did not furnish proper service. In approving the franchise, which provides for certain public service at no charge, the Board says: "The Board has hitherto objected to the imposition on franchises of a money payment as a condition of the grant; and the Board is not satisfied that it has not the power to rescind such conditions as exact unpaid service should such conditions be shown to be unjust or unreasonable. In case the town cares to impose such conditions, taking the risk of their possible annulment by the courts or the Board, the Board will not in this case require their elimination from the franchise."

NEW YORK.

A bill has been referred to committees in the Senate and Assembly directing the Public Service Commission, First District, to investigate the property, rates and fares of the Bronx Gas and Electric Company, in order to ascertain reasonable rates which such company should charge. The bill provides that the Commission may employ special inspectors and experts, if necessary.

A resolution adopted by the Assembly asks that the New York Public Service Commission of the Second District furnish to the Assembly as soon as possible the following information respecting the Westchester Lighting Company; the capitalization of such corporation; its bonded or other indebtedness; the amount of its surplus; the dividends declared during the last calendar year; the salaries paid to its principal officers; the rates of charges for the consumption of gas and electricity in the cities, villages and towns where it operates; and such other facts respecting its financial condition as the Commission may deem useful to enable the Legislature to ascertain the reasonableness of its rates.

WISCONSIN.

Two decisions have been rendered recently by the Wisconsin Supreme Court relating to the jurisdiction of the Railroad Commission. The decision in the case of the Wisconsin Traction, Light, Heat & Power Company against the city of Menasha involves the question of protection from competition. The facts in the case are briefly as follows: The city of Menasha has operated a plant furnishing street-lighting service. It began furnishing a small amount of service to private consumers, and subsequently began to furnish regular commercial electric business in competition with the Wisconsin Traction, Light, Heat & Power Company, a private company furnishing the commercial electric service. The city began furnishing the new service without securing a certificate of public convenience and necessity. Its right to do so was sustained later by the Circuit Court of Winnebago County. The Supreme Court, contrary to the decision of the lower court, holds that before the city can operate a municipal commercial lighting plant, although it has contemplated doing so for years, it must obtain a certificate of convenience and necessity from the Railroad Commission or appeal to the Legislature for relief.

The other case referred to above holds that the Railroad Commission may make independent investigations before issuing rate orders and is not bound by evidence introduced at its hearings by the interested parties. The Commission ordered the Northwestern road to reduce its rates on ice from Silver Springs to Milwaukee after a complaint brought by the Wisconsin Lakes Ice & Cartage Company. An application for a rehearing was denied by the Commission. The company, appealing to the Supreme Court, challenged the validity of the order, declaring it was contrary to law, principally because the findings were not based upon evidence introduced in the case. It contended that if the law did attempt to clothe the Commission with authority to fix rates of carriers upon extraneous evidence, or one-sided investigations conducted by itself, the act was unconstitutional as denying the carriers the guarantees of due process and equal protection of law.

The Railroad Commission authorized the Milwaukee Electric Railway & Light Company to issue refunding and extension bonds to the amount of $3,500,000, these bonds to be in the denomination of $1,000 each and to bear interest at 4.5 per cent per annum payable semi-annually. The bonds are to be secured by a mortgage or trust deed executed by the Railway and Light Company to the Trust Company of America and W. H. Leupp as trustees. The applicant proposes to pledge and deposit these bonds with the Bankers' Trust Company, subject to the provisions of the general and refunding mortgage of the Milwaukee Electric Railway & Light Company as of date December 1, 1911.

The Lena Electric Light & Power Company made application to the Commission to authorize the issuance of $2,500 of its capital stock, such capital stock being authorized to the amount of $5,000, but still unissued. The purpose of this stock according to the applicant is to secure funds for the erecting and equipping of its lighting and power plant and for expenses of organization. The Commission authorized this issue of stock, to be sold at par and for money only as provided by the stock and bond law.

The Mineral Point Telephone Company made application for authority to issue 400 shares of stock of par value of $25, this stock to be exchanged for the 200 stares of stock now outstanding, but having a par value of $50 for each share. The Commission finds upon investigation that the value of the stock outstanding, free and clear of all encumbrances, was $10,000 and that the proposed issue of stock is lawful and for lawful purposes.

An Unusual Cable Trouble.

A very peculiar and unusual accident occurred recently when the Hamburg-American Line Tug No. 3 fouled the United States Government submarine telephone cable extending from the new Barge Office at the Battery to Ellis Island, in New York Harbor.

The cable is made up of 38 stranded conductors. Each conductor is especially insulated and is waterproof. The armor consists of 33 steel wires, three-eighths inch in diameter, wound spirally around the cable, the completed cable being four inches in diameter.

Taking into consideration the size and weight of the cable, it is evident that an enormous power must have been exerted in order to twist it up in the condition found. There were 15 complete turns of the cable about itself, and in one place the two thicknesses of cable were twisted so tightly together that their combined diameter was less than that of the original cable.

The Hamburg-American Line Tug No. 3 is the most powerful tug in the harbor and was built especially to warp the steamship *Imperator* into and out of her pier. She was so badly damaged as the result of this encounter that she was unable to proceed under her own power and had to be towed away.—*New York Telephone Review.*

Copper Exports.

Exports of copper for the week ending February 5 totaled 8,324 tons; since February 1, 6,448 tons; same period last year 8,445 tons.

A New Source of Rubber.

What promises to be a new and large source of rubber supply is about to be opened in the Fiji Islands. Upon nearly all of the islands that comprise this British colony the wild bulia tree, which is exceedingly rich in rubber substance, grows profusely. It has long been known that its rubber percentage is larger than that of any other tree or shrub, far exceeding the Para rubber tree and the guayule shrub in this respect. Experiments that were made from time to time in tapping the bulia tree for the liquid rubber proved unsuccessful. The sap would not exude. Finally attention was directed to the fact that the guayule shrub in Mexico and southwestern Texas was being made a profitable source of rubber, the extraction being by means of crushing and a simple chemical process through which the shrub was put. It was decided to apply this method to the bulia tree and it has proved so successful that steps are on foot to exploit the industry on a large scale. An enormous tonnage of the trees can be grown upon a small tract of land where they are planted and cultivated. There are enough wild trees, however, to provide a supply for many years to come. Owing to the fact that these islands are of comparatively small area and are well supplied with shipping facilities, the bulia trees are convenient to transportation.

The bulia tree is of very rapid growth. It attains a size of eight to ten feet in one year. Experts who have analyzed the bulia rubber report that it is of as high quality as the best Para product.

Colonial Exposition in Java.

It is proposed to hold a Colonial Exposition in the city of Semarang, Java, in the months of September, October and November, 1914. It will celebrate the centennial of the return of the Dutch East Indies under Dutch rule. This exposition will offer opportunities for American manufacturers to introduce their goods in Java, Sumatra, Borneo and neighboring islands.

The representative of the exposition in the United States is T. Greidanus, 136 Water Street, New York City, who will furnish any desired information in regard to the exposition, which will be held under the patronage of the Governor General of the Dutch East Indies.

Telephone Operator Killed.

Miss Lura Price, an operator on the Lone Wolf (Okla.) telephone exchange, was recently killed instantly while at her switchboard, as a result of a cross with an electric light wire.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 198.—WIRING FOR ELECTRIC RANGES.—In wiring up for a number of electric ranges and hot plates in a small hotel kitchen, is it necessary to run a separate circuit for each outfit or can several of the smaller stoves be put on the same circuit? The larger ranges would each take about two kilowatts and the smallest about 600 watts. My plan would be to put three of the small stoves on a circuit and make each circuit heavy enough for two kilowatts. Would it be necessary to put a pilot lamp on each circuit?—G. S. T., Winnipeg, Can.

No. 199.—STEEPLE LIGHTS.—We have a proposition of putting an electric light on top of a church steeple which is extremely high. The nearest opening to the top of the steeple is 30 feet below the apex. I should like to inquire through your columns whether any contractor ever had a job of this kind and as to how he arranged things so that the lamp would be protected from hail and easily lowered for replacement, so as not to require the frequent services of a steeple jack. Being a church tower, any device installed must, of course, be of sightly nature.—F. W. R., Freeport, Ill.

No. 200. — ELECTRICALLY OPERATED PHONOGRAPH.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 201.—FIXTURE WIRE.—Is heavier wire than standard fixture wire required in fixture work in any city? I have been told that this would soon be required in all large cities because of the tendency to connect flatirons and other appliances to the nearest fixture outlet. Is there any basis for this belief?—S. W., Chicago, Ill.

Answers.

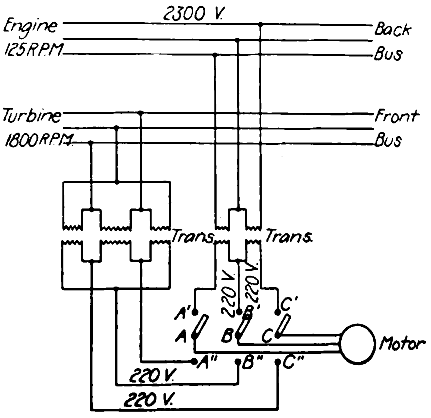
No. 183.—PURITY TEST FOR SAL AMMONIAC.—I should like to know a simple but accurate way to test sal ammoniac. I find that considerable of this material being sold is adulterated with common salt or other cheap chemicals. The burning test is not accurate enough. I should like to be able to test about what percentage of the test sample is pure sal ammoniac and how much of it is adulterated.—F. H. W., Brooklyn, N. Y.

Put a weighed amount of sal ammoniac in a vessel with a dome-like top and heat it to about 100 degrees centigrade. The sal ammoniac will be volatilized and form or condense on the dome. The residue will be impurities. Lest some of the impurities volatilize at that temperature, the condensed sal ammoniac should also be weighed. The approximate percentage of pure salt can thereby be easily determined—J. H. M., San Francisco, Cal.

No. 193.—REPAIRS TO SPARK COILS.—Is there any way to remove the wax so as to permit making repairs on the coils of a jump-spark coil box, such as used on automobiles, without spoiling the finish of the wood?—J. F. P., Canton, O.

It is, of course, understood, that the waxes in spark coils are poured in while they are hot. The solidifying takes place much more rapidly than does the melting and running of the wax in the reverse operation. This is the real explanation of the querist's difficulty. First improvise a sort of baking oven of such a size and shape as to contain the coil from which it is desired to remove the wax and have this oven of such form that the coil may be so placed as to be far from any intense heat, that is from heat which might injure or char the wood, and also so that the coil and case will drain as the wax slowly flows off. It is this "slow flow" of the waxes which you are after rather than a quick melting of them. You have undoubtedly observed the "slow flow" of cold tar due to gravity; try to get the same result with the assistance of a little heat in your baking oven. Make the latter, for example, by taking a ten or twelve-quart pail (tin, iron, or galvanized) and place the coil to be drained in a slanting position in the upper half of a smaller can, inside of the pail. Cover the large pail and apply slow heat for three or four hours.—R. L. L., Minneapolis, Minn.

No. 194.—MOTOR CIRCUIT.—In operating a hot-well pump, we use a 220-volt three-phase motor, which derives its energy from a bank of three five-kilovolt-ampere transformers that are in turn fed from an outgoing power circuit. Any outside disturbance on this particular line would always drop the switch and consequently shut down the pump. In order to avoid this difficulty we used two transformers of 7.5-kilovolt-ampere capacity which were fed from the back busbars, the leads being clamped to them. The secondary leads were run to the upper and lower terminals of a triple-pole double-throw knife switch, using the hinge terminals for the leads to the motor, as per diagram herewith. At the time of phasing out so as to keep direction of rotation the same, one turbine-driven generator was operating on the front buses, and an engine-driven generator on the back buses. In testing we used two 110-volt lamps in series and from terminal *A'* to *A"* there was no light, from *B'* to *B"* no light, and from *C'* to *C"* no light, but from *A'* to *C"* the two lamps burned dimly. We could not secure any light from any other connection. Thinking possibly that the dim burning of the lamps between *A'* and *C"* was caused by the generators coming up to synchronism, we inserted the plugs, but they were nowhere near that point, as the lamps on the synchronoscope and the instrument itself plainly showed. I have tried this over a great many times with the same result, which I cannot account for. Can some of your readers explain it?—R. J. H., Mason City, Iowa.



No. 194.—Motor Circuit Diagram.

The most probable cause of this phenomenon is the existence of a current path of fairly high resistance between the terminals *C'* and *C"*. This might be of the character of a metallic vein in the slate panel, or probably some dust on the panel upon which the double-throw switch is mounted. The reason why the lamps glow between *A'* and *C"*, and no other point is because the voltage between these two points, assuming the existence of the current path, will be the highest voltage possible to obtain on the board, that is 220 $\sqrt{3}$ or 380 volts, whereas 220 volts is the maximum voltage between any other points, and this is not enough to cause the lamps to glow. It is the writer's opinion that the 110-volt lamp will show some current when connected across some of the other points.—E. J. R., New York, N. Y.

No. 195.—POLYPHASE METERS.—Are any reliable polyphase watt-hour meters made with only one disk? Have they any advantages over the type with two disks on one spindle?—N. S. W., Peoria, Ill.

Reliable polyphase watt-hour meters are made with only one disk. These meters consist of two single-phase measuring elements mounted in a single case and acting upon a single aluminum disk. The General Electric Company puts out a polyphase watt-hour meter of this type. In the Fort Wayne type K polyphase watt-hour meter both revolving fields act upon a single drum rotor. The chief advantage claimed for this class of instrument over the type with two disks on one spindle is that the whole construction is made more light and compact.—H. G. C., Ithaca, N. Y.

There are no polyphase watt-hour meters made with only one disk. The polyphase watt-hour meter is virtually two electrically independent meter elements having a common shaft. Each meter element exerts a torque on the shaft, and the total rotative torque is therefore proportional to the sum of the power in the two metered phases, regardless of the phase relation between the phases. These meters when properly connected indicate the true power in a polyphase system with any degree of unbalance between the phases and at any power-factor. Each of the two meter elements is tested and adjusted separately, in the same way as a single-phase meter. Two disks are used regardless as to whether the meter is connected to a two-phase or three-phase circuit since the two meter circuits will be bridged across all of the leads in either case. Great care is taken to have the two meter elements exactly balanced electrically, so that they will measure correctly regardless of the direction of phase rotation. Special means are employed to make this adjustment of balance possible. The current-magnet punchings of both elements, instead of being riveted at their ends to the main punchings, are attached to a flat plate that can be shifted up and down from the front of the meter after it is assembled. Shifting this plate upwards shortens the upper air-gap and lengthens the lower, and vice versa. Adjustment is made by placing the two current coils in series and the two voltage coils in parallel but so connected that the torque of the two elements oppose, and shifting the plate so that there is no tendency to rotation in either direction. Two screws clamping the main punchings of each element are then tightened, and as these are close to the interlinked joints at the corners, the current punchings are firmly clamped against shifting. It is to be noted that the meter registers exactly the same with both elements on single-phase or with either direction of rotation on polyphase.—E. T. M., Syracuse, N. Y.

No. 196.—Speeding Up Street Cars.—If an electric street car designed for a maximum speed of 25 to 30 miles per hour is to be run part way in a rapid-transit subway at a speed of 40 to 45 miles per hour, can the motor and control equipment be readily adapted to the higher speed desired or must a motor equipment designed for the higher speed be substituted? Could this be accomplished satisfactorily by changing the ratio of the reduction gear?—B. F., Chicago, Ill.

The best way by far to speed up the cars spoken of would be by a change in the gears as it would practically mean rebuilding the motors to do this otherwise. In either case there is a question as to whether the motors are of large enough capacity to do this additional work, and I would very strongly advise against the change being made until inquiry had been made of the manufacturers.—J. H. M., San Francisco, Cal.

If the motors used are not already fully loaded, any change in the reduction gear, if it is not very great, might work satisfactorily; but, if the motors are loaded, it can be seen that the increase in speed effected by changing the ratio of the reduction gear will increase the load on the motors still more, especially when bringing the car up to the desired speed. Thus it would cause excessive heating and increase the liability of burnout. Therefore, I think that a motor designed for higher speed would give better service and probably in the end would be better for the purpose.—W. S. E., Seymour, Conn.

No. 197.—Long-Distance Telephones.—In order to have satisfactory conversation over a very long telephone line, is it necessary that the telephones used at the ends of the line be of exactly the same make, or is it sufficient to have them of the same general type and built for long-distance service?—U. S. P., Cedar Rapids, Iowa.

Satisfactory transmission over very long telephone lines is largely a question as to how well the lines are constructed and maintained. As to construction, the wires should be of proper gauge; insulation should be the best possible; transpositions must be properly cut in; and in case the lines are very long, they should be properly loaded. In regard to the type of telephones for long-distance work, the circuit can be set up between two central-battery telephones, between a central-battery telephone and a local-battery telephone, or between two local-battey telephones. They need not be instruments made by the same manufacturing company, the only condition being that they be designed for standard telephone work and that they be in good working order. However, the *best* transmission is afforded between two local-battery telephones, since the battery supply is local to the telephone, and no matter whether the distance of the telephone from the exchange is short or long, the transmitter is always supplied with the proper current. In a central-battery system, the drop in voltage may be excessive so that the transmitter may probably have but two volts or less impressed across its terminals, instead of 3.5 volts or more as required. This difficulty is remedied by installing a local-battery telephone on the central-battery line. If this be done, two points must be observed: (1) a condenser must be inserted in series with the ringer on account of supervision and (2) the receiver must be *poled*, i. e., the direct current flowing from the exchange battery must pass through the receiver windings in such direction as to strengthen the receiver magnets. This can be tested by suspending the diaphragm to the magnet cores, the correct connection being when the diaphragm is more strongly attracted. Press agents and brokers who do a large amount of long-distance telephoning, are provided with local-battery telephones, even in large towns where central-battery systems are in use, because of the higher quality of transmission.—W. C. W., Superior, Wis.

For the transmission of telephonic conversation over long lines it is not essential that the transmitters at each end of the circuit be of the same transmitting efficiency, although it is desirable that this be the case. The difficulty experienced when the transmitters have a different transmitting efficiency is that the instrument having the greater efficiency will transmit over the greater distance, assuming of course, that the battery supply in both cases is of the same type and quality. This means of course that one subscriber might find that he could hear the other subscriber who has the better instrument but he couldn't make himself heard by the distant party. This condition often exists but is more often due to the battery and substation condition than to any difference in the transmitting efficiency of the transmitters. The make of the instrument which is used is immaterial as long as its efficiency is equal or better than that of the distant transmitter, providing all substation conditions are equal. In case one station has a lower transmitting efficiency than the other any trouble from this source can oftentimes be eliminated by increasing the battery supply at the weaker station.—E. C., Kansas City, Mo.

In order to have satisfactory conversation over a very long telephone line it is not necessary to have instruments of the same type, but they should in all cases be designed for long-distance service. Instruments for long-distance work, that is receivers and transmitters, are always of higher resistance and therefore more sensitive than apparatus for use on local lines. The voltage of the current for long-distance work is generally twice the potential used for short distances, the Bell companies using 48 volts for long lines and 24 volts for short or local lines. The instruments used, therefore, must be designed for both services and obviously an instrument intended for purely short lines would be wholly inadequate for long-distance operation. In using instruments of different make and type great care must be used in seeing that they are suitable for both purposes. The Bell companies in acquiring so-called "independent" plants have in a great many cases upon merging the physical properties retained all of the instruments used in both of the systems, although care has been taken to see that the general characteristics are the same.—E. T. M., Syracuse, N. Y.

Electric Vehicles.

In a paper on "Construction and Operation of Electric Trucks" before the Pittsburgh Section of the American Institute of Electrical Engineers, on January 13, T. H. Schoepf predicted that while the electric vehicle may replace horse-drawn vehicles for delivery service, it cannot compete with the gasoline truck in its particular field of long hauls and high speeds, since the electric may be operated economically at low speeds and for limited distances only. The limiting distances range from 57 miles for a one-half ton truck with a maximum speed of 12 miles per hour to 45 miles for a five-ton truck with a maximum speed of six miles per hour. These figures are based on tests made on a smooth level track without stops. Average conditions encountered over city streets will be practically equivalent to a two-per-cent grade, however, so that distances ranging from 40 to 30 miles will correspond more nearly to average results.

The average results of the electric delivery wagons of McCreary & Company, Pittsburgh, are as follows: number of packages delivered per trip, 354; miles, 32; stops, 108; packages delivered per stop, 3.28; packages delivered per mile, 11.07; running speed, ten miles per hour; average speed over the route, 8.5 miles per hour; actual running time, 2.5 hours out of 9.

The paper was in the main devoted to a detailed description of the construction of trucks, motors and electric control, illustrated with lantern slides.

In a paper on "Electrical Equipment for Automobile Gas Engines," C. E. Wilson stated that at least 75 per cent of all cars sold this year will be equipped completely with electric starting and lighting devices, and probably more than half of the remainder will use electric lamps.

Automobile lighting is best accomplished by a combination of a direct-current generator driven by the engine, and a storage battery. When standing and at low engine speeds, the lighting is supplied by the battery; at higher speeds the generator carries the lighting load and recharges the battery.

Electric car lighting became feasible only with the introduction of the tungsten automobile lamp, as with carbon lamps, the weight of batteries required was too great. The lighting load with six-volt tungsten lamps is about eight amperes, including two 15-candlepower head lights, two 4-candlepower side lights and one two-candlepower tail light. For high-speed driving in the country, 21-candlepower headlight lamps are sometimes used.

The presence of a storage battery allows the use of a motor for starting, one-half horsepower being ample to start an ordinary four-cylinder engine. The torque required to spin a motor is proportional to the cylinder displacement and varies with the oiling, compression and general conditions; the starting torque required being two to three times the torque at cranking speed. A fairly high cranking speed gives a better mixture in the cylinder, and a better spray in the carburetor. The motor should be able to produce a momentary torque three or four times the normal starting torque of the motor to take care of the worst conditions, i. e., starting with the engine cold and the cylinder and bearing oil stiff. There are four possible combinations of lighting, starting and ignition units:

(1) A combined lighting and ignition unit with a separate starting motor.
(2) A combined lighting and starting unit with separate ignition, usually a magneto.
(3) Three separate units for lighting, starting and ignition, one being a magneto.
(4) A single unit for lighting, starting and ignition.

The first combination was the one recommended by the author. The generator carries a commutator for the ignition, and revolves at engine speed on four-cylinder engines and at two-thirds engine speed on six-cylinder engines. Voltage regulation is affected by a series field which bucks the main field. A centrifugal switch closes the generator circuit at an engine speed corresponding to about eight miles per hour on the high gear.

The use of a separate starting motor allows of a big gear reduction, permitting maximum economy in weight and cost, the motor running normally at 2500 revolutions per minute. It is of the four-pole, consequent-pole type. The one-half horsepower size will take care of the ordinary engine, while a three-quarter horsepower size will spin the largest engines at 100 to 125 revolutions per minute for four cylinders, and 80 to 100 revolutions per minute for a six-cylinder engine, the latter being inherently adapted to lower speeds.

The sudden, enormous demand for electric lighting and starting sets has produced a big variety of such devices; many of which are mere makeshifts, entirely unsuited to the work they are called upon to perform. Already there is, however, a very desirable tendency toward standardization along certain lines, as dictated by careful engineering design.

In the discussion, which was participated in by Messrs. Farrer, Randall, Criss, Eaton, Sonnergren, Hipple, McIntire, Reynders, Schoepf and Wilson, the prospective purchaser of starting and lighting devices was cautioned to make a careful examination into the mechanical design of the devices, and several experiences with unsatisfactory devices were given. The multiple spark of the old medical-coil type of battery ignition was compared with the more modern system in which the primary circuit is closed long enough to store the maximum amount of energy, which is discharged into the single spark at the instant of breaking the circuit. The resultant heavy spark is much more satisfactory than the series of smaller sparks given by the trembler type of coil. A centrifugal device automatically provides for a constant time of contact regardless of engine speed, and also advances the spark as the engine speed increases.

If the same machine is used for starting and lighting, it must either run at engine speed, requiring a big motor, of at least 150 pounds weight —three times the weight of two separate machines, or else a double winding on the armature and an automatic gear-shifting or clutch device, both schemes being cumbersome and heavy. The separate motor described weighs 20 pounds and the generator 35 pounds. The battery with this kind of an outfit requires charging only when the car is used mostly at night, for short runs only.

The reliability of the electric delivery wagon is one of its most important features. It will average not over one day per month out of commission for repairs, as contrasted with four days per month for the gasoline truck and three days per month for the horse-drawn vehicle. The electric is also much quieter and cleaner, a very important consideration for deliveries in a residence district. The modern battery, whether of the lead or Edison type, will stand heavy rates of charging, so that it can be refreshed by a charge over, say, the noon hour. At a constant voltage of 2.3 volts per cell a heavy charge can be put into a lead cell without reaching the gassing or inefficient point. While operating both gasoline and electric trucks of the same capacity for exactly the same service, simultaneously, McCreery and Company found that the electric was about 25 per cent cheaper. It was predicted that the ultimate delivery wagon will have a battery to provide power to electric motors for propulsion, and a continuously operated high-speed, gasoline engine and electric generator to keep the battery constantly charged.

Municipal Lighting Day at University of Iowa.

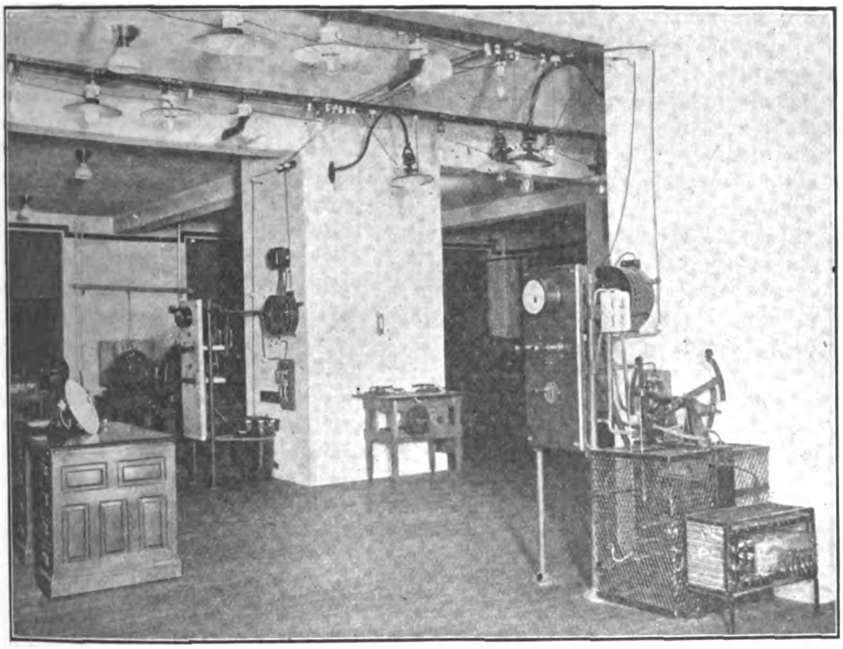
A new venture into the field of extension service was made at the State University of Iowa during the first week of the month. On Wednesday, February 4, a "Municipal Lighting Day" was held at the University in Iowa City for the benefit of city officials over the state and for others interested in the conduct of municipal affairs.

For some time a need has been felt among Iowa municipalities for scientific information on the subject of street lighting, on the care and regulation of public utilities, and on all the other problems of a like nature that harass city officials. It was in response to this demand that the University's extension department offered its facilities in the form of a special convention.

An unusual and unexpectedly large number of officials attended. Central-station men, city councilmen, mayors, and public-utility officials came from various parts of the state to the number of sixty or more. Owing to the short length of time that the visitors had at their disposal, the whole program of four numbers was crowded into a short one day's session.

The program opened late in the forenoon with a lecture on "Rate-Making for Public Utilities," by Dean W. G. Raymond of the College of Applied Science. Dean Raymond is a member of a commission of nine appointed by the American Society of Civil Engineers to standardize methods for appraising public works and to unify the various systems of control for public utilities.

He took up his subject, not from the expert accountant's point of view, but with the idea of presenting the fundamental things that must be considered in the deciding on rates for public utilities. As an example he took the specific case of a municipally owned plant and by assuming a set of figures, led his hearers on to see what the rates charged for the utility must cover. He believed that the public should expect to pay in rates: First, interest on capital, invested and working; second, cost of operation, including repairs, and third, some sort of a renewal fund. The income should be divided for collection into three parts: First, a portion levied on every taxpayer for the general service of all citizens; second, a second portion levied on all property enjoying potential or actual service because of the existence of the service lines in the vicinity, and third, a third portion paid by the users for the actual service rendered to them exclusively.



Electrical Exhibit at University of Iowa.

The sum of the three items, interest, cost of operation, and depreciation, divided by the entire output, will give the average cost per unit of output. So much of this as is to be paid by consumers for use should be arranged with a sliding scale to be determined for different utilities in different ways, so that the larger users shall pay the lower rates.

If the municipality prefers not to engage in business itself, but wishes to hire some person or corporation to do its business for it he advocated the paying of some sort of wage to the party hired, which way must take the form of a larger return on the capital invested than mere savings bank interest, which should be such as to be fairly called interest and profit on the invested capital.

A theory he held in common with some others was that a public corporation is a public agent, supplying money, constructing works and operating them for hire; that it should be paid for the use of its money at a reasonable interest rate; that it should be paid its operating expense; that it should be repaid the sum that may be reasonably invested in its plant by the time that its plant is worn out or obsolete; and that it should be paid a profit or wage for the service rendered.

The only item in all this that is really difficult to determine is the item of replacement, or as it is generally called, depreciation. He then went into an extended discussion of a plan his committee of the American Society of Civil Engineers had evolved to take care of this item. In concluding, he stated that the profit or wage allowed the corporation should be allowed as a percentage of the cost of operation, it being understood that there will be supervision to the extent of preventing undue padding of this cost, and an agreement whereby the profit or wage may be larger as the cost per unit is smaller.

Dean Raymond's talk was followed in the afternoon by an address by Prof. A. H. Ford, of the Department of Electrical Engineering, on "City Street Lighting." He divided the reasons for the existence of street lighting into three parts: First, to facilitate travel on the highways; second, to ornament and make attractive the streets of a city; and third, to assist in the prevention of crime. The relative importance of these parts varied with the locality.

The illumination of a main travelled street should be sufficient to enable one to see the irregularities of the walk with ease and also to recognize a person at a considerable distance. A business street should be lighted so that one is able to read a notebook with ease at any point along the street. The prevention of crime requires that the light shall be fairly uniform along the street and there shall be no intense shadows cast by obstructions, such as trees and buildings. Each place along the highway must therefore receive light from at least two sources.

When the street is to be really illuminated and not merely supplied with beacons, small lamps placed close together are more economical when the minimum intensity of light is fixed. He advocated the considering of the needs of foot passengers in designing a lighting system more than that of vehicles, since the latter carried lights of their own in these days. He offered for consideration several concrete plans, in which designs for lighting systems were laid out.

The artistic effect of street lighting is dependent upon the poles as much as upon any one thing. While the question as to what is pleasing in appearance is largely a matter of personal preference, yet some general principles can safety be followed in all cases.

First, the lamp supports should harmonize with the surroundings. The tendency at present, especially in curb lighting systems, is to select standards which are too heavy or too ornate to harmonize with the adjacent buildings. Second, the light itself expresses lightness of structure and therefore heavy standards should not be selected except in cases where the lamps with their shades give the appearance of weight. Third, the pleasing effect of a row of lights is due to symmetrical grouping and therefore care should be used to space the lamps at equal intervals.

The matter of cost of different systems, both as to installation and upkeep, was then gone into to a considerable extent. In conclusion he believed that the lighting of streets could be made a matter of exact design from the illuminating standpoint, and that artistically it follows well-known laws, so that there is no excuse for the present haphazard way of attacking the problem.

After Professor Ford's lecture the convention adjourned to the electrical laboratories, where a special street-lighting system had been built up in a condensed form especially for the occasion. Along the ceiling a double row of the latest and newest types of street-lighting devices had been arranged, fitted with all sorts of lamps, from the flaming arc to the nitrogen-filled tungsten. The lamps were connected in series and controlled from two different supplies; one, a Westinghouse constant-current transformer, and the other, the new A. W. control. The whole system was intended to be a miniature of a regular street-lighting scheme, and convention members were coached in its manipulation and given pointers as to the relative merits of different lighting plans for different localities.

Following the inspection of the street-lighting system, the convention listened to another talk by Charles P. Chase, of Clinton, Iowa, on municipal ownership and the new city-manager method of controlling municipalities. Mr. Chase is head of the Iowa Engineering Company and has had much experience with the problem of regulating public utilities and governing of city-managed properties.

The convention passed a unanimous resolution of appreciation of the efforts made by the University to supply them with interesting and profitable lectures. Another resolution was also passed, asking the University to have the various talks given during the day printed for distribution among their fellow workers who were unable to come. This the University agreed to do.

The convention was entertained at luncheon by the faculty of the College of Applied Science. Every member expressed himself as greatly pleased with the entire program and heartily in favor of the movement the University was making towards extending its usefulness to the people of the state in the matter of giving a better understanding of municipal problems.

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Daylight and Artificial Light.

A paper on "Some Problems in Daylight Illumination" was read at a recent meeting of the Illuminating Engineering Society in London, and the discussion occupied two evenings.

At first sight it might perhaps be supposed that daylight illumination, although naturally most important to architects, to school medical officers and factory inspectors, hardly falls within the scope of the illuminating engineer.

But the discussion mentioned above showed that this would be a quite incorrect view. In the first place it is evident that our conception of what constitutes good artificial lighting depends to a great extent on the conditions enjoyed during the day. For example many people hold the opinion that the somewhat higher value of illumination general in the United States, and in some parts of the Continent, as compared with England, is due to climatic conditions. People who are accustomed to bright sunlight and clear skies naturally form a high standard of artificial light; but those who dwell in foggy, smoky cities and in northern latitudes, would be disposed to be satisfied with a lower value.

It seems to be a fact that in buildings where the access of daylight is very deficient, and work is carried on in dim and dismal surroundings, people form a low standard with regard to artificial light and can rarely be prevailed upon to see that better illumination is needed.

Another point to be noted is that much of the factory inspection work now going on has to do with daylight; it is an accepted fact among the medical profession that deficiency of daylight encourages dirt and disease and is generally prejudicial to health. Consequently investigations into the natural and artificial lighting of factories should go hand in hand. An important problem to be settled is how far the minimum illumination required for safety or for certain industrial operations can be laid down for day and artificial light alike. From the discussion referred to above it appeared that in certain circumstances, e. g. in full midday daylight, a much stronger illumination is usually needed than by artificial light. But in the twilight it seems often possible to read by a lower illumination than would be considered satisfactory in the evening, by gas or electric light.

Another point that was strongly brought out in this discussion was the extraordinarily large variations in daylight intensity that commonly occur in different parts of one and the same room. This seems to have a curious bearing on the statements that are often made that such and such a system of artificial light is "nearest to daylight." Sometimes this claim seems to infer that the uniformity of the illumination resembles daylight; yet, as a matter of fact, daylight in a room is usually very far indeed from uniform.

P. J. Waldram, in the course of his paper, referred to the value of photometry in connection with "ancient light" cases (i. e. disputes in which one party claims that the erection of a building has prejudiced the access of daylight into a room or office, and so lessened its practical value). But it seems that such claims are often put forward and settled on the vaguest grounds, for there is, as yet, very little evidence to what extent daylight can be interfered with, before the interference constitutes a positive injury. In addition, before the advent of illumination photometers, it was often extremely difficult to prove that the light had been affected at all.

Mr. Waldram has found photometric measurements very useful in this connection. His method consists in determining the ratio between the actual illumination in a room and the unrestricted illumination out of doors. For this purpose a special tube-attachment, which is pointed towards the sky, is used—a device originally contrived by A. P. Trotter. Prof. L. Weber of Kiel uses a somewhat different form of instrument, but determines the same factor. For example, he states that in a well lighted schoolroom the illumination on the worst lighted desk should not be less than 0.5 per cent of the full daylight illumination out of doors. Another method, described by W. C. Clinton, is based on a comparison between the illumination from a quarter-sphere of sky measured on the window-sill and the illumination on the desk most remote from the window.

Many other methods of attacking daylight problems were discussed in this debate, a number being described in a complete summary of Continental literature prepared by James Kerr.

Yet another interesting experiment described by Messrs. Waldram and Clinton related to the use of small models of buildings, in order to predict beforehand the conditions of daylight illumination which should exist when the building is actually erected. Mr. Waldram showed a curve illustrating the distribution of illumination in a schoolroom at University College. Another similar curve was calculated from photometric measurements in a small model placed on the roof of the college and the results seem to have been very promising. The method is really an easier one to apply to daylight than to artificial light.

One very interesting suggestion was made by Mr. Trotter, namely that an "indicator-photometer" should be prepared which would indicate to the inmates of a room when the daylight illumination had arrived at a certain value and artificial light was needed. He suggested that this might take the form of a small Bunsen disk, but it is also possible that such a contrivance might be based on the use of a selenium cell which would ring a bell when the light had diminished to a certain point.

Such an instrument might be of considerable value in schools and factories and would secure that the artificial illumination never fell below a prescribed standard. It is common knowledge that the interval when daylight is failing and artificial light has not yet been switched on is always a trying one, and that at this period of the day accidents and spoiled work are especially likely to occur,

Midwinter Convention of Electrical Engineers.

The second annual midwinter convention of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York City, February 25 to 27. The convention will be under the auspices of the Electric Power Committee, each of the sessions being devoted to one of the subcommittees into which this general commitee is divided. The registration headquarters during the convention will be in the lobby of the Engineering Societies Building.

The convention will open Wednesday morning at 10:00 a. m. with an introductory address by President C. O. Mailloux, after which the following papers and reports will be presented:

"Electric Power," by D. B. Rushmore and E. A. Lof.

Subcommittee report, "Scope of the Engineering Data Subcommittee," P. H. Thomas, chairman.

Subcommittee report, "The Feasibility of an A. I. E. E. Handbook," Harold Pender, chairman.

At the afternoon session the following papers will be presented:

Protective Reactances in Large Power Stations," by James Lyman, Allen M. Roseman, and Leslie L. Perry.

"Outdoor versus Indoor Substations," by Alexander Macomber.

"Indoor and Outdoor Substations in Pennsylvania," by H. L. Fullerton.

"Outdoor Substations in New England," by Fred L. Hunt.

"Outdoor Substations in the Middle West," by Leslie L. Perry.

"Suggestions for Discussion on Electrical Features of Power-Station Design," by A. H. Kruesi.

Thursday, 10:00 a. m. Transmission Session.—Subcommittee report, "Problems of High-Tension Transmission Lines," P. W. Sothman, chairman. Appendix 1, "Deterioration of Porcelain Insulators in Service," by J. A. Brundige. Appendix 2, "Radius of Influence of a Direct Lightning Stroke," by L. C. Nicholson. Appendix 3, "Transmission-Line Problems in the West," by P. M. Downing. Appendix 4, "Switching," by G. Faccioli.

There will also be a paper on "Practical Operation of Supension Insulators," by H. W. Buck.

Afternoon Session.—"The Economical Capacity of a Combined Hydroelectric and Steam Power Plant," by C. T. Hutchinson.

"The Cost of Electricity at the Source," by H. M. Hobart.

Friday, 10:00 a. m. Distribution Session.—Subcommitee report, "Distribution of Electrical Energy." P. Junkersfeld, chairman. Appendix 1, "Three Wire Direct-Current Distribution," by Philip Torchio. Appendix 2, "Alternating-Current Distribution," by H. B. Gear. Appendix 3, "Effect of Consumers' Apparatus and Wiring on Distribution," by H. Goodwin. Appendix 4, "Direct-Current Distribution for Surface Railways—Urban Service," by R. H. Rice. Appendix 5, "Direct-Current Distribution for Underground and Elevated Railways," by E. J. Blair. Appendix 6, "Direct-Current Distribution for Interurban and Steam Railroads," by W. G. Carlton. Appendix 7, "Alternating-Current Distribution for Interurban and Steam Railroad," by W. S. Murray. Appendix 8, "The Relations of Distribution Problems and Switching Equipment," by E. B. Merriam. Appendix 9, "Distribution for Street-Lighting Service," by P. M. Lincoln.

Afternoon Session.—"Recording Devices," by C. P. Steinmetz. "High-Frequency Relays," by E. E. F. Creighton.

Under the auspices of the Institute and the Commitee on Organization of the International Electrical Congress, 1915, there will be held on Wednesday evening, February 25, in the ball room of the new Hotel Biltmore, a dinner-dance. The purpose of this meeting is to afford an opportunity for the members and guests to meet and become informed of the plans for the San Francisco Congress. Dinner will commence promptly at 7:15 p. m. and the dance at 10 p. m. Subscription $5.00 per person. Brief reports will be made during the dinner on the organization of the Congress.

On Thursday, February 26, at 8:30 p. m., in the Auditorium, a meeting will be held under the auspices of the Executive Committee of the Commitee on Organization of the International Electrical Congress. Ladies are invited and it is expected that the meeting will afford much of technical and popular interest. The following program of address will be delivered: 'The International Electrical Congress," by C. P. Steinmetz; "The Panama-Pacific International Exposition," by William Rader; "The Lighting of the Panama-Pacific International Exposition," by W. D. A. Ryan; "Some Science Features of a Trip to San Francisco," by James A. Cruikshank; "Some Electrical Features of a Trip to San Francisco," by P. M. Lincoln.

Safety Conference in Nevada.

"Safety-First" conference was held at the University of Nevada, Reno, Nev., on January 26 and 27. This meeting was arranged by the State Industrial Commission and the Engineering Department of the University. It was attended by about 600 persons from various Western states, including representatives of mining, railroad, manufacturing and power-plant interests, as well as state officials, labor representatives, engineers and others.

Electrical matters were considered at the second day of the conference. The meeting on Tuesday morning was presided over by A. H. Babcock, electrical engineer of the Southern Pacific Railroad. The principal paper presented was by W. K. Freudenberger, chief engineer of the Nevada State Public Service Commission, and was entitled "Safety Regulations for Electrical Power Companies."

At the session on Tuesday afternoon Governor Oddie presided. A paper was presented by J. G. Scrugham, professor of electrical engineering in the University of Nevada, on "Electric Headlights."

On Monday evening there was a demonstration of wireless telegraphy and high-potential discharges in the Department of Electrical Engineering and Physics of the University.

J. G. White Corporation to Handle Flood Problem for China.

It has been officially announced by the American Red Cross that the Chinese Government has authorized the issue of $20,000,000 of bonds for the future prevention of floods in the Huai River Valley in China, and that The J. G. White Engineering Corporation has been designated to undertake the construction of the Huai River works. The whole enterprise depends upon the ability of the Chinese Government to find a market for the proposed bond issue. It is anticipated that there will be no difficulty in this connection, and the prospect is that American money as well as American engineers will be largely involved.

Dr. Chen Chin-Tao is now on his way to America to represent his country in the negotiations, and five engineers will be assigned to confer with The J. G. White Engineering Corporation and Dr. Chen Chin-Tao, and proceed to China in time to observe the next overflow of the Huai River, which generally occurs in July.

At the earliest possible moment the development work will proceed, and The J. G. White Engineering Corporation will take charge of one of the most important engineering and construction problems in which American engineering talent has been concerned in China. The project includes the reclamation of about 17,000 square miles. The work will require approximately six years to complete, and employment will be given to about 100,000 men. The project will involve dredging to deepen the channel of the river and the Grand Canal; also the construction of dams and reservoirs to keep the Huai in its proper course, and to impound its surplus water and divert the streams flowing into the Huai, which, at the time of floods, greatly increase its overflow. The Huai River, for the greater part of its length, flows between banks that are elevated above the surrounding country, and in times past the river in overflowing its banks has changed the geography of an entire province over night.

It is the plan of the Chinese Government to pay the principal and interest of the proposed $20,000,000 bond issue from taxes to be levied on the lands that will be benefited in the flood district, and also from rentals and the sale of about one million acres of land, which, it is estimated, will be reclaimed.

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Electric Line in Palestine.

A concession for the construction of an electric line from Jerusalem to Bethlehem was granted on January 27 by the Turkish Government to the French bank that recently supplied Turkey with money to purchase the Brazilian dreadnought *Rio de Janeiro*.

CENSUS REPORT ON TELEGRAPHS AND CABLES.

Ocean Cable Systems.

Preliminary figures of the forthcoming report on the ocean cable and telegraph systems of the United States have been given out by Director Harris, of the Bureau of the Census. The statistics relate to the years ending December 31, for 1912 and 1907.

Included in the number of ocean cable systems is one system operated by a land telegraph company. The financial details for this, and the number of employees not having been segregated in the single report submitted, are made a part of the report for land telegraph systems. The miles of cable and number of cable messages, however, are embraced in the cable-systems report.

TABLE I—OCEAN CABLES.

	1912	1907	Per cent of increase:[1] 1907-1912
Number of companies or systems[2]	7	7	....
Nautical miles of ocean cable[2]	67,676	46,301	46.2
Number of messages[2]	[3]5,841,280	[3]5,869,317	—0.5
Income, total	$8,469,374	$7,671,700	10.4
Telegraph traffic	$8,065,798	$7,338,280	9.9
All other sources	$403,576	$333,420	21.0
Net income	$2,952,847	$4,079,074	—26.7
Expenses, total	$5,516,527	$3,642,626	51.4
General operation and maintenance, including salaries, wages and legal expenses	$4,008,218	$2,204,939	81.8
Interest and taxes	$1,214,554	$1,190,308	2.0
All other expenses	$293,755	$247,379	18.7
Balance sheet:			
Assets, total	$107,583,155	$95,624,892	12.5
Construction and equipment, including real estate, etc	$78,136,115	$77,438,339	0.9
Stocks and bonds of other companies, treasury stock, and "other permanent investments"	$16,811,087	$12,971,564	29.6
Cash and current assets, including supplies[4]	$12,635,953	$5,214,989	142.3
Liabilities, total	$107,583,155	$95,624,892	12.5
Capital stock	$55,489,400	$52,800,000	5.1
Funded debt and reserves	$43,549,451	[5]$36,561,391	19.1
Accounts payable	$1,459,797	$314,955	363.5
Dividends due and sundries	$587,229	[6]$2,452,351	139.5
Profit and loss surplus	$6,497,278	$3,496,195	85.8
Capitalization:			
Capital stock outstanding, par value	$55,489,400	$52,800,000	5.1
Dividends on stock	$3,040,200	$2,533,041	20.0
Employees and salaries and wages:			
Average number	[7]1,656	1,207	37.2
Salaries and wages	$1,167,014	$915,083	27.5

[1] A minus sign (—) denotes decrease.

[2] Includes returns for Western Union Telegraph Company, but no segregation could be made of financial statistics or employees for the cable business of this company.

[3] Number for one company estimated by company reporting.

[4] Includes sinking and other special funds and sundries for 1912 and industries only for 1907.

[5] Includes floating debt.

[6] Includes interest due and accrued.

[7] Number employed September 16 1912

The mileage of ocean cables is that owned or leased by the operating companies and is the entire length of such cables wherever located. The financial statistics, therefore, concern to some extent operations in foreign countries. Statistics of merely holding companies and of federal governmental cables are excluded.

The statistics of the two foreign companies having cables landing in this country and doing business here are not included. These companies are the Deutsche Atlantische Telegraphengesellschaft and the Compagnie Francaise des Cables Telegraphiques.

The figures show that the increase in nautical miles of cable was 21,375, or 46.2 per cent. There was a slight decrease in number of cable messages reported, but the gain in amount of income received from telegraph traffic was $727,518, or 9.9 per cent. The net income, as reported, decreased $1,076,227, or 26.7 per cent, there having been an increase in cost of operation and maintenance amounting to $1,803,279, or 81.8 per cent. No charges for depreciation were reported in the expense account at either census. The increase in profit and loss surplus was $3,001,083, or 85.8 per cent. Reserves were increased very largely, but the total cannot be shown separately, as it is practically that of one system. The amount of capital stock outstanding was $2,689,400, or 5.1 per cent greater in 1912 than in 1907; the number of wage-earners increased 449, or 37.2 per cent, and the salaries and wages $251,931, or 27.5 per cent.

The figures in detail are shown in Table I.

Land Telegraph Systems.

All telegraph systems, execpt one, reporting are operated by companies incorporated in the United States. The exception is a Canadian company, but its report is limited to operations in this country alone. No balance sheet is included for this company, nor for one company belonging in the United States and leasing its plant from a railway corporation.

Systems operated by the Federal Government for military or commercial purposes, either in Alaska or the insular possessions, and telegraphs owned and operated exclusively by railways, are not included. Neither do the figures include the incidental telegraph business done by telephone companies over their own wires.

The number of wage-earners does not include railway operators employed at certain railway stations and doing work also for telegraph companies.

The differences in the system of accounts between 1907 and 1912 to some extent invalidates comparison of the reports for these years. No statement of charges for depreciation or for sinking fund, if charged against income, was made in 1907.

During the semi-decade 1907-1912 the miles of single wire increased by 236,235, or 15 per cent. The increase in number of offices was 1,725, or 5.9 per cent. This number includes offices operated in connection with railway companies.

While the gross income increased $12,381,301, or 28.2 per cent, the expenses of all kinds increased by a greater amount—$14,625,438, or 38.2 per cent. The net income by this showing was therefore reduced $2,244,137, or 39.5 per cent.

The increase in construction and equipment account appears as $11,303,011, or 8.5 per cent, but the amount reported for stocks and bonds, and other permanent investments decreased $6,392,290, or 27.2 per cent. There was an increase of $19,612,023, or 179.8 per cent, in cash and current assets, including supplies and sundries, much of this being in cash and current assets only.

The capital stock outstanding increased $1,948,860, or 1.9 per cent, and the funded debt increased $2,463,000, or 6.6 per cent. There was a notable increase of $3,377,471, or 180 per cent in reserves.

The sundry account under "Liabilities" is swelled by the inclusion of the capital stock of subcompanies assumed by one great company reporting, and by the inclusion of certain deferred liabilities.

The figures in detail are shown in Table II.

TABLE II.—TELEGRAPH SYSTEMS.

	1912	1907	Per cent of increase:[1] 1907-1912
Number of companies or systems	22	20	10.0
Miles of pole line	[2]247,528	[2]239,646	3.3
Miles of single wire owned and leased	[3]1,814,196	1,577,961	15.0
Number of messages	[4]103,536,418	[5]97,924,759	5.7
Number of telegraph offices	30,781	29,056	5.9
Income, total	$56,293,469	$43,912,168	28.2
Telegraph traffic	$52,337,211	$37,916,907	38.0
All other sources	$3,956,258	$5,995,261	—34.0
Net income for the year	[6]$3,431,044	$5,675,181	—39.5
Expenses, total	$52,862,425	$38,236,987	38.2
General operation and maintenance	$39,067,011	$31,852,359	22.6
Interest and taxes	$2,740,827	$2,246,382	22.0
All other expenses	[7]$11,054,587	$4,138,246	167.1
Balance sheet:			
Assets, total	$191,516,700	$166,530,835	15.0
Construction and equipment, including real estate, etc	$143,910,631	$132,607,620	8.5
Stocks and bonds, including other permanent investments and treasury stock	$17,122,592	$23,514,882	—27.2
Cash and current assets, including supplies and sundries	$29,672,528	$10,060,505	179.8
Profit and loss deficit	$810,949	$347,828	133.1
Liabilities, total	$191,516,700	$166,530,835	15.0
Capital stock	$104,274,435	$102,289,575	1.9
Funded debt	$34,741,000	$37,204,000	—6.6
Reserves	$5,254,329	$1,876,858	180.0
Accounts payable	$12,175,438	$7,894,978	54.2
Dividends, taxes and interest due and accrued	$1,460,733	....	....
Sundries	[8]$23,447,146	[9]$87,852	....
Profit and loss surplus	$10,163,619	$17,177,572	—40.8
Net surplus	$9,352,670	$16,829,744	—44.4
Capitalization:			
Capital stock outstanding, par value	$104,274,435	$102,289,575	1.9
Dividends on stock	$3,139,861	$4,944,042	—36.5
Funded debt	$34,741,000	$37,204,000	—6.6
Employees and salaries and wages:			
Average number	[10]35,639	26,827	32.8
Salaries and wages	$23,797,980	$16,893,166	40.9

[1] A minus sign (—) denotes decrease.

[2] Exclusive of pole line wholly owned and used by railway companies.

[3] Does not include 22,816 nautical miles of ocean cable operated by one land telegraph company. Exclusive also of 314,329 miles of wire wholly owned and operated by railway companies for their own business.

[4] Does not include land messages sent over its 207 miles of leased land wire by a wireless company, nor ocean cable messages.

[5] Exclusive of ocean cable messages.

[6] Less all expenses, including charges for depreciation.

[7] Includes charges for depreciation, which were not included in expense in 1907.

[8] Includes assumed capital stock of subcompanies, deferred noninterest-bearing liabilities payable only on determination of leases, and floating debt.

[9] Includes floating debt.

[10] Number employed September 16, 1912.

Wireless Telegraph Systems.

Figures for wireless telegraph systems of the United States include only the plants operated for commercial purposes. Federal government plants and all plants, whatever their ownership, in the insular possessions, are excluded. The report of one wireless company in the hands of receivers is not included. Its principal business was that of renting apparatus and perfecting inventions. One company did some exclusively land telegraph business over a leased wire. The details could not be wholly segregated and are included in the report.

The figures presented show that while there was a net deficit in operation in 1907, a net income was the result of the business in 1912. The gross income increased $562,367, or 527 per cent over 1907. A great part of this income was the rental of wireless apparatus for ship equipment. The expenses, including charges for depreciation in 1912, increased $504,091, or 314.4 per cent. The great decrease in assets—$22,581,700, or 68.5 per cent—is due to the disappearance of one large company in a merger of interests. The decrease was largely in the value placed on patent rights, good will, and contracts in 1907, and on treasury stock.

The amount expended for construction and equipment increased $888,156, or 280 per cent, over 1907, and the number of employees 782, or 444 per cent; the increase in salaries and wages being $311,835, or 381 per cent.

The figures in detail are shown in Table III.

TABLE III—WIRELESS SYSTEMS.

	1912	1907	Per cent of increase:[1] 1907-1912
Number of companies or systems	4	5	—20.0
Number of messages	[2]285,091	154,617	84.4
Number of tower stations	74	117	—36.8
Income, total	$669,158	$106,791	526.6
Net income	[3]$4,738	....	....
Expense, total	$664,420	$160,329	314.4
General operation and maintenance	$588,712	$117,480	401.1
Interest and taxes	$7,826	$5,562	40.7
All other expenses	$67,882	$37,287	82.1
Net deficit	....	$53,538	....
Balance sheet:			
Assets, total	$10,377,197	$32,958,897	—68.5
Construction and equipment, including real estate, etc	$1,205,770	$317,614	279.6
Cash and current assets, including supplies[4]	$9,171,427	$32,196,456	—71.5
Profit and loss deficit	....	$444,827	....
Liabilities, total	$10,377,197	$32,958,897	—68.5
Capital stock	$9,602,570	$32,676,242	—70.6
Floating debt and mortgages	$18,483	$37,145	50.2
Accounts payable	[5]$583,160	$245,510	137.5
Profit and loss surplus	$172,984	....	....
Capitalization:			
Capital stock outstanding, par value	$9,602,570	$32,676,242	—70.6
Employees and salaries and wages:			
Average number	[6]958	176	444.3
Salaries and wages	$393,606	$81,771	381.4

[1] A minus sign (—) denotes decrease.

[2] Includes 5,013 land messages sent over a leased land wire by a wireless company doing land telegraph business also.

[3] Less all expenses, including charges for depreciation.

[4] Includes stocks, bonds, and sundries.

[5] Includes reserves, cash investments, interest and taxes due and accrued, and sundries.

[6] Number employed September 16, 1912. Includes, in some cases, number of operators on shipboard who, in addition to wages, receive board and quarters.

National Chamber of Commerce Holds Annual Meeting.

One of the most important gatherings of business men that has ever taken place in this country was held in Washington, D. C., during the past week. The Chamber of Commerce of the United States of America held its second annual convention there, beginning Wednesday, February 11, and ending Friday, February 13, preliminary meetings of the executive committee, the directors, and the national council having been held, respectively, on February 7, 9 and 10.

The principal feature of the program of the convention was a discussion of the anti-trust legislation proposed in, and now being considered by Congress with special reference to the views recently expressed by President Wilson. That these views have not met with complete acceptance is evident from a reading of some of the addresses. Important reports of committees were also made, including one on patents, by James G. Cutler, general chairman of the patent, trademark and copyright committee of the organization, Mr. Cutler being president of the Cutler Mail Chute Company, of Rochester, N. Y.

Frederick P. Fish, former president of the American Telephone & Telegraph Company, was one of the speakers, addressing himself to the question "Is the Trust Form of Organization Industrially Efficient?" C. A. Prouty, former member of the Interstate Commerce Commission, and now director of the Physical Valuation of Railroads Board, spoke on the valuation of railroads. One session of the convention was devoted to the subject of "The Maintenance of Resale Prices," the Commissioner of Corporations, Joseph E. Davies, presenting the Government's point of view, and discussions being presented by William H. Ingersoll, of Robert H. Ingersoll & Brother, New York, and Donald Dey, of Dey Brothers & Company, New York. Secretary Wilson spoke on the relation of the Department of Labor to industries and commerce, and at the banquet of the convention Secretary Redfield, of the Department of Commerce, spoke on the work of his department. Henry R. Seager, professor of political economy at Columbia University, New York, spoke on the proposed trust legislation now before Congress, and Charles R. Van Hise, president of the University of Wisconsin, spoke on the concentration of industry in the United States. Victor Morawetz, of the New York bar, director of the Norfolk & Western Railway, and a director of the National Bank of Commerce of New York, joined the symposium presented on the proposed anti-trust legislation. Guy E. Tripp, chairman of the Board of Directors of the Westinghouse Electric & Manufacturing Company, also took part in the discussion of the proposed "anti-trust" legislation, delivering an address on Thursday.

In a little less than 18 months there has come into existence in the United States, in the Chamber of Commerce of the United States of America, of which Harry A. Wheeler, of Chicago, has been president since its founding, a powerful grouping of the commercial elements of the nation, so that members of the chamber attending the convention at Washington believe the time has come when it is possible for the chamber to speak with authority as to that which is known as "business opinion." Most of the addresses and committee reports delivered at the convention were prepared in the light of, and on a basis of discussion of, the recently enunciated views of President Wilson, so that these addresses were regarded as replies to the views of the President. Coming as these addresses did from many of the leading business men and economists of the country, some of whom seldom appear in print, the views expressed are certain to attract deep attention throughout the country.

The Chamber of Commerce of the United States now has 487 organizations federated in it, including the American Electric Railway Manufacturers' Association, and many other organizations allied with the electrical industries. These organizations represent, in round numbers, 222,000 business men of the United States.

Extracts from some of the addresses are given as follows:

Committee on Patents, Trade Marks and Copyrights.

The report of the Chamber's Committee on Patents, Trade Marks and Copyrights, containing recommendations for action by the Chamber, was approved by the Board of Directors at a meeting held at Rochester, N. Y., December 8, 9, and 10, 1913. Owing to the proximity of the annual meeting it was decided not to submit the report to a referendum vote. The committee report is as follows:

"The Congress has enacted the Kahn Law, known as Public No. 14 (H. R. 7595), with reference to the Panama Pacific Exposition, and approved by the President September 18, 1913.

"In respect to this law, we have to report that while approving legislation to protect foreign exhibitors against infringement of patents, and the unauthorized copying of patterns, models, and designs, and desiring in every way to foster the efforts to encourage the exhibition of foreign products, we believe that the present form of the Act does not appropriately define its purpose nor adequately safeguard the interests of our own people, and we therefore approve the efforts to secure from Congress an amendment or correction of the Act which will relieve it of the provisions which have caused much concern.

"In view of the very serious objections to provisions of this Act, and to the very serious consequences to the business of the country which would follow the enactment of some, perhaps many, of the numerous bills introduced at recent sessions of the Congress amending and altering the patent laws, your Committee respectfully recommends that a referendum be taken upon the proposition that Congress shall be petitioned,

"First, that the Kahn Law be amended as follows:

"Sec. 3, after exhibited, line 8, insert, 'provided that the same be new and not previously known or used in this country.'

"After Sec. 6, insert:

"'Sec. 7. Provided that any defendant in any suit brought under the provisions of this Act may avail himself of any defense that may be made under existing laws pertaining to patents for inventions or designs, trademarks or copyrights, and the same shall have the same force and effect as if pleaded under existing laws.'

"Second, to enact as soon as possible, a law establishing a Court of Patent Appeals, to which cases may be taken by either party to a patent suit from the Circuit Court of Appeals, thus doing away with the existing situation under which a patent may be declared valid and infringed by the Circuit Court of Appeals in one district, and held to be invalid in another.

"Third, that an expert commission be created and empowered to investigate the patent laws and the practice under them, to recommend to the Congress such legislation as they may conclude to be necessary to perfect the one and to correct any abuses discovered in the other, and that no other patent legislation be enacted until this commission has made its report.

The Valuation of Railroads.

The Hon. C. A. Prouty discussed the subject of "The Valuation of Railroads," considering the matter in its broad aspect and dividing the subject into three heads—(1) the thing to be done; (2) the time and expense required; and (3) the benefit to be derived.

In the course of his address, Mr. Prouty said that while the problem of establishing railway rates would not be solved by this physical valuation the problem will be enormously simplified. It can be known with certainty whether the general level of rates is or is not too high, and in establishing the charges to be observed by a single carrier, even in placing the rate upon a single commodity, it will be of much benefit to know the value of the property involved. Every railroad commissioner, Mr. Prouty said, would join him in saying that here is the only solid foundation upon which he can stand; that the determination of these values is indispensable to the just and intelligent administration of his work. The main questions cannot be answered nor the situations justly dealt with until the actual value of the properties are known. This is the question which must be answered before the problem can be intelligently discussed. For this reason above all it is important that the work should be pressed to a completion in the most expeditious and most trustworthy manner possible.

Protection from Price Juggling.

William H. Ingersoll, of Robert H. Ingersoll & Brother, New York, in discussing the question of "Protection from Price Juggling," said that new problems of merchandising come with each decade, and that now we find the standard brands being employed against the wishes of their producers to further the tendency to monopoly in the retail market. The process used by certain classes of retailers not only threatens the existence of the brands themselves, but tends to divert trade from the local centers to the great stores of the great cities, oppresses the chance of the small merchants in cities and smaller towns, and brings about the same concentration of business in the retail field that thrust upon the people the trust problem in the industrial field. The cut price is being ruthlessly used on the country's well known standard brands of merchandise in combination with exaggerated bargain claims on miscellaneous and unknown commodities. When a well known article is sold at a cut price the first effect is a stimulated demand if the offer is bona fide. The secondary effect is that people are led to believe that they ought to get the goods regularly at the reduced price, and that those who charge more are receiving extortionate profits. The goods are cheapened in their estimation. They are no longer satisfied to pay former prices, so that the good will of the maker is seriously impaired. Other dealers in the community are unwilling to handle the goods at higher prices than are quoted elsewhere, and in fact would have a very limited sale if they tried, and it would endanger their future patronage; so that they find it better business policy to meet the cut price and close out the goods and not to carry them thereafter or to carry very limited stocks, which are sold only upon urgent demand, after the customer has declined the "something else" which the dealer, in the preservation of his very existence, finds it necessary to recommend, because even though it is unknown, it pays him the necessary profit to meet his expenses.

Discussion of the Anti-Trust Legislation.

Victor Morawetz, of New York, said that the wealth and prosperity of the country are due in a great measure to the fact that men of ability and courage have had the freedom of action as well as the opportunity to initiate and carry to success big enterprises—big business. To shackle business merely because it is big, or to penalize success merely because its rewards are large, would be a step backward. To hamper honest and legitimate enterprise merely to strike at those who break the law or benefit themselves by illegal means would not be enlightened and wise legislation. The country cannot prosper if all business must be conducted under a set of rules adapted only to a grocery store. Undoubtedly some legislation supplementary to the Anti-Trust Act is desirable. The creation of a trade commission, consisting of experienced and able men would be a wise step. There is, however, a good deal of misapprehension as to the ineffectiveness and uncertainty of the existing Anti-Trust law. The cause of this misapprehension is to be found in certain early decisions and opinions announced by the Supreme Court of the United States when the constitutionality and effect of the Anti-Trust Act were first considered by it. The Anti-Trust Act prohibits in the broadest language restrictions of trade and monopolizing, and it is now settled that the purpose and policy of the Act cannot be avoided by any disguise or subterfuge. The bill to define the Anti-Trust Act by including within its prohibitions certain definite offenses is especially subject to criticism on the ground that it defines nothing, that it clarifies nothing, and that it would create a cloud of uncertainty and doubt.

Concentration of Industry in the United States.

In speaking of the subject "Concentration of Industry in the United States," Charles R. Van Hise, president of the University of Wisconsin, said, in part: "There may be great magnitude in business and in monopoly. Indeed it is believed that by far the greater number of large organizations fall short of monopoly." Mr. Van Hise said that not only did he hold that not all large business is monopolistic, but that concentration up to a certain point is necessary in order to give efficiency. Those who were attacking combinations assert that a great many of the large industrial organizations have exceeded the magnitude which gives the highest efficiency. On the other hand, it may be asserted that very few of them have gone beyond the stage which gives increased efficiency. Neither side can prove his case because of lack of facts. If, as a result of investigation, it should be shown that the larger number of organizations have not gone beyond the magnitude which gives increased efficiency in production, then that magnitude should be retained. However, it does not follow that the large organization which has been highly efficient in the manufacture of its goods has sold them at reasonable rates. It does not at all follow that the public has secured a fair share of the advantage which resulted from their increased efficiency. If, however, it be assumed that considerable magnitude is necessary to give efficiency and the problem is one of division of profits, its solution must be along a different line from that if the greater number of large organizations have surpassed the magnitude which gives efficiency. In the former case the organization should not be destroyed but methods should be devised by which the profits are fairly distributed. Mr. Van Hise, in discussing the satisfaction that has been expressed over the dissolution of the Standard Oil Company, the American Tobacco Company, the American Telephone & Telegraph Company, and others, raises the question as to what advantage has been derived by the public from the disintegration of these corporations. The chief interest of the public in whether kerosene or gasoline is manufactured by one company or ten companies is the price paid for the product, and so with other commodities or services. Wherein he asks, "Will the public be benefited by the voluntary separation of the Bell Telephone Company and the Western Union Telegraph Company?" The economies of joint operation are so evident that if both were administered by the government in this country no one for a moment would think that they should be independent. Indeed, the Departmental Committee that has been considering the question, recommended within the fortnight that the government acquire the telephones and telegraphs of the country in order that they might be operated as a unit in connection with the mails. Why then should they be compelled to separate and therefore become less efficient than they have been under consolidation? When glee is expressed at the disintegration of a great organization we should have a satisfactory answer to the question "Where does the public come in?" before we join in the mirth. If the public has gained anything in price reduction for standard articles or for service by the destruction of the great corporations, would it not have been wiser to take steps to see that their profits were made reasonable, that the great advantages which come from their magnitude, efficiency and co-operation should be shared in a large measure by the public? There can be no question that the competitive system when unrestrained is positively opposed to the policy of conservation. The wastefulness of the competitive system may be proved with regard to every product which is taken from the earth.

Conserving Commercial and Industrial Prosperity.

In discussing the broad subject of anti-trust legislation, Frederick P. Fish, formerly president of the American Telephone & Telegraph Company, said that it should be remembered that the interest of the people as a whole should be alone considered. There should be no thought of attacking or promoting business enterprises, large or small, or other methods, generally or in specific cases, unless the interest of the community, as distinguished from that of any individual or class of individuals, requires such action. Under the conditions prevailing at present it is obvious that commercial and industrial prosperity is essential. Legislation which impairs that general prosperity is most unfortunate. The regular employment of our people, their earning capacity, for adequate compensation for their effort, the opportunity for the individual for advancement, and the necessary supply of products of proper quality and at a reasonable cost would all be jeopardized if our industries did not prosper. No one can deny that the American people as a whole deliberately fostered and promoted the line of development which has resulted in present conditions, for they responded freely and willingly to the demands of the times, which, as far as they could see, could be met only by such organization and such methods as have been worked out ,automatically, as it were, during the last 50 years, and which now prevail. Our modern business organization and business methods have developed automatically under the economic theory that in business there should be free play for individual intelligence, individual activity, individual initiative and individual effort. Every man was encouraged to build up as large an enterprise as he could; to get for himself as much trade as he could, and within the limits imposed by law and the principles of fair dealing was entirely free to exercise his ingenuity, intelligence and business skill so as to get and to do as large a business as possible. Business men are no longer free within the limits of honesty and fair dealing, as generally understood, to work out their own salvation by strenuous enterprise and strenuous individual effort. They are hampered on every side by restrictions, which a generation ago would have seemed inconceivably foolish and inconsistent with sound development. Even if the new view is correct, we should be very careful that it is not carried so far as to suppress individual effort and paralyze progress more than the public interest requires.

By way of making a constructive suggestion, Mr. Fish declared that wherever there is a complicated situation involving many elements, some of them contradictory in character, and the matter is one that vitally concerns our national well-being, the value of a commission made up of the very best men in the country is incalculably great. Experience is ample to make it possible for trained men to get out and correlate the facts and to draw conclusions from them as to every aspect of this great question. They could determine the economic necessities and the way in which they are to be met. After thorough investigation they could make a report as to how the Sherman Law might be amended to advantage, and what other legislation, if any is required, could put our industrial situation on a sound basis and to protect our business, as well as our people, against harm.

Referring in a general way to the many bills now being considered, Mr. Fish said that he could not help thinking that if these bills, in their present form, were enacted into law the conduct of our business would suffer. Back of all these suggestions as to detailed legislation is the broad question of whether we are approaching the subject of proper control and the development of our industries in the right way. He believes that it would be greatly to our advantage if that underlying question could be studied and we could be sure that it was settled on a sound basis before we advance further into the regions of the unknown by adopting speculative suggestions based on unproved and at least doubtful theories rather than on the facts and necessities of our business situation.

The Prussian railway authorities are about to construct a large railway repair and construction shop at Schweidnitz, Sileasia, Germany. Adjoining it is to be erected later a large factory for electric locomotives. Over 1,000 men will be employed in the repair shop alone. The construction cost is estimated at $1,500,000.

Steel Engineers Meet in Pittsburgh.

The regular monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., Saturday evening, February 7, 1914, and was conducted by President Friedlaender.

After the dinner, E. H. Hewlett, General Electric Company, gave a very interesting lecture on the control apparatus to be used in operating the locks of the Panama Canal. The lecture was illustrated by lantern slides showing the details of the control apparatus, and by moving pictures showing the complete equipment in operation. The pictures showed plainly the working of the indicating devices used in connection with the control equipment. Mr. Hewlett also showed the operation of the water-level indicators.

The many conditions peculiar to the Canal Zone were related, such as making all metal parts of non-corrosive alloys, using mica insulation, and non-hygroscopic insulating compounds.

Meeting of the Institute of Radio Engineers.

At the regular meeting in New York City on February 4, Vice-President John Stone read a paper contributed by C. Tissot on "The Influence of Alternating Currents on Certain Melted Metallic Salts." This paper disclosed that certain metallic salts when properly subjected to a direct potential became materially better conductors and maintained their conductivity after a removal of the potential, and that radio or audio-frequency alternating potential then applied materially decreased the conductivity.

R. H. Marriott offered resolutions on the death of Clark H. Sphar, charter member, and engineer of the American Telegraph & Telephone Company, who died January 23, 1914.

At the Washington Section, February 5, Federick Kolster contributed a paper on "The Measurements of Logarithmic Decrements," including a description of his latest decrementer.

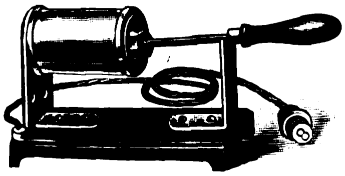
Electric Power Plant to be Built for Graz, Austria.

The city council of Graz, Austria, at a recent session decided unanimously on the construction, in conjunction with the city of Marburg, of a large water-power plant next the Felberinsel (island) on the Drave River near Marburg, for the operation of an overland central station by which the two cities and all towns and factories situated between will be supplied with electric power. The plant will yield 24,000 horsepower. The cost of construction is estimated at $2,400,000 to $2,800,000.

New Electrical and Mechanical Appliances

Electric Furnace for Heating Soldering Irons.

In order to permit electric heating of soldering irons without necessitating an expensive type of iron, the Current Electric Company, 18 East Kinzie Street, Chicago, has placed on the market a number of compact electric furnaces designed to be used for heating any type of standard soldering iron. One of these furnaces can serve for heating a number of irons, thus decreasing the initial cost of providing electric service for this purpose. The furnaces form a desirable load for a central station, since they add to the day load and, being used almost constantly, they have good load-factor. They will heat up an iron in a few minutes when the funace is already hot. The furnaces are well constructed and thoroughly insulated. They are made for connection to any regular 110-volt lighting circuit, to which they can be connected by a flexible cord and attachment plug. Their use removes the danger, delay and disagreeable features connected with the use of gas, oil or gasoline furnaces.



Electric Heater for Soldering Irons.

These furnaces are made in three sizes. The smallest is a round type, as shown in the illustration herewith; the power consumption is about 100 watts and this furnace will heat irons up to about one-half pound. The intermediate size takes irons up to three pounds and consumes about 350 watts. The larest size now made is suitable for heating irons up to four pounds and consumes 500 watts.

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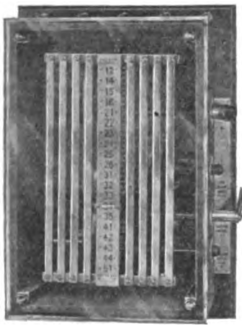
The Multi-Call System for Factories, Department Stores, Etc.

In factories, mercantile establishments and other large institutions there frequently is need for summoning quickly the superintendent, manager or other official who may be in any one of a number of departments or rooms. Of the systems developed for doing this promptly and effectively without disturbance, one known as the Multi-Call system is claimed by its manufacturer to be exceptionally compact and simple in construction, quick in operation and low in cost.

The Multi-Call is an automatic electric signaling device that is independent of any intercommunicating telephone system, although most commonly installed as an auxiliary to the same. In this case the compact calling device is placed adjacent to the private branch exchange board or center of the local telephone system. It can control any number of electric bells, buzzers, whistles, flashing lamps, etc., and provide a simple code signal for each official whose attention is desired. A special fire-alarm attachment is also provided by which instant alarm is given to all departments of the establishment. This is also used for calling fire drills that are now legally required in many parts of the country.



Multi-Call Instrument.

The equipment can be supplied with battery current or with direct current or alternating current from any line circuits up to 220 volts. This current is not used for operating the calling instrument itself, but only for operating the bells, buzzers, etc.; the current is governed, however, by a selector and mechanical relay in the instrument. The mechanism of the central instrument is operated by a powerful spring motor, always kept up to a certain tension. A very simple wiring system is used.

In calling a person it is necessary merely to move the indicating pointer opposite his number. By turning the operating key through a certain angle the spring motor is started to give the signal call one, two or three times. Signals for starting and stopping work can also be given by pushing an auxiliary button. A special switch can also be provided for operating the factory whistle.

For operating the fire alarm, the special fire-alarm switch is first pushed; this brings a special set of loud-ringing gongs into action that are not used except for fire alarm. The indicating pointer is moved to the number of the department where the chief danger exists and the operating key is turned; this notifies the fire department where the fire is located. Pilot lamps are provided to show whether the circuits are working properly.

The equipment briefly described above has been developed and placed on the market by the Multi Signal Company, 14 Harrison avenue, Boston, Mass.

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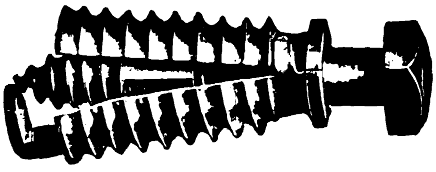
A New Lag-Screw Type of Expansion Shield.

A new type of lag-screw expansion shield has been placed on the market by the United States Expansion Bolt Company, 48 Dey Street, New York City. The particular feature of this little device is that it is adjustable so as to permit taking up or retightening fastenings which have worked loose through vibration or excessive strain. Within the shield is a special type of wedge nut which provides a powerful expanding force to the two halves of the shield. The latter has a corrugated outer surface which gives a strong gripping surface on the sides of the hole into which it is inserted. The little lug attached to the end of one part of the shield is merely for the purpose of preventing loss of the nut during shipment or before use.



Lag-Screw Expansion Shield.

In order to increase the expansion or tighten the fastening at any time one or two turns of the bolt head suffice. It is known that vibration or excess strain are apt to ream out the hole and loosen the hold of any expansion bolt. Therefore the adjustable feature of this lag shield is a valuable one that will be readily appreciated. On retightening the bolt head the fastening becomes as tight as it was originally.

The company is also continuing the marketing of several other types of expansion bolt which are slight modifications of the one shown herewith. One of these has a machine bolt and a closed-back shell. Another has a screw with a shell having four split segments on the four-way principle.

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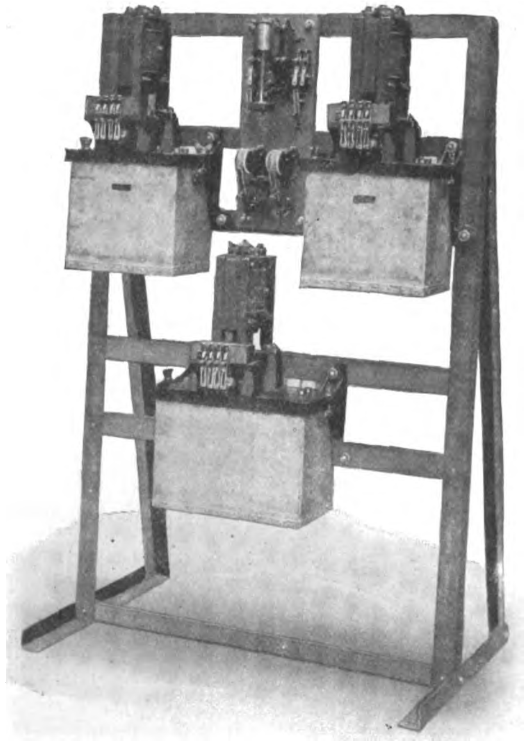
New Automatic Controllers for High-Voltage Squirrel-Cage Motors.

For centrifugal pumps and similar machines, squirrel-cage motors connected directly to 1100 and 2200-volt three-phase systems are used to a considerable extent. The use of motors operating at line distributing voltages is frequently desirable for a number of reasons and for the automatic starting of these high-tension motors a new line of self-starters has been designed by the Cutler-Hammer Manufacturing Company, of Milwaukee, Wis. These controllers are of the multiple-solenoid type, consisting of an angle iron, floor type, self-supporting frame, which carries the high-tension oil-immersed solenoid switches and necessary relays controlling the motor and autotransformer circuits.



Automatic Controller for High-Voltage Induction Motors.

The oil-immersed type primary and starting switches used are operated by single-phase solenoids. All contacts are entirely inclosed under oil, so that no live parts carrying 1,100 or 2,200 volts are exposed. Low-voltage current is used for the operation of the solenoid coils. The capacities of the standard types of these self-starters range from 20 to 300 horsepower, and they are made for both 25 and 60-cycle three-phase circuits. They can be automatically controlled when operating on an open-tank system by means of a float switch, and on a closed or compression-tank system by means of a gauge or diaphragm pressure regulator. For remote control from one or more points control stations can be employed so that the operator need only to push the button to start or stop the motor.

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Electric Vibrator for Pattern Tapping in Foundry Service.

In making molds for casting, that stage in the molding work when the pattern is ready to be withdrawn requires that the pattern be carefully tapped on all sides, so as to free it from the sand at the same time that it is carefully guided and withdrawn from the mold. In a large casting, the latter operation requires almost the entire attention of the molder and for this reason various types of vibratory devices have been developed to relieve him of the burden of tapping the pattern. In molding machines such devices form a part of the machine and greatly facilitate the work.

The vibratory devices of this kind most generally used have been of the pneumatic type, which, although effective, have used a considerable amount of power, considering the small force needed in the actual tapping work, and they have also necessitated an expensive air-compressor equipment. The air hose and pipe being very subject to leakage, a great deal of power is wasted. To overcome these difficulties there has been developed an electric form of vibrator by the International Electric Tool Company, Fourth and Windlake Avenues, Milwaukee, Wis. This is a compact and relatively light-weight outfit, which, according to the statement of the manufacturer, takes less than one-tenth the power of a pneumatic vibrator. It can be supplied from a small generator, which will operate a large number of vibrators.

The vibrator itself is very simple in construction, since it consists merely of a solenoid with an iron frame. Within the solenoid is a steel plunger that moves back and forth, and when in operation practically floats in the axis of the coil, thus requiring no lubrication since there is substantially no wear. There is also provided a switch operated by a knee plate. The vibrators are made in several sizes and adapted for attachment directly to the pattern or for use with molding machines.

Dumore Vacuum Cleaner Used in Electric Vehicle.

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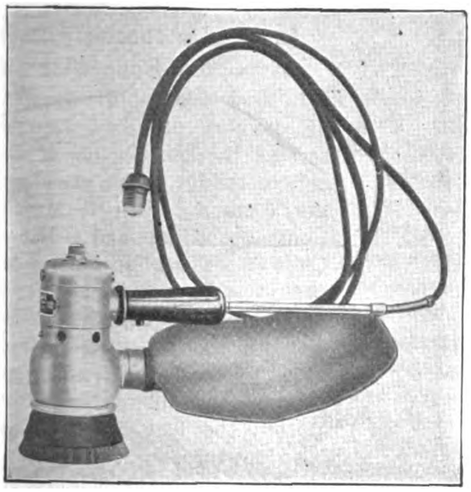
The Dumore Electric Vacuum Cleaner.

A very handy type of electric vacuum cleaner has been developed by the Wisconsin Electric Company, Racine, Wis. It is known as the Dumore. This appliance is of compact construction and of relatively light weight, so that it can be readily handled by any person. It is practically an effective brush and is designed particularly for places where a handy appliance of this kind without cumbersome hose attached is necessary and in which the outfit is completely self-contained, requiring only a flexible cord for connection to any electric circuit.

These cleaners are made for either direct-current or alternating-current and for any voltage. One form of these appliances that has been found of great value is made especially for use in cleaning the upholstery in electric vehicles, which it does thoroughly and rapidly without stirring up the dust in the unsanitary manner that a whisk broom does. This type of cleaner is also going into use by porters in hotels, barber shops and in Pullman cars, thus removing the very disagreeable cloud of dust usually experienced when a porter attempts to dust the clothing of patrons.



Dumore Portable Electric Vacuum Cleaner.

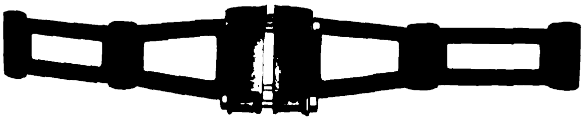


Fig. 1.—Crossarm for Chicago Overhead Street-Lighting Circuits.

Another form of this appliance is used for cleaning live stock. It has been shown that disease among live stock is largely spread by germs. The dust and dandruff removed from the hair and skin of horses and cattle by the old-fashioned methods is invariably scattered into the air and becomes a source of contagion both to the attendant and the cattle. The cleaning of live stock by the new appliance is a very simple and easy operation, being made pleasant both for the operator and for the animal. A curry comb or brush attachment is used, neither of which revolves, vibrates or irritates. In all cases dust, dirt and dandruff are sucked into a small dustproof bag, where it is held until emptied at the convenience of the operator at some place where there is no danger from the dirt coming in contact with any animals or person liable to be infected thereby.

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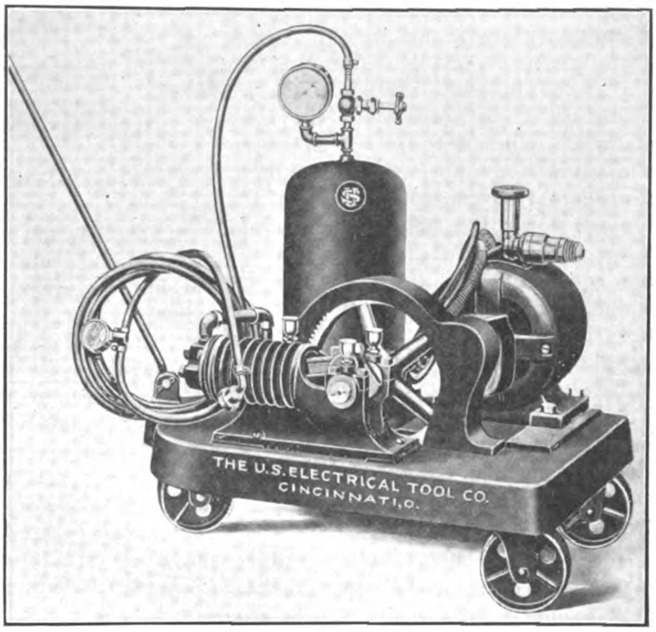
Motor-Driven Tire Pump.

The illustration herewith shows a new tire pump, suitable for public and private garages, which has been placed on the market by the United States Electrical Tool Company, Cincinnati, O. It is simple and compact in construction and, being mounted on a truck, it can be easily taken around the garage or outside to the curb. A tank 12 inches long by 6 inches diameter, into which the pump discharges, prevents condensation and oil from entering and injuring the tire. The pumping action is rapid, since a 35 by 4-inch tire can be pumped from flat to 70 pounds in one and one-half minutes. The motor is of Westinghouse make, one-quarter horsepower in capacity, and can be operated from the lighting circuit.



Motor-Driven Tire Pump.

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Arc-Lamp Brackets and Crossarms for Chicago Street Lighting.

In our issue of September 6, 1913, there was given an extended article describing the new electric street-lighting system of the city of Chicago. As pointed out in that article, the standard lamp equipment for use in practically all parts of the city consists of flaming-arc lamps mounted at a height of 22 or 25 feet above the street surface on steel tubular poles. In Fig. 2 herewith is shown a close view of the standard bracket used for supporting these lamps. As shown, it is of simple yet graceful design, including the city's emblem, the inverted Y. The upper portion of the bracket is a covered trough and includes a pulley at the pole end and also one over the lamp. Over these pulleys a steel rope passes, permitting the lowering of the lamp.

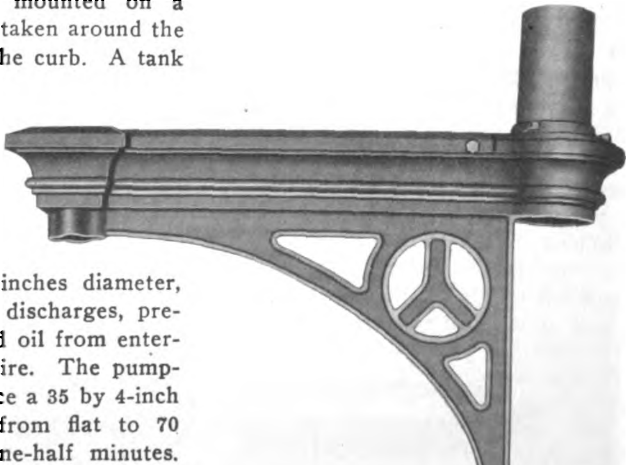

Fig. 2.—Arc-Lamp Bracket for Chicago Street Lighting.

The type of bracket shown is that used for outlying districts in which the circuits are carried overhead. Practically the same type of bracket is used in the downtown district in which the circuits are carried underground and are brought up in protected cable through the pole and through the trough at the top of the bracket. In each case the bracket is slipped over the top of the pole and clamped securely thereto. The pole extension shown in the illustration is used for supporting the crossarm in the overhead construction.

A view of one of these crossarms is also shown. They are of malleable iron of T section, so as to combine great strength with minimum weight. These arms are made for two, four and six pins, steel pins with porcelain insulators being used. In each case they are clamped over the heavy extension shown in the upper part of Fig 2. Considerably over 8,000 brackets of the type shown in Fig. 2 or similar thereto have been used in the new street-lighting equipment for the city. The installation is being made by the Sanitary District of Chicago for and under the supervision of the Department of Electricity of the City of Chicago. The brackets and crossarms are being manufactured by the Line Material Company, South Milwaukee, Wis.

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Solderless Connecting Terminals for Flexible Instrument Leads.

In testing rooms or laboratories where a large number of tests have to be conducted and convenience and time economy are therefore important, there has been need for a good type of terminal for instrument leads. The requirements of such a terminal are that it must make a perfectly tight and permanent connection from the electrical standpoint and that it must protect the insulation and adjoining portion of the cord from abrasion and breaking. A study of these needs has resulted in the development of a type of terminal specially designed for this purpose, which has been placed on the market by the Meliorate Manufacturing Company, 299 Taaffe Place, Brooklyn, N. Y. These terminal connectors consist of three parts; the outer insulating sleeve, the inner brass body and connecting sleeve and the terminal piece, which is screwed into the end of the brass sleeve and acts to clamp the wire.

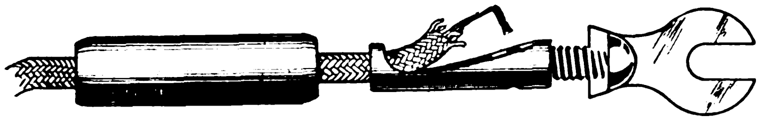

Fig. 1.—Parts of Instrument-Lead Connector Ready for Assembling.

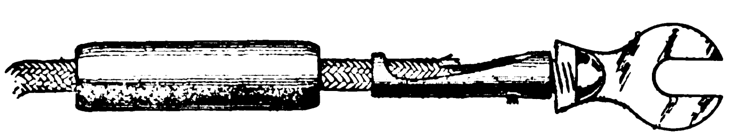

Fig. 2.—Wire Inserted in Binding Hole and Tightened.

In Fig. 1 these three parts are shown and the first step in connecting the terminal is made clear. The wire is passed through the outer sleeve and through the hollow of the brass sleeve. The next step is to push the twisted and bent end of the wire through the transverse hole near the righ-hand end of the brass body, so that the wire projects a small amount through the lower portion of the binding hole. The terminal piece is then screwed into place, clamping the wire securely, as shown in Fig. 2. Finally the insulating sleeve is pulled over the brass sleeve, bending over the projecting ends of the wire strands and thus holding them against the brass. The completed terminal of the smaller pattern is shown full size in Fig. 3.

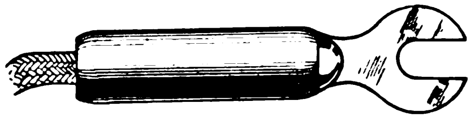

Fig. 3.—Finished Terminal.

The outer insulating sleeve is made of a polished material which the manufacturer states will not chip, crack or break while in service; it is moisture-proof and unaffected by temperatures even up to 180 degrees centigrade; these outer sleeves are furnished in red and black colors so that they may be used to denote polarity. The inner body is of hard-drawn brass, which is nickel-plated. It accommodates the insulation of the wire with the outer sleeve and protects the brass from fraying or sliding back from the exposed part of the wire. It also reinforces the sleeve throughout its length.

The terminals are also of nickel-plated hard brass and are made in three forms, of which the type shown in the illustrations is suited for such testing work where the leads must be quickly changed from one instrument to another. Where a considerable longitudinal strain is apt to be placed on the leads, the slot is made at one side at right angles to the axis of the terminals; this prevents the terminal from slipping out and yet permits its ready removal. A third type of terminal piece is made round with a concentric hole in the center for fastening to a binding post of a laboratory type of instrument to which the instrument lead is more or less permanently fixed. Each of these types of contact face or terminal piece is interchangeable. Thus one pair of leads may be used for several different purposes without removing the body of the connector from the wire, it being necessary merely to change the terminal piece. When the outer sleeve is in place the wire cannot be removed and the contact face released. Thus the joint is not only electrically satisfactory, but is said to be a permanent one. This overcomes the difficulty of changeable resistance from soldered terminals in which the corrosive effects of soldering pastes or salts are liable to cause change in electrical conductivity.

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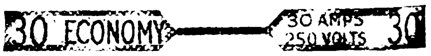
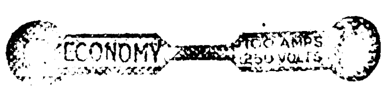
Internal Asbestos Sheath for Economy Renewable Fuses.

In an article published in this journal on January 13, 1912, there was described the construction of the renewable cartridge fuses manufactured by the Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago. These fuses are made for 250 and 600-volt circuits and for a great many current capacities. They are made in both the ferrule and knife-blade types and in external appearance resemble standard cartridge fuses. Within the fuse, however, they have been ingeniously constructed so that the fuse element, which is of standardized size and shape for each rating, can be readily renewed on removing the end terminals, thus making a renewal of the fuse when it has blown at minimum expense, since only the fuse element must be replaced and the outer shell and terminals can be used over and over. These fuses have been found to meet all standard requirements of rating and performance laid down for cartridge fuses. Experience with these fuses for several years has shown that since the cost of renewal with the proper fuse element is very low, they are properly renewed in actual service. They have, therefore, been the means of practically eliminating the hazard introduced in standard non-renewable cartridge fuses from having such fuses renewed on the premises in an improper manner.



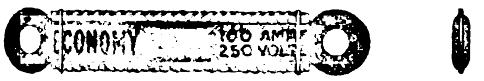
Renewable Element for Ferrule-Type Fuse.



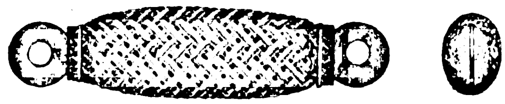
Renewable Element for Knife-Blade Fuse.

In the ferrule type fuses no filling material is placed around the fuse element. The fiber tubular casing connected with the end terminal construction is so designed as to provide an indirect vent for the gases to escape when the fuse is blown. This restricted path for the gases causes them to be cooled before final exit and removes all danger of fire.

The knife-blade type of Economy fuse has recently been improved by using in place of the powdered asbestos filler that was formerly placed about the fuse element a sheath of woven asbestos which is slipped over the fuse link and fits it snugly, as shown in the accompanying illustrations. This sheath is made of long tough fibers of pure asbestos knitted into a braided tubing with a comparatively thin wall and with an inner opening of a size that will just permit easy insertion of the renewal link. This sheath tubing is cut to a definite length for each size of fuse and after being applied to the renewal link is secured thereto at the ends by means of a small fastener.

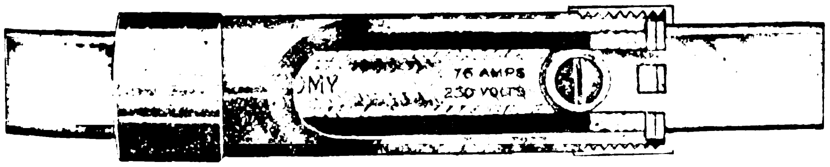


Side and End Views of Fuse Element with Asbestos Sheath.



Same After Short-Circuit has Disrupted the Fuse.

When the fuse is blown on moderate overload the fused metal of the link is confined within the sheath without distorting the shape of the latter. If the blowing of the fuse is due to a short-circuit, the violent explosion of gases produced by this causes the asbestos sheath to swell out and open the small interstices between its fibers. This relieves the gas tension within and yet confines the force of the explosion, so that the gases can slowly dissipate themselves through the vents at the ends of the fiber sheath without danger to the surroundings. At the ends of the fuse tubing a shredded asbestos packing is provided as an auxiliary to the venting feature. This acts like a screen and prevents flame from passing out through the interstices, as this is a well-known property of gauze structures. When a fuse has been blown on a short-circuit the asbestos sheath is rendered unserviceable for further use on account of its distorted and brittle condition, but a number of spare sheaths can always be obtained with the renewals of the fuse element.



Knife-Blade Fuse with Shell Cut Away to Show Internal Arrangement.

The manufacturer claims that the use of the asbestos sheath produces a fuse having greater uniformity in performance than fuses which employ a powdered type of filling material.

A New Ground-Locating Apparatus.

A new ground-locating apparatus is being put in service in New York City. It is of unique design and has been worked out by men in the operating department of the New York Edison Company, says *The Edison Weekly.* The principles of the apparatus, its construction and use are briefly as follows:

An alternating current of widely different fundamental frquency is superimposed on current of normal frequency. The different frequencies are readily distinguishable by means of a telephone receiver connected to an exploring coil or "rumbler" placed against the wire or cable carrying the currents. The apparatus consists of a dynamotor, the alternating-current end of which is wound for 220 volts at a frequency of 500 cycles. Two constant-potential transformers are used between the generator and the grounded circuit, so that the two parts of the outfit are connceted inductively only. The generator side of the outfit is grounded for protection. One side of the secondary circuit is grounded through a lamp bank. The other side of this circuit is brought through a lamp bank to an attachment for connection to grounded cable or wire. A make and break switch is used to make and break the test circuit periodically.

This outfit consists of a flasher driven by a small alternating-current motor, which does not actually break the circuit, but simply shunts the outside circuit. The outfit operates as follows: When a circuit becomes grounded it is put on a separate bus by the operator. The dynamotor is then started, and when up to voltage and speed the flasher outfit is started and the apparatus is then connected to the grounded cable. The high-frequency current having been sent out, a troubleman goes out on the circuit with a telephone receiver and exploring coil. By placing the exploring coil near the cable he will get one or two distinct sounds in the receiver, depending on his location in reference to the ground, the sound or note given by the 500-cycle test current, being of a much higher pitch, is very distinctive and quite easily picked out from the 60-cycle or working frequency. The high-frequency note prevails up to the point of ground and then ceases. The troubleman by making tests at points along the circuit is able to follow the note to the source of the trouble.

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Convention of The Standard Paint Company's Sales Force.

The eastern sales force and office staff of The Standard Paint Company, after having been in convention for several days, wound up a most successful session at an informal banquet held at the Chemists' Club, New York, on Monday evening, December 29, 1913.

The feature of the evening was an address by Ralph L. Shainwald, president of the company, in which he explained that, besides being its organizer, he was the first salesman for the company, and told some interesting and instructive incidents of his early experience, which led to the great success of The Standard Paint Company's products.

In addition to the speech made by the president, interesting talks were also given by Herbert Abraham and H. A. Gillespie, assistant managers; J. H. Thomas, manager railroad department; C. E. Smith, manager paint and electrical department; H. A. Collins, eastern sales manager; W. F. Fairbrother, manager advertising department, and others.

As the convention of the eastern division adjourned in New York, the western contingent convened in Chicago.

After several days spent in the exchange of ideas and experiences, the high point was attained at a banquet in the Hotel Gladstone on Saturday evening, January 3.

William F. Pitts, western sales manager, made a most interesting and enthusiastic address, the keynote of which was optimism. W. F. Fairbrother also addressed the meeting on "Advertising and Salesmanship." Speeches were made by C. W. Dohm, superintendent Chicago Heights plant; Harry E. Smart, who travels in Ohio; W. H. Mullen, the Arkansas traveller, and others.

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Life of Okonite Insulation.

The excellent life of Okonite insulation is attested in a letter written by the Commercial Cable Company, of New York City, calling attention to a cable laid about

13 years ago in New York Harbor between Coney Island and New York City. This cable was recently removed and the Okonite wire was found in excellent condition. The cable was again laid under the East River to Far Rockaway.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

"Hubbell."

Edison type, 660 watts, 250 volts; catalog No. 5,915.

Approved January 6, 1914.

ATTACHMENT PLUGS, Fuseless.—Hotpoint Electric Heating Company, Ontario, Cal.

"Hotpoint," 660 watts, 250 volts.

This device consists of a standard Edison screw shell, porcelain body and black composition cap.

Approved December 27, 1913.

660 WATTS
250 VOLTS
Hot-point

Attachment Plug.—Hotpoint Electric Heating Company.

CURRENT TAPS.—Chapman & Walker, Limited, submitters, 118 Richmond Street, West, Toronto, Can. Manufactured by The Sterling Telephone & Electric Company, Limited, Telephone House, 210 Tottenham Court Road, London, W., England.

Multiple wireless plug clusters, catalog Nos. A-497, A-498 and A-499.

Note.—Where, in addition to sockets or receptacles already installed, connections are desired on lighting circuits for portable lamps or for other special appliances requiring only small amounts of current, multiple current taps may be used, provided the total energy required in the circuit to which they are connected does not exceed 660 watts, and provided their use cannot under any conditions necessitate a departure from the requirements of Rule 23*d* of the National Electrical Code.

Current taps must not be used in key or pull sockets if the device controlled through such sockets requires more than 250 watts.

Approved January 12, 1914.

FIXTURES.—Thyge Nelson, 4200 Milwaukee Avenue, Chicago, Ill.

Cast-iron bracket and ceiling fixture intended for use on porches or where exposed to the weather.

Approved January 5, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

HEATERS, Electric.—The Advance Machinery Company, 525 Hamilton Street, Toledo, O.

Electrical glue heater. Model "R-J," 108-115 volts, 300-70 watts.

In event of water in the jacket boiling away while the heater is turned "on," the casing rapidly attains a high temperature sufficient to ignite combustible material. With normal operation this heater when connected by approved fittings to a circuit of suitable capacity provides a relatively safe means of accomplishing the purposes intended.

Approved January 5, 1914.

HEATERS, Electric.—The Advance Machinery Company, 525 .Hamilton Street, Toledo, O.

Electrical glue heaters.

Model "A," 110-112 volts, 5.2 amperes to 20 amperes.

Model "R-A," 110 volts, 0.62 amperes.

Approved January 6, 1914.

LAMP GUARDS.—Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.

"Benjamin."

Catalog No. 260-V.P.P., for use in garages or damp places.

Approved January 12, 1914.

RECEPTACLES For Attachment Plugs.—Connecticut Electric Manufacturing Company, Connecticut and Florence Avenues, Bridgeport, Conn.

"C. E. M. Co." flush receptacle and face plate, catalog No. 3,000, for use with approved Edison screw shell attachment plugs.

Approved December 27, 1913.

RECEPTACLES, Weatherproof.—The Arrow Electric Company, 630 Capitol Avenue, Hartford, Conn.

Porcelain base receptacles, 660 watts, 250 volts; catalog No. 62,358.

Approved January 6, 1914.

RHEOSTATS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H" self-starters for 110, 220, 440 500 and 550 volts, alternating-current and direct-current elevator motors.

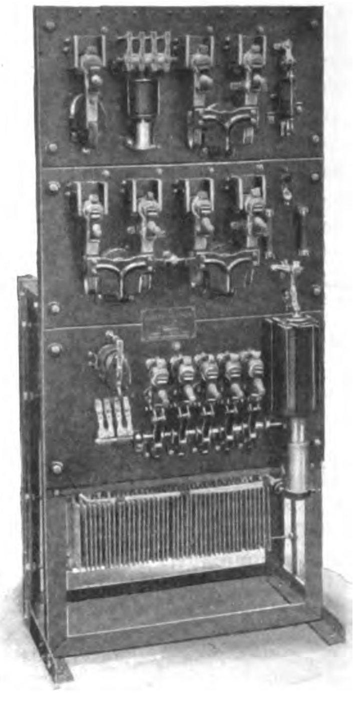
Bulletin Nos. 7,110, 7,120, 7,130, 1,140, 7,150, 7,160, 7,170, 7,180, 7,190, 7,200, 7,210, 7,225, 7,240, 7,250, 7,540, 7,550, 7,560, 7,568, 7,570, 7,572, 9,700, 9,720, 9,725, 9,730, 9,740, 9,745, 9,750, 9,760, 9,800, 9,810, 9,827, 9,828, 9,829.

Approved December 27, 1913.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

660 watts, 250 volts.

Porcelain shell, catalog No. 61,417.



Elevator Starter No. 7560.—Cutler-Hammer Manufacturing Company.

Standard for temporary outdoor use, and only when connected to stranded rubber-covered wires.

Approved January 6, 1914.

SWITCHES, Push-Button Flush.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Catalog No. 3,176, 10 amperes, 125 volts, 5 amperes, 250 volts, for remote-control solenoid-operated apparatus.

Approved December 29, 1913.

SWITCHES, Surface Snap.—General Electric Company, Schenectady, N. Y.

"G.E," 600 volts.

Three-way, 3 amperes, catalog No. 89,596.

Approved December 23, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

MERRILL, IOWA.—Bonds for $3,500 have been voted for an addition to the electric light plant.

CANTON, ILL.—The Council plans to place the wires underground. Address the city clerk for particulars.

FARRAGUT, IOWA.—The Commercial Club has started a movement for electroliers on the business streets. C.

SAN RAFAEL, CAL.—Bids have been called for the installation of 97 electrolier posts on Fourth Street.

WARREN, IND.—The town Board contemplates improving the electric light plant. Address the clerk of the board.

DECATUR, ALA.—The Alabama Power Company is contemplating the building of a big power plant in Decatur.

DECATUR, NEB.—Bonds have been voted for the construction of an electric-light system here. Address the city clerk.

PADUCAH, KY.—The Board of Public Works is considering the construction of an electric light plant at a cost of $16,500. G.

STEWARTVILLE, MINN.—$15,000 in bonds will be issued for the erection of an electric light plant. Address the city clerk.

WALLOWA, ORE.—L. A. Reinaman has been employed by the City Council to estimate the cost of a municipal electric light plant.

DRESDEN, TENN.—$27,000 in bonds have been voted for a light and water system. Address R. L. Suddath, mayor, in regard thereto.

SANTA BARBARA, CAL.—The Santa Barbara Gas & Electric Company proposes to extend its electric system to Carpinteria and Goleta.

ANDERSON, S. C.—Walhalla Light & Power Company has been incorporated with a capital of $10,000 by William H. Strother and Jesse W. Bell.

BUFFALO, IOWA.—A committee has been appointed to secure estimates for a municipal lighting plant. Address LeRoy Eggers for particulars.

WOONSOCKET, R. I.—A petition has been presented to the city government asking for better lighting facilities on the streets in the business section. W.

CLEVELAND, O.—The Council recommends placing 14 miles of wire underground each year. Address Public Service Director W. J. Springborn.

EASTON, MD.—This town is planning to construct an electric light plant here; $30,000 in bonds will be issued. Address the town clerk for information.

JACKSON, TENN.—This city is considering issuing $25,000 in bonds for the purpose of building a power house and extending its electric light system. G.

PARKER, S. D.—The Council plans to establish a municipal lighting plant. Address the city clerk for information.

WATERTOWN, MINN.—The Crescent Electric Company has been incorporated with a capital of $50,000 by Guy E. Halgren, James J. Ponsford and others. C.

RICHMOND, IND.—The Richmond Light, Heat & Power Company is planning a bond issue for the purpose of financing the purchase of additional equipment. G.

TALLAHASSEE, FLA.—$45,000 in bonds has been voted for the enlarging and improving of the electric-light plant and for other purposes. Address L. M. Lowery, mayor.

PERHAM, MINN.—The Council is considering employing an expert to go over the electric plant, with a view to making improvements and installing modern equipment. C.

HAZARD, KY—The Hazard Light & Power Company, which recently increased its capital stock from $15,000 to $30,000, will spend $10,000 in the installation of additional equipment. G.

TOLEDO, O.—The East Side Commercial Club is considering ways and means to extend the electric lighting on Second street. Address the secretary in regard to this improvement.

GRAND FORKS, N. D.—Efforts are being made to have the "White Way" lighting system extended on Bruce avenue, Fourth and Fifth streets. Charles J. Evanson is city auditor. C.

CADIZ, KY.—George L. Smith, manager of Cadiz Water Company, will purchase electrical equipment for the purpose of utilizing current from a waterpower plant of A. P. White & Company.

ATLANTIC, IOWA.—It is more than likely that the Rock Island, if it installs its own water-pumping plant here, will also install its own lighting plant. Address F. J. Glover, city engineer, Chicago.

AUSTIN, MINN.—Farmers east of here are urging the City Council to extend the lighting system eight miles east to furnish them with lights, with a probability of extending it later to Dexter. C.

SCOTTSBURG, IND.—The Indianapolis & Louisville Traction Company is considering providing a street lighting service in Scottsburg, it is reported, a franchise now being before the City Council. G.

CORVALLIS, ORE.—The committee appointed by the Commercial Club here a short time ago to estimate the cost of installing a power plant and distributing system for this city, reports that it will cost $111,570.

SEGUIN, TEX.—The City Council has ordered an election for February 19 on the proposition of issuing $20,000 of bonds, $12,500 of which will be used in enlarging and improving the water and electric light plants. D.

COTULLA, TEX.—The City Council has granted a 25-year franchise to E. B. Zachry for an electric light plant. Construction work will be started within 90 days, and the plant must be in operation within a year. D.

JOHNSTOWN, PA.—The Citizens Light, Heat & Power Company will build a transmission line from Johnstown into Echo in the early part of next spring, or as soon as the new Brookdale-Echo road is completed.

SEATTLE, WASH.—The plant of the Washington-Oregon Corporation at Kalama was destroyed a short time ago by fire, incurring a loss estimated at $45,000. The plant will be rebuilt, according to officers of the company.

HANOVER, IND.—The Hanover Lighting Company is being organized for the purpose of building a street lighting system. Current for its operation will be secured from the Madison, Ind., Light & Street Railway Company. G.

WEST WARWICK, R. I.—Business men of this town are agitating for improved street lighting. The present equipment consists of 495 small incandescent units, for which the current costs the town $12 per lamp per year.

SPRINGFIELD, MASS.—The City Property Committee is considering the project of procuring generating apparatus to manufacture electricity to light the municipal buildings. An estimate will be prepared on the cost of the installation.

BRYAN, TEX.—The Bryan Commercial Club is promoting a project to erect a municipal power plant costing $30,000, to furnish power for the Bryan-College Station interurban, which it is proposed to electrify, and for city street lighting. D.

WYNDMERE, N. D.—The Commercial Club has taken up the proposition of securing electric lights for this town. It is proposed to extend the Ottertail Light & Power Company's line from Wahpeton through Mooreton and Barney to Wyndmere. C.

HIBBING, MINN.—The village of Kitzville has granted a franchise to the Chisholm Electric Light Company to erect poles and wires in the village for the sale of current. John Meadows, president of Kitzville Council, may be addressed. C.

PROVO, UTAH.—A. P. Merriall, local manager of the Utah Light & Power Company, appeared before the County Commissioners and submitted a tentative plan for better lighting on the principal streets. The plan includes the installation of 50 arc lights.

EAST PITTSFORD, VT.—Plans for a 6,000-horsepower hydro-electric development here are fast being matured. The Rutland Railway, Light & Power Company will utilize the waters of the Chittenden storage basin, where a billion cubic feet of water is impounded. W.

CANTON, O.—O. C. Barber, of Barberton, announces that he intends to establish an electric light and power plant in this city, which will compete with the Canton Electric Company. Members of the City Council have said they would grant him a franchise.

CASHMERE, WASH.—The Cashmere Water Power Company has announced it will develop 2,500 horsepower near the town of Cashmere. The directors of the company are A. J. Mills, L. H. Titchenal, E. F. Stowell and O. B. Hallis, of Spokane, who is secretary.

KENTON, O.—The Hardin Wyandotte Lighting Company has decided to remodel the old plant between South Main and South Detroit streets, according to P. M. Magley, general manager. New machinery will be installed and improvements costing $40,000 will be made.

DENISON, TEX.—It is announced by President J. K. Strickland, of the Texas Power & Light Company, that a large power plant will be erected by the company near Denison, but on the Oklahoma side of the Red River. It is planned to have the plant in operation early in 1916. D.

ESTHERVILLE, IOWA.—At a recent meeting of the City Council, W. H. Grover, an expert from Ames, was employed to examine the electric light system here and prepare data for the entire reconstruction of the plant. Owing to the growth of the city, the plant is inadequate.

JOPLIN, MO.—Application has been filed by the Empire District Electric Company with the Public Service Commission for authority to issue $120,000 general-improvement bonds. The proceeds would be expended in making betterments at various points served by the company.

BELLINGHAM, WASH.—J. H. Bloedel, president of Bloedel-Donoval Mills Company, owner of one of the largest lumber mills on the coast, has announced that the plant will be electrified at a cost of $60,000, and that contracts for the machinery will be awarded during the month of February. O.

PRINCE RUPERT, B. C.—The Star Electric Light & Power Company, J. P. Puckett, manager, recently filed articles of incorporation in this city, with a capital stock of $10,000. The company proposes to construct and operate electric lines for light and power purposes. For further information address J. N. Shaver, secretary. O.

TANANA, ALASKA.—The Tanana Gold Fields Company has in view a plan to start an electric plant near the properties in the Tanana gold field region, to transmit power to its properties and to the Fairbanks district and vicinity. Address John L. Timmons, of Fairbanks, Alaska, for general information.

GRAND CANYON, ARIZ.—J. Bishop & Company, platinum manufacturers of Malverne, Pa., who have taken 10 of the 40 platinum claims of Ralph H. Cameron in the Grand Canyon of the Colorado River near Bright Angel trail, will erect a generating plant on Indian Garden Creek to furnish power for a 100-ton reduction plant to be erected nearby.

ESCANABA, MICH.—It is understood that during the coming year the Escanaba Traction Company will build a new power dam on the Escanaba River, two miles from the city limits. The traction company has applied to the State Railroad Commission for authority to issue $225,000 worth of bonds. Address John K. Stack, president, for further information.

LOUISVILLE, KY.—The Swiss Cleaners and Dyers are having plans for a $50,000 plant drawn by D. X. Murphy & Brother, architects of this city. The plant will be electrically operated, the company generating its own current. A 60-kilowatt generator, as well as a corresponding horsepower in motors, will be purchased. Dr. H. E. Mechling is general manager. G.

JACKSON, TENN.—The Jackson Railway & Light Company will purchase a rotary convertor in the near future, having decided to improve and enlarge its power plant. John Wisdom is superintendent. The company is also in the market for construction material, with the exception of rails, for an extension of its traction line, which it plans to build in a few months. G.

WEAVERVILLE, CAL.—The Hardscrabble Mining Company, whose property is near here but whose headquarters are in Los Angeles, is making many improvements to its property and many more are in prospect. The company intends installing an electric power plant, stamp mill, machine drills and other equipment during the coming summer. John Nefroney is general manager of this company. T.

OLEAN, N. Y.—It is understood that negotiations are under way by Supervisor Charles B. Nichols, of Ischua; President Joseph B. Mayer, of the Olean Electric Light & Power Company, and other officials of the lighting company, in regard to the construction of an electric power transmission line from Hinsdale along the Buffalo-Olean highway to Ischua and Franklinville.

WORCESTER, MASS.—W. Emory Wardwell has completed the incorporation of the Tennessee Valley Light & Power Company under a Massachusetts charter. The new corporation is the consolidation of several companies in the Tennessee Valley near Chattanooga. These companies carry on business in 15 towns. The capital of the new corporation is named at $1,100,000. The company will furnish both power and light for several cotton mills, lumber mills, foundries and iron mills. Mr. Wardwell is secretary, vice president and director of the new company.

ASHEVILLE, N. C.—Developments of far-reaching importance to Western North Carolina are presaged by the reorganization yesterday of the Toxaway Power Company, a corporation chartered about a year ago with an authorized capital of $1,500,000. When the company was charted the incorporators were H. S. Mitchell and W. E. Moore, of Pittsburgh, and George H. Wright, of Asheville. The new company owns or controls extensive water rights and property in Western North Carolina and it intends to develop power projects along the Toxaway River in Transylvania County, the Green River and other streams.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

WEBSTER, S. D.—Webster Telephone Company is considering rebuilding its system. C.

BALLATON, MONT.—Riverside Telephone Company will extend its lines into this place at once. C.

BARODA, MICH.—The Baroda Telephone Company has been incorporated with a capital stock of $25,000.

CARDINGTON, O.—The Farmers' Mutual Telephone Company has been incorporated by M. D. Miller and others.

ALAMEDA, CAL.—The Pacific Telephone & Telegraph Company has been granted a 20-year franchise in this city.

HOMERVILLE, GA.—B. A. Harvey has purchased the telephone system from H. J. Dame and will improve and extend it.

SPOONER, MINN.—A co-operative telephone line will be built along the state road to Loman. Address V. E. Lindholm for particulars.

CUMBERLAND, WIS.—The McKinley Telephone Company will improve its plant here. Address E. J. Pfluger, secretary, for information.

PALMER, IND.—Palmer Telephone Company has been incorporated with a capital stock of $2,000 by G. W. Mehrling, J. W. Smith and G. F. Claussen.

PANORA, IOWA.—The Panora & Jefferson Road Mutual Telephone Company has been incorporated, with S. H. Orr as secretary. The capital is $10,000. C.

SEQUIM, WASH.—The Sequim Mutual Telephone Company has been incorporated with a capital stock of $5,000 by E. Roberts, Lou Goldschmith and P. A. McNamara.

ST. JOHN, WASH.—St. John Co-operative Telephone & Telegraph Company has been incorporated with a capital stock of $6,000 by Walter Black and H. M. Halstead.

PORT HURON, MICH.—The local telephone company will expend $30,000 in improvements. A new exchange will be erected. Address Manager Barry for desired information.

CENTRALIA, WASH.—The South Hannaford Farmers' Telephone Company has been incorporated by Isaac M. Pollack, Fred Buchanan, William J. Merriman and F. R. Lobdell.

HARRIETVILLE, O.—The Harrietville Telephone Company has been incorporated with a capital stock of $350 by W. R. Martin, Charles Miller, N. F. Schott and Jacob Kimmach.

RICHLAND, WASH.—The Richland Telephone Company has been incorporated with a capital stock of $5,000 by E. E. Floyd, J. R. Gardner, William Reed and John Erickson.

CENTRALIA, WASH.—Mary E. Hoffman, of Chehalis, has been granted a franchise to erect a telephone line over certain roads from Stearns Creek to Adna, and from Adna to Bunoer Siding.

SCOBEY, MONT.—The Moore Telegraph & Telephone Company, of which R. G. Moore, Glasgow, is president, will begin in the spring building lines into this place and Opheim. An exchange building will be erected here. C.

PALACIOS, TEX.—W. H. Dean, of this city, has stated that he has sold his telephone business in Palacios to the Port Lavaca Telephone Company. The new owner proposes to extend the line and improve the service generally.

MARSHALL, MICH.—The Street Committee of the Council has decided to make a report favoring the laying of all telephone, telegraph cables and wires underground in the business district. Address the city engineer in regard to this matter.

TEMPLE, TEX.—The Southwestern Telegraph & Telephone Company has made an appropriation of $18,000 to be expended in this city during the present year in underground conduit service, and plans are now being formulated for the work. Address the secretary.

ELECTRIC RAILWAYS.

(Special Correspondence.)

FORT WAYNE, IND.—Grant and Foote are interested in the proposed electric road to extend from Ft. Wayne to Goshen.

HOOPPOLE, ILL.—Plans are under way for the extension of the Tampico Hooppole Electric Railway for a distance of 15 miles. Address George Mathes, of Hooppole.

STOCKTON, ILL.—Local capitalists are interested in a project to build an electric railroad from Lancaster, Wis., to Stockton, through a region now untouched by either steam or electric lines. Address Fred E. Hammond for particulars.

DENVER, COLO.—The Chamber of Commerce and other civic bodies in Colorado Springs, Pueblo and Denver have been asked to co-operate in the construction of an electric line connecting the three cities, a total length of 115 miles. Frank R. Dusen, of Denver, represents the promoters.

HAGERSTOWN, PA.—Plans for a proposed electric railroad to connect Harrisonburg and Winchester, Harper's Ferry, W. Va., and Frederick and Hagerstown, by way of the Shenandoah Valley, are progressing rapidly, according to reports. The road will be continued into Washington eventually.

ARDMORE, OKLA.—F. B. McElroy, president of the Ardmore & Western Interurban Company, announces that his company will build a line connecting the Healdton fields with the Ringling road, a distance of about eight miles, and that this will be the beginning of an interurban system in the country.

HAMILTON, ONT.—The proposed electric line from Hamilton to Watertown, through Guelph, to a point on the Georgian Bay, is being agitated, some of those interested being Mayor Carter, J. W. Lyon, Alderman Hannigan and R. Symmers, all of Guelph. The opinion was that the line should be built and that the project should be taken up with the Hydro-Electric Commission.

FAYETTEVILLE, TENN.—Representatives of the proposed Franklin, Shelbyville & Fayetteville interurban are asking a subscription of about $68,000 to bring this road to Fayetteville. The proposed Tennessee & Alabama Railroad representative will ask a subscription of $75,000 from Lincoln County, Tenn., and a like amount from Madison County, Ala., for this road, which, it is said, will be a steam line, operating electric storage battery cars for passenger service. This road would connect with the Southern Railroad at Huntsville, Ala.

SANTA ROSA, CAL.—Electric railroad development is interesting northern Sonoma at the present time. Arthur D. Bowen, who promoted and financed the Santa Rosa and Petaluma Electric Railroad some years ago, is interesting capital to build an electric system to radiate from the city of Healdsburg and traverse the wonderfully productive and thickly populated Dry Creek Valley, Alexander Valley and Geyserville and nothern parts of the county, thus opening up with better transportation facilities a big section of country.

TORONTO, ONT.—George E. Smith has completed the purchase of the complete rights to the charter, franchises and other property of the Eastern Ontario Electric Railway Company, a new corporation which proposes to build an electric line across the southern line of the Province of Ontario, Canada. The railway company is chartered to build a line from Toronto to Cornwall, at the eastern extremity of Ontario, with a branch from Brockville to Ottawa, the whole being 376 miles long. It touches 52 cities and towns en route. The company has authority to capitalize at about $16,000,000. The charter provides the right to conduct a railway with any motive power except steam, to carry passengers, freight, mail and express and to manufacture and sell electricity for light, heat and power.

PROPOSALS.

LIGHTING SYSTEM.—Bids will be received until February 16 by the Board of Supervisors, Los Angeles, Cal., for the installation of a lighting system in the Moneta lighting district.

ELECTRICAL EQUIPMENT.—Bids will be received February 16 for the furnishing of electrical equipment for the improvement of the municipal light and water plant, Springfield, Ill. Address Arthur M. Morgan, consulting engineer, First National Bank Building, Chicago.

RADIO SET.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until February 16 for furnishing under Proposal 688 one radio set, one-kilowatt, 500-cycle, quenched-spark type, complete. For further information address Charles S. Wallace, Captain, Signal Corps, U. S. Army.

WIRING AND LIGHTING.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 24, for changes in the conduit and wiring and lighting fixtures in the post-office at Buffalo, N. Y., in accordance with drawings and specifications, copies of which may be obtained from the custodian of the site or the office of the Supervising Architect.

LIGHTING FIXTURES, ETC.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until March 11 for furnishing the lighting fixtures for the post office at Osage City, Kans.; and until March 13 for the lighting fixtures for the post office at De Soto, Mo.; and until March 14 for the same for the post office at Bainbridge, Ga. Drawings and specifications may be obtained from the custodians of the sites or the office of the Supervising Architect.

ELECTRICAL SUPPLIES.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 3 for furnishing 15 portable electric drills, 125 volts, two speeds, as per Schedule 6390, and 20 telegraph hand keys for radio transformer, as per Schedule 6383, for delivery at the Navy Yard, Brooklyn, N. Y.; one 72-cell storage battery, complete, and 20 gallons of electrolyte, as per Schedule 6371, and 14,500 feet of rubber-covered duplex lighting and power wire, as per Schedule 6386, for delivery at the Navy Yard, Brooklyn, N. Y.; four ringing dynamotors and two telephone motor generators, as per Schedule 6371, for delivery at the Navy Yard, Camden, N. J.; 30 miscellaneous telephone jacks, two telephone switchboards, miscellaneous telephones, as per Schedule 6371, for delivery at the Navy Yard, Quincy, Mass. The Bureau will also receive bids until March 10 for one electric dynamotor, with controlling panel and leading rheostats, as per schedule 6361, for delivery at the Navy Yard, Annapolis, Md.

NEW INCORPORATIONS.

NAUGATUCK, CONN. John L. Russell Manufacturing Company has been incorporated, capitalized at $15,000, to manufacture lighting fixtures.

WILMINGTON, DEL.—Southern Timber & Power Company has been incorporated with a capital stock of $100,000 to acquire lands and improve the same.

SUPERIOR, WIS.—Articles of incorporation have been granted to Riley S. Hartley Company, capitalized at $5,000, to do a general electrical business.

LOUISVILLE, KY.—The Standard Lighting & Heating Company has been incorporated with a capital stock of $1,000 by T. C. Vance, C. H. Franklin and others.

PORTLAND, ORE.—Articles of incorporation have been filed by the Kingery & Marrs, Incorporated, capitalized at $15,000. The incorporators are J. D. Marrs, R. C. Kingery and J. F. Barrett.

WEEDSPORT, N. Y.—Economy Telephone & Telegraph Company, Incorporated, has been incorporated with a capitalization of $9,000, by George R. Nash, Daniel S. Gibbons and J. N. Mills, all of Weedsport.

BENNINGTON, OKLA.—A charter has been issued to the Bennington Light, Ice & Power Company, capitalized at $5,000. The incorporators are H. S. Clark, W. S. Murphy and J. S. Dawson, all of Bennington. P.

CLIFFWOOD, N. J.—The Atlantic Electric Company has been incorporated with a capital of $250,000 to operate as electricians and in electrical supplies. T. D. Finizio, L. Biondi and Bradford A. Turcott are the incorporators. A.

RAMSEN, N. Y.—Ramsen Telephone Exchange Company, Incorporated, has been incorporated with a capital stock of $5,000 by Roscoe C. Critchard, Steuben N. Y.; Owen J. Griffith and Frank Y. Sanborn, both of Remsen.

MANHATTAN, N. Y.—Engineering Utilities Corporation has been incorporated with a capitalization of $10,000 by Roland Rasquin, Maurice D. Waller and Frederick Monckmeyer. The company will deal in and manufacture electrical supplies.

NEW YORK, N. Y.—National Lighting Fixture Manufacturing Company, Incorporated, has been incorporated to manufacture electric light and gas fixtures by Ben Kaplan, Albert Etepfer and Louis C. Kurchenoff, of New York City. The capital stock of the company is $10,000.

NEW YORK, N. Y.—The United Gas & Electric Engineering Corporation has been formed with a capital stock of $100,000, all of which has been purchased for cash at par by the United Gas & Electric Corporation. The new company will carry on a general consulting and contracting engineering business and will give such service as may be required by the operating companies of the United Gas & Electric Corporation, and its subsidiary, the American Cities Company. The new company also will engage in the purchase of equipment, supplies and material of all kinds, and has taken over the purchasing department of the United Gas & Electric Corporation. Gearge Bullock is president; S. J. Dill and J. S. Pevear, vice-presidents; and B. F. Wood, chief engineer.

FINANCIAL NOTES.

The annual meeting of the Kings County Electric Light & Power Company will be held February 24.

The Pennsylvania Water & Power Company has sold to the Fidelity Trust Company, of Baltimore, $680,000 five-per cent first-mortgage bonds, to be offered to the public around 93.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, is offering to stockholders for subscription at par, in the proportion of one share of the new stock to each 10 shares of the old stock, the $1,416,000 of stock recently authorized by the Maryland Public Service Commission. Rights of subscription accrue to stockholders of record February 16.

At the annual meeting of the Narragansett Electric Light Company former directors and officers were re-elected and the stockholders approved an increase in the capital of the company from $6,000,000 to $7,500,000. Whether the new capital will be issued in the form of convertible debentures or capital stock, as well as the time of issue, will be decided later by the board. The new debentures or stock will be sold at not less than par, the par value of the shares of stock being $50.

Plans have been completed for the merger of the Twin City Traction Company, of Dennison, Ohio; the Midland Power & Traction Company, of Cambridge, Ohio; the Coshocton Light & Heat Company, of Coshocton, Ohio; and the Lafayette Light & Power Company, of Uhrichsville, with the Ohio Service Company, which will result in the immediate improvement of the light and power service in Dennison and Uhrichsville. The Ohio Service Company will start work in a few weeks on the erection of a transmission line from Coshocton to Uhrichsville and Dennison.

The Utah Power & Light Company has sold $10,000,000 first mortgage five per cent bonds, dated February 2, 1914, and due February 2, 1944. These bonds are part of an authorized issue of $100,000,000, of which the present amount is the first that have been sold. Proceeds from the present issue will be used to retire such portion of the approximately $22,000,000 six per cent ten-year notes of the Utah Securities Corporation, now outstanding. Tenders for these notes will be asked to such an amount as the proceeds of these bonds will purchase. The Utah Power & Light Company, with its subsidiary, the Western Colorado Power Company, is the operating company of Utah Securities Corporation.

The combined statement of the electric railway, lighting, gas and water-power companies under the control of the Stone & Webster Management Association for the year ended December 31 shows a total capitalization outstanding of $186,515,400, consisting of $86,512,100 bonds and coupon notes, $38,092,100 preferred stock and $61,911,200 common. The combined earnings for the year were $26,688,521 gross and $11,104,764 net. There was a balance after all charges of $6,195,340, of which $4,184,476 was distributed in dividends, leaving $2,010,863 for reserves and depreciation. The total disbursements for the year 1913 for interest on bonds and notes and for dividends amounted to $8,616,581.

The Columbus Railway, Power & Light Company has taken over the operation of the public utilities of Columbus, Ohio, which heretofore have been operated, under lease, by the Columbus Railway & Light Company. The new company is a consolidation of the underlying properties and not a leasing company, the leases, with the exception of that of the Columbus Light, Heat & Power Co., having been cancelled. The board of directors of the new company is made up of men selected from the boards of the old companies. Its officers are S. G. McMeen, president; C. M. Clark, vice-president; E. K. Stewart, vice-president and general manager; P. V. Burington, secretary; H. W. Clapp, general superintendent.

New officers of the Federal Light & Traction Company were elected, February 4, at a meeting held at the company's offices, 60 Broadway, New York City. The revised list of Federal officials follow: E. N. Sanderson, president, in place of James C. Colgate, resigned; Francis Blossom, vice-president, was elected in place of C. C. Chappelle, who continues to act as general manager; Craig Colgate was re-elected vice-president; H. Hobart Porter was again elected secretary; L. C. Gerry was re-elected treasurer, and elected assistant secretary; J. B. Marsh was re-elected assistant secretary; Richmond Talbot was elected to fill the position of assistant treasurer, a vacancy being caused by resignation of Harvey N. Wadhams; Francis Blossom was elected a director in place of Parmely Herrick, resigned. At the annual meeting of stockholders held prior to the directors' meeting, the treasurer submitted his report upon which a regular quarterly dividend of one and one-half per cent was declared on preferred stock, payable February 28 to stockholders of record February 14.

Dividends.

American Telegraph & Cable Company; quarterly of 1.25 per cent payable March 1.

Detroit United Railways; regular quarterly of 1.5 per cent, payable March 2 to stock of record February 14.

Federal Light & Traction Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable February 28, to stockholders of record February 14.

Kings County Electric Light & Power Company; regular quarterly of two per cent.

Northern Texas Electric Company; the regular semi-annual dividend of $3 a share on its preferred stock and a quarterly dividend of $1.75 a share on its common stock, both payable March 2, to stock of record February 14.

Ontario Power Company; quarterly of 1.25 per cent, payable March 2 to stock of record February 21.

Pacific Gas & Electric Company; regular quarterly of $1.50 on preferred, payable February 16 to stock of record January 31.

Portland Railway Light & Power Company; $1, payable March 2 to stock of record February 12.

Twin City Rapid Transit Company; regular quarterly of 1.5 per cent on common and 1.75 per cent on preferred, payable April 1 to stock of record March 14.

Reports of Earnings.

CHATTANOOGA RAILWAY & LIGHT.

	1913.	1912.
December gross	$ 100,378	$ 95,454
Net after taxes	39,604	38,369
Surplus after charges	13,490	14,406
Twelve months' gross	1,204,928	1,064,674
Net after taxes	487,303	430,058
Surplus after charges	189,221	164,029
Balance after preferred dividends	89,221	64,029

MT. WHITNEY POWER & ELECTRIC.

Mt. Whitney Power & Electric Company reports for the year ended December 31, 1913, as **follows:**

	1913.	1912.
Gross earnings	$526,852	$445,826
Expenses and taxes	256,456	218,787
Net earnings	306,395	227,038
Interest charges	129,900	109,500
Surplus	176,495	117,538

PORTLAND RAILROAD CO.

	1913.	1912.
December gross	$ 79,867	$ 76,698
Net after taxes	28,810	16,446
Surplus after charges	5,312	6,193
Twelve months' gross	1,036,316	981.052
Net after taxes	346,840	305,458
Surplus after charges	*165,959	184,291

*Equivalent to 8.3 per cent on capital stock.

LEWISTON, AUGUSTA & WATERVILLE STREET RAILWAY.

	1913.	1912.
December gross	$ 50,420	$ 47,359
Net after taxes	13,302	15,078
Surplus after charges	*2,036	673
Twelve months' gross	675,554	618,039
Net after taxes	247,839	228,487
Surplus atfer charges	68,264	55,418
Balance after preferred dividends	32,264	19,418.

*Deficit.

AMERICAN GAS & ELECTRIC.

The earnings of six subsidiaries of the American Gas & Electric Company for the year ended December 31, 1913, compare as follows:

	1913	1912
Canton Electric:		
Gross earnings	$418,643	$347,248
Net after taxes	208,632	175,201
Surplus after charges	147,389	118,416
Marion Light & Heating:		
Gross earnings	$257,041	$225,332
Net after taxes	118,326	83,204
Surplus after charges	72,504	48,765
Muncie Electric Light:		
Gross earnings	$456,365	$389,169
Net after taxes	194,477	166,080
Surplus after charges	109,065	84,754
Rockford Electric:		
Gross earnings	$464,669	$417,318
Net after taxes	245,235	202,826
Surplus after charges	148,868	108,399
Scranton Electric:		
Gross earnings	$932,766	$803,071
Net after taxes	576,383	448,910
Surplus after charges	376,467	297,963
Wheeling Electric:		
Gross earnings	$312,115	$257,639
Net after taxes	150,914	117,408
Surplus after charges	82,645	58,432

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 9	Feb. 2
American Tel. & Tel. (New York)	121	123
Commonwealth Edison (Chicago)	136	133½
Edison Electric Illuminating (Boston)	255	257½
Electric Storage Battery common (Philadelphia)	54	51¼
Electric Storage Battery preferred (Philadelphia)	54	51¼
General Electric (New York)	146	147
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1⅛	1¼
Massachusetts Electric common (Boston)	10½	12
Massachusetts Electric preferred (Boston)	62	63½
National Carbon common (Chicago)	155	155
National Carbon preferred (Chicago)	111	116¾
New England Telephone (Boston)	140½	139½
Philadelphia Electric (Philadelphia)	26⅝	26¼
Postal Telegraph and Cables common (New York)	81	82
Postal Telegraph and Cables preferred (New York)	69	69
Western Union (New York)	63	63½
Westinghouse common (New York)	70	71
Westinghouse preferred (New York)	116	116

LEHIGH VALLEY TRANSIT.

	1913	1912
December gross	$ 140,525	$ 130,702
Net after operation	69,053	61,233
Surplus after charges	13,045	16,548
Twelve months gross	1,774,820	1,541,510
Net after operation	890,876	767,876
Surplus after charges	301,409	262,691

HUDSON & MANHATTAN.

The Hudson & Manhattan Railroad Company reports to the New York Stock Exchange for the ten months ended November 30, 1913, as follows:

Gross	$4,535,389
Net after taxes	2,443,458
Other deductions	221,110
Balance	2,222,348
Interest on bonds	1,680,961
Net inc. avail. for int. on adj. inc. bonds	*541,388

*Includes 276,071, the first installment of interest at $8.34 per $1,000 earned during five months prior to July 1, 1913, leaving $265,317 available for distribution.

PACIFIC TELEPHONE & TELEGRAPH.

The Pacific Telephone & Telegraph Company reports to the New York Stock Exchange, for the ten months ended October 31, 1913, as follows:

Gross earnings	$15,081,892
Expenses*	11,389,052
Net earnings	3,692,840
Other income	177,933
Total income	3,870,772
Interest, etc.	1,991,334
Balance	1,879,438
Dividends	1,440,000
Balance	439,438

*Includes maintenance, $2,730,195; taxes, $609,991; depreciation, $2,281,200; and operating expenses, $5,767,666.

KEYSTONE TELEPHONE.

The report of the Keystone Telephone Company, for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$1,265,778	$1,217,428
Net profits	319,077	305,745

From the net profit there was deducted $108,038 for depreciation and reserve, $46,622 for bad accounts, $10,000 for bond discount, and $58,105 for preferred dividends, leaving a balance of $96,311 to be added to the profit and loss surplus.

LAKE SHORE ELECTRIC RAILWAY.

The income account of the Lake Shore Electric Railway Company for the year ended December 31, 1913, compares as follows:

	1913	Increase
Gross earnings	$1,119,312	$66,793
Operating expense	670,604	65,541
Net earnings	448,707	1,252
Other income	25,000	....
Gross income	473,707	1,252
Interest charges	324,696	1,996
Surplus	149,011	*743

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*Decrease.

ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER.

	1913	1912
December gross	$ 117,830	$ 110,874
Net after taxes	57,479	53,501
Surplus after charges	37,285	33,791
Twelve months' gross	1,252,904	1,179,839
Net after taxes	540,676	510,816
Surplus after charges	299,311	274,756
Balance after preferred dividends	*221,311	196,756

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*Equivalent to 6.3 per cent on common stock.

JACKSONVILLE TRACTION.

The comparative report of the Jacksonville Traction Company, under Stone & Webster management, for December and the twelve months ended with December is as follows:

Month of Dec.—	1913.	1912.
Gross earnings	$ 64,485	$ 48,623
Net earnings	16,781	15,442
Surplus over charges	3,910	4,680
Jan. 1-Dec. 31—		
Gross earnings	679,622	562,537
Net earnings	241,033	184,026
Surplus over charges	97,316	65,039

PERSONAL MENTION.

MR. A. W. McLIMONT, vice-president and general manager of the Michigan United Railways, has been elected vice-president and general manager of the San Francisco-Oakland Terminal Railways Company.

MR. B. D. CHRISTIAN, formerly electrical engineer of the Merchants Light & Power Company, Indianapolis, Ind., has accepted a position with the Crocker-Wheeler Company as sales engineer at Chicago, Ill.

MR. C. F. ZIEGLER, president of the Reynolds Electric Flasher Company, Chicago, is making an extended trip to the south, including visits to Cuba and the Panama Canal, combining business with pleasure.

MR. A. H. MOSHER, Westfield, N. J., has been appointed works manager for the C. & C. Electric Company, Garwood, N. J. Mr. Mosher succeeds MR. W. B. ELLIOTT, resigned, who has been works manager for the past eighteen years.

MR. F. LAURENT GODINEZ, Jersey City, N. J., consulting lighting specialist,, tendered an address on "The Physiological and Psychological Functions of Artificial Light" at the meeting of the Hudson County Medical Society, at Jersey City, February 3.

MR. LOUIS D. GIBBS, superintendent of advertising, and MR. W. GRAYDON STETSON, superintendent of the appliance department of the Edison Electric Illuminating Company of Boston, spoke before the students in salesmanship and efficiency at the Boston Young Men's Christian Union, February 3. The stage was fitted to represent the salesroom of a large electric appliance house.

MR. SAMUEL INSULL, president of the Commonwealth Edison Company, returned to Chicago on February 8 after one of his periodical trips to England. While in London he noticed that a decided improvement in the financial situation took place and the long business depression began to give way to an optimistic turn that manifested itself immediately in reduction in bank rates and greatly increased activity in the security market. The gigantic central-station system of which Mr. Insull is head is being pointed out as a model by the financial and municipal authorities who are trying to bring about a combination of the numerous central-station undertakings in London.

MR. J. G. WHITE, president of the J. G. White Companies, has invited a large party of friends and business associates to accompany him on a trip through Florida, leaving New York on February 20. The party will number about 60 persons, and will visit many of the towns where there are electric light, power and ice plants owned by the Southern Utilities Company. The itinerary covers the main railroad line as far as Jacksonville, where the party will branch off to visit the towns of Kissimmee, Lakeland, Punta Gorda, Fort Meyers, Brandentown, St. Petersburg, Belleair and Tarpon Springs. At Tarpon Springs the party will witness a demonstration by the Greek sponge divers. A trip will also be made through the ship canal from Lake Okeechobee to the Atlantic, inspecting the progress that is being made in draining the Everglades. The trip will include a week of recreation at Miami and Palm Beach. The special train of six compartments-sleepers, observation car and dining cars, will return to New York about March 8.

MR. E. H. MURPHY, assistant superintendent of Police Telegraphs of New York City, was retired from active service of February 7. Mr. Murphy went on the police force as a civilian employee, February 17, 1885, working as a telegraph operator. In 1893 he was appointed assistant superintendent of telegraph. At the time of the consolidation of Brooklyn and New York in 1898, Mr. Murphy with a number of others joined the uniformed force. Previous to his connection with the police department he was employed as an operator for the Western Union Telegraph Company, and for a time was employed in the same capacity by the New York *Herald*. Mr. Murphy gained unique distinction in his department by his unprecedented action in dispensing with all rules and red tape and acting upon his own initiative at the time of the burning of the General Slocum in the East River. When the first word of the disaster reached him over the wire, without authority he instantly dispatched every police boat, police surgeon and all of the reserves of the east side precincts and the nurses of the Charities Department to the scene of the disaster. For this action he was warmly commended by Police Commissioner McAdoo.

DATES AHEAD.

Tennessee Electrical Contractors' Association, Memphis, Tenn., February 16.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20. Secretary, Bradley Stoughton, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Supply Jobbers' Association. New Willard Hotel, Washington, D. C., February 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Central Electrical Railway Association. Cleveland, O., February 26-27. Secretary, A. Neereamer, 308 Traction Terminal Building, Indianapolis, Ind.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. B. Burritt, 29 West Thirty-ninth Street, New York, N. Y.

Cleveland Electrical Exposition. March 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

American Electrochemical Society. New York, N. Y., April 2-4. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Society of Efficiency, New York, N. Y.,

April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa. Secretary, H. E. Weeks, Davenport, Iowa.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth street, New York, N. Y.

With the Electrical Manufacturers

Connecticut Electric Manufacturing Company, Bridgeport, Conn., is erecting a brick addition to its plant, of three stories, 51 by 150 feet.

Acme Wire Company, New Haven, Conn., is soon to build a reinforced concrete addition to its plant in Camden, of two stories, 60 by 400 in ground dimensions.

Franklin Electric Company, Hartford, Conn., is about to increase the capacity of its Woodbine Street factory by the addition of another story, making the building of three stories, 62 by 34 feet.

The Sanax Company, Incorporated, 123 East Twenty-third Street, New York City, is sending out cards calling attention to a number of its electrical appliances, particularly the Foen hair drier, the Sanax vibrator, the Sanofix vibrator, etc.

Delta-Star Electric Company, Chicago, Ill., is distributing a new folder devoted to a concise description of its "unit type" busbar supports and phase-rotation indicator. Full directions for using this indicator are incorporated and will be of use to operating engineers.

American Steel & Wire Company, Chicago, Ill., in a recent number of *American Wire Rope News*, the house organ of this firm, has published an interesting article with numerous illustrations on proper and improper methods of unreeling and uncoiling wire rope which should prove of interest to those using this material.

The Oshkosh Manufacturing Company, Oshkosh, Wis., has appointed the Union Electric Company, of Pittsburgh, Pa., as its Pittsburgh agents and has arranged with them to carry a large and representative stock of construction tools and specialties on hand ready for prompt shipment. It has been arranged so that Eastern jobbers can use this stock to advantage.

Curtis & Carhart, 150 Chambers street, New York, has been incorporated and will be known in the future as Curtis & Carhart, Inc. W. F. Curtis, president; B. I. Carhart, vice-president and treasurer; P. J. Murley, secretary. The new company will continue to handle "Colonial" motors and generators, and "Colonial" Mazda lamps, "Sterling" insulating varnishes, "Viking" transformers and electrical specialties.

General Electric Company is erecting a group of three buildings at East Boston, Mass., on a site comprising about 170,000 square feet of land recently acquired. The main structure will be 80 to 92 feet in width, with a present length of 260 feet, later to be increased to 650 feet, and of four stories and basement. It is stated that about 1,200 persons will be employed in the new works, which when fully completed will furnish employment to three times that number.

Adams-Bagnall Electric Company, Cleveland, O., announces that there is no basis in fact for the statement attributed to Mr. Beach in the report of the meeting of the Illinois Electrical Contractor's Association on page 180 of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, January 24, that the company had discontinued its Chicago office. The company maintains its Chicago office at 417 South Dearborn Street, under the management of A. J. Selzer, as heretofore.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued an eight-page pamphlet on door safety switches for electric elevators. It has been found that a great majority of elevator accidents are the result of starting the elevator machine before the doors are closed and locked and the passengers clear. The type of door switch described in this pamphlet has, therefore, been developed to prevent turning on the power before the door is closed and locked. The pamphlet describes the switches with the aid of numerous half-tones and dimension diagrams.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a 48-page publication dealing with Westinghouse electric starting, lighting and ignition systems for gasoline automobiles. This elaborate pamphlet, which is profusely illustrated, describes first in some detail different types of generators used for ignition and lighting, and the motors for starting both flywheel and crankshaft drive. The single-wire system, which has always been advocated by the Westinghouse company, is thoroughly explained and its advantages clearly brought out. The details of wiring, such as switches, sockets, fuses, meters, and batteries are also discussed. "The Power of a Name" is the title of a circular with an art cover also issued by the Westinghouse company. It contains reproductions of advertisements which have been run by this company in the various popular and technical papers describing its electric ignition, lighting and starting systems.

Safety-Armorite Conduit Company, Pittsburgh, Pa., has prepared a very interesting and neat little 12-page booklet entitled "Wiring the Home." This has been especially gotten up for distribution by contractors and the company is prepared to imprint the name of any electrical contracting firm on the back cover of the booklet. The booklet makes a strong plea for wiring of finished houses and shows both pictorially and with simple explanatory matter that such an undertaking is not so formidable a one as most householders believe it to be. The method of wiring is explained in simple terms and illustrations show how it is carried out. The use of the company's Sterling armored conductors is advocated for this purpose incidentally. The booklet points out the value of electric service not only for lighting but for other household purposes and makes a valuable piece of literature by means of which a contractor can secure a great deal more work of this kind than by random solicitation.

Record of Electrical Patents.

Issued by the United States Patent Office, February 3, 1914.

1,085,598. Ozone Generator. W. O. Freet, Hackensack, N. J., asisgnor to Steynis Ozone Co. Includes a flat electrode on an insulating base, a flat dielectric plate over the electrode and a number of flat strip electrodes supported by racks over the plate.

1,085,608. Circuit-Breaking Means for Motor-Vehicles. H. S. Heath and M. L. Heath, Kenton, O. A pendulum device controlling the ignition circuit of a motorcycle.

1,085,613. Vehicle Fender. A. J. Kolanko, Chicago, Ill. Is connected with circuit-breakers in a motor circuit so as to cut off the power and apply the brakes when a body comes in contact with the fender.

1,085,615. Telephone System. P. Lavery, Webster, and W. E. Bandlow, Dudley, Mass. A lockout system for party lines.

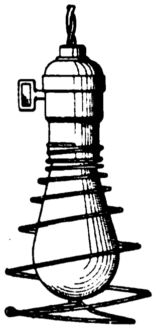
1,085,616. Inductive or Transformer Bond. J. S. Lennox, assignor to Union Switch & Signal Co. Within a cylindrical casing is a laminated core with primary and secondary windings.

1,085,621. Telephone Signaling for Railways. M. Lutenberger, Blocton, Ala. A soundproof hood with side receivers and a transmitter, is adapted to be placed over the engine man's head.

1,085,637. Galvanometer. R. R. Shap, Park Ridge, and M. C. Stoelting, Chicago, Ill. The suspended coil of a D'Arsonval galvanometer carries an indicating finger moving over a scale.

1,085,646. Electric Shut-Off Cock. M. H. Tracy, Worcester, Mass. Has an electromagnetic release and an electric alarm.

1,085,678. Time Recorder. H. T. Goss, Rutherford, and J. W. Bryce, Bloomfield, N. J. Manually and electromagnetically controlled.



1,085,750.—Lamp Guard.

1,085,693. Carriage Attachment for Desk Telephones. H. K. McKinney, Kansas City, Mo. A plate with castors and fingers to clamp about the base of the stand.

1,085,707. Electric-Storage-Battery Negative-Pole Plate. E. W. Smith, Philadelphia, Pa. A powdered inert material is mixed with a finely divided lead compound and filled into the cavities.

1,085,718. Apparatus for Preparing Bleaching and Like Fluids. C. A. M. Buckley, London, England. An electrolytic outfit with a number of anodes in one tank and a cathode in another tank.

1,085,721. Electromagnetic Structure. A. E. Berdon, Indianapolis, Ind. Has a swinging armature provided with a retractile spring held at both ends and carrying a tongue whose free end is connected to the armature.

1,085,726. Railway Signal. J. P. Coleman, assignor to Union Switch & Signal Co. A multipolar stator acts inductively on a rotor connected with the signal so as to move it through a limited angle on either side of a biased mean position.

1,085,743. Anode Support. C. E. Leffel, assignor to Spirella Co., Niagara Falls, N. Y. The anode is cast around the threaded shank of a hook.

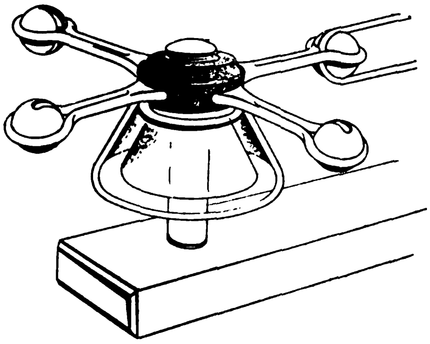
1,085,744. Electroplating Rack. C. E. Leffel and J. D. Leffel, assignors to Spirella Co. A horizontal bar with two inclined arms for securing to a conductor carries U-shaped wire loops to hold the plated articles.

1,085,750. Guard for Incandescent Lamps. J. A. McMichael, Toledo, O. A spiral spring wire guard secured at its smaller end to the socket (See cut).

1,085,769. Spot-Welding Thin Sheets. E. Thompson, assignor to Thompson Electric Welding Co., Lynn, Mass. Consists in clamping the two sheets together, leaving them exposed at spots for application of the welding electrodes.

1,085,802. Electrical Agricultural System. C. S. Doney, Wallace, Idaho, assignor of one-third to J. T. Boyle. Has stationary parallel supply wires and movable transverse feed wires to which a trolley of the machine is attached.

1,085,810. Electromagnetic Relay. J. F. D. Hoge, New York, N. Y., assignor to American District Telegraph Co. Three stationary contacts are located on the same side of the armature which is free to rest simultaneously against the contacts irrespective of their plane.



1,085,813.—Insulator and Distributer.

1,085,807 and 1,085,808. Alternating-Current Motor. V. A. Fynn, London, England. A commutator motor to whose rotor current is separately supplied along two axes.

1,085,813. Insulator and Current Distributer. E. H. Knutz, Arcata, Cal. Supports radial arms with grooved insulating balls in the eye portions of their extremities (See cut).

1,085,826. Indicating Push Button. W. R. Schlage, San Francisco, Cal. Has an indicating shutter in the upper part of the casing.

1,085,829. Trolley-Wire Ear. W. C. Starkey, Zionsville, Ind. Comprises a boss and a grooved extruded metal runner piece having lips to support the trolley wire by clenching.

1,085,840. Portable Grinder. M. F. Apgar, assignor to Taylor Iron & Steel Co., High Bridge, N. J. Mounted on a portable platform is a take-up reel for electric cable, and an electric motor driving the grinder through a flexible shaft (See cut).

1,085,851. Light Support. W. E. Donner, Grand Island, Nebr. For holding a street lamp hood and line insulators on a span wire.

1,085,854. Controller Regulator. H. Elbe, assignor to Lord Mfg. Co., New York, N. Y. For regulating the handle motion of a drum-type motor controller.

1,085,858. Mixer. W. H. Fulton, assignor to Fulton-Bell Co., New York. A small motor-driven liquid mixer.

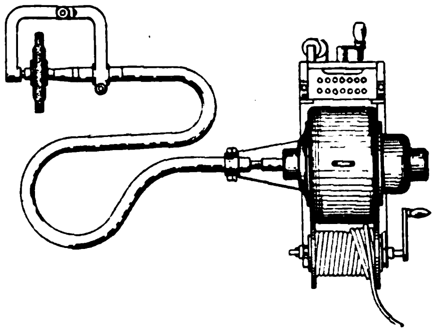
1,085,916. Intercommunicating Telephonic Apparatus. M. R. Hutchison, Summit, N. J. Secured to a person's cap is an adjustable receiver and an adjustable transmitter with sound-excluding mouthpiece.

1,085,920. Electrical Switch. G. A. Knaak, Oshkosh, Wis. A spring switch controlled by fluid pressure.

1,085,937. Automatic Elevator Plant. C. O. Pearson and A. Sundh, assignors to Otis Elevator Co., New York, N. Y. A special engine-driven generator supplies the elevator motor; electromagnetic switches control the starting and stopping of the engine and motor.

1,085,943. Electric Self-Playing Violin. H. K. Sandell, assignor to Mills Novelty Co., Chicago, Ill. Motor-driven and electrically controlled through a music roll.

1,085,947. Adjustable Electric-Light Fixture. T. Smith, assignor to Theo. Smith Mfg. Co., Chicago, Ill. Has two telescoping parts, one carrying the lamp.



1,085,840.—Portable Grinder.

1,085,951. Electric Fusion of Metals. A. P. Strohmenger, assignor to Ester & Co., London, England. Consists in placing two metal rods parallel to each other and placing between them a layer of fusible insulating material adapted to form a slag, connecting the rods to the terminals of an electric circuit, passing an arc between the rods and collecting the fused metal as it drops.

1,085,952. Combined Friction and Spur Gearing for Traction Elevators. A. Sundh, assignor to Otis Elevator Co. Provides special gearing between the motor and drive sheave.

1,085,959. Terminal for Secondary or Storage Batteries. J. W. Achard, Philadelphia, Pa. The lead busbar between end cells of stationary batteries has a copper connecting bar partly imbedded therein.

1,085,960. Electric Connector. J. Berg, assignor to Metal Specialties Mfg. Co., Chicago, Ill. A bayonet style plug and sleeve.

1,085,974. Telephone System. E. R. Corwin, assignor to Corwin Telephone Mfg. Co., Chicago, Ill. Includes special busy-test equipment.

1,085,981. Block Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co., Swissvale, Pa. A relay-controlled railway-signal system.

1,085,982. Electrical System of Distribution. H. Hazelton, Englewood, N. J., assignor to Gould Storage Battery Co. A storage battery is arranged to be charged in series with lamps, and to light a different set of lamps when the power is off.

1,085,987. Reversal Regulator for Single-Phase Motors. D. L. Linquist, assignor to Otis Elevator Co. Prevents operation of the reversing switches until the speed of the motor has been reduced.

1,086,010. Influence Machine. B. E. Baker, Hartford, Conn. A static machine including generating plates, field combs, connecting combs and main discharge terminals with means for regulating the field strength.

1,086,028. Electrical Protective Device. F. B. Cook, Chicago, Ill. A fuse support for a telephone terminal rack.

1,086,029. Indicating Ringing Key. E. B. Craft, assignor to Western Electric Co. For telephone party lines; on release of the key that has been depressed, it projects above the remaining keys of the set until another key is depressed.

1,086,040. Intermittent Searchlight. F. Giannattasio, New York, N. Y. The mechanism is driven by an electric motor.

1,086,041 and 1,086,042. Welding Machine. J. H. Gravell, assignor to Hale & Kilburn Co., Philadelphia, Pa. A transformer type electric welder.

1,086,044. Coin Control for Motor Vehicles. A. D. Grover and E. E. Barber, assignors to A. P. Browne, Cambridge, Mass. An indicator with a motor-circuit-closing hand.

1,086,049. Printing Telegraph Receiver. G. S. Hiltz, assignor to Stock Quotation Telegraph Co., New York, N. Y. An electromagnetically controlled type wheel.

1,086,069. Safety Appliance for Railway Cars. C. M. Mock and A. U. Gerber, Chicago, Ill. Electromagnetically operated valve for an air-brake system.

1,086,072. System and Apparatus for Electrically Selecting and Controlling a Number of Elements from a Distant Point. N. H. Morrison, Meredith, N. H. Includes separate and group conductors and switches for units, tens and hundreds.

1,086,079. Method of Maintaining the Efficiency of Brass-Pickling Solutions. R. R. Parish, assignor to Chase Rolling Mill Co., Waterbury, Conn. Consists in providing continuous circulation of the unspent solution through an electrolyzing tank whereby a continuous electrolysis of the solution is maintained.

1,086,080. Snap Socket Shell. C. D. Platt, assignor to H. D. Sears, Boston, Mass. Special means for locking the shell and cap of a lamp socket.

1,086,083. Electric Bell. H. E. Reeve, New York, N. Y. Covers details of construction.

1,086,088. Manufacture of Filaments for Tungsten Lamps. G. P. Scholl, assignor to Westinghouse Lamp Co. Consists in making a paste of metallic tungsten and casein, forming filaments therefrom, and passing current through the filaments while in an atmosphere containing hydrogen.

1,086,096. Field-Coil Support. C. W. Starker, assignor to Westinghouse Electirc & Mfg. Co. Has spring grids between the coils and yoke.

1,086,101. Means for Transforming Electrical Energy. E. Weintraub, assignor to General Electric Co. A mercury-vapor lamp with an auxiliary or starting electrode containing graphite and clay.

1,086,102. Method of Transforming Electrical Energy. E. Weintraub, assignor to General Electric Co. The method of securing stable operation of a mercury-arc lamp consists in supplementing the production of vapor by locally generating ionized vapor.

1,086,103. Electric Lamp. E. Weintraub, assignor to General Electric Co. Has a mercury cathode and a co-operating anode of graphite.

1,086,104. Producing Light by Electricity. E. Weintraub, assignor to General Electric Co. A modification of the above.

1,086,105. Vapor Electric Apparatus and Method of Operating the Same. E. Weintraub, assignor to General Electric Co. The lamp is started by ionizing the residual mercury vapor through an initial discharge between a solid auxiliary anode and the mercury cathode.

1,086,106. Vapor Electric Apparatus. E. Weintraub, assignor to General Electric Co. A mercury-arc rectifier has its anodes protected in partly isolated chambers.

1,086,107. Electric Lamp. E. Weintraub, assignor to General Electric Co. An electromagnet is provided to tip the tube and start the mercury arc.

1,086,109. Rheostat. N. Wilkinson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. A liquid rheostat with movable barriers between the electrodes to vary the resistance.

1,086,132. Process for the Industrial Manufacture of Electrolytic Iron. A. Boucher, assignor to Société "Le Fer," Societe Anonyme, Grenoble, France. A step in the process consists in regulating access of air to the electrolyte to produce sufficient basic iron salts to effect the depolarization of the cathode.

1,086,147. Electrical Connection for Telephones and the Like. J. A. Douglas, Waterloo, Iowa, assignor of one-fourth to A. O. Goff. For readily connecting a removable wall set to stationary circuit terminals.

1,086,164. Electric Furnace. B. Guthrie and J. P. Karch, assignors to C. P. Carpenter, Pittsburgh, Pa. The electrodes are of a shape and so located as to almost completely encircle the crucible.

1,086,165. Electric Heating and Cooking Device. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Mfg. Co. The heating element consists of a plaited resistance ribbon and notched insulating strips fitted into the plaits.

1,086,171. Process of Treating Incandescent-Lamp Filaments. R. H. Henderson, assignor to Westinghouse Lamp Co. Consists in applying to a metal filament an excess current in an atmosphere of phosphorus.

1,086,185. Vapor Electric Apparatus. O. O. Kruh, assignor to General Electric Co. A mercury-arc rectifier with an insulating shield for each of the anodes.

1,086,186. Vapor Electric Device. O. O. Kruh, assignor to General Electric Co. Has a baffle plate between the anode shields.

1,086,196. Electric Whistle-Blowing Apparatus. E. C. McCaffrey, Burlington, Vt. A normally closed circuit has a solenoid arrangement to open it and sound the alarm.

1,086,234. Automobile Signal. W. I. Smith, Silverlake, Ind. A lamp socket and lamp are held in a U-shaped section of a rotatable shaft in a cylinder.

1,086,249. Electric Switch and Locking Means Therefor. R. H. Vickers, Fayetteville, Ark. A push-bar lamp-socket switch.

1,086,278. Car-Feeding Device for Tunnel Furnaces. A. H. Cowles, Sewaren, N. J., assignor to Electric Smelting & Aluminum Co. Electrically controlled and motor driven.

1,086,300. Rectifying Apparatus. C. A. Kraus, Newton Highlands, Mass. Includes two transformers, two reactances and two mercury-arc rectifiers which are cross-connected.

1,086,301. Means for Operating Street and Station Annunciators for Cars. T. G. Leavell, Spokane, Wash. Spaced contacts on the trolley wire act on an arm on the trolley pole of the car.

1,086,303. Headlight. W. T. Moran, Quincy, Mass. The lamp socket can be withdrawn from the reflector against the force of a spiral spring.

1,086,311. Electric Arc Lamp for Searchlights, Projectors, and the Like. H. Beck, Meiningen, Germany. The method of operating consists in employing a high current density to produce a tongue in the negative flame and deflecting the tongue away from the center of the positive electrode by a jet of gas.

1,086,327. Spark Plug. M. G. Kopf, assignor to McCormick Mfg. Co., Dayton, O. Covers details.

1,086,334. Tracker Bar. L. M. Sanders, assignor to G. H. Davis, West Orange, N. J. A metallic reed over each air duct governs an electric circuit including the musical instrument.

1,086,338. Insulating Lining. C. L. Sherman, Philadelphia, Pa. For an incandescent lamp socket.

Patents Expired.

The following United States electrical patents expired February 9, 1914:

576,545. Apparatus for Electrically Heating Metal. G. D. Burton, Boston, Mass.

576,551. Telephone Transmitter. M. E. Clark and E. C. Clark, Minneapolis, Minn.

576,577. Telephone System. A. S. Hibbard, Chicago, Ill.

576,621. Electric Switch. M. Schalscha, Hoboken, N. J.

576,622. Electric Locomotive and Railway System Therefor. M. Schalscha.

576,683. Controlling Mechanism for Projectors. J. MacHaffie and E. F. G. H. Faure, Schenectady, N. Y.

576,710. Ventilated Fuse-Plug for Electric Circuits. H. C. Wirt, Schenectady, N. Y.

576,720. Galvanic Battery. H. J. Brewer, New York, N. Y.

576,721. Trolley System. W. G. Caffrey, Reno, Nev.

576,732. Electrical Regulating Device. J. F. Kelly, Pittsfield, Mass.

576,766. Electric Heating Apparatus. A. Robertson, Taunton, Mass.

576,802. Electric Arc Lamp. H. Baurlin, Aarburg, Switzerland.

576,804. Telephone Apparatus. C. E. Buell, North Plainfield, N. J.

576,813. Telephone Transmitter. J. F. Gilliland, Adrian, Mich.

576,933. Electric Lighting for Vehicles. J. A. Ageron, Paris, France.

576,936. Battery. F. B. Badt, Chicago, Ill.

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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THE PRACTICAL TREATMENT OF WORKING CAPITAL.

In proceedings before public-utility commissions, the treatment of working capital is often of much importance. In rate cases it frequently is necessary to explain to the regulating board how the working capital allowance of the operating company is derived, in order that the commission may pass intelligently upon the return to be permitted upon this component of the total investment in the property. Specific discussions of this topic are helpful, and one of the most fruitful which has lately come to hand is that of the New England Telephone & Telegraph Company before the Vermont Public Service Commission in connection with a pending rate case.

In the case of the New England Company the amount of working capital which should be apportioned to its Vermont business had to be a matter of estimate. The auditor estimated the working capital in Vermont in proportion to the value of the plant of the company in that state as compared to the total plant value.

Additional light was thrown upon this question by Mr. William J. Hagenah, a well known expert testifying on behalf of the company. Mr. Hagenah stated that in order to determine the proper amount of working capital in such a plant, he would make an examination of the company's balance sheets over a series of years to determine the amount invested in materials and supplies, which he considers a liquid asset, the amount of cash ordinarily carried and required in the business, the amount of the accounts and bills receivable, and the accounts and bills payable. Ordinarily the net working capital is the excess of the current assets over the current liabilities, although that again would be a subject of further study as to local conditions. The witness stated that the allowance for working capital in public-utility cases, including material and supplies, can be arrived at roughly as 25 per cent of the gross earnings in one year, or, say, five per cent of the appraised replacement value of the property. It is suggestive that the Nebraska State Railway Commission has in a recent case allowed six per cent of the reproductive value for supplies and working capital.

The thoroughness with which the Vermont company was able to explain its figures is worth emulating in other branches of public-utility service. These matters are obviously closely allied to the more technical duties of the accountant, but are problems with which a public-utility manager has to deal. They are important, and it is worth bearing in mind that it is just as essential in a rate case to present to a commission a correct total of the investment upon which returns are to be earned as it is to hunt down elusive heat units in the steam piping and boiler gas passages in the attempt to save money in fuel outlays.

MAXIMUM DEMAND AND THE COOKING LOAD.

At the last meeting of the Point Fives, a club of English central-station managers whose meter charge is 0.5 penny or one cent per kilowatt-hour, an interesting discussion took place regarding the basis upon which the additional or demand charge should be scheduled. The paper of the evening by Mr. A. H. Seabrook was an advocacy of a system unknown in this country but prevailing to a wide extent in England. In this system the fixed payment is proportioned to the assessed valuation of the residence which is supplied and it is advocated mainly on account of its simplicity and the fact that no instrument is required, as in the case when the maximum demand is actually measured. The system is easily understood by all and is regarded as involving an element of reasonableness in that the amount of lighting load will bear some rough relation to the value of the property lighted. This system is not applied to offices, stores, factories or other business properties.

While such a system is of interest there are several reasons why it is not likely to be ever introduced in this country. Its attainment of the desired end does not compare in accuracy with a measurement of the demand, nor even with an ascertainment by inspection of the connected load. The measurement of cubical contents or of floor area to be lighted would seem much more equitable, and assessed value has the single advantage that the premises need not be visited in order to determine the charge. In this country assessed valuations are too erratic and unequal to form a basis for any kind of charge except taxes, as it is in only a comparatively few cities, such as Cleveland, O., and Houston, Tex., that values have been assessed on any systematic basis which insures a reasonably definite relation to the actual value. Moreover, our whole tendency is towards systems of rates based upon the cost of service and such a rough approximation to actual demand costs has little to recommend it.

One of the most interesting points that came up in the discussion of this paper was in connection with the effect upon maximum demand of adding a cooking load to an already existent lighting load. It must be remembered that the members of this club are all interested in the development of cooking and other heating loads. One of the members raised the point that in encouraging a heavy cooking load the maximum demand might be largely increased, owing to the overlapping of the two peaks. Mr. Seabrook replied that this fear arose from lack of experience with cooking load and instanced a plant having a 60-kilowatt lighting load, to whose lines a cooking load of about 75 kilowatts was connected. The combined maximum demand was not large enough to require any increase in the capacity of the plant, indicating a large diversity of load.

Another point brought out was that under a system of rates where the energy charge is so small it was becoming common to have an all-night heating load in residences during periods of cold weather.

DISTINCTIVE ADVERTISING BY CENTRAL STATIONS.

As central-station managers realize the possibilities of advertising along originaal lines which pertain especially to the field of applied electricity, the industry is bound to witness a great expansion in this kind of activity. The opportunities are literally innumerable, and in many cases may be turned to account at a nominal cost. In a representative case a central station which used to have a reputation for extreme conservatism took up the question of distinctive advertising within its own organization, and the results have many times repaid the time and trouble involved in preparing displays. The company's campaigns to arouse popular interest have been conducted along the usual newspaper lines, but in addition, the show-window spaces at the main office have been featured with more than ordinary ability, and the kind of displays exhibited from time to time deserve comment.

One of the most effective demonstrations was the installation of a one-thirty-second-horsepower motor and a 36-inch pulley, the two being connected by a single piece of looped twine. The pulley was of the ball-bearing type and was easily started by throwing the motor switch. A small groove cut in the face kept the cord in place and suitable placards set beside the apparatus emphasized the efficiency of the electric drive. Now to an engineer, this display was ridiculously simple, appealing to kindergarten standards of technical intelligence; but it caught the passing crowd's attention, drove home a lesson regarding the cleanliness, compactness and effectiveness of the individual motor, and cost next to nothing to operate continuously—probably not greater than a half cent a day.

Another exhibit which appealed to the public was a transparency showing how the principal street of the city would look when illuminated by a proposed "White Way" lighting installation. In this case the actual view happened to be taken in another town, but the street section selected closely resembled the thoroughfare in front of the company's office and gave an excellent idea to the public of the quality of illumination resulting from the close spacing of magnetite lamps on the sidewalks. Here again, the cost of operation was small, three or four 25-watt tungsten lamps sufficing, when placed behind the transparency in a light-proof box with a few holes in the sides to provide for ventilation. The company also showed a single ornamental luminous arc lamp in its windows in the form of a drawing on transparent paper set into a box in which were a couple of 25-watt lamps which threw the accepted standard into prominence on the screen and beautifully demonstrated the type of individual street-lighting unit later adopted by the city fathers.

A more elaborate but comparatively inexpensive display consisted of a model central-station system, showing the various steps in energy transformation between the coal pile and the consumer's lamp. The actual transformations were not attempted, but by connecting toy boilers, engines, generators and motors in appropriate sequence, including a miniature pole line with tiny street lamps run off the office circuit, an excellent exhibit resulted. The small motors were arranged to drive toy woodworking machinery and the attention that the display received surpassed all expectations. Another central station in the same territory carried out this scheme a little further by building a model motor-driven machine shop some 4 feet long and 30 inches high, in which the flexibility of the group drive could be demonstrated with striking effect. This exhibit has been much in demand at "Merchants' Weeks," fairs, home-coming weeks, Chamber of Commerce displays and other occasions of local importance.

With the co-operation of manufacturers of motor-driven machine specialties it ought to be easy to get up a new display every fortnight based on the application of the motor drive to some particular industry. Experience indicates that a single machine properly placarded and equipped for actual movement before the public eyes may be fully as effective as a complex and multiplied form of demonstration.

In like manner, there is a broad field for the display of lighting specialties in distinctive central-station publicity. The local art museum may be considering the adoption of special reflecting apparatus, or a shop in which the community takes pride may have improved the lighting of some department. The display of representative photographs or sample equipment units associated with these newsy changes represents the acme of effective publicity. On every central-station system except the smallest there are today in operation numerous devices which are more than adaptable to window featuring, and at a cost far below their usefulness to the company having the foresight to turn these things to account. In brief, the distinctive advertising of the modern central station should be an indication of its progress so far as the newspaper displays go, and a moving picture of its development and increasing usefulness to the community in the office-window branch of its publicity campaign.

TRANSFORMER RATIO AND REGULATION.

The fact that the ratio of a potential transformer is somewhat affected by the magnitude of the exciting current as well as by the load current is probably responsible for the circumstance that a formula for regulation which involved the exciting current was in extensive use a few years ago. In an article published in this journal in the issue of August 7, 1909, it was conclusively shown that exciting current has no appreciable effect upon the value of the regulation. This work has been followed up at the Bureau of Standards and another contribution is published in this issue by Messrs. Agnew and Silsbee, which should leave no doubt in anyone's mind that the formulas given correctly represent the values of the regulation as well as those of the ratio and phase angle.

These formulas give the above quantities in terms of the readings which can be obtained by a short-circuit test and upon open circuit These are the readings usually taken in a transformer test and represent a method much more convenient than that of actually loading the transformer. It is the customary commercial method. The object of this paper is to show that the results obtained from computation based upon such readings are justified. The experimental results given by the authors demonstrate this for the particular transformers which were tested, but it might perhaps be of value to carry out similar measurements upon widely different types and sizes of transformers in order to show whether any limitations must be put upon the formulas in practical use. The laboratories of manufacturers having the necessary facilities might well investigate this point.

In this connection it should be remembered that the regulation of a potential transformer is the ratio of the rise of secondary terminal voltage from rated non-inductive load to no load (at constant primary impressed terminal voltage) to the secondary terminal voltage at rated load. A transformer is rated in terms of its output, so that full load represents the delivery from the secondary of rated wattage or current at rated secondary voltage. When the voltage rating is stated in terms of the primary there may be some question as to the exact value which should be taken for the secondary voltage, but when the secondary voltage is stated this doubt should not arise. On account of the voltage drop in the windings of the transformer, a slightly different voltage must be applied to the primary to give secondary rated voltage at no load and at full load. According to the Standardization Rules of the American Institute of Electrical Engineers, rated load is determined as above stated and regulation should be based upon whatever primary voltage is necessary to give the rated conditions at the secondary terminals. The change in secondary voltage when the primary impressed voltage is kept constant determines the regulation.

Jovian Meeting in Chicago.

M. R. Lash, with M. B. Austin & Company, Chicago, was the speaker at the meeting of the Jovian League of Chicago, on February 16. Mr. Lash first called upon Jovians who travel to practice co-operation by commenting on street lighting, or the lack of it, when visiting a city and thus show the citizens that the present system, if modern, is attracting attention, or if lacking, that this fact is noticeable to the stranger.

Speaking of street-lighting installations, Mr. Lash called attention to the various underground transmission systems used, comparing these with steel-tape cable which, he claimed, is much less expensive—both in first cost and maintenance—is easy and inexpensive to install and is suitable for any type of installation. To install this cable it is simply necessary to dig a suitable trench and lay the cable, no extra protection being necessary. It is not affected by moisture and in no case has trouble from electrolysis been encountered.

Following the address of Mr. Lash, Chairman Niesz presented a set of resolutions which provided for the discontinuance of the weekly meetings and consolidating with the Chicago Electric Club, providing the latter accepted the resolutions. The Jovians voted unanimously in favor of the merger and the matter will now be taken up by the Electric Club.

Pittsburgh Section Banquet.

The annual banquet of the Pittsburgh Section of the American Institute of Electrical Engineers was held at the Fort Pitt Hotel, Pittsburgh, Pa., on Saturday evening, February 14, over 300 members and guests being present.

C. O. Mailloux, president of the Institute, was guest of honor. A. M. Dudley, chairman of the local section, made a brief welcoming address and introduced the toastmaster, S. M. Kintner. The first speaker, Mr. Mailloux, responding to a toast "The Institute," spoke of the Institute as performing a great service to humanity by educating the general public along electrical lines, and by breaking up the cliques which formerly existed among electrical workers.

P. M. Lincoln, discussing "Rates," pointed out the unreasonableness of the popular demand for house service at the same rates that are given to factories. L. M. Davidson, superintendent of Pittsburgh schools, responding to "The Making of an Engineer," pleaded for co-operation between the American Institute and kindred organizations, and the public schools in the training of good citizens. George P. Early, of the American Sheet and Tin Plate Company, responded to "Stomatology."

New York Electrical Society.

On the invitation of the United Electric Light and Power Company the New York Electrical Society will hold its 326th meeting at the new 201st Street generating station of the Company, on Friday, February 27, at 8 p. m.

Frank W. Smith, vice-president of the Company, will give a brief review of the history of the Company and the development of alternating-current supply in this city.

H. W. Leech, electrical superintendent, will give an illustration description of the station.

Following the meeting the station will be inspected, the company providing special guides for that purpose.

The premises may be easily reached from the Dyckman Street Station of the Broadway subway.

Change of Date of I. E. C. Dinner-Dance.

Announcement is made of the interchange of the dates of the International Electrical Congress publicity meeting and the Congress dinner-dance to be held during the midwinter convention of the American Institute of Electrical Engineers at New York City next week. According to the revised program the publicity meeting will be held in the auditorium of the Engineering Societies Building on Wednesday evening, February 25. On Thursday evening, February 26, the I. E. C. dinner-dance will be held at the Hotel Biltmore.

Oklahoma Telephone Meeting.

At the annual meeting of the Oklahoma Telephone Association held last week at Oklahoma City, Horace Trumen, of Geary, was elected president; L. T. Hine of Purcell, vice-president; and Frank McGuire of Broken Arrow, secretary and treasurer. Addresses were made by L. T. Hine on "Government Ownership;" by W. J. Steele on "Why Two Associations?" and by G. W. Hardwick on "Construction."

Westinghouse Dinner.

The Westinghouse Progress Club had a dinner at McCreery's, Pittsburgh, on February 14.

Congressman M. Clyde Kelly spoke on "Ideals of Progress." Other speakers were President E. M. Herr and J. J. Jackson, of the Westinghouse Electric & Manufacturing Company. The toastmaster was R. L. Wilson, superintendent of the Railways Department.

Minnesota State Association Meeting.

The annual convention of the Minnesota Electrical Association will be held at Minneapolis on March 18, 19 and 20.

Empire Association Meeting.

A joint meeting of the Empire State Gas & Electric Association and the Eastern New York Section of the National Electric Light Association was held at Schenectady, N. Y., on February 6 and 7.

At the session on Friday morning William McClellan presented a discussion of various matters affecting public opinion with respect to gas and electric companies. He referred to (1) the necessity of maintaining intimate relations with the public, by having all officers easily accessible and the offices of the company surrounded by an atmosphere of welcome; (2) the necessity of giving all employees of the company as much authority as is safe to make adjustments and handle complaints and other business with consumers; (3) the necessity of considering all employees as company outposts in the community, recognizing that they are easily accessible to many citizens whom they meet in business, in recreation and at home; (4) the responsibility of the company to be a good citizen in public welfare work and the desirability of contributions to public institutions, etc.; (5) the subtle but powerful influence resulting from cordial and frank action of the company in connection with all legislation directly affecting it or indirectly affecting it through the community; (6) advertising might also be added in connection with the discussion on public opinion but this is such a large and special subject it should only be referred to in such a meeting as this; (7) the necessity of prompt and adequate settlement of complaints; (8) the effect of a thoroughly systematic set of rate schedules capable of explanation to the consumer and giving the least opportunity for the charge of discrimination.

Lunch was served at the Mohawk Golf Club. At the afternoon session C. W. Stone spoke on "Commercial Aspects of New Lamp Development with a Retrospect as to the Effect of the Mazda Lamp on Central-Station Revenues." C. H. B. Chapin made a report on the calorimeter situation. Dinner was also held at the Mohawk Club.

On Saturday morning visits were made to the works of the American Locomotive Company, the General Electric Company and the Mohawk Gas Company.

Ohio State Convention.

The annual convention of the Ohio Electric Light Association will be held at Cedar Point, O., on July 21, 22, 23 and 24. There will be no exhibits at the convention this year and the afternoon entertainment will be superseded by sessions of the convention. The usual evening entertainments will be repeated.

Electricity in Glove Manufacturing.

Cleanliness and reliability are two of the most important requirements of power transmission in glove factories. Electric motor drive with central-station power successfully meet these requirements and in addition make possible a greater production with the present labor and equipment, due to the better speed characteristics of motor-driven machines. Data are given in this article concerning several typical plants purchasing power.

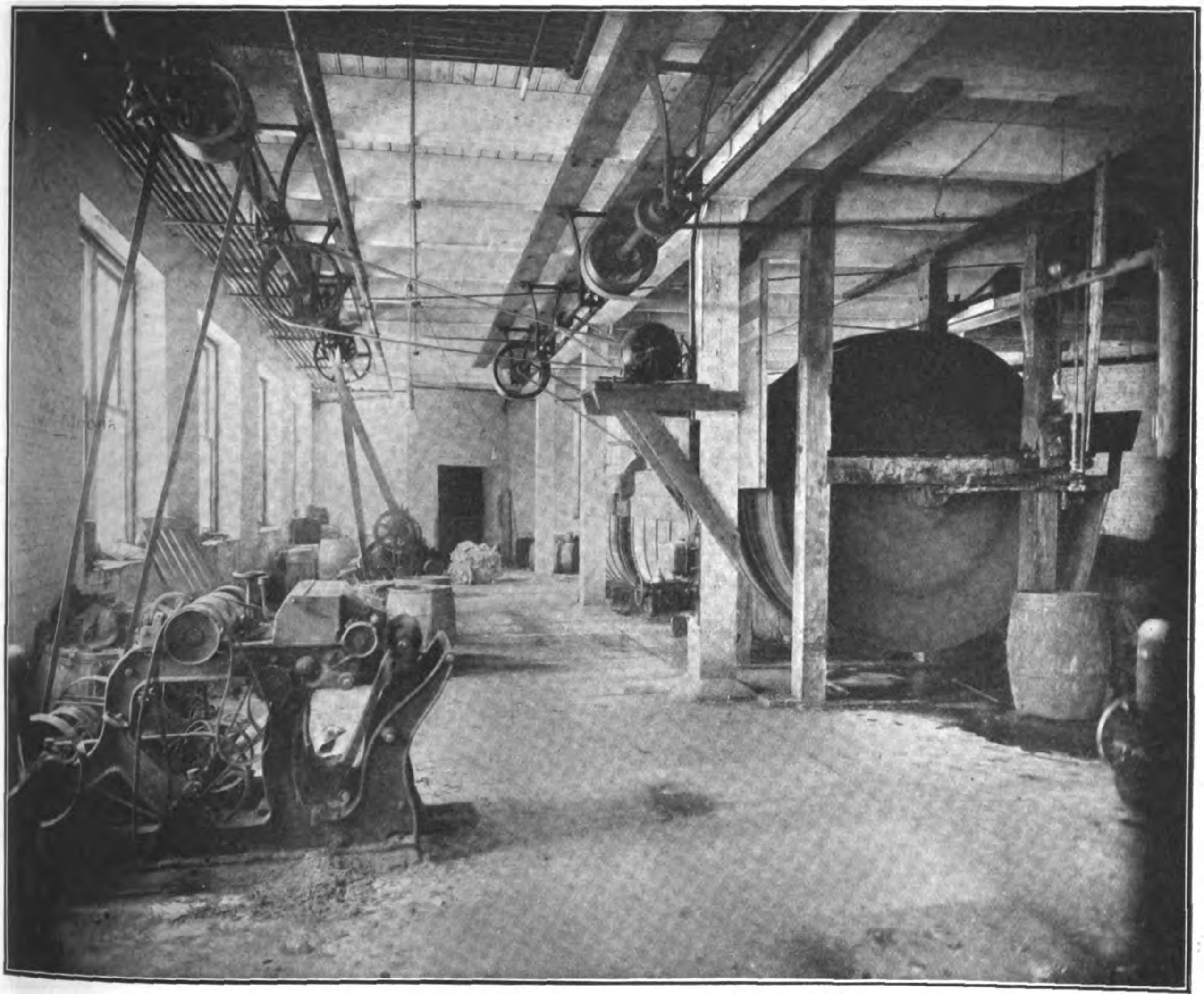
The two most important requirements of power transmission in glove factories are cleanliness and reliability. The importance of cleanliness is readily appreciated by those manufacturers who have changed from the mechanical to electric drive and have been in a position to observe the savings. In plants employing steam-engine drive considerable dirt and grease are thrown about by the belts and pulleys and the amount of goods damaged in this way is by no means a negligible item chargeable to mechanical drive. This is true even when liberal use is made of drip pans under hangers.

In regard to reliability it is evident that since the payroll is one of the largest items in the cost of glove manufacturing the chance of accident should be reduced to a minimum. With a private plant the production of power while an important matter, is a side issue and as such cannot receive as much attention as if it were the sole reason for being in business. The reliability of the power supply is thereby impaired.

The failure of any part in the power plant may cause a complete shut-down for a more or less extended period. The reliability of the supply is largely dependent upon the efficiency and foresight of the engineer.

A shut-down in an isolated plant is liable to be prolonged by inferior facilities available to the operators, their own small number and lesser ability to cope with emergencies. Shut-downs are expensive in glove factories, for even though a part of the payroll may stop with the machinery, as when the girls are on piece work, still the production has been curtailed by an amount proportional to the duration of the shut-down. The investment charges go on whether the machines are running or not.

On the other hand, the production and marketing of power is the sole reason for the existence of the central station, consequently every effort is made by the management to improve the service in every possible detail. There is, however, no possible chance for a complete shut-down due to an accident to any machine as there is always a spare unit available.



Group of Staking Machines and Scourers in Tanning Department of Glove Factory.

Another of the important advantages of electric motor drive in glove factories, when central-station power is used, is the increased production with the present equipment and labor. This is due principally to the uniform speed of motor-driven machines, whether driven by individual motors or in small groups.

A reciprocating steam engine seems to give a steady speed when a speed indicator of the usual type is applied to its shaft. The rapid variations in angular velocity due to the change from linear to rotating motion, while too rapid to be seen, are usually great enough to cause wastage and to unduly shorten the useful life of shoe machinery.

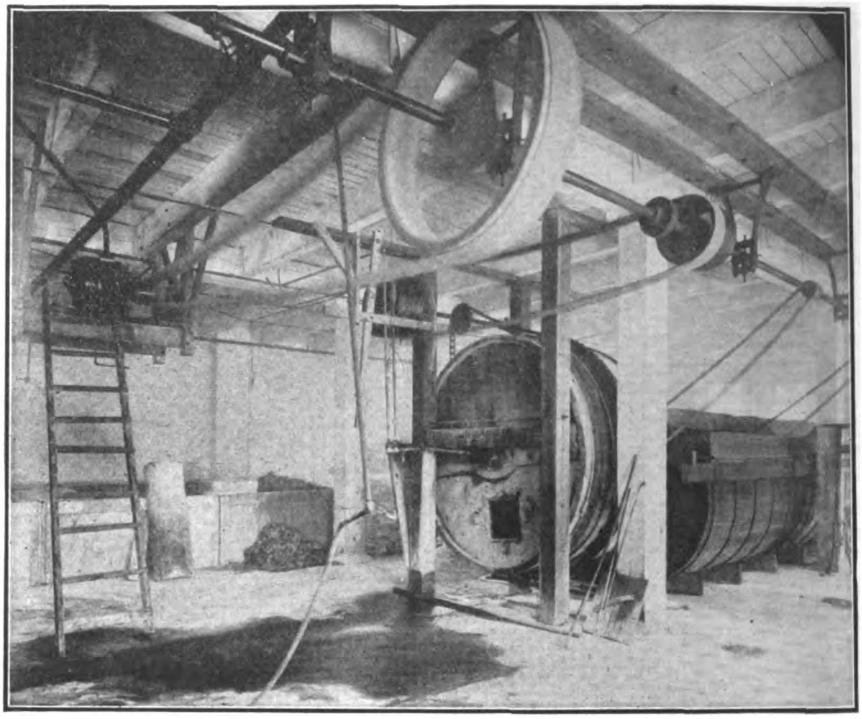
A long shaft driven by reciprocating engines often shows 10 per cent speed variation at the end farthest from the prime mover. This variation is caused by the initial unsteadiness of the prime mover, accentuated by the slipping and crowning of belts partly due to glazed spots and by the jerks of the machines themselves.

The steadiness of electric drive with their constant angular velocity, increases the useful life of the driven machinery and greatly reduces wastage.

The slipping of belts between engine and driven machine frequently results in 10 to 20 per cent loss of speed to the latter. With group electric drive the number of belts and shafts is greatly reduced, while with individual-motor drive they are entirely eliminated and each machine is kept up to its maximum productive speed at all times.

Also, a careful study of the manufacturing process often suggests a much better arrangement of the machinery. The proper machine layout, only possible with electric drive, means a minimum handling of material with the maximum facility for rapid work. It is often found that certain machines retard the entire factory output. Obsolete or worn-out machines should be discarded and replaced by modern machines of ample capacity. The addition of a machine or employee in a process which is limiting the factory output will generally increase the output. The substitution of modern machinery to perform these processes carried on by hand not only lowers the cost of production, but also increases the output.

Glove manufacturing inherently requires small amounts of power spread over a comparatively large floor area. On account of the better light, those processes requiring power are usually located on the upper floors. If mechanical drive is used it must of necessity be complicated and uneconomical.



Motor Driving Washing Drums.

Factory Layout.

Maximum output at minimum cost is the goal toward which the manufacturer is ever working. The best possible routing of material and of the partly finished garment, combined with making the best possible use of the available daylight, are very important factors in increasing efficiency. If the building is long and narrow, the sewing-machine tables should be located parallel and as near to the building walls as possible. The sewing tables, where work of an exacting nature is done, should also be similarly located. The less exacting work should be located in the middle of the building. If the building is broad and well lighted by daylight, it is often advantageous to place the sewing-machine tables, as well as those tables on which the best light is required, at right angles or at the most desirable angle to the building walls. This angle will depend somewhat on the size and spacing of the windows and should be determined by experiment. The length of these tables will usually be limited by the amount of daylight obtainable on the inside ends of the tables. White oil-painted walls and ceilings increase the amount of effective light. Those processes which do not require so much light should be carried on in the center of the floor.

The tables in the cutting rooms are generally placed at right angles to the building walls. As the cutters stand at their work and work from both

Group of Motor-Driven Sewing Machines.

Glove Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

The Ross-Sellinger Company, Sheboygan, Wis. This company manufactures a complete line of leather gloves of all varieties. The average daily output is 400 dozen pairs. There are 100 men and 200 girls employed, working 9 hours per day.

Total connected horsepower, 40. Total number of motors installed, 11. Average kilowatt-hours per month, 2,379. Average kilowatt-hours per month per horsepower connected, 59.4.

Kilowatt-hour consumption for 12 months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,000	May	1,920	September	2,540
February	2,760	June	2,510	October	2,570
March	1,620	July	2,050	November	2,880
April	2,650	August	2,420	December	2,630

Load-factor, 19 per cent; operating-time load-factor, 25.4 per cent.

The approximate electrical energy consumption per 100 dozen gloves manufactured is 22.8 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,800	Belted to line shaft driving 108 sewing machines (Singer and Wheeler & Wilson).
1	5	1,800	Belted to line shaft driving 44 sewing machines.
1	5	1,200	Belted direct to mechanism of freight elevator.
1	3	1,800	Belted to short line shaft driving machine-shop equipment.
1	5	1,800	Belted to line shaft driving 60 sewing machines.
1	3	1,800	Belted direct to special emery wheel for smoothing hides.
1	3	1,800	Belted direct to a Seelye Manufacturing Company 46-inch cloth press.
1	1	1,800	Belted to direct-current generator for supplying energy to a hand cutting machine.
1	2	1,800	Belted direct to a Seelye Manufacturing Company 66-inch cloth press.
1	2	1,800	Belted direct to a Seelye Manufacturing Company 48-inch cloth press.
1	1	1,800	Belted direct to a buffing machine for polishing and finishing gloves.

Glove manufacturing plant located in Wisconsin. Plant operates 48 hours per week. The output varies, the product being leather and canvas driving and work gloves principally.

Total connected horsepower, 5. Total number of motors installed, 2. Average kilowatt-hours per month, 482. Average kilowatt-hours per month per connected horsepower, 96.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	668	May	700	September	198
February	717	June	642	October	13
March	624	July	590	November	50
April	720	August	796	December	67

Load-factor, 17.6 per cent; operating-time load-factor, 46.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is single-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	3	1,800	Belted to 10-foot line shaft driving one four-blade staker, one Vaughn leather measuring machine; one cutting press, for cutting glove linings; and 14 sewing machines.
1	2	1,800	Belted to line shafting driving 36 machines of Wheeler & Wilson make such as sewing machines, binders and silkers.

Small glove factory, located in Chicago making cloth and canvas work gloves and mittens. Plant operates 60 hours per week.

Total connected horsepower, 7.5. One motor is installed. Average kilowatt-hours per month, 354. Average kilowatt-hours per month per connected horsepower, 48.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	297	May	489	September	304
February	390	June	431	October	218
March	397	July	360	November	301
April	400	August	388	December	281

Load-factor, 8.6 per cent; operating-time load-factor, 18.2 per cent.

MOTOR INSTALLATION.

The following is a record of the motor installation. The supply source is three-phase, 60 cycles, 220 volts:

No.	Horse-power	Speed R. P. M.	Application.
1	7.5	1,200	Belted to line shafting driving one 46-inch cloth press; one 66-inch cloth press; and 48 Wheeler & Wilson and Singer machines of various descriptions.

Glove-Manufacturing Data—Sheet No. 2.

Richard Evans & Sons, Gloverville, N. Y. This plant manufactures gloves on a large scale making principally heavy buckskin working gloves, automobile gauntlets and various other styles in cheaper quality sheepskin leather. The average daily output is 300 dozen pairs of gloves. There are 350 men and girls employed working 10 hours per day. About 500 persons work at home for the company.

Total connected horsepower, 19.5. Total number of motors installed, 7. Average kilowatt-hours per month, 1,682. Average kilowatt-hours per month perhorsepower connected, 86.5.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,751	May	1,752	September	1,721
February	1,933	June	1,739	October	1,621
March	1,583	July	1,659	November	1,653
April	1,710	August	1,576	December	1,534

Load-factor, 15.8 per cent; operating-time load-factor, 33 per cent.

The approximate electrical energy consumption per 1,000 pair of gloves manufactured is 19 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 110 volts. Energy is supplied by the Fulton County Gas & Electric Company. The motors are all of the Westinghouse squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application.
1	3	1,800	Belted to 39-foot line shaft, nine hangers, driving 20 machines such as wax-thread machines, stitchers, seamers, etc., of Singer, Curtin & Herbert and Union make.
1	3	1,700	Belted to a 40-foot line shaft, 10 hangers, and two countershafts, two hangers, driving 19 machines of Wheeler & Wilson make such as needle machines, binders and needle silkers; one eight-inch engine lathe; and one six-inch double emery wheel.
1	3	1,700	Belted to a six-foot shaft, three hangers, and then to two 50-foot shafts and a two-hanger countershaft driving 81 machines such as over-stitchers, needle silkers, binders, etc., of Wheeler & Wilson, French, and Polamateer make; one plush-wheel stand (three bearings) two wheels, 12 by 8 inches; and one United Shoe Machinery Company clicking machine, flywheel 16 inches in diameter.
1	5	1,120	Belted to a five-foot shaft, three hangers and one countershaft, two hangers, driving one Vaughn Machine Company leather splitter, two-inch blade.
1	0.5	1,720	Belted to a two-hanger shaft driving one Vaughn Machine Company leather measuring machine, driven pulley 16 inches by 2.5 inches.
1	2	1,700	Belted to a 15-foot three-hanger shaft driving two Shepard stakers, 56-inch wheel carrying four blades, 18 and 22 revolutions per minute, respectively; and one United Shoe Machinery Company clicking machine.
1	3	1,720	Belted to a two-hanger shaft driving an H. J. Anthony cutting press for cutting cotton lining for gloves.

Meyers and Company, Gloversville, N. Y. This company manufactures a high grade of kid gloves, having an average output of 400 dozen pairs per day. There are 500 employees working 10 hours per day.

Total connected horsepower, 38. Total number of motors installed, 8. Average kilowatt-hours per month, 2,440. Average kilowatt-hours per month per horsepower connected, 64.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,370	May	2,950	September	2,570
February	3,070	June	2,160	October	2,310
March	2,690	July	2,270	November	2,630
April	2,770	August	2,330	December	2,230

Load-factor, 11.8 per cent; operating-time load-factor, 24.6 per cent.

The approximate electrical energy consumption per 1,000 pairs of gloves manufactured is 18.2 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase 60-cycles, 220 volts. Motors are of Westinghouse squirrel-cage induction type Energy is supplied by the Fulton County Gas & Electric Company.

No.	Horse-power	Speed R. P. M.	Application.
2	0.5	1,700	Each belted direct to one Anthony die press.
1	20	1,200	Belted to a 40-foot shaft, seven hangers, driving four buffing wheels; one finishing machine; and one Buffalo No. 5 blower.
4	3	900	Belted to line shafting driving 38 Wheeler & Wilson silkers, over-stitchers, hemmers, etc.; 48 Singer seamers, stitchers, etc.; 28 Singer and Wheeler & Wilson two, three and four-needle stitchers: and 28 Singer making-up and finishing machines.
1	5	1,200	Geared to mechanism of a one-ton freight elevator.

Three-Horsepower Motor Driving Sewing Machines.

sides of the table, it would be poor practice to place these tables parallel to the windows where those working with their backs to the windows would be standing in their own light.

Selection of Motors.

Nearly every type of machine found in a glove factory runs at constant speed. For this reason either alternating or direct-current motors can be used to advantage, although it is evident that as most of the motors in the factory are not larger than five-horsepower, the extreme simplicity of control of the induction motor is a strong point in its favor. Induction motors of less than 7.5 horsepower are started by simply closing a switch.

Sewing machines are the principal machines used in glove manufacturing. In general, where there are a number of sewing machines on somewhat similar work, group drive is preferable. Tests show that a group drive of ten sewing machines in the average factory takes one horsepower. If individually driven, each machine should be equipped with a one-sixth-horsepower motor. While the load-factor on a single sewing machine is low, the load-factor on a group-drive motor is high. This is due both to the approximately regular periods at which each machine is working and to the fly-wheel effect of the rotating parts. Group drives of from ten to thirty machines are most desirable, twenty being the average. Slow-speed motors, either alternating-current or direct-current, should be used and should be direct-connected to the shafting driving the machines. These motors should run at approximately 500 revolutions per minute. This arrangement is by far the simplest and most satisfactory.

When changing over a factory from line-shaft drive to motor drive, in case conditions demand it, motors of higher speeds can be placed under the tables and connected with short belts to the sewing-machine table shafting. Motors and belts should be properly boxed in as a guard against accident.

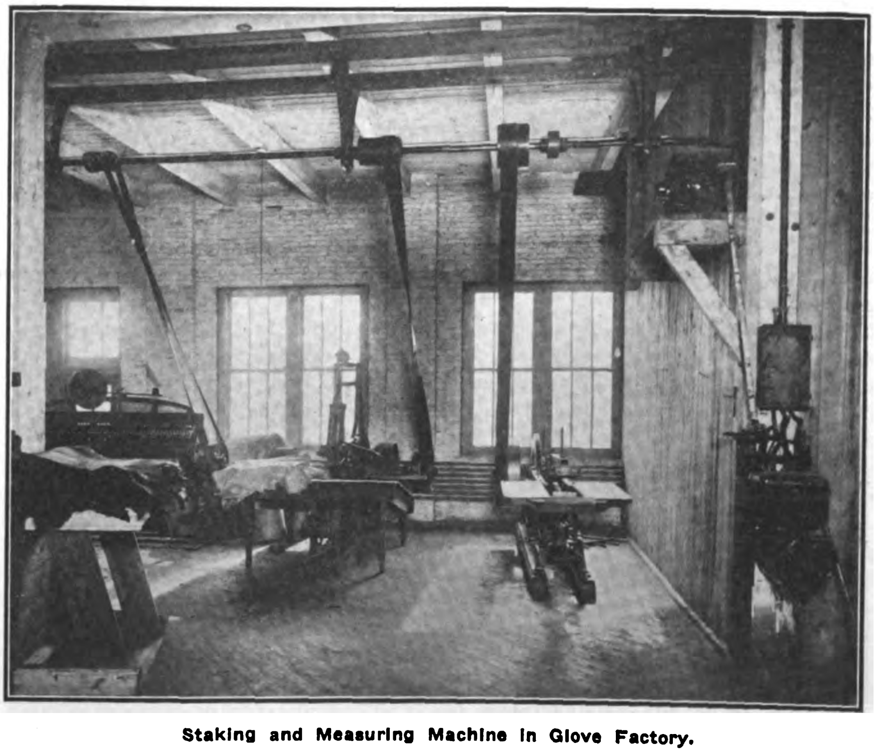
Clicking machines or dies used for cutting leather require only about 0.1 horsepower. Power presses for cutting cloth require from 0.5 to 3 horsepower depending upon the size. Direct-connected portable cutting machines are used for cutting a large number of thicknesses of cloth at one time. Some of them will cut a layer of cloth three inches thick. Their horsepower varies from one-thirtieth to one-sixth.

Lighting.

The arrangement of the machines and tables should be such as to take advantage of the daylight to the greatest extent consistent with the best routing of materials and partly finished goods. Light-colored floors and ceilings painted with white oil paint increase both the natural and artificial illumination to a surprising extent.

On account of its color value, high efficiency, and its adaptability to various conditions, the tungsten lamp has come into very general use in glove factories. With the exception of the individual lights on the sewing machines and a few of the sewing tables, the tungsten lamp has been very generally substituted for the carbon. Where individual lighting is necessary, general illumination of low intensity, with the units close to the ceiling, is very desirable.

Data on sewing-machine lighting in clothing factories were presented by H. O. Stewart in a previous issue of this journal. The conditions found to exist in clothing factories apply in a like manner to glove manufacturing plants. Sewing-machine illumination requires an intensity of approximately ten foot-candles at the needle. On account of its high intensity and the angle at which the light should strike the needle, individual lighting is generally adopted. Four or eight-candlepower lamps, equipped with concentrating me-



Staking and Measuring Machine in Glove Factory.

tallic reflectors, and either mounted rigidly on the machine frame or on a flexible arm fastened to the table, give best results. Reflectors should be so selected and placed that no light is thrown about the room. The following comparison shows strikingly, the value of proper reflectors. A bare eight-candlepower lamp suspended from a drop cord 14 inches above the table gives a 2.5-foot-candle intensity of light at the needle. The same lamp equipped with the proper reflector illuminates the needle with an intensity of ten foot-candles. The bare lamp irritates the operator's eyes as well as those of others about him and furnishes an insufficient amount of light on the work.

Sewing tables 12 feet in length are properly illuminated by two 60-watt tungsten lamps placed 4 feet above the table and equipped with intensive reflectors. This type of illumination is more economical and gives better satisfaction than individual lighting. Eight eight-candlepower carbon lamps would take more than double the power taken by two 60-watt tungsten lamps and the total maintenance cost of lamps and wiring would be much higher.

In those cutting rooms where there are a number of cutting tables placed parallel to each other and moderately close together, a single row of 60-watt tungsten lamps 10 feet apart over each table will furnish ample illumination. The lamps should be 4 feet above the tables and equipped with extensive reflectors. With this layout, the illumination from a row of lamps over a particular table supplies a considerable amount of illumination to the tables on both sides of it, thereby diminishing the intensity of the shadows caused by reason of the cutter bending over his work.

Should it be desired to use only one table, it will be necessary to use the row of lamps on each side of it as well as that over the table. If the tables are not located as indicated above, or where but one table will be used at a time, two rows of 60-watt tungsten lamps should be placed over each table, each row being over the edge of the table. The lamps should be 8 feet apart, 4 feet above the table and equipped with extensive reflectors. This layout will insure ample illumination without shadows.

Commercial Practice
Management, Rates, New Business

Commonwealth Edison Makes Modifications in Battery-Charging Rate.

The Commonwealth Edison Company, Chicago, through George H. Jones, power engineer, announces a number of important modifications in regard to conditions under which the company furnishes electric service for vehicle charging. These changes, which become effective at once, are as follows:

(1) The maximum price for current used in public garages for charging storage batteries has been reduced from 5 to 4 cents per kilowatt-hour, with the stipulation that no charging be done between the hours of 4:00 p. m. and 8:30 p.m., during the standard "peak" months.

(2) The "peak" months have been reduced to four, viz: November, December, January and February, the "peak" hours during these months being from 4:00 p. m. to 8:30 p. m. on every day excepting Sundays. This permits charging to be done between 4:00 p. m. and 8:30 p. m. on Sundays, without the usual "peak" demand charges being made.

(3) The current used during the "off-peak" period will be billed monthly instead of on the yearly basis, which will make a considerable reduction in large garages where the maximum demand may vary considerably from month to month.

(4) The company is at the present time arranging to install in several of its substations in the outlying districts, facilities for giving a boosting charge of 200 amperes. This is of importance to those interested in the use of large trucks.

It is believed by the company that the changes will give impetus to electric-vehicle development in Chicago.

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New-Business Meeting in Toledo.

A meeting of the Committee on New Business Co-operations of the Ohio Electric Light Association will be held on Wednesday, February 25, 1914, at Toledo, Ohio.

This Committee decided at its first meeting that because of the fact that practically 90 per cent of the central-station member companies of the Association operated in small cities and other companies were more or less active in the work of the National Electric Light Association that their work should be of such a nature to assist the companies operating in the smaller communities entirely. Believing also that the central stations would be benefited by securing the co-operation of the electrical contractors through suggesting ways and means whereby his business could be increased as well as the central stations, the committee after a considerable thought, arranged the following program:

Paper by H. E. Bonner, manager new-business department Citizens Gas & Electric Company, Elyria, Ohio, entitled, "Plans for Securing New Business in Small Cities."

Paper by N. H. Boynton, National Quality Lamp Division General Electric Company, Cleveland, Ohio, entitled, "How the Electrical Manufacturer is Prepared to Assist the Electrical Contractor in Large or Small Cities and Suggestions Whereby Through the Co-operation of the Electrical Contractor and Central Station New Business Can Be Secured."

Paper by E. L. Callahan, new-business manager, H. M. Byllesby & Company, Chicago, Ill., "Suggestions to Assist Central-Station Salesmen to Secure New Business."

Invitations are being sent out to all the member companies in Ohio with the appeal that they will send to Toledo for the day the men that are responsible for the securing of new business. The member companies are in turn asked to extend the invitation to the electrical contractors in their community and to secure their attendance if possible.

Any person deciding to attend is requested to notify the chairman of the Committee, Thomas F. Kelly, sales manager of the Dayton Power & Light Company, Dayton, Ohio, by February 23 if possible.

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Utilities in China.

At the present time only four cities in the extensive domain of China have electric street railways. Three of these operate in British, French and Japanese settlements and only one is a native project.

ELEMENTS OF A STREET-LIGHTING CONTRACT.

By S. B. Way.

Some excellent and original provisions that should be embodied in a street-lighting contract between utility company and municipality are discussed in this paper, which was presented before a recent meeting of the Milwaukee Electrical League. Mr. Way is vice-president of the Milwaukee Electric Railway & Light Company.

The purpose of a street-lighting contract is to provide the basis on which a municipality may obtain street-lighting service upon the most favorable terms. The basis of making such contracts differs materially as between competitive conditions and conditions as they exist in this state today, under state regulation of public utilities. Under competitive conditions, the prices obtained by municipalities would depend to some extent upon what the traffic would bear, and very largely upon the ability of the municipality to establish its own street-lighting system.

Under existing conditions in this state, the prices for utility service is determined upon the basis of the cost of rendering such service by municipally or privately owned utilities, and a street-lighting contract, under conditions of utility regulation partakes of the nature of a franchise for the operation of a utility, such as a street railway, an electric lighting plant, a gas plant, etc.

It is now well recognized by economists and students of public utility affairs that the best type of franchise is one providing for indeterminate duration, but giving to the municipality or the state the right to recapture or own the utility at any time it so desires. Such franchise possesses a distinct advantage, both from the standpoint of the public and the utility over any definite term, and particularly short-term franchises.

Where the utility is operating under a franchise having a definite term, it is well recognized that the cost of service must include a reasonable allowance for the amortization of the value of the physical property over and above any allowance for ordinary depreciation. Such amortization must be of sufficient amount to equal the difference between the cost of the physical property and approximately its scrap value at the end of the term of the franchise. This is necessary because experience in negotiating for extensions to franchises which are about to expire has indicated a decided tendency to take advantage of utilities facing termination of term franchises. With an indeterminate franchise, it cannot be as successfully urged that an allowance for amortization of physical property is necessary, since the utility can be viewed as being required to operate in perpetuity.

Ideal Form of Contract Indeterminate.

From the foregoing considerations and the similarity that exists between a franchise and a contractor for municipal street lighting, it is evident that the ideal form of street-lighting contract would be one having no definite term, but providing for the supply of street-lighting service at cost and for an indefinite period, or until such time as the municipality desires to terminate the contract. The condition of termination, where service has been rendered at cost, would necessarily be that the municipality would be required to take over, at its then present value the special investment made by the utility for the purpose of carrying out the contract, or otherwise compensate the utility for the remaining value rendered useless to the utility by the termination of the contract.

Statutes Limit Contract Period to Ten Years.

This ideal condition cannot, however, be realized, as the statutes of Wisconsin limit the term for which a municipality can execute a street-lighting contract to a period not longer than ten years. It is, therefore, necessary under present statutes to specify a definite term in any actual contract executed between a municipality and a utility. Such a condition is neither advantageous to the municipality nor the utility and has some influence on the cost of service or the price paid by the municipality.

Cost of Street Lighting.

The principal elements constituting the investment in a street-lighting system are, distribution system, manufacturing or generating plant, special station and substation equipment and lamps and lamp supports. The report of the Railroad Commission of Wisconsin, presented to the Street Lighting Committee of the Milwaukee Common Council shows that the investment in a street-lighting system if constructed by the municipality would be apportioned among the foregoing items as follows.

	Per Cent.
Distributing system	71
Generating plant	14.73
Special station and substation equipment	7.38
Lamps and supports	6.89

It will be observed that the distribution system constitutes nearly three-fourths of the total investment, and that the distribution system, together with the special station and substation equipment and the lamps and supports, constitutes over 85 per cent of the total investment. Since the investment in a large part of the distribution system and all of the special station and substation equipment as well as the lamps and supports, must be paid for within the period of the contract, it is evident that the short-time contract must exert a material influence in raising the cost of the service when compared with the long or indeterminate-term contract. This influence can be shown, for a definite case, by taking the figures contained in the report of the Railroad Commission of Wisconsin to the Milwaukee Common Council Street Lighting Committee, covering the estimated cost of street-lighting service under the plan considered by the Commission. The figures given represent the cost per lamp year, subdivided into the principal elments of operating costs and fixed charges which would obtain under term contracts for five years, ten years and an indeterminate period.

	Five-Year Contract.	Ten-Year Contract.	Indeterminate-Term Contract.
Power plant expense	$ 8.75	$ 8.75	$ 8.57
Distribution expense	12.36	12.30	12.30
General and undistributed expense	2.06	2.06	2.06
Interest	19.04	19.04	19.04
Taxes	4.76	4.76	4.76
Depreciation of general equipment not exclusively used for street lighting	6.45	6.45	6.45
Depreciation of special equipment used only for street lighting	22.20	11.10	7.88
	$75.56	$64.46	$61.24

From the foregoing tabulation, it will be noticed that the current ordinary operating expenses or cash cost is the same for each of the contract periods and amounts to $23.11 per lamp year. The fixed charges, including interest, depreciation and taxes, amount to $52.45 per lamp per year in the case of a five-year contract, as compared with $38.13 in the case of an indeterminate-term contract.

Comparative Costs Under Indeterminate Contract and Municipal Ownership.

The basis for calculating the costs of a municipally owned street-lighting system would be the same as that employed in computing the cost of service purchased from a utility under an undeterminate-term contract. It may be interesting, therefore, to compare the foregoing figures, based upon an indeterminate term contract, with the figures contained in the previously mentioned report of the Railroad Commission, concerning the cost of service with an equivalent municipally owned system. These figures of cost are as follows:

	Indeterminate Term Contract.		Municipally Owned System.	
	Cost.	Per Cent of Total.	Cost.	Per Cent of Total.
Current ordinary expense or cash cost	$23.11	37.8	$31.95	42.6
Fixed charges, including interest, depreciation and taxes or lost taxes	38.13	62.2	43.16	57.4
	$61.24	100.	$75.11	100.

The foregoing figures and comparisons have been made upon the basis of a predetermined number of lamps definitely placed, with certain numbers being supplied from underground and overhead supply circuits, respectively, and upon the presumption that the type of lamp selected, and upon which the operating costs have been based, would be utilized until worn out from natural causes or replaced by other equipment following substantial advances in the art.

System Should Be Kept Modern.

It would be unwise for any municipality to enter into a street-lighting contract that did not require that the system be efficiently maintained and be kept modern. Under the principles of regulation provided by the Public Utility Law and as applied by the Railroad Commission of Wisconsin, the matter of arriving at equitable charges for public-utility service has, in a large measure, been simplified. There now seems to be no way in which either the municipality or the utility can take advantage of each other. No contract can be entered into between a municipality and a utility that will not be subject to review by the Railroad Commission at any time. The Railroad Commission, in its practice of regulation, applies, so far as practicable, the principles of cost analysis to the determination of reasonable charges for service. The cost of services is made up of the several factors hereinbefore enumerated. The value of the property devoted to the particular service is appraised and the annual allowances for interest, depreciation and taxes are determined, and from this analysis and a determination of the reasonable and necessary operating expenses, the cost of the service is computed. As has been seen, the item of depreciation constitutes a relatively large proportion of the total cost of service, and if the term of the contract be less than the natural or useful life of the special equipment required for street-lighting purposes, the difference between the rate of depreciation corresponding to the natural life of such equipment and the actual life, as determined by the term of the contract, must be allowed as special depreciation or amortization. The special equipment useful only for street-lighting purposes and which must be so treated, would ordinarily include lamps, circuit cables or wires, special lamp supports, special underground conduits and the regulating or special apparatus needed in the power plant or substation to render available the particular character of current required for the lamps employed.

Specifications Necessary.

If the price to be included in any street-lighting contract is to be based upon cost analysis, then all uncertain elements entering into the determination of the cost must be eliminated. With a definite specification as to the number and type of lamps to be used, their location and the term of the contract made definite or indeterminate, the cost of the service can be predicted with a high degree of accuracy. Such cost will tend downward as improvements are made in the efficiency of generating equipment, distribution methods and organization, and, under the theory of regulation, a municipality obtaining service under a contract subject to review by a competent regulating body would secure the advantage of any such reduction in operating costs. If, however, the terms of the contract provide severe penalties for outage or failure of lamps to burn, or require the utility to move lamps without limit at the direction of the municipal authorities, and contain no specification as to the number of additional lamps permitted to be added during any year at contract rates, or require the utility to substitute for lamps specified in the contract some new type of lamp, perhaps not known at the time the contract price was estimated, it is clear from a consideration of ordinary business principles, that the estimated cost of the service must contain a liberal item for such contingencies. While it is not only desirable but necessary that the municipality shall have the utmost freedom in relocating lamps, selecting new and improved types and causing the same to be installed, and adding to the street-lighting equipment from time to time, as the growth of the municipality warrants, the fairest, and at the same time the cheapest way for the municipality to retain full latitude and control would come from a provision in the contract requiring the utility to move lamps at cost, to substitute new and improved types upon the cost of service basis, which, of course, would include any unearned depreciation of existing equipment displaced, and a provision under which the municipality might order additional lamps during the last few years of the contract by paying an additional rate therefor, which would protect the utility in the event such new lamps were not continued in service after the date of expiration of the contract. In the event such lamps would be continued under a renewal or extension of the contract, such additional sums so paid should be rebated to the municipality.

Lamps and lamp supports may be owned by the municipality as a means of placing the character of the lamps used within the absolute control of the municipality, but as a change in type of lamps is very likely to make necessary a change in distributing system or special station equipment, the cost of changing the lamps and supports will not, in most cases, cover the entire cost of the substitution. The history of municipally owned street-lighting systems shows that municipalities generally continue the use of lamps and supports long after they have become antiquated and relatively inefficient and that depreciation and obsolescence are not in any manner arrested in favor of municipal undertakings. As the lamps and supports will usually constitute but a small percentage of the total investment, perhaps 7 per cent or less, it is apparent that the matter is relatively unimportant and not in any sense determining. It does not seem difficult to arrange to have the rate contemplate either the municipal ownership of the lamps and supports initially or at the expiration of the contract. Under a contract in which the rates would be based upon the cost of the service, it would probably be found more convenient to require the contractor to substitute lamps at cost and include the cost as a small increment in the rate, than for the municipality to make periodic outlays of relatively large sums to cover such replacements.

Contract.

The principal elements entering into a contract which would be so constructed as to eliminate to the greatest possible extent all uncertainties, and which would permit, therefore, a rate to be calculated upon the cost-of-service basis, and which would, at the same time, permit the municipality the widest latitude in keeping its system modern and up-to-date, in changing the location or character of service supplied to lamps and eliminate the tendency to avoid the installation of needed additional lamps during the last years of the contract, would include the following:

General. A general paragraph providing that it should be the intent of the contract that the municipality should at all times during the life of the contract be provided with adequate and modern electric street-lighting service, and that it should be the duty of the utility to exercise skill, diligence and foresight to provide continuously the service specified.

Number and Types of Lamps to be Furnished. The initial and minimum number of each type of lamp should be stated and a technical description of each type of lamp should be included, together with a plat showing the location of all lamps covered by the contract. If the lamps are properly described, it becomes a relatively simple matter for the municipality to check the service being furnished by the utility and to assure itself that the service is being rendered in accordance with the specifications.

Lamp Supports. The character of supports used in mounting street lamps can vary over a wide range of design and cost, and the specifications upon which a utility could bid intelligently and accurately should set forth in detail the number and kind of each type of support desired, and upon a plat showing the location of each type of lamp should also be indicated the type of support to be employed.

Character of Service Lines. The elements of cost arising from interest, depreciation and taxes which enter into the calculation of the rate, will be governed largely by the character of service lines specified, that is, whether overhead or underground. In many parts of a large city, underground service is necessary and desirable, and likewise, in many other parts of a city overhead lines serve every needful purpose. To enable a utility to bid closely, the character of service lines wanted for each lamp location should be definitely set forth.

Lighting Schedule. The lighting schedule under which the lamps are to burn must be definitely stated, as, for instance, "every night from one-half hour after sunset until one-half hour before sunrise."

Deductions for Outage. To minimize the time lamps are out of service for any reason is very desirable, as the purpose in making a street-lighting contract is to secure the lighting of the streets. When lamps are out, a valuable police aid has been lost and the citizens of the municipality are inconvenienced through the darkness of the streets. To cause the utility to promptly relight all lamps found not burning, the contract should provide that the utility should employ efficient means for restoring the service, irrespective of when the lamp is reported as being out, and that the contractor should keep a daily record of each lamp reported out, showing the time so reported, the time relighted and should furnish to the properly constituted municipality authority a copy of all such reports, from which deductions from compensation due utility on account of outage could be computed. The deduction for outage may impose a penalty upon the utility so as to cause the contractor to give prompt attention to the restoration of any service interrupted. A pro rata deduction for outage is a severe penalty, since all the utility saved during the period of outage is the energy not used by the lamps out. All other operating expenses and fixed charges continue against the contractor irrespective of whether lamps are burning or not.

Rates. The rates of charge for each type of lighting covered by the contract should be set forth in the contract for the initial installation and should be subdivided as between lamps supplied from overhead distribution systems, as distinguished from those supplied from underground distributing systems. Such separation of cost, as between underground and overhead service will enable municipal authorities to pass more intelligently upon the question of whether the desirability of underground service offsets the added cost.

Additional Service. The contract should provide, in addition to the rates for the initial installation of lamps, rates at which additional lamps can be installed during, say, the first 70 per cent of the contract period. These rates, while based upon the cost of service, should preferably be so arranged, in conjunction with the initial rates, as to invite the installation of additional lamps, and the rates for lamps installed during the first few years of the contract might, therefore, be properly lower than the initial rates. The cost, however, of supplying service to additional lamps will depend, in a great measure, upon the location of such lamps, and the contract should, therefore, contain a provision that where new lamps are ordered at a distance in excess of an agreed maximum that the utility should be paid the added cost of installing such lamps over and above the cost that would occur in making the installations within the agreed maximum distance from any then existing lamp or circuit. For lamps ordered during the last three years or the last 30 per cent of the contract period, the contract should provide that the utility shall install such lamps ordered, subject to a provision that the lamps shall be supplied at contract rates, but that the utility should receive additional compensation to cover the special investment necessarily and especially made for the installation of such lamps and which would be spread over the remaining period of the contract in monthly payments. The contract should contain a provision that, in case a new contract is executed between the municipality and the utility utilizing the equipment so paid for during the latter years of the contract, amounts so paid should be returned to the municipality.

Substitution of Lamps or Service. Subject to review by the Railroad Commission, the municipality should have the right to require the utility to substitute, or the utility should have the right to substitute for the type of lamps specified in the contract, new or improved lamps, of at least equal illuminating power. In case substitution of lamps or other necessary equipment is desired, the party to the contract desiring to make such substitution, should serve upon the other party written notice setting forth in detail the character of lamps and service which it is desired to substitute in place of that covered by the specifications in the contract. The Railroad Commission should not only approve of the substitution desired but should also specify the rates of charge under which the utility would be required to supply the new types of lamps or service.

Compensation for Relocation of Lamps or Change in Character of Service. With the growth of most municipalities, it becomes necessary from time to time to order changes in the location of lamps theretofore installed or in the character of service lines supplying lamps. For such changes in location or in character of service lines, the municipality should compensate the utility for the full net cost of complying with such orders for the reason that no element has been included in the rate to cover such unforeseen expense.

Review by Regulating Commission. The contract may contain a provision that it should at all times be subject to review by the Railroad Commission of Wisconsin as to rates of charge and quality of service furnished. Under the present laws such a provision is unnecessary because the public-utility law already so provides.

A municipal street-lighting contract embodying essentially the provisions just briefly outlined would be a distinct advance in form over any heretofore prepared. It would insure to the municipality a modern system at all times and place at the disposal of the public an efficient operating organization provided by the utility and the economies of large scale production and purchases, while insuring to the utility compensation for the cost of the service rendered. The attainment of these ends is the ultimate object of every fair-minded municipal official and is the guiding policy of every officer of a well managed public utility.

Electric Sign Data

Electric Sign Progress.

It would be impossible to chronicle the progress of electrical advertising on this page each week, for many reasons, chief of which is lack of space. The market for electric signs is almost without limit and the demand is ever increasing. A few of the recent noteworthy installations are mentioned in the succeeding paragraphs, these illustrating, to some extent, the diversified applications of this form of publicity.

An electric sign, four feet long and eighteen inches high, now marks the famous old town of Lee in the Massachusetts Berkshires. The sign is mounted on a wooden pole in the middle of the town common, and burns all night long. It contains six 40-watt tungsten lamps, and the name, "Lee," appears in raised letters which can be read by approaching tourists, in the daytime as well as by night. The sign has already proved itself a profitable investment. It marks the identity of the town and impresses the stranger as he motors through.

In Chicago two new electric signs have recently been built for the Crown Piano Company and the Great Northern Hippodrome. The Crown Piano sign, which is 64 feet long by 40 feet high, combines the company's trademark with "quality talk" in a strong, effective way. The trademark is a jewelled crown set in the center of the letter "O" of the word "Crown," and the white electric rays radiating from this crown are one of the flashing features of the sign. The letter "O" is eight feet high and contains a variety of colored lamps.

This sign contains 2,660 ten-watt Mazda lamps and is located on the roof of a building facing one of Chicago's most prominent boulevards.

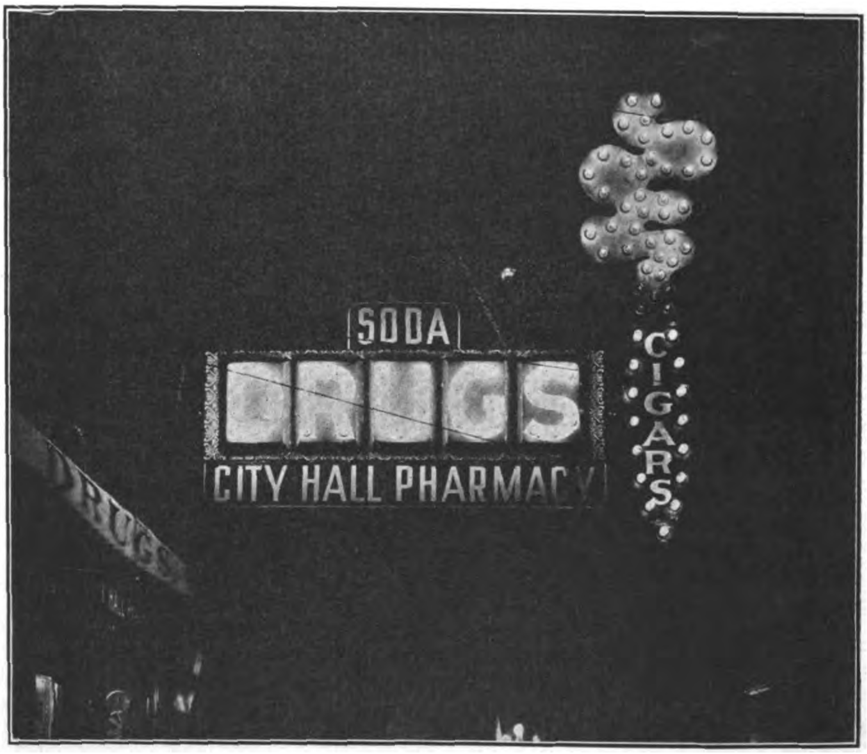
The sign over the entrance to the Great Northern Hippodrome at the corner of State and Quincy Streets, is 45 feet high by 40 feet wide, and contains 1,766 four anl eight candlepower Mazda lamps. The display is first shown with an elephant drinking water from a tank. Then, he raises his trunk and throws a volume of water directly at the theater. This flashing feature is supplemented by a number of others, including a changeable-letter panel which is capable of producing five different flashes per minute. Both the Crown Piano and the Hippodrome signs were sold and built by the Thomas Cusack Company of Chicago, Ill., in co-operation with the Commonwealth Edison Company.

The Fulton (Ky.) Electric Light & Power Company is planning the erection of a large electric sign advertising the community. The cost of maintenance will be borne by the business men.

A large civic slogan sign, 48 feet high, and containing 32,000 lamps, is being erected in San Diego, Cal. It will cost $10,000. Across the top of the sign will apppear, in large letters, the slogan, "San Diego, First Port of Call." The lower half of the sign will be utilized by business firms for their own messages. The San Diego Consolidated Gas & Electric Company will supply the current.

The Thomas Cusack Company, Chicago, has recently erected at various vantage points in Chicago electric signs advertising the La Azora cigar. The signs are 22 feet long by 17 feet high and contain a reproduction of a burning cigar with the words reading, "La Azora, The Cigar of Cigars." Altogether there are eight of these signs and each is located at one of the city's prominent transfer corners.

The contract, it is stated, represents an investment of $16,000.



Electric sign for drug store built by the Federal Sign System (Electric), Chicago, Ill. This particular combination of "Drugs," Soda," and "Cigars" is an excellent one for druggists which combines the publicity value of three separate signs.

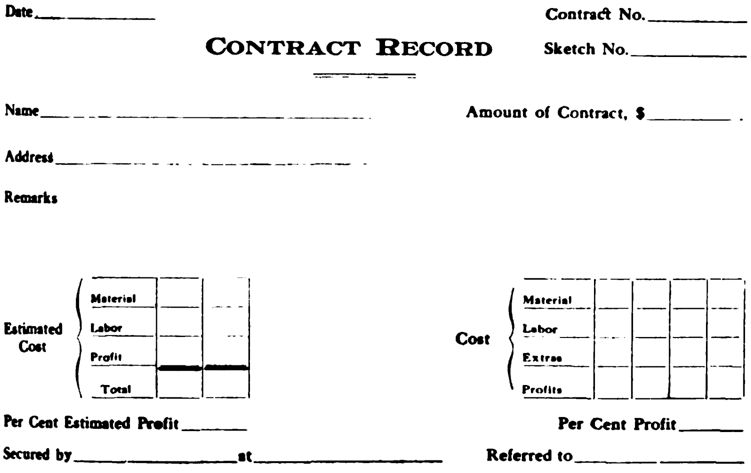
The sign is of blue-enameled metal, the word "Drugs" being composed of standard Federal interchangeable letters. 44 lamps are used in the letters and 56 lamps in the cigar and smoke. Red lamps are used at the burning end of the cigar. The sign is a double-faced one.

Electrical Construction

ESTIMATING FOR THE ELECTRICAL CONTRACTOR.

By D. R. Shearer.

The development of the field of electrical contracting has been so rapid in recent years that it has been difficult to keep track of the changes made necessary by varying conditions. Formerly an electrical contractor needed only a screwdriver, a pair of pliers and a small stock of supplies to carry on his business, but from this state the contracting business has grown to a position in the world of business requiring the most careful thought and conscientious attention to every detail for carrying on successfully this line of work.



Date________ Contract No.________

CONTRACT RECORD Sketch No.________

Name________ Amount of Contract, $________

Address________

Remarks

Estimated Cost	Material		
	Labor		
	Profit		
	Total		

Cost	Material				
	Labor				
	Extras				
	Profits				

Per Cent Estimated Profit________ Per Cent Profit________

Secured by________at________ Referred to________

Fig. 1.—Contract Record.

Three departments are ordinarily found in the business of a modern electrical contractor. The estimating and soliciting department, the construction or erection department and the office or executive department. Each of these departments bears a certain relation to the firm, to the other departments and to the public. The executive department is carried on under business methods which are highly developed and in which there are few chances for error by those who know the proper methods of buying and of bookkeeping. The operating department, too, offers no great difficulties to the foreman who is thoroughly competent, is alive to modern wiring practice, acquainted with the numerous details of electrical installation, and has sufficient executive ability to manage his men and secure from them first-class work and attention to their duties.

The soliciting and estimating department, on the other hand, is subject to many difficulties and is probably harder to manage than either of the other component parts of a contracting firm.

It is the estimator we wish to consider in this brief article, for upon him devolves the responsibility of estimating material, drawing the layout and making bids. Upon his shoulders rests a great responsibility and upon him may depend the success or failure of his employer. Should he make errors and exceed in his estimates the material required for a given job the probabilities are that his bid will be high and the contract go to a more accurate competitor. On the other hand, if he underestimates the material required, his bid may be too low and his firm lose money.

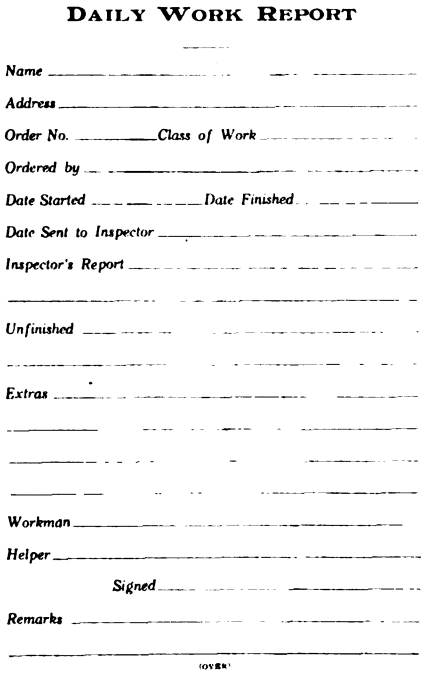
The estimator is placed in the unenviable position of standing between three forces, any or all of which may be unfriendly toward him. That is, he bears a definite relation to his employer, to the workmen who install the work on contracts he has secured, and to the public from which he endeavors to secure business and to whom he must submit his bid.

In his relation to his employer, he must have two aims, to secure business which will net his firm a profit, and at the same time to secure for his firm the good will and confidence of present and future customers. In his relation to the workman, he must ever bear in mind that his designs for installation must be practical and must be satisfactory from the position of a man having the work to do. If he underestimates, some blame may rest on the workmen for using too much material and thus the workman's confidence in the estimator is lowered. The relation of the estimator to the public is even more precarious. He must be diplomatic, careful, and have the full confidence of those to whom he is bidding or for whom he is asked to make estimates.

Many factors enter into the formation of a bid and any one of these factors may destroy the chances of the bidder. Named in the order of their importance, they are as follows: material cost, labor cost, overhead expense, transportation or in-situ cost, contingencies and profit. Some contractors place more prominence on certain of these items than on others and many contractors go so far as to entirely overlook some of these very factors which are so important in the creation of a fair and satisfactory bid. Another factor which many contractors consider very important is that of competition, but this is the last to be considered as well as the least and should rarely enter into consideration when making a bid. The contractor should take the stand that if he cannot secure a given job at a fair profit to himself it would be wise to let his competitor take it from him at a lower bid.

The material cost may be made as accurate as the estimator chooses, or rather this cost may be as accurate as he chooses to make it for a given layout, but this layout may be changed to increase the cost or decrease it as the case may be. This accuracy depends on the amount of time he feels called upon to give to the job. A considerable amount of judgment is required in order to determine just how complete or how good a layout to formulate. One may decrease the cost by changing the plans until an absolutely inferior installation would result, or he can increase the efficiency and completeness of his designs to such a point that the installation cost would be prohibitive. If the estimator can plan an installation so suitable and adequate to the needs of the customer that the customer accepts his layout and will have no other, the hardest part of the fight has been won, for in such a case the customer will require all the other bidders to make their estimates on the same identical installation, excepting, of course, for certain minor details. This step being made, it is necessary for the estimator to work out every possible scheme that might effect a saving in amount of material used or in the labor necessary for its installation. All items of material should be carefully checked over with a view of changing or substituting in such a manner as to retain all the advantages and good points of the layout and yet reduce its cost. Careful measurements should be made for the amount of conduit and wire necessary. The carrying capacity of the wire used should be ample, yet by using too large a margin of safety, the cost is unduly raised. Careful consideration should be given to the proposed methods of installation. The layout should be designed so as not to burden the workmen with unnecessary complications and with labor above that which is necessary. Sometimes it is well even to consider the characteristics of the individual workman, if savings in labor may be effected by so doing. The location and methods of placing switches, cutouts, panelboards, cutins and other functional parts of the system should be determined with an eye single to efficiency and cheapness of installation as long as cheapness may be secured without detracting from the best features. Non-standard fittings and accessories should be avoided, for not only may they be difficult to secure but delayed shipments may result in unnecessary prolongation of the job. It is well for the estimator to have a thorough knowledge of the stock his employer carries and work to the end of using stock material wherever possible. After forming a general mental sketch of a proposed installation, either a complete plan or an adequate pencil sketch should be drawn to be used by the foremen if the job is secured and to be filed as reference regarding similar future installations if the contract is lost. With this sketch as a basis for a complete list of the material and fittings necessary and a good mental idea of the way the work should be installed, the estimator is in a position to figure on the labor. There are many methods used in estimating labor costs but perhaps the most accurate is that of comparing the time required by the workmen employed by the given contractor for installing work of a similar nature. The amount of work done varies greatly with the locality, the type of men employed and their training, and with the practice of the contractor. Adequate data should be kept on the amount of time required to complete different items of installation under certain conditions and this data used on future estimates.

In considering material costs, we find that several factors enter into the price at which material may be furnished at a cost basis. The greatest part of this amount or basis from which we may work is the invoice price. This in itself is a variable quantity for each item and depends upon the house from which it is purchased, the quantity in which the material is bought and upon the buyer's ability to recognize low prices when they are furnished him. Of course, there is supposed to be a reasonable uniformity in the prices at which jobbers sell to the contractors, but owing to certain conditions and the circumstances of the jobber, these prices may vary to a considerable extent on the same class and quantity of goods. One jobber may become overstocked on some article which he desires to close out at practically cost and so special inducements are frequently made to the contractor even on small quantities for immediate delivery. Thus, although against the practice of some buyers, it is well to keep in contact with several jobbing houses and it is usually found advisable to purchase certain supplies from one house and other material from other houses. In some instances, a considerable saving may be effected by buying direct from the manufacturer, as theoretically he is able to furnish goods more cheaply than the jobber. Another item that goes far toward reducing the cost of supplies is the cash discount allowed by practically all jobbers and manufacturers. Although this is usually only 2, 3 or 5 per cent, this small percentage is just that much towards reducing the basic cost. Another factor that sometimes plays an important part in the cost of certain lines of material is delivery. Frequently savings may be made by changing points of shipment or by routing the shipment over different roads. Breakage, too, on fragile material necessarily increases the cost and on top of all these items which go to make up a cost price, we must add drayage and stock-room handling.



DAILY WORK REPORT

Name

Address

Order No. Class of Work

Ordered by

Date Started Date Finished

Date Sent to Inspector

Inspector's Report

Unfinished

Extras

Workman

Helper

Signed

Remarks

(OVER)

Fig. 2.—Daily Work Report.

The efficiency of the stock-keeper is difficult to classify as it may come under the head of either material costs or labor costs. By the efficiency of the stock-keeper, we mean the accuracy with which he keeps his records and the care he uses in measuring and charging out material used. Nevertheless his efficiency affects the gross cost of practically all the supplies used. The estimator should have a thorough knowledge of these cost factors and should have a mental idea of the relative proportion they bear toward the whole.

The labor cost is made up primarily of the rates at which the men are paid, but here again certain additions must be made to this basis of cost. For instance, the accuracy with which the foreman keeps the time of the individual workman and the time which is lost in transit and freight on materials to the point of installation. The foreman's time or salary also furnishes an item of cost from the labor point of view and must be considered when estimating a job of any size.

The overhead running expense is an item of cost which is rarely thoroughly understood by an estimator but nevertheless ranks third in importance in making up a bid. Different contracting concerns classify their overhead cost in different manners, but in the writer's opinion the overhead should be made up of the following items; salaries of the officials and office employees or any other money expended for labor or services which cannot be directly charged out to a given job, rent, advertising, telegraph and telephone expenses, freight and express charges which cannot be charged out against material or installation work, light, heat, upkeep of tools and accessories, office-fixture depreciation, depreciation of stock, insurance (both fire and liability), stationery, taxes, license, inspection fees and any other items whatsoever that are not or cannot be charged directly to the customer. The overhead costs will vary greatly in different localities and with the efficiency in management of any concern. Perhaps the best way to get at the overhead expense is to work by the time periods. That is, we check over our costs for a given period of time, either six months or a year, and take the relation of the expenses to the gross amount of business done during the same period, evaluated as a percentage. To be more accurate, these overhead expenses should be proportioned not to the gross amount of business, but to the business done less the profit. However, by holding in mind the methods by which we arrive at an overhead percentage, we can secure accurate results in estimating by either system.

It is seen from this outline of the business procedure of an electrical contracting concern that the estimator and solicitor should be thoroughly acquainted with every detail going to make up a net cost. He should not only hold in mind these cost factors but should have files and records to which he may refer as an assistance on every contract of any size. To prove the most efficiently helpful, these records for the use of the estimator must be made up of partial records from each of the three departments, that is, from the executive, the installation department and from records made by the estimator himself. A record card of this type is shown in Fig. 1. It is noted that on this card we have two distinct columns, the first to be filled entirely by the estimator, the second to be filled by the foreman and office. Thus, after writing out the name and address of the customer, the date and name of the estimator and a sketch of the work to be done on the back of the card, the estimator fills in the assumed cost, the assumed profit and the bid he has made to the customer. This card is placed in the live file and there it remains until the contract is let, either to the bidder or to a competitor. In the first case, the card is transferred to the working file, where it remains until the job has been completed and the right-hand column filled in by the bookkeeping department, after which it is transferred to the dead file for future reference. In case the bid is let to a competitor, his name and bid are secured, if possible, and placed on the card, after which it also is transferred to the dead file. If this card system is carefully kept up it will prove an invaluable aid to any man who does estimating.

SOLICITOR'S REPORT DATE

CALLED ON	REMARKS	FUTURE ENGAGEMENT

Fig. 3.—Solicitor's Report.

In Fig. 2 is shown another card which is filled in complete by the foreman and placed in the same file with the cost-keeping card. It is really considered an aid or an accessory to the cost card and the two are usually considered as a unit. In Fig. 3 is shown still another card which is used by the estimator and kept for his own benefit in tracing prospects and in keeping tab on engagements. By reference to this file, the chief executive of a contracting firm is able to determine how closely his solicitor or estimator follows up prospects.

The last factor we shall consider entering into the make-up of a bid is the profit. This is the most variable and most elastic of all the factors considered. It may be much less than nothing or it is possible that it can be as large as all the other factors combined. Many concerns favor the use of a fixed percentage of profit, but this will rarely be found feasible. For instance, on certain classes of work where unforeseen contingencies may arise, 75 per cent net profit may not be too high to figure, while in other cases when selling wire or conduit or some other staple 5 per cent may be considered high. Again, that material which is turned over rapidly and depreciates but little may be sold at a closer margin than other lines which move slowly and are subject to greater depreciation, such as ornamental fixtures, heating devices, electrical toys and items of like nature.

Returning once more to estimating proper, it may not be amiss to review briefly a line of procedure to be followed by an estimator in arriving at a bid on a certain installation.

Assuming that he knows the material costs of his concern as furnished him by the buyer, the labor cost as furnished him by the foreman and the overhead percentage supplied by the office, he should first take a general view of the plans for the given installation, or if full plans and specifications are not furnished, of the location of the installation itself, and after getting a general idea of the requirements, make a preliminary sketch of the work he proposes to do. The proposed installation must be looked at from every possible point of view, taking into account the location, the surroundings, the class of work to be done and any other factors that may bear directly or indirectly on the ease or efficiency with which the work may be done. He should next accurately measure for the material required, either on the blueprints or on the job and tabulate each class by itself. After every item of material that is found to be necessary is arranged and listed conveniently, the labor should be estimated. Frequently in this work, the consultation or advice of the foreman is a valuable adjunct. When this preliminary work has been done, the estimator adds the material and labor costs and figures the overhead to be allowed. This gives him the net cost of the given job and upon this a fair and just profit should be added. He is now ready to draft a bid, but before doing so should again go over the plans and specifications, whether made by the architect or by himself, to see if any items have been omitted or if any changes in the wording are necessary. In doing this, he must have in mind the legal aspects of the contract and see that no clauses occur which might be prejudicial to his employer. The bid may then be submitted.

From this outline, it might seem that too much is expected of an estimator, but whether he be one whose sole duty it is to make estimates, or an executive of the concern having other duties, it is necessary that very close attention be given to this phase of the electrical contractor's business.

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New York Code Ruling.

In an effort to secure a standard interpretation of the switchboard wiring requirements contained in Rule 2*b*, third and fourth paragraphs of the Electrical Code of The City of New York, the Commissioner of Water Supply, Gas and Electricity has established the following ruling:

Where a tight non-combustible outer cover is required, compliance with Rule 2*b* will be deemed to have been secured if asbestos tape is wound helically over the inflammable outer braiding, then wrapped with light twine or heavy pack thread, and then painted with soluble glass; or, if a braided asbestos tubing is drawn over the insulated wires and secured in place at the ends by means of twine or pack thread and then painted with soluble glass.

It should be noted that in either case care must be taken to leave about two inches of the inflammable braiding free from this fireproofing covering at lugs and terminal connections, and also to keep the flameproofed wires away from all live metal parts.

◆

Important Canadian Development.

The Winnipeg Electric Railway Company has engaged the J. G. White Engineering Corporation to plan a development of 100,000 horsepower near the city of Winnipeg, Canada. There will be an initial development of 40,000 hydroelectric horsepower.

THE ELECTRICAL CONTRACTOR[1].

By Louis Kalischer.[2]

When you consider that all branches of the electrical business have grown up in the past generation, the tremendous strides that have been made are really remarkable.

Formerly, one organization encompassed the entire field; but the rapid expansion brought about a number of subdivisions: notably, the central station, the manufacturer, the supply house, the consulting engineer and the contractor. The contractor is the only one of the units that is brought in direct contact with each of the others, as well as the most important of all, the customer; and his efficiency—is directly proportional to the kind of contact; a poor contact at any point, will result in heat and may cause the temperature of all to rise.

He is expected to know all forms of the lighting company's contracts and the service in all parts of the city; he is expected to be familiar with every device and appliance on the market; he must know where to get the material best suited for the work, at the right price; know all the Underwriters' and City Departments' requirements and, sometimes, the interpretations of the rules of the individual inspectors; he must have a good knowledge of building construction, be a good judge of workmen, and at times he is expected to know what the customer will need for future expansion.

He must be equipped with a complete set of measuring instruments, be able to make accurate tests on engines, generators, motors, etc., either to locate the trouble or give advice; and if awarded the contract, he must back his judgment with his own money as to the cost of labor and material to do the work, and follow, at times, an ambiguous specification, combining all the items and complete the work to the entire satisfaction of all parties concerned —he is the shock-absorber of the electrical business, as it were.

From the time he spends his first dollar estimating on the work, until he puts the final payment in the bank, he has been "going some."

There is another feature that I should like to say a few words about; that is, estimating.

First, there is the contractor that knows the cost of the work and the cost of his overhead; second, the one that has a general knowledge, but does not know what his cost of doing business is; third, the fly-by-night concern that has an angel to back it. They usually last about a year, as it takes about that length of time to complete the various jobs; the manager usually makes one job wash another. The time also depends, of course, on how much the angel can be separated from. I know of one that let go of $50,000 before he was satisfied to call "quits."

Fourth, the erratic bidder, who on some work is very low, and on others is very high. He causes the most trouble. His high bid is laughed at and put into the W. B. file; but his low bid, if it is considered at all, is sometimes used to sandbag the man who had put in a legitimate estimate for the work to be done. He is the man who always tells you that the successful bidder is going to lose money on the job because he imagines the work was awarded at a figure lower than his.

We also have the customer who is quite sure that the lighting company and the various inspection departments are merely adjuncts of our organization; and, when his building is about 80 per cent complete, wants current at once, and believes you are neglecting him in a most shameful manner.

The representatives of the lighting company and the inspection departments know only too well that the contractors do their utmost to secure service for them, and I want to, here and now, acknowledge, on behalf of the Electrical Contractors' Association of Long Island and myself, the kindly assistance that the Edison Company and the inspection departments render us —also the big manufacturing companies who are always willing to place at our disposal engineering data, and their engineers, if necessary.

There is only one way to properly handle the conditions as outlined, and that is, by inducing the majority of the contractors to join an organization such as the Electrical Contractors' Association of Long Island. The co-related interests are only too anxious to help the contractor, even to the extent of changing their rules, if the matter has been thoroughly discussed by the various contractors and a better solution offered. Our Association is always ready and willing to assist a member with its experience—to permit him to successfully carry out his contracts, and leave a fair margin of profit for himself—and, when all is said and done, aside from the pleasure of solving the various problems, this is a matter of most importance; otherwise, there would be no contractors.

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The use of electric signs is slowly but steadily increasing in Hongkong, China. Even flashing signs are coming into use.

Local Organizations in Iowa.

The activities of George W. Hill, of the National Electrical Contractors' Association, have been evidenced in Iowa by the formation of local organizations in Marshalltown and Waterloo.

In Marshalltown a meeting was held on January 11 and organization effected by the election of J. Boughton, of the Buchanan Boughton Company, as president; E. N. Peak, of the McCarten Plumbing Company, as secretary; and Charles Munson, of the Iowa Railway & Light Company, as treasurer. This organization is not confined to electrical contractors, but will be in the nature of an electric club for all interests.

The Waterloo Electric Club, which will meet weekly, has elected the following officers: president, H. R. Plowman, of the Black Hawk Electric Company; secretary, M. T. Humphrey, of Hitchcock & Humphrey; treasurer, J. A. Hartleip, of the Waterloo Electrical Supply Company.

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Among the Contractors.

Hampton & Buerke, Tampa, Fla., have secured a contract to install a "White Way" on the Bay Shore Boulevard through Wallcraft, a suburb of the city; also the contract for wiring the new Mugge Hotel.

The Lafayette Plumbing & Electric Company has been organized in Lafayette, Ga., and has been given the privilege of handling electric supplies exclusively, the municipality, which heretofore dealt in this kind of goods, turning over this department to the new concern, which started business February 1.

The Grossman Electric Company, 1532 South Fourth Street, Philadelphia, has just completed the wiring in a six-story concrete building for the Penn Card and Paper Company. Conduit was used throughout.

L. R. Barton, of Richmond, N. Y., has the contract for wiring the new Moravian Parish House at New Dorp, Staten Island.

W. C. L. McCoy, Lincoln, Neb., has started a contracting and motor-repair business at 302 South Twelfth Street.

Charles E. Strong has started an electrical contracting business at 60 East Sixth Street, St. Paul, Minn.

The William A. Carrao Electric Company, of St. Louis, has the contract for wiring the Warwick Hotel, in that city.

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[1] Response to a toast at dinner given by Edison Electric Illuminating Company to Brooklyn contractors.

[2] President of Electrical Contractors' Association of Long Island.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, president,
59 Deerfield Street, Hartford, Conn.

H. S. WYNKOOP, vice-president,
13 Park Row, New York, N. Y.

WILLIAM LINCOLN SMITH, secretary and treasurer,
Concord, Mass.

JAMES E. COLE, Representative on Electrical Committee of
National Fire Protection Association, 11 Wareham Street, Boston, Mass.

J. E. LATTA, assistant secretary.

Executive Committee

EUGENE N. DAVIS, chairman, Brookline, Mass.

Frank R. Daniel
R. P. Strong
Henry A. Knight
C. H. Fletcher
Washington Devereux
James B. McCarthy
James H. Fenton
R. J. Forsyth
C. W. Mitchell
A. W. Hopkins
G. W. Perry
George L. Collison
T. H. Fritts
A. H. Soper
T. W. Bowry
F. G. Hartwell
A. A. Moffitt
Thomas D. McColl

Secretary's Message.

The Secretary takes pleasure in announcing the organization of the Philadelphia Section, N. A. E. I., which has the following officers: president, A. H. Lilley, 3826 North Seventh Street; vice president, W. W. Hollingsworth, 2252 North Twelfth Street; secretary and treasurer, W. H. Hall, 5243 Addison Street; representatives on the Executive Committee, N. A. E. I., Washington Devereux, 131 South Fourth Street, and A. H. Engle, 6643 North Eighth Street.

He also is pleased to announce the reception into the Association of the New York Section which starts with 36 members, headed by a gentleman whom many of us know, and the better we know him the more we esteem him, J. C. Forsyth. The Secretary regrets that he has not at hand the list of officers of the Section, which must lay over until a later message.

The third piece of information is that under the section in the new Articles relating to membership, honorary membership has been conferred upon James E. Cole, commissioner of wires of the City of Boston. This is not the place to enter upon an appreciation of our friend and yet the Secretary cannot record the above fact without adding a word or two. Mr. Cole has been twice president of the Association and has continually been its representative upon the Electrical Committee, first of the National Board of Fire Underwriters, and later of the National Fire Protection Association. No one can overestimate the value of the work he has done for the Association, active in office, wise in advice, never hesitating to go on foot or out of his way to assist and serve its interests. 260 questions have been sent out for this department of our work and every one has had a thoughtful and carefully considered reply from Mr. Cole. In the Eastern Massachusetts Section, the meetings of which are frequently held in his office, his judgment and judicious counsel are sought by us all, and always to our benefit. Our President in the course of his business was in Boston yesterday and dined with the Secretary, and in the course of conversation said only he himself knew how often he had sought and been guided by Mr. Cole's advice in Association matters and every time events had proved that the advice was correct.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

If our worthy President does not like that he has only himself to blame since he himself in the course of said dinner officially directed the Secretary to present our new Honorary Member with a metaphorical bouquet, which duty he has tried to perform, well knowing how inadequate it is. It is pleasant to add for the benefit of the members who have not a copy of the Articles at hand, that the clause on honorary membership closes "such membership carries with it all the rights and privileges of active membership."

As one of our sister electrical organizations has chosen a slogan which apparently has become somewhat widely recognized (see February 7 issue of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN), "Do it Electrically," our President and advisers have thought it no more than our duty to follow such an excellent example and adopt a slogan also, one which we propose to make just as full of meaning as we can and as an Association stand to flatly nd at all times. It is this: "LET THE CODE DECIDE." These words will hereafter appear somewhere visibly in connection with all our activities. In a very little while the Secretary will be able to print (at least he has been so promised) an article by our President explaining what he believes this slogan should mean for us and accordingly he does not intend here to enlarge upon it. He cannot, however, help adding that while it certainly does not mean that we look upon the Code like a law of the Medes and Persians, nor that each of us may not see some point where if he had his way it might be changed, yet each must recognize that the Code as it stands is assuredly the result of ripe judgment, carefully considered experience, soberly considered estimation and weighing of facts and arguments, by as well prepared, selected, and earnest a body of men as ever attempted such a work. If you do not believe it, get the record of that first meeting of the National Conference on Standard Electrical Rules, which opened at 10 a. m., March 18, 1896, at the rooms of the American Society of Mechanical Engineers on West Thirty-first Street, New York (a date we should all remember), and read it carefully; then study the records of the successive meetings down to the present day and you will begin to realize what has gone into the making of the Code, how much greater it is than any one man's or any one body of men's opinion—not because it is the fiat and say so of a committee, but because it is the outcome and unmeasured and united effort to establish electrical construction and installations upon as solid and unshakable a foundation of security as our experience up to the present day can afford.

Finally the Secretary may say that in view of the number of sections organized, certain changes in the Executive Committee are made necessary which will be stated later when completed.

The questions which follow are clear and require no comment, with the exception of No. 254. In this will be noticed quite a marked divergence of opinion. The Secretary recommends the reading of this Rule 67*j* carefully. and especially the third fine-print note, which is where the point arises and which reads "For three-wire systems cutouts must have the break distance required for circuits of the potential of the outside wires."

It will be observed that the word here is "systems," not "circuits." Circuits is used a little further on and personally I must confess that I can get no other meaning from this wording than a requirement for the larger break distance in the case mentioned, as I cannot see how it can be argued that this two-wire tap circuit is not a part of the three-wire "system" to which it is attached, although possibly it is not a part of the three-wire "circuit."

This provision is identical with the same note in the 1911 Code, while the rule governing grounding has changed the word "may" to "must." It seems to me that if you bear this in mind and make a few sketches of what may happen under varying conditions the reason for the note will be clear enough. Whether the larger break distance is necessary with a solidly grounded neutral has nothing to do with the question; it may be or it may not, but it does seem to me that the requirement is plain and I feel positive it is safe.

Small Wires in Parallel.

Question 252. Does the Code anywhere approve (or not allow) the use of small wires in parallel in place of one larger cable? If not, what is considered good practice in this regard?

Answer 1 (W). I do not know of any Code ruling on this question, either for or against. In some places it might be advisable to use smaller wires in parallel in place of a very large wire.

Answer 2 (D). The paralleling of conductors is permissible so long as the adequate capacity is provided.

Answer 3 (U). I do not know of any Code rule, but I should object. First, there is no rated capacity for a number of wires so connected, the rating being for single conductor or several bare conductors stranded together. If one wire became broken, the others would be called upon to carry more current than figured on. In a stranded cable this is not apt to occur and if it did would only diminish the capacity to a very slight extent.

Answer 4 (V). Where main feeder wires are of large size it is considered good practice to allow the use of two or more wires for each main, the total carrying capacity of course being sufficient to carry load.

Answer 5 (O). It could not be considered good practice at any time to use several wires in parallel in place of one larger wire of sufficient capacity; it is not, however, specifically prohibited by the Code.

Answer 6 (Y). The Code does not prohibit this type of wiring but I would consider it inadvisable, owing to the liability of some of the smaller wires becoming broken and overloading the remainder.

Answer 7 (R). Not referred to in the Code at all.

Answer 8 (B). I know of no provision in the Code that specifically permits or condemns the running of small wires in parallel in place of one larger cable (except of course the combination of small conductors under one insulation as a flexible conductor) and while in some cases it may be necessary or advisable, as a general proposition it would be poor practice.

Answer 9 (N). I consider this to be purely an engineering question; should never think of combining four No. 14 to get No. 8, where I might think it wise to use two 0 wires instead of one 0000 conductor.

Answer 10 (E). I know of no rule in the Code where this method of construction is spoken of. I have seen it used, however, with the several wires tied in to each other and the combined wires protected by a fuse equal to the combined carrying capacity of the wires.

Answer 11 (Q). Code does not approve the use of two small wires in parallel in place of one large wire. If there is good reason for doing this, wire should be cabled.

Answer 12 (H). I think the Code is silent on this question, but using a divided circuit is not in general good practice.

Answer 13 (P). The intent of the Code is against the placing of small conductors in parallel in place of using a larger cable. Perhaps the best proof lies in the fact that nowhere in the Code is provision made for fusing arrangements for such parallel conductors.

Our practice is to permit this paralleling only where an existing line must be reinforced, or where the ampere capacity required exceeds the limits of any cable that might ordinarily be placed conveniently in the location under consideration. For these larger sizes we consider it good practice to tie the cables together at the far end by means of a busbar, and to tie them together at the near end through individual fuses so selected that they will blow when pumping current back through a ground on a cable, the fuse of which has already blown, before this current can exceed the carrying capacity of the cable in question.

Answer 14 (S). I do not find anything in the Code that gives the information asked for. I should require each wire or cable protected by a fuse. Rule 18-a should be complied with for protecting each wire or cable.

Answer 15 (X). Code neither approves nor prohibits using small wires in parallel in lieu of one of a larger size.

Good practice consists in bending to the conditions to be faced.

Fuses in Parallel.

Qestion 253. How would the above question (252) apply in regard to fuses in parallel?

Answer 1 (W). The Code nowhere prohibits their use.

Answer 2 (D). As regards fuses, same are approved in parallel where capacity exceeds 600 amperes.

Answed 3 (U). The Code nowhere even refers to such practice.

Answer 4 (V). There is nothing in the Code bearing on the matter.

Answer 5 (O). The use of fuses in parallel could in no case be considered standard or the equivalent of a larger fuse of proper capacity. In case of overload the fuses would operate at different times and the last fuse to blow would probably be called upon to break an arc much heavier than that for which it was designed, with probable disastrous results to the fuse.

Answer 6 (Y). The Code does not refer to parallel fuses but it is bad practice as in case of a broken wire the overload on the balance would open the fuses and the temptation to overfuse would be very great.

Answer 7 (R). Not referred to in the Code at all.

Answer 8 (B). See answer to Question 252.

Answer 9 (N). This appears to me always and everywhere an unfortunate practice, but it may occasionally be almost necessary.

Answer 10 (E). A single fuse equal to the combined wire capacity should be used.

Answer 11 (Q). Fuse in parallel is not considered good practice. There are conditions, however, under which it will be almost necessary to do this and approval could be given if the work were properly done.

Answer 12 (H). It strikes me that fuses located as indicated would be simply foolishness.

Answer 13 (P). In some cases we have been obliged to authorize the placing of several fuses in parallel in order to secure a capacity in excess of the largest cartridge fuse. Our experience has been that if one fuse fails, they all fail, and they, therefore, serve the same purpose as if one large fuse had been employed.

Answer 14 (S). The Code is silent in regard to fuses in parallel. I see no objection to fuses so installed.

Answer 15 (X). Code does not rule on fuses in parallel in this sense.

Break Distance for Cutout.

Question 254. Referring to the third note to Rule 67j, what must be the break distance for a two-wire link-fuse cutout on a 110-volt lighting circuit taken from one side of a 110-220-volt, three-wire system?

Answer 1 (W). This being a two-wire cutout on one side of a three-wire system (it being impossible to impress a voltage of over 110 on cutout) it would take the 125-volt spacing.

Answer 2 (D). I think a distance of at least two inches should be required.

Answer 3 (U). When a two-wire cutout is used, it calls for 125-volt spacing. When a three-wire cutout is used, it calls for 250-volt spacing.

Answer 4 (V). Should stick to the spacings of the two tables.

Answer 5 (Y). Break distance as required for 125 volts of rated capacity.

Answer 6 (B). The break distance on a two-wire link-fuse cutout for a lighting circuit taken from one side of a 125-250-volt circuit should be that required by the Code for 250-volt cutouts. The distance between opposite poles may be that specified for 125-volt cutouts.

Answer 7 (E). I would ask for the spacings that appear in the 125-volt table of the rule.

Answer 8 (Q). Three-fourths inch for ten amperes or less.

Answer 9 (H). From 1.25 to 2 inches, depending upon the amperage.

Answer 10 (P). I should rule that in the case of a two-wire cutout, the other side of the three-wire circuit, which is not carried on the cutout, should be disregarded; and accordingly I would point to the first table of Rule 67*j*, "Not over 125 volts," as indicating the minimum break distance required.

Answer 11 (S). Rule 67*j* takes care of the fuses for mains and branch circuits of a three-wire system in the fine-print note.

Answer 12 (X). Code rules maximum voltage. If the three-wire system is inside then the voltage of the outside wires of the system governs. If one side only is used it is obvious that the maximum is in use. It is also obvious that to constitute a three-wire system all the voltages must be accessible.

Answer 13 (N). The Rule appears perfectly plain, the third fine-print note being clear enough. A two-wire branch or tap circuit from one side of a three-wire submain is a part of a three-wire system by all the Code intimations as well as engineering meaning of the word "system" and 250-volt spacing should be uniformly demanded.

Answer 14 (O). The branch circuit described is a 110-volt circuit and the spacing for the cutout should conform to Rule 67*j*, first table headed "Not over 125 volts."

New Street Lighting in Providence.

The Narragansett Electric Lighting Company, Providence, R. I., for the past year has been changing the street lighting system of the city of Providence, making an installation of 1,600 6.6-ampere magnetite arc lamps and about 7,500 60-candlepower incandescent lamps. These lamps replace an installation of 1,900 old-type 9.6-ampere open arc lamps and about 2,500 32-candlepower incandescents.

The installation is about two-thirds completed and will be finished some time in the spring.

Savannah River Plant Starts Operation.

On February 16 the city of Augusta, Ga., celebrated the opening of the hydroelectric power plant located on the Savannah River, nine miles above the city. Since that date energy has been supplied from the new plant and the steam station of the Augusta-Aitken Railway & Electric Corporation has been shut down. An excursion was arranged in the morning by the company to visit the power plant. The dam and power house were inspected and a barbecue was arranged at Stevens Creek. In the evening there was a banquet with speeches by Governor Slayton, municipal officials and an executive of the J. G. White Management Corporation.

Current is transmitted to the city at 44,000 volts. The plant has a capacity of 24,000 horsepower. The dam is 2,000 feet long and 27 feet high and forms a reservoir with an area of 4,000 acres.

Longitude Determined by Wireless.

Wireless experiments which have been carried on between the Eiffel Tower in Paris and the Arlington Station at Washington have resulted in a correction to the figures previously obtained for the difference of longitude between these points. This correction is equivalent to a distance of 279 feet, the two stations being that much further apart than previously supposed. The distance between the two stations is 3,860 miles.

Three hundred tests were made altogether in exchanging signals, and the time records of sending and receiving were compared with astronomical observations made upon a selected list of 60 stars. The time for the double transmission of signals, that is, across the ocean and back, was 0.063 second.

American Society for Fire Prevention.

The organization meeting of the American Society for Fire Prevention was held on February 11 in New York City. The Society is incorporated under the laws of the state of New York. Charles W. Abrams was elected treasurer, Bernard Glaser secretary, and Abram Herbst director of safety.

The object of the Society is to carry on an aggressive and militant campaign for fire prevention in all parts of the United States. It will endeavor to point out just what should be done and how to do it. Arrangements have been completed for the issuance of a monthly magazine known as Fire Prevention, which will be its official organ.

The use of pumps operated by electricity, in connection with the city water supply, is being considered.

Public Service Commissions

CALIFORNIA.

Pacific Telephone & Telegraph Company. The Commission authorized the company to put in effect a new schedule of rates for telephone service to subscribers in the City of Eagle Rock. These rates are established for service connecting telephone subscribers of Eagle Rock directly with the Los Angeles exchange and are based on the Los Angeles exchange rates plus an average mileage of one-half mile for the entire city of Eagle Rock.

Home Telephone & Telegraph Company of Santa Barbara is authorized to issue three notes, in the aggregate amounting to $20,000, in renewal of notes now outstanding.

Coast Counties Gas & Electric Company is authorized to issue $150,000, face value of debentures bearing six per cent interest, to be sold at not less than 93.

Southern California Edison Company. The Commission authorized the campany to sell its bonds, which were authorized to sell at 92, at 89 and granted an extension of the time in which bonds may be sold from January 30, 1914, to January 30, 1915.

E. M. Wilson et. al. were granted a certificate of public convenience and necessity to construct and operate an electrical distributing system so as to serve the towns of Biever and Lookout in Modoc County.

IDAHO.

Lewiston-Clarkston Improvement Company. The Company applied for authority to file and publish on less than statutory notice a supplement changing its rate schedule. The amendment provided a material reduction in the Company's rates and the Commission granted the application.

Pocatello Gas & Power Company. The application of the Company for authority to change its schedule on less than statutory notice was granted. One of the changes established a rule requiring a minimum deposit of $3.00 to be made by all non-property owners as a guarantee for payment of bills.

ILLINOIS.

The Springfield Gas & Electric Company and **Peoria Water Works Company** are respondents in cases brought before the Commission on complaint of the cities. These are the first utility rate cases on the Commission's docket and a decision in these matters will no doubt show the Commission's policy in investigation for rate making purposes.

KENTUCKY.

A bill, providing for regulation of public utilities, and following closely the provisions of the Ohio law, has been introduced.

MISSOURI.

The Missouri Electric, Gas, Street Railway & Water Works Association has appointed a conference committee to co-operate with the Public Service Commission in working out a satisfactory uniform classification of accounts and form of annual report.

NEW JERSEY.

Winthrop M. Daniels, chairman of the Board of Public Utility Commissioners, has been appointed by President Wilson to the Interstate Commerce Commission. John L. Treacy of Jersey City has been appointed to fill the vacancy on the Board.

NEW YORK.

Amendment to Public Service Commissions Law. An amendment was introduced in the Assembly providing that no county in the First Public Service Commission District shall have more than two resident commissioners. If a commissioner for such district changes his residence to another state, or to the Second District, or to a county other than the one in which he resides, such change shall operate as a forfeiture of his office. Existing appointments are not to be affected.

OHIO.

Cleveland Electric Illuminating Company. The City of Cleveland has applied to the Commission asking that a valuation be made of the property of the electric company, a subsidiary of the Central States Electric Corporation, to be used as the basis for determining reasonable rates for electric service.

PENNSYLVANIA.

General Order No. 2. A general order has been issued relating to the regulation of the crossing of the facilities of one public service company with those of another public service company.

WISCONSIN.

Mineral Point Public Service Company. The Railroad Commission has approved an issue of $200,000 par value of six-per-cent bonds by the Mineral Point Public Service Company, the proceeds to be used in paying off outstanding indebtednesses, making extensions and additions to the property and in paying reorganization expenses. Inasmuch as the contemplated expenditures include interest and premiums on bonds, etc., which are not chargeable to the capital account, the company will be required to set aside each year such a sum that when the present issue of bonds shall become due the total amount so set aside shall be sufficient to discharge an amount of bonds equal to the foregoing uncapitalized expenditures.

Fond du Lac Telephone Company. The petition of the Fond du Lac Telephone Company requesting permission to extend its lines has been denied by the Commission on the ground that the district to be served by the proposed extension is now adequately served by the Eastern Wisconsin Telephone Company, a party to the proceedings.

Milwaukee Consolidation. The purchase of the property of the Central Heating Company of Milwaukee by the Milwaukee Electric Railway and Light Company has been approved by the Commission. Authority has also been granted the Wisconsin Public Service Company to acquire by purchase the property of the Green Bay Gas and Electric Company, located at Green Bay.

Dodgeville Service. An order has been issued by the Commission requiring the Dodgeville Electric Light and Power Company to thoroughly overhaul its entire system so as to give service in full compliance with the standards of service. The order provides that the company shall engage some competent engineer who understands the needs of the system; that the Commission shall be notified concerning the securing of such service; that the complete plans and specifications covering the new equipment and changes be filed with the Commission within 30 days after the engineer shall have been engaged; that the work of rehabilitation be completed within 60 days. The above order was issued only after the company had repeatedly refused to comply with the standards of service.

The Neshonoc Light and Power Company has been ordered to make extensive changes in its hydroelectric plant and transmission system in accordance with plans suggested by the engineers of the Commission. It was found to be impossible to render service in compliance with the standards of service with the present plant and equipment.

The Mt. Horeb Electric Light Company has been authorized to abandon its present schedule for electric lighting and power and to substitute schedules prescribed by the Commission. The present rates do not yield sufficient revenue to take care of interest and depreciation charges. Furthermore, the company plans to enlarge its equipment and to furnish day service. The rates authorized by the Commission are not as high as were petitioned for nor as high as the cost of service would warrant for, in the opinion of the Commission, the business of the utility can be developed to better advantage through a reasonable schedule of rates. The present rate is 12 cents net per kilowatt-hour. The rates prescribed are as follows: primary rate, 14 cents net for kilowatt, for the first 30 hours' use per month of the active connected load; secondary rate, 12 cents net for the next 60 hours' use of the active connected load; excess rate, 9 cents net. In class A, consisting of residences, etc., 60 per cent of the first 500 watts connected and 33.3 per cent of the remainder is to be considered active. In class B, consisting of stores, offices, banks, saloons, etc., 70 per cent of the first 2.5 kilowatts and 55 per cent of the balance is to be considered active. In class C, consisting of churches, industrial establishments, club rooms, hotels, schools, etc., 55 per cent of the connected load is to be active.

The rate for power service consists of a service charge of 75 cents net per month per horsepower and an energy charge of 5 cents net for the first 50 hours' use per month of the connected load and an excess rate of 3 cents net per kilowatt-hour.

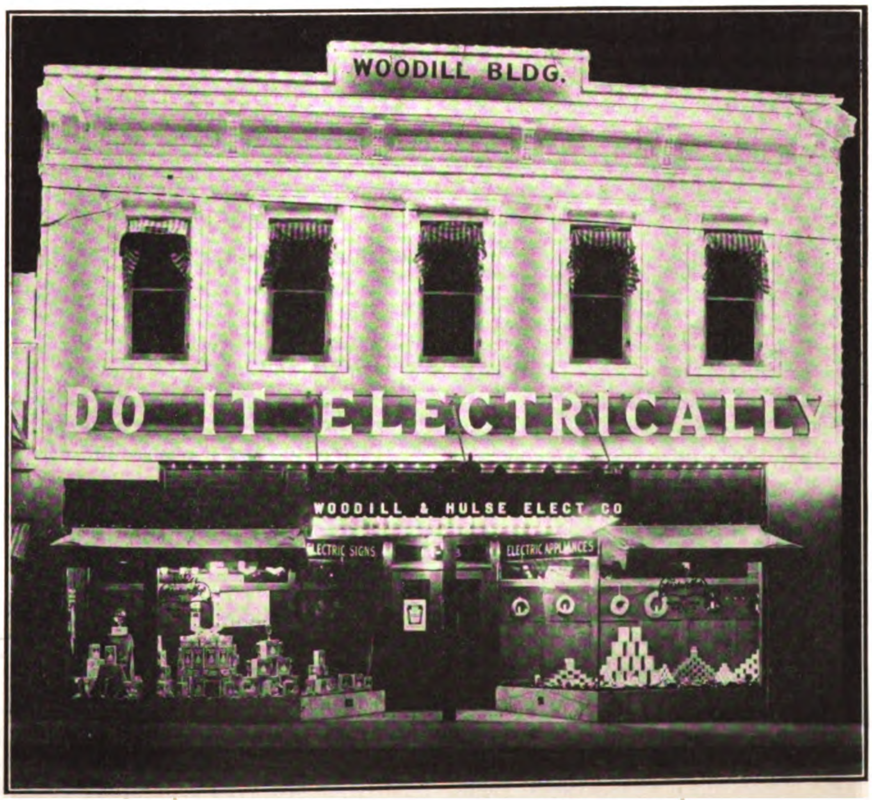
Among the Supply Men

The Walsh Electrical Supply Company, Incorporated, New York, N. Y., has been organized as a corporation to carry on a general jobbing business in electrical supplies. The company will have no retail store and will cater to the electrical contracting trade and the general and building contracting business only. The business will be conducted by John F. Walsh, at present president and manager of the Alpha Electrical Supply Company of New York City. The officers of the company are: John F. Walsh, president and treasurer; James G. Walsh, vice-president; Chester N. Rogers, secretary. The warehouse of the company will be established at 129 and 131 West Thirty-fifty Street.

The Electric Appliance Company, of New Orleans, held its annual meeting and banquet on January 24. The dinner program was ornamented with illustrations of the various buildings occupied in turn by the business of C. Robert Churchill and later the Electric Appliance Company. From these illustrations it appears that in 1898 the place of business and stock in trade was a rather neat looking black felt hat. In 1900 there was a warehouse in Dosiere Street, and in 1903 this became enlarged. In 1905 the Electric Appliance Company was established at 139 and 141 Chartres Street, in 1907 the building at 205 to 209 Chartres Street being established. In 1914 the new building at 408 to 416 Canal Street was occupied.

A Progressive Electrical Supply Store.

One of the progressive electrical supply houses of the country is the Woodill & Hulse Electric Company, of Los Angeles, Cal. Although just recovering from a fire which practically cleaned up the entire stock, the company is making a handsome display in its new store which is equipped with a complete line of electrical supplies. The company is a member of the Society for Electrical Development, Incorporated, and it is believed to be the first dealer in the United States to advertise the slogan "Do It Electrically." The illustration herewith shows how this slogan stands out



Store of Woodill & Hulse Electric Company.

Lighting of a Mail-Order Mercantile Establishment.

The February meeting of the Chicago Section, Illuminating Engineering Society, was held on the evening of February 11th at the Chicago headquarters of Sears-Roebuck & Company. This is the largest mail-order house in the world, employing about 10,000 persons in Chicago alone.

The company gave a dinner to the visitors, who numbered about 100. S. E. Church, electrical engineer of the company, made a brief address outlining the program of the evening. Mr. Church then led the party through various departments and offices of the main merchandise building, several large offices in the administration building, the press room and composing room of the printing building, and the boiler, engine and refrigerating room in the power house. A special fire drill by the private fire department of the company was witnessed. At a number of points the party paused to make a detailed study of the illumination. Mr. Church presented data on the equipment.

In a typical office section in the merchandise building the bays are 16 by 14 feet in area and the ceiling 11 feet 7 inches high. Direct general lighting is employed; desk lamps for local lighting are used in but very few cases. The illumination is provided by four 60-watt bowl-frosted tungsten lamps, evenly spaced, per bay; each lamp is equipped with a Holoplane-D'Olier enameled steel reflector, the lower edge of which is 8 feet, 11 inches above the floor. With only one bay lighted the average illumination on the working plane was 1.57-foot candles. With the whole room lighted this average illumination was 3.63 foot-candles. The maximum variation from the average was 11 per cent. A test of depreciation from two months' accumulation of dust on the lamps and reflectors showed a falling off of 23.2 per cent in the illumination. Open wiring is used with eight 60-watt lamps per circuit. The circuits are arranged parallel to the window; the lamps on the middle circuits of the wide room are on nearly all day; as it becomes darker one after another circuit is turned on until the windows are reached on either side of the room at dusk.

In one of the large offices (the order-entry department) of the administration building indirect lighting is used. The bays are 20 feet square and the ceiling height 14 feet 6 inches; the upper edge of the reflector is two feet from the ceiling. Four 100-watt clear tungsten lamps are used with X-Ray silvered glass reflectors. Each unit is hung directly on the cord without chain or stem suspension. Originally the walls and ceiling had a dark color and the illumination on the working plane averaged 1.32 foot-candles with only one bay lighted. On repainting walls and ceiling with a light cream color the illumination in one bay was raised about 50 per cent to 2.09 foot-candles. With the entire room lighted the average illumination values were 1.5 and 2.5 foot-candles before and after repainting. The illumination was exceptionally uniform. Depreciation from two months' accumulation of dust on the reflectors and lamps was about 22.5 per cent. No local lighting whatever is provided in these offices. The average cost of cleaning each fixture in the entire plant, both direct and indirect fixtures, is two cents for each cleaning; two months is the longest interval between cleanings.

In the large press room in the printing building the bays are 16 feet square and lighted with three 100-watt tungsten lamps in enameled steel reflectors intended for 150-watt lamps so as to almost hide the lamps from view. The reflectors are 13 feet 10 inches from the floor. The average illumination is 2.71 foot-candles. In the composing room prismatic glass reflector units provide the general illumination and local lighting is used for the composing racks and make-up stones.

The total number of lighting outlets in the establishment is about 31,000. There are in use about 20,000 carbon, 7,000 tungsten, and 3,000 Nernst lamps.

◆

Automatic Telephones in England.

The Postmaster-General of England, after satisfactory trials, has decided to use automatic telephones for the public service, and not only London, but various towns in the North, will be served with as little delay as possible. In Manchester and the surrounding district many underground cables are being laid for the purpose, and an automatic exchange is to be installed at Stockport.

◆

High-Speed Telegraphy.

The Creed automatic system of high-speed telegraphy has been adopted between the London and Edinburgh offices of the *Scotsman*, and it is stated that the three wires previously necessary have now been superseded by one wire.

CALCULATION OF WIRE SIZES FOR MULTIPLE-UNIT POST STREET LIGHTING SYSTEMS.

By Arthur L. Abbott.

A somewhat interesting application of Ohm's law, and one which is a little puzzling until it is given some attention, arises in calculating the drop on unbalanced three-wire circuits as almost universally used in operating ornamental-post street-lighting systems.

In a typical installation, the posts have five lamps, one top lamp consuming 100 watts, and four lower lamps consuming 60 watts each. The posts are operated on a three-wire multiple system, using 110-volt lamps, the four lower lamps being connected to one side of the system, and the one top lamp being connected to the other side. Switches are connected as shown in the diagram, Fig. 1, so that all lamps may be burned from dark to midnight, and then the lower lamps can be switched off, leaving the top lamps to burn till daylight. The distance being given from feed-point to first post, or between two posts, and the number of posts, size of lamps, and percentage drop being specified, it is required to find the size of each of the three wires. It is of course required that the drop on the two sides of the three-wire system shall be as nearly equal as possible, using standard commercial sizes of wire, also that operation shall be satisfactory after midnight when the lower lamps are switched off.

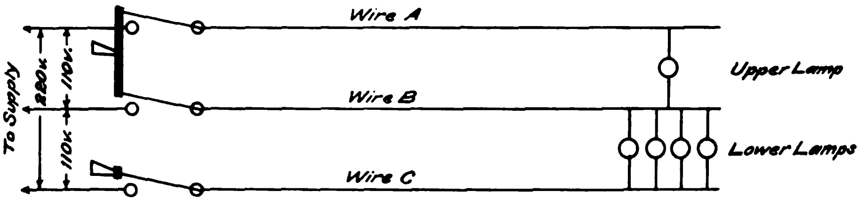


Fig. 1.—Wiring Diagram for Switches.

There are, in general, two arrangements which should be considered.

Case I.—B and C may be the same size, with A a smaller size.

Case II.—A and B may be the same size, with C a larger size.

There are, of course, other possible arrangements, but none which are of any practical importance.

Case I.

Let I = amperes in wire A
I' = amperes in wire C
M = circular mils of wire A
M' = circular mils of wires B and C
$K = 10.8 \times D$ (10.8 being taken as the resistance in ohms of a mil-foot of copper, and D being the length of one wire.)

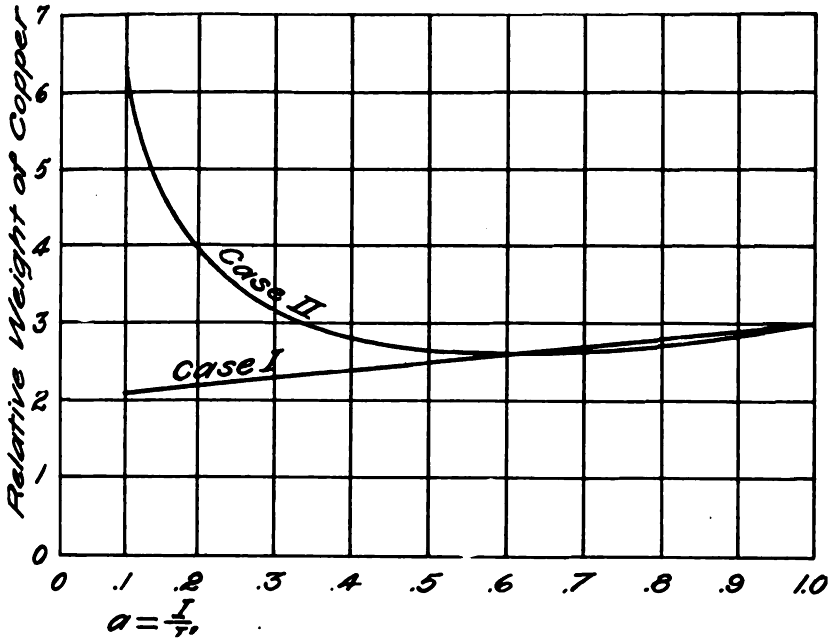


Fig. 2.—Relative Values of Total Area of Wires.

Then drop in wire $A = IK/M$

drop in wire $B = (I' - I)\,K/M'$

drop in wire $C = I'\,K/M'$

Total drop for lower lamps = drop in B + drop in C = $(2\,I' - I)\,K/M'$.

To find the size of wire A, the condition is given that the drop for the lower lamps shall equal the drop for the top lamps. Since the drop in the neutral wire B affects the upper and lower lamps equally, it is plain that to fulfill the condition stated, the drop in wire A must be equal to the drop in wire C, or

$$IK/M = I'K/M'$$

Whence $M = M'\,I/I'$

When the lower lamps are switched off, we have

Total drop = drop in wire A + drop in wire B = $I\,K/M + I\,K/M' = (M' + M)\,I\,K/M\,M'$

Case II.

Let N = circular mils of wires A and B

N' = circular mils of wire C

Then drop in A = $I\,K/N$

Drop in B = $(I' - I)\,K/N$

Drop in C = $I'\,K/N'$

Total drop for top lamps =

$I\,K/N + (I' - I)\,K/N = I'\,K/N$

The value of N in terms of N' is found by equating the drop in A and the drop in C.

$$I\,K/N = I'\,K/N'$$

Whence $N = N'\,I/I'$

When the lower lamps are switched off, we have

Total drop = $2\,I\,K/N$

The drop being the same in both cases, we wish to determine which arrangement is the more economical of copper. Equating the expressions for the total drop in the two cases with all lights burning,

$$(2\,I' - I)\,K/M' = I'\,K/N,$$
$$N = M'\,I'/(2\,I' - I)$$

If I is less than I' in the ratio $I/I' = a$,

$$M = M'\,a$$
$$N = M'/(2 - a)$$

In case I we have

One wire of area M circular mils = $M'\,a$ circular mils

Two wires of area M' circular mils.

Total area of the three wires = $(a + 2)\,M'$

In case II we have

Two wires of area = N circular mils

One wire of area N' circular mils = N/a circular mils

Total area of the three wires $= 2\,N + N/a = (2a + 1)\,N/a = M'\,(2a + 1)/(2a - a^2)$

Relative values of total area of the three wires for varying values of a are shown for both cases by the curves in Fig. 2. Values of the ratio of drop with all lamps burning, to drop with top lamps only burning, are shown for the two cases by the curves in Fig. 3. From a consideration of Fig. 2 and Fig. 3 it is evident that in most actual cases, neither of the two arrangements has much advantage over the other. Where there is any choice, Case I has somewhat the best of the argument.

It is desirable to figure the size of wire required for a specified percentage drop by the use of a standard table giving percentage drop for all sizes of wire and all common voltages, for various values of "ampere-feet," the quantity "ampere-feet" being the amperes in the circuit multiplied by the single distance in feet.

In Case I, the drop = $(2\,I' - I)K/M' = (2/a - 1)\ 10.8 \times D\ I/M'$

The standard table referred to is calculated from the formula

$$\text{Drop} = \frac{I \times 10.8 \times 2\,D}{\text{Circular mils}}$$

The expression for the drop in Case I may be reduced to the similar form Drop $= 1/2\,(2/a - 1)\,I \times 10.8 \times 2\,D/M'$ $= (1/a - 1/2)\,I \times 10.8 \times 2\,D/M'$

Hence, if we find the ampere-feet for the top lamps, and multiply this quantity by the constant $(1/a - 1/2)$, we have a quantity which may be called the "equivalent ampere-feet" and which may be used with the table for finding the size of wire C. The value of M' (the size of wire C) being determined, the value of M (size of wires A and B) is given by the formula

$$M = M'\,a.$$

Values of I, I', a, and the constant $(1/a - 1/2)$ by which the ampere-feet $I\,D$ must be multiplied in order to obtain the "equivalent ampere-feet" for use with a table, are given in Table I for all ordinary combinations found on five-light posts.

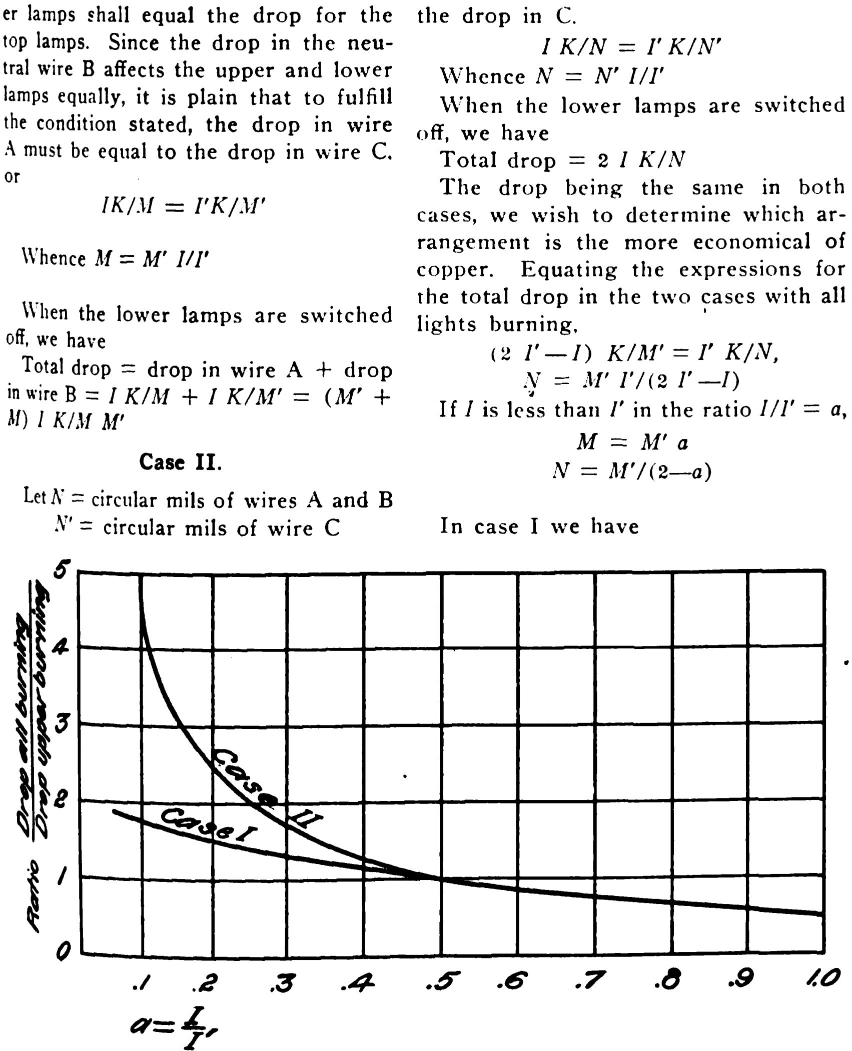


Fig. 3.—Ratio of Voltage Drops.

TABLE I.

Top Lamp Watts.	Four Lower Lamps Watts each.	I per post.	I' per post.	a.	$\frac{1}{a}-\frac{1}{2}$
150	100	1.36	3.64	0.38	2.17
150	60	1.36	2.18	0.63	1.10
100	60	0.91	2.18	0.42	1.90
60	60	0.545	2.18	0.25	3.50
60	40	0.545	1.46	0.37	2.17

ACCURACY OF THE FORMULAS FOR THE RATIO, REGULATION, AND PHASE ANGLE OF TRANSFORMERS.

By P. G. Agnew and F. B. Silsbee.

There has been a great deal of discussion of the formulas for the predetermination of the performance of transformers from the constants obtained from the "short-circuit" and "open-circuit" tests, particularly in regard to the formula for computing regulation. We have very little data available, however, which will enable one to compare the formulas with accurately observed values. Bedell[1] and Drysdale[2] have published results for some of the formulas, which show a very fair agreement but so far as the authors are aware no comparisons have hitherto been published based on the precise potentiometer methods now available for the direct determination of ratio, regulation, and phase angle.

Only a summary of the formulas is given here, but a complete discussion showing the magnitude of all the approximations involved in their derivation has been published elsewhere.[3]

If n=ratio of turns, primary to secondary.

E_1, E_2=primary and reversed secondary terminal voltages.

R_1, X_1, Z_1=primary resistance, reactance and impedance.

R_2, X_2, Z_2=secondary resistance, reactance and impedance.

R, X, Z=total resistance, reactance and impedance, referred to the primary, so that

$R=R_1+n^2R_2$, $X=X_1+n^2X_2$, $Z=Z_1+n^2Z_2$.

$I=I_2/n$=load current referred to primary side.

θ=angle by which I lags behind E_2.

I_0=exciting current.

φ=magnetic flux.

γ=angle by which the exciting current lags behind the induced voltage.

Then in Fig. 1 the vector difference between E_1 and nE_2 is made up of four parts, IR and IX in phase and in quadrature, respectively, with I, and I_0R_1 and I_0X_1 in phase and in quadrature, respectively, with I_0.

Then the formulas are:

$$\text{Ratio} = n\left[1+\frac{IR\cos\theta \pm IX\sin\theta}{nE_2} + \frac{(IR\sin\theta \mp IX\cos\theta)^2}{2n^2E_2^2} + \frac{I_0R_1\cos\gamma + I_0X_1\sin\gamma}{nE_2}\right]$$

$$\underset{(\text{Power-factor}=\text{I})}{\text{Ratio}} = n\left[1+\frac{IR}{nE_2}+\frac{I^2X^2}{2n^2E_2^2} + \frac{I_0R_1\cos\gamma + I_0X_1\sin\gamma}{nE_2}\right]$$

$$\underset{(\text{no load})}{\text{Ratio}} = n\left[1+\frac{I_0R_1\cos\gamma+I_0X_1\sin\gamma}{nE_2}\right]$$

$$\underset{\text{regulation}}{\text{Per cent}} = 100\left[\frac{IR\cos\theta \pm IX\sin\theta}{nE_2} + \frac{(IR\sin\theta \mp IX\cos\theta)^2}{2n^2E_2^2}\right]$$

$$\underset{(\text{Power-factor}=1)}{\text{Per cent regulation}} = 100\left[\frac{IR}{nE_2}+\frac{I^2X^2}{2n^2E_2^2}\right]$$

$$\text{Phase angle} = \frac{1}{E_1}\left[IR\sin\theta - IX\cos\theta + I_0R_1\sin\gamma - I_0X_1\cos\gamma\right]$$

$$\underset{(\text{Power-factor}=1)}{\text{Phase angle}} = \frac{1}{E_1}\left[-IX + I_0R_1\sin\gamma - I_0X_1\cos\gamma\right]$$

$$\underset{(\text{no load})}{\text{Phase angle}} = \frac{1}{E_1}\left[I_0R_1\sin\gamma - I_0X_1\cos\gamma\right]$$

(The last three equations give the phase angle in radians. To get minutes, multiply by 3438.)

When the phase angle is + the reversed secondary voltage leads the primary voltage. When ± signs occur the upper sign should be used for lagging, and the lower sign for leading current.

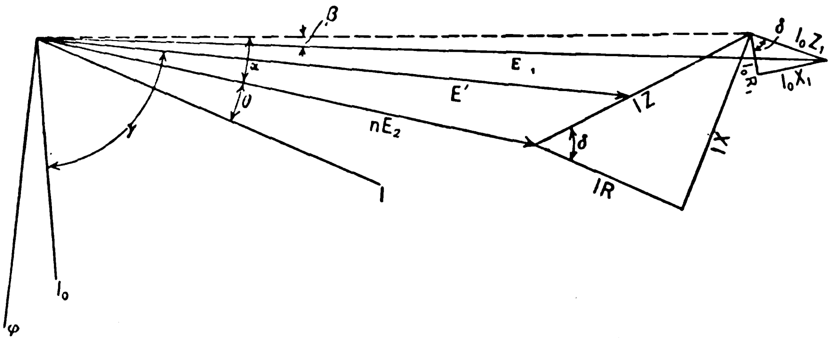


Fig. 1.—Vector Diagram of Transformer Voltages.

Since the primary and secondary reactance cannot be directly determined separately, one may assume that the reactance drop is equally divided between primary and secondary, so that

$$X_0 = X/2$$

For most practical work the square terms in the formulas for ratio and regulation may well be omitted.

Discussion of Formulas.

The combined approximations made in the deduction of these formulas are less than 0.01 per cent in ratio and regulation, or 0.4 minute in phase angle in a transformer having an impedance drop of 2.5 per cent of rated voltage and a magnetizing current of 6 per cent of rated current. For smaller impedance drop and magnetizing current the magnitudes of the approximations are still less. In nearly all practical cases the inaccuracy of the temperature measurements alone is sufficient to cause an error as great as the combined approximations, to say nothing of instrumental errors and the assumption that the reactance under working conditions is the same as that under short-circuit conditions.

In fact in most cases it is meaningless to compute regulation to 0.01 per cent since the accuracy of the experimental data does not warrant it.

It is evident from the form of the equations that when plotted against current at a given power-factor and voltage the phase angle of a transformer gives a straight line. The ratio and regulation give nearly a straight line, the very slight curvature being due to the square term. With constant secondary current, the phase angle gives a sine curve when plotted against the phase angle of the connected load, crossing the axis of zero phase near the point where $\Theta = \tan^{-1}X/R$. Similarly, the ratio and regulation give nearly sine curves (distorted by the square term) which have their maxima where $\Theta = \tan^{-1}X/R$. These relations may be found useful even when the short-circuit data are not available.

As they now stand the Standardization Rules of the American Institute of Electrical Engineers are not definite in regard to the exact definitions of rated current and rated voltage when the voltage drop within the windings is taken into consideration. However, this has been brought to the attention of the Standards Committee and will be corrected.

Numerical Example.

Consider a 2-kilowatt, 1000/100-volt, 60-cycle transformer. Let $R_1 = 6$, $R_2 = 0.065$, $X = 15$, $I_0 = 0.12$, $\cos\gamma = 0.4$, $n = 10$, $I = 2$, $R = R_1 + n^2R_2 = 12.5$, $X_1 = X/2 = 7.5$.

The no-load ratio is

$$10\left[1+\frac{0.12\,(6\times 0.4 + 7.5\times 0.92)}{1000}\right] = 10.011$$

The per-cent regulation at 0.6 power-factor, lagging current, is:

$$100\left[\frac{2\times 12.5\times 0.6 + 15\times 2\times 0.8}{1000} + \frac{(2\times 12.5\times 0.8 - 15\times 2\times 0.6)^2}{2\times 100\times 10000}\right]$$
$$= 3.90 \text{ per ccnt.}$$

and the phase angle is

$(2 \times 12.5 \times 0.8 - 2 \times 12.5 \times 0.6) / 1000 + 0.12 (6 \times 0.92 - 7.5 \times 0.4) / 1000 = + 0.0023$ radian $= + 8'$.

The positive sign indicating that the reversed secondary voltage leads the primary voltage.

Experimental Tests of the Formulas.

As a test of the formulas accurate measurements were made of ratio and phase angle of two different types of lighting transformers by the potentio-

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[1] Bedell, Chandler and Sherwood: *Electrical World*, 30, p. 190; August 14, 1897.

[2] Drysdale: *Electrician*, 65, p. 643; July, 1910.

[3] *Bulletin of the Bureau of Standards*. 10, p. 279. Reprint No. 211.

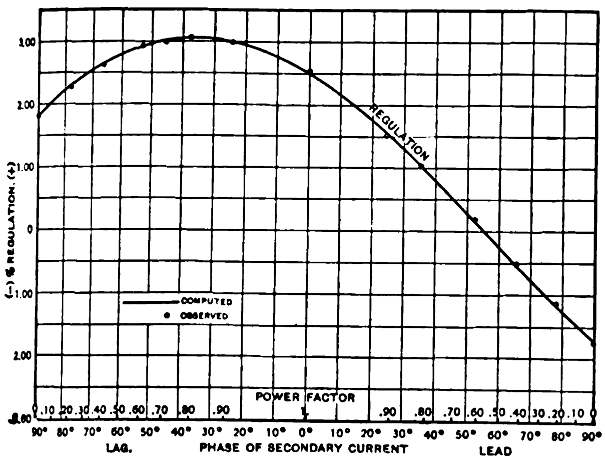

Fig. 2.—Regulation of Transformer A.

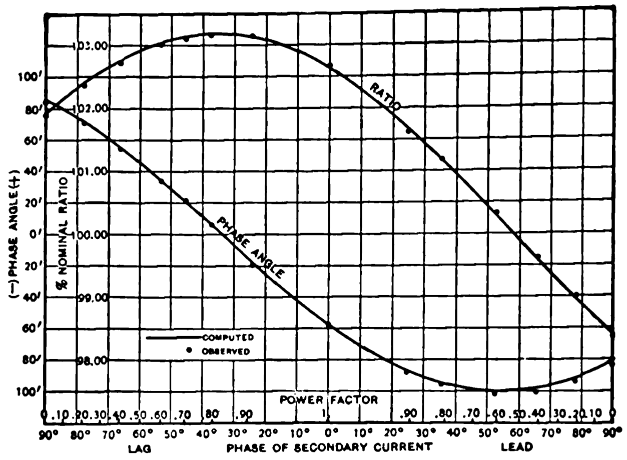

Fig. 3.—Ratio and Phase Angle of Transformer A.

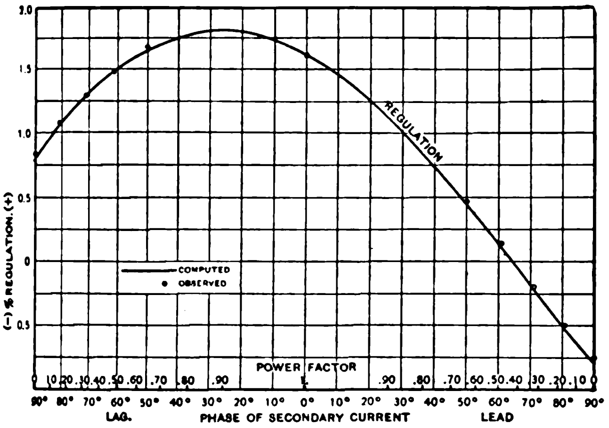

Fig. 4.—Regulation of Transformer B.

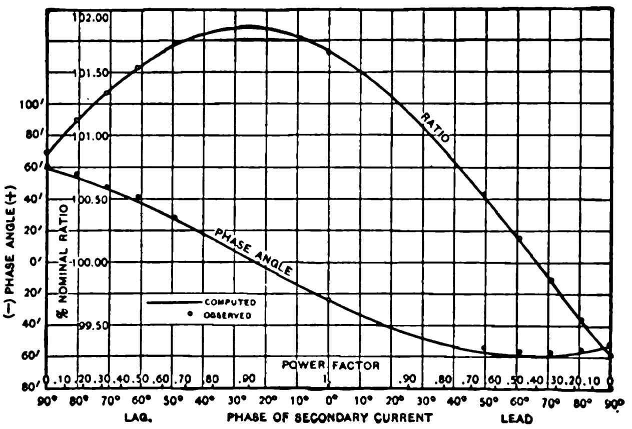

Fig. 5.—Ratio and Phase Angle of Transformer B.

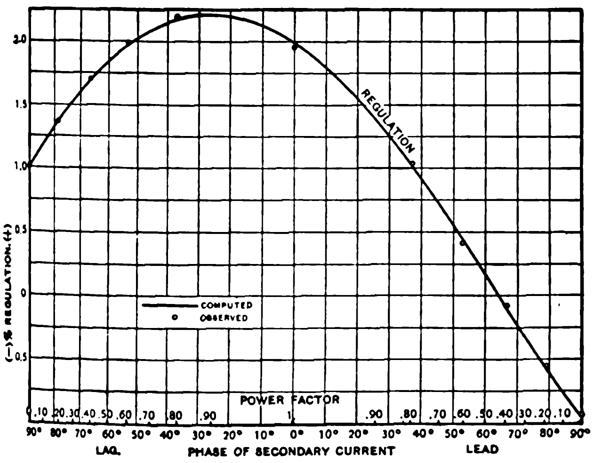

Fig. 6.—Regulation of Transformer B at Excess Voltage.

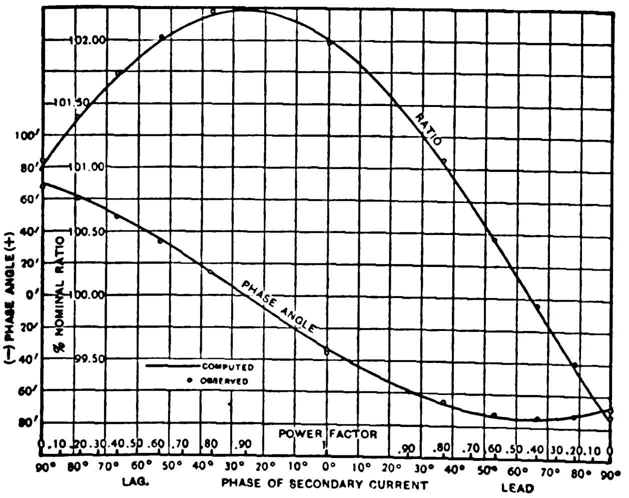

Fig. 7.—Ratio and Phase Angle of Transformer B at Excess Voltage.

meter method[4] and covering the whole range of power-factors from zero power-factor, current leading, to zero power-factor, current lagging.

DATA ON TRANSFORMERS

	Transformer A	Transformer B
Rated kilowatts	0.6	5.0
Frequency	60.0	60.0
Voltage	240/120	1,100/110
Method of cooling..	Air only	Oil.
Resistance drop — per cent	2.3	2.0
Reactance drop—per cent	1.6	1.0
Impedance drop—per cent	2.8	2.2
Exciting current at rated voltage—per cent	11.0	3.4
Power-factor of exciting current at rated voltage—per cent	0.39	0.23
Increase of voltage to give 11 per cent exciting current—per cent		23.0
Power-factor at 11 per cent exciting current		0.09

These phase relations were obtained by opposing two similar transformers as in the usual connections for a heat run. The electromotive force which was inserted to circulate the load current was derived from the secondary of a phase-shifting transformer excited from a second generator on the same shaft as that which excited the transformer under test. The magnitude of the current could be controlled by the generator field and its phase adjusted independently by the position of the rotor of the phase-shifting transformer. The temperature was maintained very nearly constant during the measurements, and the results have been corrected for the slight variations which did occur. As the transformers were small, it was necessary to correct for losses in the measuring instruments employed.

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[4] For a description of this method, see Agnew and Silsbee, *Proceedings American Institute of Electrical Engineers*, 31, p. 1,267; June, 1912.

The impedances were determined by the usual short-circuit test, using carefully calibrated portable instruments. In both transformers the resistance was found to be the same on alternating current as on direct current and the leakage reactance appeared independent of the current up to twice rated current.

Figs. 2 to 5 have been plotted to show the results of the comparison. Ratio, regulation, and phase angle are plotted against the angle between secondary current and voltage. (Power-factors have also been indicated on the axis of abscissas.) The full lines are computed by the formulas from the short-circuit data, while the circles represent observed points. It will be seen that the agreement is quite satisfactory. In the runs plotted in Fig. 6 and 7 the voltage on transformer B was arbitrarily raised to give an exciting current of 11 per cent of rated load current, so as to magnify the effect of the approximations made in the derivation of the formulas. The agreement between computed and observed values is entirely satisfactory, again showing that the effect of the exciting current upon the regulation is inappreciable.[5] The current rating was taken as unchanged and hence the regulation is proportionately less than at rated voltage.

It is evident, at least for the two types of transformers represented in these tests, that the short-circuit test gives results which are entirely adequate for the predetermination of the operating characteristics, the accuracy being limited by the errors of measurement and not by theoretical errors.

Railroad Yard Lighting.

On Friday evening, February 13, A. C. Cotton and H. Kirschberg presented a paper on "Railroad Track Scale and Yard Lighting" before the Pittsburgh Section of the Illuminating Engineering Society. Preliminary to this paper, J. L. Minick outlined the general conditions to be met in this class of work. On account of the value of the land it is usually undesirable to allow sufficient clearance between tracks for pole lines. Consequently, lighting a yard presents the same general requirements as would lighting a city of long, narrow streets, with high buildings on both sides.

The paper on "Yard Lighting" was read by Mr. Kirschberg, and was devoted largely to outlining the conditions to be met by the illuminating engineer. Freight is collected at various points along the main line and branches, by what are known as collection freights, and conveyed to receiving yards, situated at convenient points on the division. Immediately adjacent is the classification yard, with the track scales between. The train of cars is pushed from the receiving yard to the hump, where each car is cut from the train and allowed to float by gravity, down a two-per-cent grade to and over the scale, thence down a 1.4-per-cent clearance grade to the classification yard to be made up into trains. As the car passes over the scale at a speed of about 2.5 miles per hour, the weighing is done, the number and weight (empty) of the car is read from the side or either end, and a record made, the entire operation taking from eight to twelve seconds.

Of the many special problems of illumination presented on a railroad, none, perhaps, is of more importance or is capable of more solutions than that of track-scale lighting. A modern track scale is from 37 to 83 feet in length and of 300,000 pounds capacity and is used to weigh all freight passing over the road, a large percentage of the weighing being done at night. Inasmuch as better light around the scales permits a better movement of cars through the yards, thereby increasing their capacity, it is evident that the successful solution of this problem is greatly to be desired. The conditions to be met are:

(1) Sufficient illumination in the scale house, with special attention to the scale beam, to permit rapid and accurate weighing. The lamps must be so placed and shielded that none is in the field of vision, either from the inside or outside of the scale house, and that no reflection of the lamps is seen in the windows, making it difficult to see the numbers on the cars outside.

(2) Sufficient illumination outside the scale house to enable those inside and those outside to perform the following duties: safe cutting of cars at the hump; seeing location of car at every point in its movement; clear sight of every wheel onto the scale; reading light weights and numbers on ends of approaching cars; reading same on side of car while on scale (for this, a clearance of 2 feet, 11.5 inches is all that is allowed); reading of same on receding end of car if not previously secured; clear sight of movement of wheels off the scale; clear sight of movement of car down the clearance grade, in order to safely pass the next car over the scale; location of position of car on the clearance grade in order not to bump cars too hard when making up drafts of cars to go down the classification yard.

It is evident that the weighmaster must look from a well lighted room, through glass, into an illuminated open space with a dark background; also that the riders in charge of the cars are continually moving from a well lighted zone into one with a very low intensity of illumination. Glare in such cases is productive of danger to individuals and possible damage to equipment.

Considering all the conditions to be met, an attempt to adequately light the scale and its surroundings inexpensively and efficiently requires not only a thorough knowledge of illuminants and their particular qualities, but also a fair amount of ingenuity in their use to obtain the best results. With so many variations in surroundings, a standard scheme is well nigh impossible.

The trackage layout in the yards should provide space for poles on which to mount lamps, but the space allotted to the lighting is not only often insufficient, but is also poorly located. The usual lighting scheme employs a line of arcs down the center of the yard, and a line on each side. Other methods have been used, with as poor results. Many engineers, in designing this class of lighting, have considered the yard as an open space and have lighted it accordingly. Quite contrary to this idea, the problem of yard lighting may be stated to be more involved than any problem of street or park lighting. A classification yard consists of a series of streets, three to four feet wide, with buildings about 14 feet high on both sides. The ideal system would provide light on and between every pair of tracks.

The conditions to be satisfied may be briefly stated as follows: (1) illumination of the grade leading from the scale to the yard; (2) illumination of the switches at the head of the yard, to facilitate control of car movement from the switch tower; (3) illumination of every track, irrespective of position of adjacent cars; (4) illumination of every car in the yard; (5) absence of glare from every position in the yard. The foregoing must be accomplished without the retention of too much space from trackage, this space usually being allotted in advance without regard to its adaptability for the purpose intended.

In the discussion, which was participated in by Messrs. Mundo, Minick, Cotton, Roosa, Riker, Travers, Meeker and Kirschberg, the following points were brought out.

The railway illuminating engineer has to meet all the problems which are common to other installations and many which are not met with elsewhere. For scale lighting the flaming arc is being superseded by 250-watt tungsten lamps with suitable reflectors, in some cases being replaced lamp for lamp and in other cases six tungsten lamps replacing four flame arcs. The principal advantage of the tungsten lamp is its reliability, freedom from flickering and ready replacement by unskilled persons. A large number of small lamps would be ideal for yard lighting, but the expense would be great, and catenary construction would be required.

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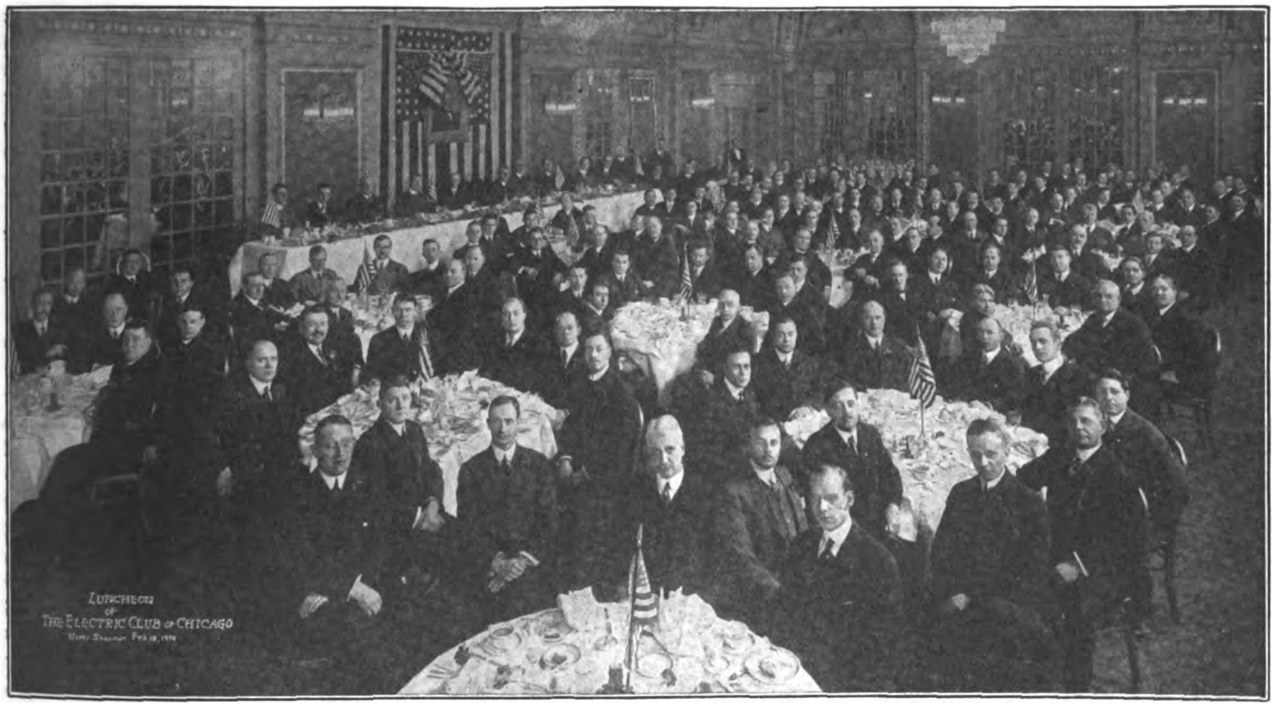
[5] For further experimental evidence on this point see Lloyd and Agnew, Bureau of Standards, 6, p. 273.

Meter Bills in Massachusetts.

Hearings were held February 13 by the Committee on Public Lighting of the Massachusetts Legislature, on bills to compel all electric, gas and water companies to issue duplicate readings of meters to their customers, and on a bill which aims to reduce the legal maximum charge for the use of electric meters from $9 to $5 per year. Petitions for the first bill urged that buyers of any commodity have a right to know, at the time the charge is made, just the amount of the obligation. It was suggested that the meter readers' books should have duplicate leaves for each customer's monthly reading, one of which would be left with the customer. It was stated that some companies send bills two or three weeks after the reading of the meters, too late for a satisfactory adjustment of errors.



Luncheon of the Electric Club of Chicago at the Hotel Sherman, Chicago, February 12, 1914.

Attorneys for the lighting companies brought out the fact that the law requires gas companies to give a duplicate of gas meter readings on the customer's request. The main objection, from the companies' standpoint, to the giving of duplicates to all consumers was the cost. The requests for duplicate readings of gas meters are few.

Everett W. Burdett, representing the electric companies, stated that the Boston Edison Company has for eight years made it a rule to give duplicate readings of meters on request. The company has 60,000 meters on its services, but there are only about 200 patrons who request duplicate readings. The company issues a card describing how to read meters and urging customers to compare their own readings with the bills. No objection was offered to the extension of the law relating to gas meters to include electric meters.

Joseph W. Cowles, meter expert for the Boston Edison Company, stated that the meter readers' record card bears the words "Leave Readings" in rubber stamp in cases where duplicates are wanted.

Warren D. King, of the Peabody municipal plant, stated that of 1,300 customers he had requests for only two duplicates. The management sends postcards to customers not found at home showing dials of the meter, with the request that these patrons indicate the position of the hands and send the postcards to the office. These readings are checked up from subsequent readings by the plant's employees.

On the bill to reduce the meter charge to $5 per year, Mr. Burdett pointed out that last year the maximum legal charge was reduced from $12 to $9. He held that the claim that meter charges should be constantly reduced or done away with is based on a false assumption. Customers who use as little electricity as $5 worth per year are unprofitable. The meter charge is not simply for the use of the meter but the fair charge for the company's readiness to serve. The whole plant is at the command of the customer. A reduction in charges to unprofitable customers would necessarily result in placing an added burden on the larger consumers.

Mr. Burdett pointed out that the energy loss of the Boston Edison Company is about $2.34 per meter and that the whole cost of maintaining meters is between $7 and $8 per year each. Mr. King, of Peabody, held that the actual excitation loss in the meter amounts to $4.20 a year at a 12-cent rate. This loss is not recorded by the meter and is borne by the central station.

◆

Chicago Electric Club.

A special luncheon in honor of Lincoln's birthday was held by the Electric Club of Chicago, on February 12. Henry Walter Grahm delivered an address on Lincoln and a musical program of patriotic airs was provided. Special decorations in honor of the occasion were provided The attendance at this meeting was 179.

◆

Louisville Automobile Show.

Electric vehicles were prominently displayed at the annual automobile show held in Louisville, Ky., February 11-14, and the evident popularity of cars of this type was generally commented upon. The Kentucky Wagon Manufacturing Company, of Louisville showed a full line of its electric commercial cars, while the Detroit, Waverley, Rauch & Lang, Baker, Ohio, Chicago and Woods passenger vehicles were also displayed.

◆

Wiremen Oppose Government Ownership.

At a meeting of the New England District Council of the American Federation of Labor, Electrical Workers' Unions, held in Boston on February 8, a vote was passed opposing the government ownership of telephone and telegraph systems. It was the sentiment of the meeting that government ownership would be inimical to the interests of labor unions.

Kings County Electric Light Has Good Year.

The Kings County Electric Light & Power Company's report for the year ending December 31, 1913, shows that the year just past has been one of increased activity, and has been attended by satisfactory financial results. The following is a condensed statement of earnings and expenses with 1912 comparisons:

	1913.	1912.
Total revenues....	$5,742,548.12	$5,245,835.31
Expenses, including taxes and depreciation charges	3,662,627.99	3,395,006.59
Gross income	$2,079,920.13	$1,850,828.72
Bond interest and other income deductions	$ 877,095.37	$ 898,944.14
Dividends, profit sharing, etc. ...	1,042,125.66	846,192.64
Surplus for the year	$ 160,699.10	$ 105,691.94
Stock outstanding Dec. 31	$12,942,900.00	$10,000,000.00

These results have been made possible by effecting economies in administration and operation wherever consistent with first-class service, and by rapid increase in the public use of the company's electric service.

On July 1, 1912, the retail rate for current was reduced from 12 cents per kilowatt-hour to a sliding scale demand rate, beginning at 11 cents per kilowatt-hour, and continuing at eight cents and four cents for increased hours of use. Tungsten-lamp prices were greatly reduced and sizes of 100 watts and over are supplied free to all retail customers.

Special effort has been devoted to obtaining large power business and over one hundred private plants, ranging in capacity as high as 1,000 horsepower, have been replaced by the service of the company. During the year 23,855 contracts were signed. In addition to the current supplied for lighting, 74,052 horsepower in motors are operated from the company's lines.

On March 1, $2,500,000 of six per cent12-year convertible debenture bonds were offered to the stockholders at par in proportion to their stockholdings and were fully subscribed. On the same date, the first issue of $4,000,000 similar debenture bonds became convertible into stock of the company at par, and up to the end of year $2,942,900 of these bonds were converted.

The plant and property as shown by the balance sheet has substantially increased and includes a new boiler house, substation and station apparatus.

The profit-sharing plan inaugurated in December, 1910, was continued and on January 1, 1914, $56,653.72 was distributed to 927 employees. The Brooklyn Edison Investment Fund, designed for the purpose of encouraging thrift and enabling employees to invest their savings in the securities of the company, achieved a wider usefulness, two-thirds of all employees being depositors in the fund. Three men who had served the company for over 20 years, and who, owing to age and physical disability were unable to perform further duty, were pensioned. In addition to the foregoing, a number of opportunities for physical and mental development were offered employees.

The company also reports a growing cordiality in relationship between its customers and its employees, and notes that despite the high cost of living and increase in cost of labor, materials and commodities generally, the adoption of substantial economies and increased efficiency have made possible continued first-class service at low rates with a continuance of the high standard of wages to employees. Indications are that the current year will compare favorably with 1913.

◆

Cleveland Electrical Exposition.

Cleveland, O., is planning a great electrical exposition to be held May 20 to 30 in the Coliseum. The project is to be given under the auspices of the Electrical League of Cleveland, whose committees have been so active during the first month of preparation that success is already assured.

Cleveland claims to lead the nation in many departments of the electrical trade. It is the headquarters for the greatest lamp works, the home of the biggest carbon manufacturing plant, and it boasts of three leading manufacturers of electric vehicles. It holds highest rank in the manufacture of electric cranes and hoisting machinery and is a leader in the making of batteries.

For its decorating and lighting scheme the committee has the services of a corps of leading electrical engineers. This is to be the first electrical exposition ever held in Cleveland, and the city is planning to give it in the same manner that characterized its Industrial Exposition.

Among the companies that have already notified the committee that they will exhibit are the following:

The A. & W. Electric Sign Company, The Adams-Bagnall Company, Adapti Manufacturing Company. The Walter P. Ambos Company, American Steel & Wire Company, The Atlas Car & Manufacturing Company, Bailey Reflector Company, The Brookins Company, Case School of Applied Science, Chicago Pneumatic Tool Company, Cleveland Armature Works, Cleveland Crane & Engineering Company, The Cleveland Electric Illuminating Company, Cleveland Electric Machine & Manufacturing Company, The Cleveland Switchboard Company, The Cleveland Telephone Company, Electric Controller & Manufacturing Company, Electric Products Company, Electric Storage Battery Company, The Electric Welding Products Company, Electrical Contractors Association, Electrical Distributors Company, Enterprise Electrical Construction Company, Enterprise Electrical Fixture Company, The Erner Electric Company, Esterline Company, The Euclid Avenue Electric Fixture Company, Eureka Vacuum Cleaner Company, Franz-Premier Vacuum Cleaner Company, The P. A. Geier Company, General Electric Company, Gould Electric Storage Battery Company, Hickok Electrical Instrument Company, Holophane Works of General Electric Company, R. C. Hull Electric Company, H. W. Johns-Manville Company, The Kinney & Levan Company, Leece-Neville Company, Leonard-Bundy Electric Company, Mead Electric Signal Company, Multi-Lux Illuminating Company, National Carbon Company. National Electric Lamp Works, The Nungesser Carbon & Battery Company, The Price Electric Company. The Rauch & Lang Carriage Company, The Republic Electric Company, John A. Roebling's Sons Company, Salzer Electric Company, The Sterling & Welch Company, The Strong - Carlisle - Hammond Company, The Tuec Company, The Van Dorn Electric Tool Company, Western Electric Company, Westinghouse Electric & Manufacturing Company, The Willard Storage Battery Company, The George Worthington Company.

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Chicago Vehicle Men to Hold Bowling Contest.

A special committee of the Chicago Section, Electrical Vehicle Association of America, which has been working on plans for a social gathering for members and their friends, reported at the regular meeting on February 17. Tuesday, March 3, has been selected as the date for the function which will take the form of a bowling contest. Schiller's billiard and bowling alleys at 318 East Thirty-first Street, have been engaged for the evening and arrangements have been made to serve a special dinner in the restaurant adjoining, at 6:30 p. m.

Tickets at $2.00 each, which include meal and privilege of the pool tables or bowling alleys, can be secured from E. J. Kilborn, 2241 S. Wabash Avenue. Chicago.

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Missouri Association Meeting.

The next annual convention of the Missouri Electric, Gas, Street Railway & Waterworks Association will be held on board the steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return on May 21, 22 and 23.

Instructions for Substation Operators.

Last year, while connected with the Galveston-Houston Electric Railway Company, John G. Montgomery wrote a set of "Instructions for Operators" for the substation and switchboard operators of the company. These instructions are not intended to be elaborate and the main consideration was that the operator should be able to understand them. As they may be found useful to others, they are reproduced, substantially in full, below.

The Machine, Its Care and Management.

Before Starting.—See that the machine is in good order, and that none of the parts have been damaged or changed.

Adjust the brushes if necessary.

Inspect the oil glasses, to see if there is enough oil in the bearings.

Inspect the field-magnet circuit for loose or broken wires and to see if connected correctly.

Remove all stray keys, bolts, nails, etc., out of the neighborhood of the machine.

Starting Direct-Current Method.—Arrange the controlling apparatus on the alternating-current switchboard, according to the following: Set exciter "load" rheostat to the normal operating position; close alternating-current motor-field switch; insert alternating-current voltmeter plug in the receptacle.

Arrange the direct-current controlling switches and apparatus according to the following: Have the generator-field rheostat cut out in order to obtain a strong field. Close double-throw switch on small panelboard attached to generator to upper contacts, thereby cutting out the series field of the generator so that it can operate as a shunt motor.

After you have carried out the above instructions and you are sure that everything is all right, then proceed to close the direct-current circuit-breaker. Close the direct-current starting switch to the first contact, then wait until the machine does not appear to be gaining speed, then advance one more contact, and so on until the last contact; then close the direct-current main or positive switch, and open starting switch clear of all contacts.

Synchronizing.—The object of synchronizing is the regulation of one alternating-current machine to be connected in parallel with another alternating-current machine, so that they shall be identical and simultaneous both in phase and voltage.

Regulate the speed of the motor-generator set and the alternating-current voltage by means of the 600-volt rheostat, and the exciter's "load" rheostat, by the indications of the synchroscope. If the synchroscope indicates FAST, this means that the machines are running too fast. Cut out more of the resistance in the 600-volt field rheostat until the pointer of synchroscope slows down to about 12 revolutions per minute or less.

If the local and power-house voltmeters indicate the same voltage, watch for a favorable chance to catch the synchroscope pointer on the point of synchronism, and as quickly as possible close alternating-current running switch.

If the voltage is not correct this can be regulated by means of the exciter "load" rheostat.

Always try to have the synchroscope pointer indicating FAST, as this will cause less interruptions to service in case you fail to get the switch in time.

Clearing the Direct-Current Switchboard.—If you were successful in synchronizing the machines, proceed to clear the generator which has been running as a motor off the line as follows: Open direct-current circuit-breaker. Open the double-throw switch on small panelboard attached to the generator.

Putting Generator on Line.—All that is now necessary is to close the direct-current circuit-breaker and the main or positive switch.

While Running.—Test the bearings to ascertain if they heat, and also notice if the oil ring which lubricates the bearings is revolving with the shaft.

Heavy Loads.—1,000 or more amperes should be considered as a heavy load, and should not be allowed to continue for more than five minutes on any one generator. A two-car train, made up of two motor cars out of (——————) and a two-car train starting up at the substation will give a load of 1,200 amperes or more. Such a load is too great for a single generator and should not be allowed to continue. *To decrease load shift the brushes forward or in the direction of rotation of the armature.*

Sparking.—Giving off sparks at the commutator of the generator's armature due to bad adjustment or bad condition of the parts, and resulting in serious injury to the machine if allowed to continue. On light loads when the generator shows signs of sparking or poor commutation wipe the commutator with a clean dry rag; a little oil on the rag will also improve the commutation. *Do not grease the commutator with an oil-soaked rag, as this will cause sparking in little time; use little oil on commutator.*

Increase of Power.—It is necessary to run two units when trains made up of two motor cars are in operation on the line. It is not necessary to run units when trains made up of one motor car and trailer are in operation on the line, unless such trains are running in sections 5 to 10 minutes apart. As the speed of the motor cars varies with the voltage and not with the output of the station, have the voltage at all times as high as possible.

A boost in the voltage from 20 to 30 volts may be obtained by shifting the brushes backward or in the direction opposite to the rotation of the armature. If the machine shows signs of sparking or bad commutation decrease the load.

Interruptions and Troubles.—In case your station is pulling a heavy load and you notice the alternating-current voltage falling to a point where the machines are liable to pull out of phase, trip the machine direct-current circuit-breaker; this will relieve the sudden load on the alternating-current generator at power house and will probably cause less interruption of service. Do not do this unless you are sure it is going to a low point. Whenever a motor-generator pulls out of phase, trip the direct-current circuit-breaker first and then the alternating-current one, if necessary.

If the high tension is out entirely, open the direct-current circuit-breaker and switch, and alternating-current switch of the motor-generator without fail. The north and south feeder breakers do not have to be tripped. If for any reason a circuit-breaker should arc across, use the Pyrene fire extinguisher to break the arc.

Rapid or Frequent Interruptions of Direct-Current ***Circuit-Breaking.*** — On days that your station is pulling heavy loads and running two machines and you have trouble with the feeder breakers coming out, set them above the maximum load, to 1,800 amperes if necessary. Never close switch first and then circuit-breaker.

Rapid or Frequent Interruptions of Oil Switches.—Telephone to the engineer at power house and tell him your troubles and you will receive the necessary advice.

Instrument Fires.—If the instrument is on a circuit protected by a fuse or switch, open the switch or remove fuse; if the instrument is afire use the fire extinguisher.

Transformer Fires.—Clear the switchboard, leaving the feeder switches closed. Pull high-tension switches. Run oil out of transformer that is afire only, not all of them. Telephone power house and inform the engineer.

Burn-outs.—If the burn-out of any instrument does not cause any other interruption, continue to run the machine until it is necessary to shut down at the proper time.

Failure of Generator to Build Up Its Voltage.—After starting the generator and finding you have no indication of voltage, inspect the following: tap voltmeter lightly to release pointer, if stuck. Look for open circuit in voltmeter wiring. See that all necessary switches are closed. Trouble may be found in some of the following circuits: Open circuit between shunt-field coils; open circuit between field rheostat and field coils.

After inspecting all of the above and finding nothing wrong, proceed as follows: Bring the motor-generator up to speed by the direct-current method of starting and you will perhaps find the generator will indicate the correct voltage.

Accidents to Watt-Hour Meters.

If an accident happens to any watt-hour meter, causing it to be inoperative and it is required of you to show the readings on the daily reports the same as if the station was not crippled by a defective meter, proceed as follows: If it is a direct-current watt-hour meter that is defective and it is required to obtain the hourly readings, multiply the alternating-current meter readings (input) by the efficiency of the motor-generator set; the product will equal approxmately the direct-current meter readings or output.

The efficiency may be obtained by referring to the last meter readings previous to the accident to meter, and by applying the following formula: Efficiency equals direct-current meter reading divided by alternating-current meter reading; that is, divide output by input.

If it is an alternating-current watt-hour meter that is defective and it is required to obtain the hourly readings, *divide* the direct-current meter readings (output) by the efficiency of the motor-generator set; the quotient will equal approximately the alternating-current meter readings or input.

Checking Meter Readings.—An easy method of checking the daily meter readings and kilowatt-hours in order to know if they are correct is to calculate the efficiency by dividing the direct-current readings by the alternating-current readings. The efficiency should be approximately 80 per cent and never lower than 70 per cent.

Failure of Exciter Generator to Build Up Its Voltage.

After starting the motor-generator and finding you have no indication of amperes, inspect the following: Tap ammeter lightly to release pointer, if stuck. Look for open circuit or blown fuse in ammeter circuit. See that all the necessary switches are closed, and that the brushes are making good contact with commutator. Trouble may be found in some of the following circuits: Open circuit between shunt-field coils; open circuit between field rheostat and field coils.

After inspecting the above and finding nothing wrong, proceed to excite the shunt-field windings. Disconnect the shunt-field terminals from the binding post, on small panelboard attached to the exciter-generator, and connect them to the two ends of the wires that are to be used to carry the exciting current from the other exciter. Connect the other two ends of the wires to the positive and negative terminals of the other exciter. Leave the wires connected for about one minute, then disconnect them and connect the shunt-field terminals to the binding post on small panelboard as they were connected.

Northern White Cedar Association Committees.

One of the important features of the work of the Northern White Cedar Association (formerly the Northwestern Cedarmen's Association) are the duties performed by the various standing committees. At each annual meeting these committees report upon certain definite conditions, and, incidentally, all through the year devote a great deal of time to the special matters coming within their jurisdiction.

President J. W. Benham has appointed the following committees for 1914:

Insurance—E. L. Clark, T. M. Partridge, M. Sperry, Milwaukee, Wis.; J. C. Kolliner, Stillwater, Minn.; L. L. Hill, Minneapolis, Minn.

Legislation—L. L. Hill, C. E. Learned, Minneapolis, Minn.; T. P. Bradley, Duluth, Minn.; J. C. Kirkpatrick, Escanaba, Mich.; W. B. Earle, Hermansville, Mich.

Railroads—H. F. Partridge, L. A. Furlong, L. A. Page, Jr., Minneapolis, Minn.; Joseph Meloney, Spooner, Minn.; Wm. Patch, Menominee, Mich.

Posts and Shingles—W. C. Moss, P. H. Anderes, Minneapolis, Minn.; J. E. Gerich, Milwaukee, Wis.; H. M. Dixon, Cloquet, Minn.; W. B. Thomas, Manistique, Mich.

Poles—H. W. Reade, Escanaba, Mich.; A. T. Naugle, Chicago, Ill.; Jos. Meloney, Spooner, Minn.; E. L. Clark, T. M. Partridge, Minneapolis, Minn.

Official Inspection—H. S. Gilkey, L. A. Page, Jr., Minneapolis, Minn.; E. N. Whyte, Duluth, Minn.; M. K. Bissell, J. E. Zeluff, Escanaba, Mich.

Ties—W. B. Thomas, Manistique, Mich.; H. M. Clark, Bemidji, Minn.; T. P. Bradley, Duluth, Minn.; J. C. Kirkpatrick, Escanaba, Mich.; Ben Finch, Duluth, Minn.

Pulpwood—E. N. Whyte, Geo. W. Martin, T. P. Bradley, Duluth, Minn.; Jas Sullivan, Black Duck, Minn.; F. W. Wilhelmi, Cloquet, Minn.

San Francisco in 1915.

One hundred and ninety-one conventions, which will be attended by delegates from all parts of the world, have voted to hold their sessions in San Francisco in 1915. The organizations are varied in character and include civic, religious, social service, educational, engineering, scientific, fraternal, business, labor, commercial, agricultural, live stock and scores of other interests. Several of the leading electrical bodies have already arranged to visit the coast next year.

INTANGIBLE VALUES OF PUBLIC UTILITIES.

By Arthur Halsted.

Definite and logical methods are followed in evaluating tangible capital of public utilities, and intangible capital, such as promotion expense, franchise value, working capital, etc. Even the matter of "going value" is well settled and supposed to be taken care of in development expense and appreciation.

To eliminate ambiguity, a common definition of "going concern value" will be discussed apart from a consideration of any other intangible capital of a concern.

The initial operation of a public utility is frequently attended by a deficit. This deficit is due to the building up of an organization, and a revenue-producing business, and covers a variable period of time during which the utility, at initial rates, is unable to earn a fair rate of return upon the capital investment. This deficit represents an intangible capital investment, usually called "going cost." Weight of opinion is that going cost, franchise cost, promotion expenses, may be temporarily charged to capital account, but should be amortized when surplus earnings appear.

Going value, however, may have a different meaning from going cost. Going value, from a practical standpoint, is that bonus which a willing purchaser will give a willing seller, over and above the physical value of the plant, to secure an established and going business.

In an established commercial business going value is determined by the risk to capital involved in establishing such a business, by the present earnings and reputation, and by the prospects and prognosis of the future of the business.

In determining the going value of a public utility for rate-making, a going value due to earnings cannot exist.

The going value, due to the apparent permanency of the business and to the risk to capital involved in promoting and establishing a similar enterprise, should be considered.

Going value in this light may be defined as the unearned increment of a successful venture.

As between buyer and seller, that business which had the larger going cost might well have the lesser going value or rewards of risk.

Unearned increments of real estate value and unearned increments due to the metamorphosis of a promotion project into a self-perpetuating financial institution, may be treated as upon a parity.

Going value under this definition may be added to a public utility, being evaluated for rate-making in two ways (1) by a high allowable rate of returns on the invested capital, or (2) by an inflation of capital value.

Because of future additions to capital under public control, in which the risk will be very much less than the initial capital risk in founding the plant, going value should not be allowed by a high rate of returns.

The rate of returns upon capital invested in the utility should then be determined by the market price demanded by capital in equally secure investments.

The going value, or unearned increment in the value of the business, if any exists, should, therefore, be allowed as an inflation of capital above the tangible investment.

From our definition, going value, then, depends upon and is determined by the risks of the initial and early investments and upon the absence of risks in future investments and earnings of the utility.

Philadelphia Vehicle Meeting.

The February meeting of the Electric Vehicle Association of America, Philadelphia Branch, was held in the rooms of The Philadelphia Electric Company on Wednesday evening, February 11. About 40 members and guests were present, among whom were Albert Jackson Marshall, the new executive, secretary from New York City, and Mr. Street, general sales manager of the Walker Electric Vehicle Company, from Chicago.

The addresses of the evening were made by Mr. Woodruff, who has charge of the delivery department of Strawbridge & Clothier, and by Mr. Hancock, who holds a similar position with the Curtis Publishing Company.

The former told how five years ago his concern started experimenting with the use of motor trucks, and now they have 39 in service, five of which are electric cars. He stated that setting aside all records for economy, it would be practically impossible for them to return to horse delivery because of the different conditions which are now met. Business has been increased and their territory of free delivery greatly enlarged. Points are now reached and business secured which would have been impossible under the former conditions. The electric cars are used exclusively for city delivery and their experience has shown that one electric car has been able to displace six horses. The electric cars each make about forty miles per day; one of them gets a midday boost and covers a little more territory. They have been able to materially reduce the cost for this class of delivery.

Mr. Hancock stated that one year ago last August, they started experimenting with electric trucks, putting one seven-ton vehicle in service. They formerly had all their trucking done by contract, and it required the use of anywhere from 20 to 40 double teams. Six months of the year their business is much heavier than the other six months, which accounts for the variation in trucking demanded. The experiment proved entirely satisfactory and they now have in service in addition to the above mentioned, four 3.5-ton trucks, four 5-ton trucks, one 1-ton truck, and one 1,000-pound car, making a total of eleven electric vehicles in service. The 1-ton car is in service practically all day and night. It is never put into the garage and is charged while standing waiting for its load. It runs to and fro between the publishing house and the freight station, carrying mail. It is equipped with an Edison battery and covers anywhere from 30 to 45 miles per day. The other trucks are used for hauling paper, 200 tons of which are carried into the warehouse each of five days in the week. In addition to this there are 175 tons of mail carried each day for six days in the week. The maximum which created a record for one day showed a total of 451 tons of mail and paper handled inside of 24 hours. Each one of these cars travels about two miles in a round trip, and they make ten trips per day. The service has been eminently satisfactory and has shown a very great saving in the cost of this end of the business.

The papers were discussed by Messrs. Rodman, Marshall, Street, Metcalf, Phillips and others.

The new secretary, Mr. Marshall, was then called on and made a few appropriate remarks.

The chairman mentioned two garages which had recently installed battery-charging apparatus for the use of the public.

Indirect Outdoor Illumination at the Panama Exposition.

A system of lighting never before utilized in expositions will maintain an illumination of the buildings at the Panama-Pacific International Exposition to a height of 125 feet, with a variation of but five per cent throughout this height. Nitrogen-filled incandescent lamps will be used.

The lamps will be ranged up and down standards of from 10 to 30 feet in height, and the eye of the observer will be shielded from the powerful direct rays by metal banners. In fact, all the lighting of the exposition palaces and grounds will be by the indirect system, from concealed sources.

A battery of forty-eight 36-inch searchlight projectors, will throw intense beams of light through color diffusers to polished glass jewels hanging upon the buildings. These beams will also be thrown upon the gardens and courts, and will play upon the beautiful white fog banks which often at twilight roll in through the Golden Gate.

TENNESSEE ELECTRICAL CONTRACTORS' ASSOCIATION.

Annual Meeting Held at Memphis, February 16 and 17.

The third annual convention of the Tennessee Electrical Contractors' Association was held at the Assembly Hall of the Business Men's Association of Memphis on February 16 and 17. The membership of this association is composed of electrical contractors from the states of Tennessee, Arkansas and Mississippi.

The Jovian League of Memphis assumed the duties of host and spared neither effort nor expense in the preparation of the entertaining features of the program.

In the absence of J. P. Lawrence, president of the Association, the first session was called to order by the secretary, J. A. Fowler. After a few remarks appropriate to the occasion, Mr. Fowler introduced J. M. Tuther, secretary of the Business Men's Club, who welcomed the contractors in a very hearty and felicitous manner. Mr. Tuther extended to all the members of the association and guests every privilege of the Club and issued membership cards to all who registered.

The secretary then called upon C. P. Chapin to read a paper on co-operation between central station and contractor, prepared by J. F. Ramier, of the Memphis Consolidated Gas & Electric Company, statesman of the Jovian Order.

Mr. Ramier attributed a large part of the phenomenal growth of his company to the ready response with which the contractors had received their plans. The growth in motor load was at first slow, but an active campaign on the company's part resulted in an increase of 25 to 30 per cent yearly. Then the contractors took hold and aided greatly in increasing this application of electric current. A similar experience was had with electric fans, an active campaign on the part of the contractors having shown excellent results. The experience of the central station has warranted the policy of keeping out of the business of selling appliances and giving the contractor moral support so that he is made in effect a strong part of the central-station organization. The central station is today facing problems such as the theft of current and fire protection, and hopes to have the assistance of the contractors along these and all other lines.

At the conclusion of this paper Mr. Fowler stated that W. R. Herstein, president of the Jovian League, was unable to be present and requested Mr. Watson to read the paper on

"Practical Jovianism" which Mr. Herstein had prepared.

Next in order was a paper prepared by J. A. Fowler, entitled "Humor and Pathos of Electrical Contracting." This will appear in our next issue.

After briefly outlining the program of the convention, Mr. Fowler adjourned the meeting until 2 p. m.

The afternoon session was called to order at 2 p. m. and James Singleton, of Nashville, was appointed temporary chairman. The regular order of business being disposed of, the chairman appointed a committee for the nomination of officers. The following slate was presented and accepted:

President, W. C. Tupper, Memphis.

First vice-president, J. A. Singleton, Nashville.

Second vice-president, F. H. Cantrell, Chattanooga.

Third vice-president, S. P. Watson, Knoxville.

Secretary, J. A. Fowler, Memphis.

Treasurer, H. S. Street, Memphis.

Director of the National Association, J. A. Fowler.

Mr. Tupper was then called upon to talk on the subject of legislative matters. Mr. Tupper told what had been accomplished in the way of state and city ordinances in Tennessee and Memphis, and offered to give whatever help he could to other communities.

Mr. Fowler followed this talk with a few remarks on the subject of "Employers' Liability Insurance Rate." Letters were read from some of the principal cities, showing that the rates ranged from 75 cents to $2.85 per $100. He said that 'Memphis is now paying over $2.00 and that they are fighting unceasingly for a lower rate. At this session the members endorsed the Compensation Act, which limited the employer's liability to $3,500.

Papers on the topic of "Consideration of Ethical Relations" were read by R. L. Clift and Edward Brown.

Mr. Cleft summarized his ideas in the form of the following ten precepts:

(1) You can find a better field than chasing the drops on the other fellow's wiring job. He has sockets, rosettes and cord, and a first right to sell his wares.

(2) If you find you can reduce your bid, after it is filed, do so before they are opened, or play with children who cry over lost marbles.

(3) Do you work up to the rule, and you can look the inspector in the eye and say, "I am as independent of you as you are of me."

(4) If your bid is too low to make a profit, lose like a gentleman and do not cry on the job because you neglected to read specifications or the other fellow's price showed your oversight.

(5) If you take a job at a known loss and rob your customer on extras, get a good lawyer for a son-in-law and it will help to keep him profitable in the family.

(6) Offer various articles in your stock as leaders at no profit and the shoe man will get your money that should have been put in your drawer.

(7) Fight competition with price and you will some day wonder why your friends seem so prosperous in the other lines of business.

(8) You cannot get all the business —the other fellow has friends and neighbors that do not know you.

(9) If you do not figure overhead, do not think you are fooling any one, for the sheriff will tell you some day to wake up and move.

(10) If you cannot maintain a reasonable legitimate selling price in a city, you can educate to the advantage of all as to estimating cost, for you have this on every job.

Mr. Browne made a plea for co-operation and consideration for the other fellow. While the securing of a contract means a skirmish, the competition should be in the open and above board. One should lose an order rather than his self-respect, but he can get both if the standard is kept high enough. Be ready to admit that the other fellow's job has merit and lose an order rather than speak ill of him. Instruct your workmen to do likewise. Do not cut any man's price on a job, for the public will crowd every order down until there is nothing but bankruptcy ahead. Do not let any person use you to tear down another's work. Do your work to the best of your ability and neglect no opportunity to raise the standard of the electrical field.

At this point Mr. Fowler announced that the next meeting of the Tennessee Electrical Contractors' Association would be held at Nashville at a time selected by the committee.

Tuesday Sessions.

It was planned to hold a reception for the delegates of the National Association at the Hotel Chisca at 10 a. m., but this part of the program was cancelled, owing to the delay of the train on which Ernest Freeman, president of the National Association, and some of the other distinguished guests, were to arrive, and the inability of Ell C. Bennett, of St. Louis, to be present.

The afternoon session was called to order at 2:45 p. m. and G. W. Hill, special representative of the National Electrical Contractors' Association, was called upon to describe to the delegates the bookkeeping system adopted by the National Association.

Since the publication of this system in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, a new estimating form has been added, which enables the contractor to keep a permanent record of all estimates made. Mr. Hill stated that he knew of several contractors who had deceived themselves in the belief that they were making a profit on every job when there was an actual loss which could not be detected because they did not keep the proper records. Mr. Hill had a complete set of forms with him and offered to explain the system to any of the members.

During Mr. Hill's talk President Freeman arrived and was accorded a warm welcome.

The topic of Mr. Freeman's talk was the National Association. To forcefully bring out the progress of the association, Mr. Freeman asked the delegates to consider what the present-day conditions would be without it. He pointed out the influence of the association in obtaining fair revision of the Code. He also urged the use of the new estimating sheet. It was his opinion that the labor cost on a job should be figured precisely the same as the material by the preparation of a table that would show the time consumed in putting certain specified wires through conduit the length of which had been determined. Installation of switches and, in fact, every detail of electrical construction, he stated, could be figured in the same way.

In closing, Mr. Freeman referred to the next convention of the National Association which will be held in Detroit, Mich., in July. He stated that from present indications it would be the largest and best meeting ever held, and he urged every member to make a special effort to be present.

G. M. Sanborn, of Indianapolis, past president and chairman of the Databook-Committee, made a thoroughly interesting talk on the use of the data sales book.

J. T. Marron, of Rock Island, Ill., chairman of the Membership Committee, deviated from his topic "Why More Members" to discuss liability insurance. He pointed out the unfair discrimination in rates and advocated the plan adopted by the Illinois Contractors' Association of appointing a representative to see what could be done to effect a remedy.

Mr. Marron also suggested that the contractor keep an exact record of all installations, and, at certain periods, show the central station to what extent they have increased the load. This method, he said, would establish better feeling between the contractor and the central station.

Ernest McCleary, of Detroit, Mich., past president and chairman of Code Committee, explained in a brief manner the recent changes in the National Electrical Code.

P. R. Jaehnig, of Newark, N. J.,

chairman of the Legislative Committee, spoke on the subject of "New Laws," with special reference to electrical contractors.

G. H. Duffield, of Utica, N. Y., national secretary and editor of *The National Electrical Contractor,* made a very stirring talk on the journal of the association. The meeting was then adjourned.

Entertainment Features.

On Monday evening the delegates and guests attended a box party at the Lyceum Theater. An automobile ride was arranged for the ladies on Tuesday afternoon, which included a visit to the Automobile Show. The electrical parade was one of the principal features of Tuesday evening. This parade consisted of an automobile for each officer of the Sons of Jove, with the name of the officer prominently displayed in electric lights.

The candidates, 57 in number, followed and some of the prospective members were very conspicuous in a cage fitted to an automobile, which was also a part of the parade. The last float had mounted on it a gas engine generating electricity to supply current to a sign erected thereon which read "Electric Light and Power." The rejuvenation was held at the Orpheum Theater and the joviaticn took place immediately following in the banquet hall of the Hotel Chisca.

The following were in attendance: Jake Bateman, Clarendon, Ark.; A. N. Bentley, Electric Storage Battery Company, Atlanta, Ga.; S. J. Burke, Federal Sign Company, Memphis, Tenn.; S. A. Collins, Electric Supply Company, Memphis, Tenn.; G. H. Duffield, Utica, N. Y.; Clifford Demere, Memphis, Tenn.; Thomas Dies, Memphis, Tenn.; Ernest Freeman, Chicago, Ill.; C. B. Frayer, Edison Storage Battery Company, Chicago, Ill.; G. W. Hill, Rock Island, Ill.; John M. Hewitt, Memphis, Tenn.; W. H. Ilderton, Memphis, Tenn.; P. H. Jaehnig, Newark, N. J.; L. M. Long, Memphis, Tenn.; R. N. Lloyd, City Electric Company, Memphis, Tenn.; J. T. Marron, Rock Island, Ill.; T. N. Meriwether, Memphis, Tenn.; A. D. McWhorter, Memphis, Tenn.; Ernest McCleary, Detroit, Mich.; M. A. Patterson, Electric Supply Company, Memphis, Tenn.; J. H. Patterson, Newbern, Tenn.; G. M. Sanborn, Indianapolis, Ind.; G. B. Stevenson, Memphis, Tenn.; John M. Tuther, Memphis, Tenn.; F. Underwood, Memphis, Tenn.; T. R. Winfield, Memphis, Tenn.; E. J. Brown, Hollipeter and Jantz, Blythesville, Ark.; J. J. Brennan, Memphis, Tenn.; E. J. Browne, Browne and Borum, Memphis, Tenn.; F. C. Bragg, Electric Construction Company, Little Rock, Ark.; R. L. Clift, Electric Novelty Company, Memphis, Tenn.; P. E. Cooley, Hollipeter and Jantz, Blythesville, Ark.; Ike Contor, Terrell-Hedges Company, Chattanooga, Tenn.; C. K. Chapin, Memphis, Tenn.; N. W. Campbell, Arkansas Electric Company, Little Rock, Ark.; F. M. Fleming, Fairbanks Company, Louisville, Ky.; Jos. A. Fowler, Fowler Electric Company, Memphis, Tenn.; E. W. Frye, Electric Supply Company, Memphis, Tenn.; E. W. Grey, Grey Brothers Electric Company, Memphis, Tenn.; Fisher Harwell, Harwell Electric Company, Memphis, Tenn.; G. D. Hancock, Electric Supply Company, Memphis, Tenn.; W. P. Holcombe, Frank Adam Electric Company, St. Louis, Mo.; V. A. Henderson, Memphis, Tenn.; Walter Kleinschmitt, Electric Supply Company, Memphis, Tenn.; P. W. Lytle, Lytle Electric Company, Memphis, Tenn.; C. C. Lewis, Memphis, Tenn.; John Motley and Robert Motley, Motley Brothers Electric Company, Memphis, Tenn.; M. J. Mallory, Westinghouse Electric & Manufacturing Company, Memphis, Tenn.; W. A. Munding, Electric Supply Company, Memphis, Tenn.; F. S. Montgomery, National Metal Molding Company, Atlanta, Ga.; H. G. Mitchell, Electric Supply Company, Memphis, Tenn.; W. C. Mac Guire, Arkadelphia, Ark.; J. F. Ramier, Memphis, Tenn.; C. B. Rutledge, Bluff City Electric Company, Memphis, Tenn.; C. K. Steig, Memphis, Tenn.; W. A. Scott, Fairbanks Company, Louisville, Ky.; G. B. Shawver, Springfield, Tenn.; J. A. Shingleton, Nashville Machine Company, Nashville, Tenn.; A. J. Sharenberger, Sharenberger Electric Company, Nashville, Tenn.; H. G. Street, Memphis Electric Company, Memphis, Tenn.; George W. Steenbergh, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago, Ill.; Burns Stewart, Memphis, Tenn.; R. A. Street, Memphis Electric Company, Memphis, Tenn.; Paul Towner, Towner and Company, Memphis, Tenn.; W. C. Tupper, Bluff City Electric Company, Memphis, Tenn.; Theo. C. Treadway, Treadway Electric Company, Little Rock, Ark.; R. L. Whitfield, Nashville Electric Company, Nashville, Tenn.; V. A. Watson, Electric Supply Company, Memphis, Tenn.; C. J. Watson, Electric Supply Company, Memphis, Tenn.; S. P. Watson, Acme Electric Company, Knoxville, Tenn.

Inter-Insurance for Ohio Utilities.

The insurance Committee of the Ohio Electric Light Association, consisting of D. L. Gaskill, J. C. Martin and Elam Fisher, has investigated the question of inter-insurance as a means of reducing the rates for fire and liability insurance among utility companies of the state. This committee has investigated the Utilities Indemnity Exchange and reports it to be reliable and worthy of the confidence of the members of the Association as a means of reducing premiums about 40 per cent.

Power Conditions in Massachusetts.

The Amherst Power Company, a transmission company supplying energy to a large territory in central Massachusetts, and closely related to the Turners Falls Company which operates a large hydroelectric plant on the Connecticut River, has the following manufacturing concerns as its customers: Fisk Rubber Company, whose normal load is 3,000 horsepower; Springfield Street Railway Company, 2,000 horsepower; Chicopee Manufacturing Company, 750 horsepower; and the Page-Storm Company, with a normal load of about 400 horsepower. The Amherst Power Company has a contract with the United Electric Company of Springfield by which it is prepared to supply about 2,500 horsepower for local service.

The Agawam Electric Company, another transmission company related to the Turners Falls Company, furnishes 200 horsepower to Lane's Quarry, Westfield; 150 horsepower to the West Springfield waterworks and about 300 horsepower to the Ramapogue Ice Company. The Northern Connecticut Light & Power Company takes about 700 horsepower for lighting services in six towns.

Local Fire Alarm Systems in New York Factories.

A fire-alarm signal system with a sufficient number of clearly audible signals is required in every factory building over two stories high in which more than 25 persons are employed above the grade story by the new labor law of New York state.

A sub-committee of the industrial board has been at work drafting rules and regulations for factory fire-alarm systems which will be issued this month.

At present the most complete rules for factory alarm systems are those in use in New Jersey. Some engineers do not favor open circuits in fire-alarm systems, which are permitted in New Jersey. It is thought that the New York rules will require closed circuits. New Jersey has regarded electric siren horns rather more favorably than gongs.—*Safety Engineering.*

License Required in Milwaukee.

On February 16 an ordinance went into effect in Milwaukee, Wis., regulating the installation of electric wiring and apparatus. Any person or firm wishing to engage in this work must first obtain a license, the fee for which is $25. The city building inspector is given authority over electrical inspection. Penalty for violation of the ordinance consists of imprisonment or fine ranging from $5 to $250.

LETTERS TO THE EDITOR.

Utilization-Factors.

To the Editor:

The article by Mr. J. B. Jackson in the issue of February 7, on planning lighting installations, was very interesting and shows that since the wiring contractor plans about nine-tenths of all lighting installations he should be in a position to calculate beforehand the illumination required for a certain purpose. There seems to be a lack of information on the subject of the "utilization-factor" of various style and shapes of the new glassware; the writer has written several large makers of reflectors and so far has only been able to get a reply from one concern that seems to have any data such as the illumination curves about its various styles of reflectors, utilization-factors for bowls and dishes used in semi-indirect lighting, whether shallow, medium or deep. As this quantity is of much importance in the final results, there should be a more complete subdivision of types and styles of reflectors.

For instance, on the chart given out by the National Lamp Works the table of utilization-factors is as follows for light ceilings:

Unit	Walls Light	Medium	Dark
Prismatic glass	60	50	40
Opal or milk glass	50	42	33
Decorative or art glass	30	25	20
Semi-indirect	40	35	30
Indirect	38	35	32

These values are rather indefinite, as they leave one to guess just under which classification the particular glassware he is working with belongs, also the style and shape of the reflector, whether bowl, dish or sphere. While we are at it why not try and get more accurate data on the various kinds of reflectors, especially the newer styles of bowls for semi-indirect use which seem to be gaining favor now. The effects now obtainable with modern glassware are not a mere accident and the public is coming to appreciate the difference between a properly planned lighting installation and one that is put up regardless of results or efficiency.

E. M. Raetz.

Rochester, Minn., February 9, 1914.

Tungsten Lanterns from Arc Lamps.

To the Editor:

It might be interesting to some of your readers to know that since the tungsten lamps have replaced many of the other types of lamps, principally the inclosed arcs, that instead of relegating the latter to the scrap pile they can be very cheaply transformed into a very neat-appearing street or factory fixture by simply removing the lamp mechanism and making a plate to fasten to the bottom of the center supports, in which are drilled two or four holes, as may be required. Into these are inserted and soldered four or two lamp sockets, the main portion of which together with the wiring, are inclosed within the lamp casing.

These old lamps when transformed will easily hold four 100-watt lamps and together with the reflector, which incidentally affords ample protection against the elements, makes a very neat-appearing fixture.

I have changed many of them and find that they serve the purpose equally as well as the most expensive fixture.

J. W. Walters.

Latrobe, Pa., February 11, 1914.

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BOOK REVIEWS.

"Electricity for the Farm and Home." By Frank Koester. New York: Sturgis and Walton Company. Cloth, 280 pages (5¼x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.00.

This little book is one of a series included in the Farmer's Practical Library. In casting about for someone to prepare a reasonable study of electricity for the farm and home a happy selection indeed has been made in securing Mr. Koester to prepare this work. By training, experience and sympathy Mr. Koester is preeminently qualified to discuss the subject. He is familiar with German practice, from which we are able to take a great many useful lessons. He has probably done more in one way or another to stimulate the development of apparatus adequate to meet the demands of rural communities and to disseminate information with respect to the utilization of electricity on the farm and in the home than any other contemporary writer. The present work is divided into 15 chapters and covers practically every phase of the subject from the benefits of agricultural electricity, central-station service, to the cost of operating, the use of electricity in the manufacture of by-products, diverse applications of electricity, electrical power in irrigation and electric stimulation of vegetation. There are 53 illustrations which enhance the value and increase the interest of the book. At the end of each chapter there is a series of questions which serve to fix the impression already created by the simple and lucid explanatory discussion of each particular.

"The Price of Inefficiency." By Frank Koester. New York: Sturgis & Walton Company. Cloth, 440 pages (6x7½ inches). Supplied by the Electrical Review Publishing Company for $2.00.

The author has gathered together an immense amount of material respecting the apparent inadequacy of our conception of the proper utilization of any of our resources and the total inefficiency and depravity of our methods of disposing of the things that are. If all that the author says be true we are arraigned before a most conspicuous indictment for uselessness of purpose and misapprehension as to a proper regard for either our own welfare or the welfare of those depending upon us. Were it not for an underlying spirit of hardy optimism the reader would be well nigh disgusted and disheartened with the exposures that are piled one upon the other. There is no doubt but that as a nation we are guilty of some appalling wastes, but it is doubtful indeed whether the reasons for this condition are not considerably a matter of evolution and a reward of circumstances rather than because of the direct desire upon the part of those who have made the country great to bring about wastefulness in our many avenues of effort. The book is valuable because it gathers under one cover pretty nearly everything of a similar character that has been published for a good many years. Consequently it is easy to review and become acquainted with the sum total of our iniquity. The author has made a considerable study of the literature of the subject and has undoubtedly given the matter first-hand analysis. It is too bad, however, that there is not more of constructive suggestion of a practical nature.

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Electrical Aging of Alcoholic Beverages.

Recent progress in the practical application of electrical current in the manufacture of alcoholic liquors has been described in *L'Electricien.*

Spirituous liquors as commercially manufactured contain organic compounds, particularly aldehydes, which are undesirable, and various attempts have been made to change them by both chemical and electrical means, as well as by distillation.

In Naudin's method electrolysis is used before distillation in order to form alcohol from the aldehydes by the action of hydrogen. The liquid is mixed with a solution of sulphuric acid of one part in one thousand. Platinum electrodes are used and after treatment the mixture passes into a vat containing enough granulated zinc to neutralize the acid. It is then distilled. By this means the commercial efficiency is 15 per cent higher than by the ordinary process.

Ozone has been employed in various ways, one of which is to bubble a stream of electrically generated ozone through the liquid. Chemically prepared ozone has also been used. This process not only destroys the organisms of secondary fermentation but assists the formation of the ethers which give bouquet to the wine. This treatment improves the aroma and taste of inferior qualities of real wines, but artificial wines are deteriorated by the process.

New Electrical and Mechanical Appliances

Twin Receptacles for Ralco Plugs.

In machine shops and in factories where portable electric tools are much used there has arisen a demand for a twin receptacle to which portable motors and lamps can be readily connected. This has been met by the development of a twin receptacle suitable for the Ralco plugs described in these columns a few months ago. These receptacles are made fused or fuseless. One of them consists of two 30-ampere receptacles fitted into a compact cast-iron box in whose design special attention was given to the ease with which it could be wired, and to assist the electrician ample space was provided for that purpose. The box is primarily, designed for inside use, and is fitted with three-quarters-inch knockouts on two sides and top. If the receptacle is required for outside use, it can be made waterproof.

Twin Receptacles and Cutout Box.

Another outfit is made of almost identical construction except that it has space on top for either one of two cutouts. When equipped with one cutout the boxes are marked 15 amperes per plug; when equipped with two cutouts, 30 amperes per plug, because the fuse block governs the rating. Fuse blocks and receptacles come wired, so that all that is necessary in order to install the outfit, is to bring the line wires down to the terminals of the fuse block. A door is provided in order to make it easy to replace a fuse when blown.

These receptacles have been placed on the market by the Central Electric Company, 320 South Fifth Avenue, Chicago, Ill.

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Lincoln Automatic Battery-Charging Outfit.

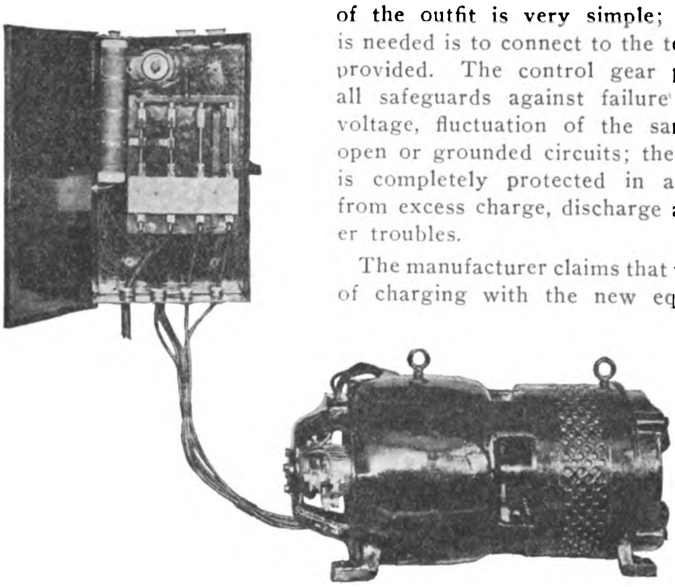
A practically automatic electric-vehicle storage-battery-charging outfit has been placed on the market by the Lincoln Electric Company, Cleveland, O. It comprises a two-bearing motor-generator set and control panel therefor. The outfit is designed particularly for charging from alternating-current circuits, although a direct-current motor can be furnished where direct current is supplied at unsuitable voltage, say 500 volts.

The outfit is intended especially for charging lead storage batteries. The standard size is suitable for a 40-cell type 9, 11 or 13 MV Exide battery or any lead battery of similar capacity. This size is suitable for pleasure cars or trucks up to 2,000 pounds rating. Special sizes for other battery capacities and voltages can be obtained.

Probably the most distinctive feature of the equipment is that it is so automatically controlled as to give a tapering and non-gasing charge to the battery. This type of charging is becoming recognized as the ideal method of charging lead batteries because the old method of constant-current charging produced excessive gasing when full charge was approached, which resulted in early destruction of the battery. The tapering charge supplies a heavy current at first and gradually reduces the charging rate to keep it below the point at which injurious gasing begins. Thus the life of the battery is increased from 50 to 100 per cent over that of a battery charged at constant current. Depreciation is retarded and mileage increased. Overcharging can be carried on indefinitely at a low rate without damage to the battery.

The control equipment is all mounted on the panel and is already wired to the machines, so that installation of the outfit is very simple; all that is needed is to connect to the terminals provided. The control gear provides all safeguards against failure of line voltage, fluctuation of the same, and open or grounded circuits; the battery is completely protected in all cases from excess charge, discharge and other troubles.

The manufacturer claims that the cost of charging with the new equipment is much less than with other methods, when proper account is taken of the increased battery life and efficiency, elimination of rectifier-tube renewals and other troubles. A battery can be put on charge in completely exhausted condition, partly discharged or almost fully charged state without fear of damage. The battery can be left on charge indefinitely because the current is reduced to a very low value when the full-charge condition is attained.



Lincoln Battery-Charging Motor-Generator and Automatic Control Board.

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Spanish Government engineers are making surveys and estimates for a double-track electric railway from Madrid to the nearest point on the French frontier.

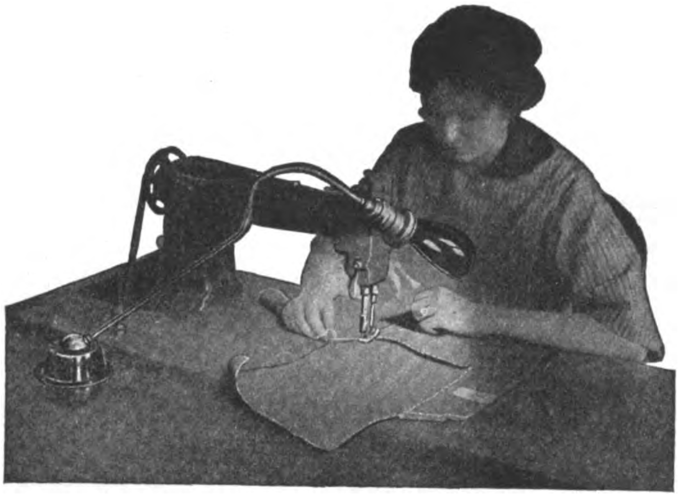
Franks Adjustable Fixtures for Factory Sewing Machines.

The severe competition in the clothing industry has necessitated that the closest attention be given to economy of production and to increasing the effiency of employees. It has been found that good lighting is essential both to satisfactory production and the welfare of operatives. This is particularly true of those who work on sewing machines. General lighting has been found inadequate except when working on simple white goods; local lighting is insisted on by the operatives in nearly all other cases.

A study of these requirements has resulted in the development of a new system of sewing-machine lighting, which makes use of the well known Franks adjustable fixtures. The distinctive feature is the use of a readily adjustable ball joint, which permits setting of the fixture to any angle or shifting it by the touch of a finger and without manipulating set screws or other time-consuming adjustments. Ten-watt lamps are used to insure economy in current consumption. The reflector protects the eyes of the operative from glare and throws the light rays where they are needed. The bulb is also protected from breakage.

Although the installation can be made through hanging drop cords, the most satisfactory and also correct method of installing these fixtures is to run conduit underneath the tables, supported by pipe hangers, then use either a T Condulet, an Adaptibox, or similar fitting, for the machines. The fixture is so placed to the side of the head of the machine that it allows the goods to pass through the machine readily and does not in any way interfere with the operative. It is a great improvement over exposed pendent lamps.

These fixtures are made by the Franks Manufacturing Company, 1524 Fourth Avenue, Rock Island, Ill.



Adjustable Fixture for Factory Sewing Machines.

Safety Device for Curved Subway Platforms.

At a few points in the New York subway system stations are unavoidably located at curves in the line. In order to provide necessary clearance between the platform and cars there is left a dangerous gap between the platform and either the center or ends of the cars, depending upon whether the platform is concave or convex. A number of accidents have happened at these dangerous pitfalls. Since it was found impossible to change the station to a straight portion of the track, efforts were made to find some way to close the gaps while a train is at the station.

There has recently been developed a means for doing this by projecting segments of the station platforms against the cars after the train has come to a stop. This is done by means of compressed-air cylinders, which are electromagnetically controlled. As a 10-car train enters the station an operator takes his position at the forward end of the train and a few seconds before the train has come to a stop he moves a control handle to the operating point. Through the electromagnet control air is admitted to the cylinders and hidden segments beneath the edge of the platform are pressed against the car, closing the gap. When the train leaves the station its motion causes automatic reversal of the electropneumatic action and the segments of the platform recede. The preliminary test of this device has been very successful and it is expected to equip at least the Fourteenth Street station with a complete installation.

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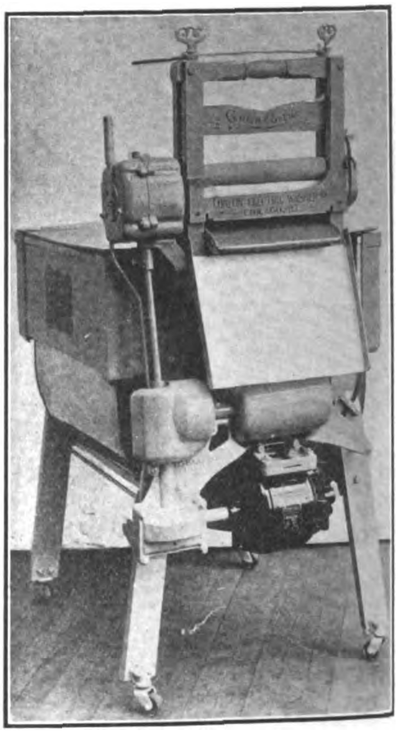
The Conlon Electric Washing Machine.

One of the conspicuous features in the design of the new Conlon electric washer is the care taken to insure its complete safety. Every moving part is completely inclosed so it is impossible to catch the fingers or the dress. The tension on the wringer rolls can be instantly removed by a patented release, thus preventing injury from this source to the operator or to the clothes. A friction clutch protects the motor in case of an overload. No belts or chains are used, the motor driving through a steel worm and bronze worm gear which run in hard grease. Quiet operation is thus obtained. The motor and the drive are so located that they are out of the way and the whole machine is made neat and compact.

The machine is lined throughout with metal, making it highly sanitary since there are no cracks and crevices to absorb dirty, soapy water. The machine is made in three sizes, driven respectively by one-sixth, one-fifth and one-fourth horsepower Westinghouse electric motors which can wash and wring at the same time. It is manufactured by the Conlon Electric Washer Company, 312-320 North May Street, Chicago.



Conlon Electric Washer.

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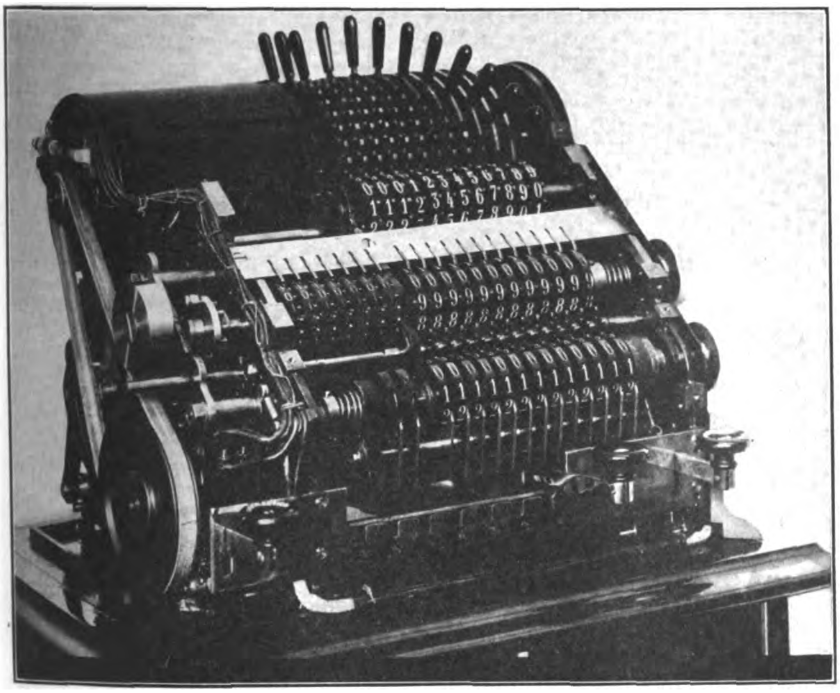
A French Electric Calculating Machine.

The new electric calculating machine known as the "Eclair" is a Paris invention, and it is claimed to solve the problem of a rapid calculation for modern business use, as it reduces mental effort to a minimum and suppresses manual work in a great degree. Its movements are carried out for the most part by electromagnets. Without entering into the details of the apparatus, we may state that the figures are first set upon certain of the drums by the use of the twelve levers which are seen at the top of the device, and by the combined action of these levers with the three operating keys placed at the bottom of the apparatus, the results, such as addition, etc., are seen to appear automatically upon suitable drums in another place, these drums being rotated by electromagnetic action. The two milled buttons at the side only serve to bring the drums back to zero in order to recommence work.

Aside from ordinary work, such as addition, division, etc., other calculations can be made, as for instance extraction of roots, interest, exchange and discount determinations, so that it will be seen that for business work the machine is likely to be very useful. It is claimed to be far more rapid in its work than all others on account of the small amount of mechanical work required by the operator, hence a great increase of speed is possible. As all the actual work in making up the results is done by the self-contained action of the machine, its operation is independent of any nervousness on the operator's part, and this it is said is the source of the greater part of the errors made by other calculating machines. It reponds at once to the desires of the operator and with its own energy which nothing can influence. Another point is said to be that no rough usage can be given the working parts, since it is the current that carries out the movements and not the operator. All manipulations are made by levers or keys which are now admitted to be the most practical for this class of work.

This machine has been perfected and placed on the market by the Société de le Calculatrice Electrique, 6 Rue de Hanovre, Paris, France.



Electrically Driven Calculating Machine.

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Exploding Submarine Mines by Wireless Telegraph.

Manrico Compare, an Italian electrician, has invented a wireless system for exploding mines at sea. The American consul at Leghorn, in reporting a successful demonstration of the invention, says the instrument was placed in a small building in a park. Two mines were put in the sea about 450 feet from the shore and 50 to 100 feet apart. The inventor exploded one mine and, after a brief interval, the second one. The distance from the apparatus to the mines was about 2,500 feet. Raised ground with trees, solid stone fences, and buildings, and a stretch of water lay between the apparatus and the mines. Three naval boats with wireless apparatus on board were about one and one-half miles farther out at sea, and the wireless station of the Royal Naval Academy was within a mile. The two tests demonstrated that the manipulator of the apparatus could control the destination of the waves sufficiently well to explode the mines separately.

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Proposed Railway Electrification at Bombay, India.

About a year ago, at the suggestion of the Governor of Bombay, India, two electrical engineers of well known reputation, C. H. Merz and F. F. P. Sisacre of the English firm of Merz & McLellan, visited Bombay for the special purpose of considering the possibility of profitably electrifying the Bombay suburban railways systems and the adjacent railway system of the Port Trust. These engineers have now submitted a report to the boards of the Bombay, Baroda & Central India Railway Company, the Great Indian Peninsula Railway Company, and the Bombay Port Trust, who are the authorities immediately concerned. Their report heartily recommends as a practical proposition a proposal to furnish Bombay with a first-class system of electrical railways communicating with its suburbs. The capital cost of such electrical railway equipment is estimated at nearly $4,000,000. The report states that there would be a gain by electrification of about $350,000 annually, an increase of about 20 per cent in speed, also improved punctuality, greater frequency of trains, and the development of residential area. For the Bombay suburban lines there is proposed a train unit of three coaches; that is, three coaches coupled permanently together and having a motor in one coach, so that they can be run as a small train by themselves, or joined to another similar unit to make a longer train. A train of three, six, or nine coaches can thus be made up.

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Branch Offices of the Bureau of Foreign and Domestic Commerce.

In order to permit of more direct co-operation with American manufacturers and exporters, branch offices of the United States Bureau of Foreign and Domestic Commerce have been opened in New York, Chicago, and New Orleans, where the Bureau's publications, samples of foreign-made products, plans and specifications of construction work abroad, lists of foreign dealers in various lines, manuscript consular reports, and similar documents are available to interested individuals and firms. Reserved addresses in connection with "foreign-trade opportunities," published in the *Daily Consular and Trade Reports*, may be obtained by application in letter form from these offices. It is suggested that firms in the districts served by these branch offices acquaint themselves with the material available through them, as time may frequently be saved by making application to the branch office instead of to the Bureau in Washington. The addresses of the branch offices are as follows:

New York, Room 315, United States Customhouse.

Chicago, 629 Federal Building.

New Orleans, Association of Commerce Building.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" 660 watts, 250 volts; catalog No. 500, non-separable porcelain.

Approved January 17, 1914.

CABLES, Armored.—Columbia Metal Hose Works, Cottage and Orient Streets, Bayonne, N. J.

Marker: letter "C" stamped in the armor at intervals of about six inches.

Armored cables shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved January 20, 1914.

FUSES, Cartridge Inclosed.—General Electric Company, Schenectady, N. Y.

"G. E." glass-tube fuses, 250 volts.

For rosettes, attachment plugs and for protection of instruments and pilot lights on switchboards; catalog No. 132,765, one ampere; catalog No 132,766, two amperes.

For rosettes only; catalog No. 132,767, three amperes.

Present specifications do not admit the use of special fuses such as the above as a substitute for standard designs except as indicated in notes preceding Rule 53*d*, and following Rule 2*c*, respectively.

Approved January 6, 1914.

FUSES, Open Link.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Repulsion-type fuses, 35-100 amperes, 250 volts, for use in cutout bases, 189 and 190.

Approved December 27, 1913.

LIGHTNING RODS.—Dodd & Struthers, 720 Sixth Avenue, Des Moines, Iowa.

"Dodd System" of lightning protection for buildings.

In this system woven copper cables and copper tubing are used, having a weight not less than three ounces per foot and intended for the protection of residences, barns, stores and similar buildings where the maximum height of any point does not exceed 60 feet and where corrosion is not liable to occur to any extent.

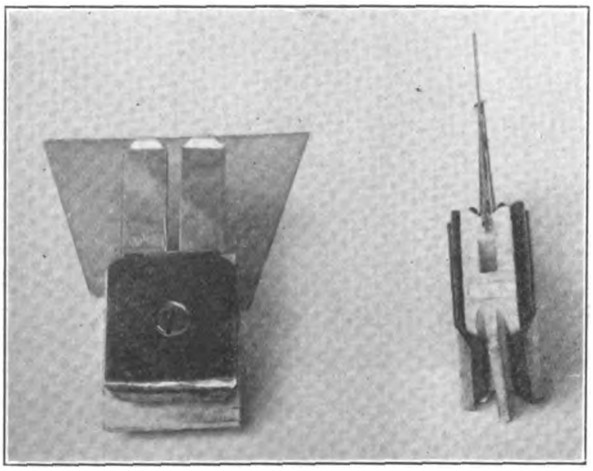
Installations of this system are to be made by men in the employ of the manufacturers and should in all cases be made in conformity with the "Suggestions of the National Board of Fire Underwriters for Protection Against Lightning as recommended by the National Fire Protection Association," edition 1913.

Approved January 17, 1914.

RECEPTACLES, for Attachment Plugs.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Adapters, 660 watts, 250 volts (combining Hubbell plug with Edison shell receptacles); catalog Nos. 5,424, 5,737 and 5,897 for use with receptacles rated 20 amperes, 250 volts.

Approved January 6, 1914.



Open-Link Fuse.—Metropolitan Engineering Company.

RECEPTACLES, Standard.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C E. M. Co." 660 watts, 250 volts.

Sign; catalog Nos. 777, 967.

Approved January 17, 1914.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Border light receptacles; catalog No. 273.

Approved January 6, 1914.

RECEPTACLES, Standard.—C. S. Knowles, Chelsea, Mass.

"C. S. Knowles" 600 watts, 250 volts. Cleat receptacle, catalog No. 50,175.

Approved January 17, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell, closed or slotted bases.

Key, 250 watts, 250 volts; molding, "Fluto" catalog No. 471. Pull, 250 watts, 250 volts; molding, "Fluto" catalog No. 473.

Also the above types with shadeholders attached; key type with composition or insulated metal key, or with "Shurlock" attachment.

Approved January 17, 1914.

RECEPTACLES, Standard.—Pass & Seymour. Incorporated, Solvay, N. Y.

"P. & S." brass-shell, closed or slotted bases.

Keyless, 660 watts, 250 volts; for use on metal ceilings, catalog No. 412; for mogul base lamps, "Fluto" catalog Nos. 1, 44.

Molding, "Fluto," catalog No. 472.

Also the above types with shadeholders attached, or with "Shurlock" attachment.

Also connecting block for molding bases, catalog No. 489.

Approved January 19, 1914.

ROSETTES, Fuseless.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

"C. E. M. Co." three amperes, 250 volts.

Combined cleat and concealed single-piece type, catalog No. 2,696-B.

Molding two-piece type, catalog No. 2,755.

Approved January 17, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." porcelain-shell sockets.

Key, 250 watts, 250 volts; catalog Nos. 485, 488.

Standard for use only in places where they will not be exposed to hard usage.

Approved January 17, 1914.

SWITCHES, Automatic.—Automatic Switch Company, 131 Liberty Street, New York, N. Y.

"S. V. R. Syphon Vacuum-Regulator" switch.

A single-pole snap switch connected in series with one of the following motors coupled to a rotary pump for producing vacuum in an "Arco Wand" vacuum cleaning system and so arranged that when the vacuum falls the switch is automatically closed.

The motors are as follows:

Direct-current; Roth Brothers & Company, 0.75 and 1.50 horsepower, 230 volts.

Alternating-current; Wagner Electric Manufacturing Company, 0.75 and 1.50 horsepower, 220 volts.

Standard when used in connection with a fused double-pole switch.

Approved January 17, 1914.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

ROCHESTER, KY.—The mayor may be addressed regarding plans for an electric light plant. G.

NEWTON, TEX.—H. T. Howard is planning to erect a plant to furnish electric lights for this place. D.

LARNED, KANS.—The Council is planning ways and means to secure a municipal lighting plant.

WILLOWS, CAL.—Improved lighting will be established. Address H. G. Keesling for desired information.

GATLIFF, KY.—The Gatliff Coal Company is planning to install electric light facilities for coal mining camps.

MINDEN, IOWA.—Bids will be asked at once for the construction of an electric plant. Address the city clerk.

RICHLANDS, N. C.—An electric plant will be installed in the spring. Address the town clerk for particulars.

HOUSTON, TEX. — Improvements valued at $23,000 will be made by the Houston Lighting & Power Company.

BARRY, ILL.—The citizens of this place are planning to erect a lighting plant here. Address Mayor Beavers.

LOWELL, WIS.—W. F. Pease, of this place, is promoting the establishment of an electric light plant here and at Reeseville.

MELBOURNE, FLA.—$5,000 in bonds has been voted for the construction of an electric light plant. Address the town clerk.

OVID, MICH.—The Council plans to install an electric pump for the water works. Address the city clerk in regard thereto.

HANCOCK, IOWA.—The Council is negotiating for an electric-light plant. Address the city clerk for general information.

GAYVILLE, S. D.—The Council is considering ways and means to establish a municipal lighting system. Address the city clerk.

PORTLAND, N. D.—The Council plans to establish a municipal lighting plant. Address the city clerk for further information.

NEWCASTLE, O.—The Council will award a new contract for electric lighting. Address the city clerk for further information.

WHITESBURG, KY.—The Commercial Club may be addressed regarding plans for the establishment of an electric light plant.

LOUISVILLE, KY.—The Louisville Silo & Tanks Works, of which W. C. Curry is manager, is in the market for 20-horsepower in motors.

KENYON, MINN., Business men are forming a company and will install electric lights for the town. Address F. W. Patridge for information.

QUINCY, FLA.—The city will install additional machinery in the electric power plant to cost $2,500. Address the mayor for further information.

MISSION, TEX.—A stock company is being organized to install a light, water and ice plant. Address E. O. Scott for general information.

ASTORIA, ORE.—The Seaside Light & Power Company is preparing to extend its transmission line across Clatsop plains to the south line of Warrenton.

ORLEANS, IND.—The Orleans Electric Light & Power Company has been incorporated with a capital stock of $35,000 by E. M. Heise, Albert Heise and others.

THROOPVILLE, N. Y.—The citizens are considering ways and means to secure electric lighting. Address S. C. Houghaling, chairman of Committee, at Auburn.

LEXINGTON, KY.—The City Commissioners are co-operating with the Commercial Club for the establishment of an ornamental lighting system on Main street. G.

HELENA, MONT.—The Standard Engineering Company has asked for a franchise to furnish light and power. Address D. J. McConnell, city clerk, for desired particulars.

SHEBOYGAN FALLS, WIS.—$49,000 in bonds have been voted for the construction of an electric-light and power plant. Address the city clerk for general information.

ST. CLOUD, MINN.—Merchants of Seventh Avenue will circulate a petition for the installation of a "Wihte Way" system of lighting. Address the city clerk for particulars.

LOUISVILLE, KY.—A considerable horsepower in motors will be required by Jones & Hughes for a candy factory and coffee-roasting plant, which they are planning to establish. G.

SALINA, KANS.—The stockholders of the Salina Light, Power & Gas Company will make a number of electric extensions throughout the year. Address Walter Grundy secretary.

ELLETTSVILLE, IND.—The Southern Indiana Light & Power Company, which operates a plant at White River, will construct an extension of its lines from Bloomington to Ellettsville. G.

BOWLING GREEN, KY.—The City plans to enlarge and improve the electric light plant and provide power for an ornamental street lighting system. Address James H. Kilkerson, superintendent.

CITY OF MEXICO, MEX.—The Federal Government has granted a concession to Guillermo Novoa for the use of the waters of the Purification River for the generation of electric power. D.

EUFAULA, ALA.—In order to better the lighting service furnished to the residents of Eufaula by the municipal power plant which was built two years ago numerous improvements are proposed. Address the mayor.

RICHLAND, IOWA.—A favorable proposition was submitted to the Council by Mr. Van Meter of the Sigourney Transmission Company, relative to furnishing electricity for this city. A franchise will have to be granted.

FLAT RIVER, MO.—There is a movement well under way to organize a stock company, with a capital of $40,000, to build and operate an electric plant, to supply light and power to the towns of Flat River, Elvins and Desloge.

IRON RIVER, MICH.—The Peninsular Power Company will spend $80,000 to $100,000 in Iron River this summer remodeling and adding to its power plant. This was the announcement of L. T. Stirling, assistant secretary of the company.

MERCHANTVILLE, N. J.—The Public Service Electric Company is planning for the installation of additional incandescent street lamps, and has entered into negotiations with the Borough Council for the improvement.

WORCESTER, MASS.—An addition to the Webster Street powerhouse of the Worcester Electric Light Company is being planned. Superintendent Fred M. Smith will send the specifications to contractors when the plans are ready.

MAGAZINE, ARK. — The City Council of Magazine has granted a 20-year franchise to the Magazine Electric Company for a continuous current in this city. The Company will at once install a modern and up-to-date plant and system.

CENTRAL CITY, KY.—The Central City, Greenville & Drakesboro Traction Company, will construct a central steam-driven electric plant on the Green River, two miles from Central City, and transmit electricity to 21 coal mines and other plants within a 200-mile radius.

LOVELAND, COLO.—Through the appropriation by the City Council the preliminary work of constructing a municipal light and power plant on the Big Thompson River, 14 miles west of the city, will be started at a cost of $120,000. Address the city clerk.

YOUNGSTOWN, O.—The Council will employ an expert electrical engineer to represent the city's interest and assist the Lighting Committee of the Council in securing from the lighting company a contract for a better and cheaper system of light for the city of Youngstown.

ABILENE, TEX.—The Central West Texas Irrigation Association is considering the proposition of building transmission lines from this city to carry electric power from the Abilene power plant to the territory around Abilene for the operation of irrigation pumps and farm machinery. D.

WAUCOMA, IOWA.—The Council is planning ways and means to secure a municipal light plant and arrangements have been made to call a special election on bonding the town for $12,000 to purchase the rights and property and to erect and operate a light plant. The election will be held in March.

GRAND RAPIDS, MICH.—A delegation of Madison Square Board of Trade officials met with the Ways and Means Committee of the Council, for the purpose of advancing the plan for a boulevard lighting system in that locality. The business men of Madison Square have sufficient money with which to purchase the posts and lights and they now want the city to furnish the power. Address city clerk.

SHELDON, N. D.—Instead of putting in an electric light plant, Sheldon may secure its power from Enderlin over a transmission wire. Enderlin has a splendidly equipped plant, capable of manufacturing enough electricity for the local needs there and here as well. It would cost about $5,000 to construct the wires. Local people believe the plan preferable to having the town establish a plant of its own.

CHARLOTTE, N. C.—Contracts involving approximately $1,000,000 have been let by the Southern Power Company to the Hardway Construction Company of Columbus, Ga., and the Parker-Brooks Construction Company of Macon, Ga., for the building by the former of the big dam and power station at Lookout Shoals on the Catawba River, between Iredell and Catawba Counties, and the construction by the latter of five miles of railroad from the Southern Railway to the site of the development. The Lookout Shoals will develop 26,400 electrical horsepower. The machinery installation consists of four 6,000-horsepower uints and two exciter units. A fall of 74 feet will be secured by reason of the location of the dam at a point just above the Island Ford road.

POUND, WIS.—The prospect of securing electric light and power for this village and Coleman looks brighter than ever. A stock company will be organized composed of local men, and some outside capital will also be secured. The capital stock of the company will be $10,000 and it is expected that the plant will be ready for operation by July 1. Practically an unlimited amount of electric current will be obtainable and power for manufacturing purposes can be secured very cheaply. The source of the current will be from the High Falls plant of the Wisconsin Public Service Company. The local company will be known as the Coleman-Pound Light & Power Company, and it is expected that the incorporation of the company will take place within the next two weeks.

HUNTSVILLE, ALA.—J. W. Worthington, vice-president of the Alabama Power Company, has in hand tentative plans for the development of the enormous power of the Muscle Shoals in the Tennessee River. These plans, which alone cost $25,000, will be put in use if the government accepts the bid of Mr. Worthington's company for a lease on the power rights for a long term of years. So far this is the only bid that has been made. The project involves millions of dollars. Two immense dams are provided in the plans. It is estimated that a million horsepower can be generated. Mr. Worthington believes that the Engineering Board of the army will recommend that the plans for developing Muscle Shoals be adopted.

TELEHONE AND TELEGRAPH.

(Special Correspondence.)

VESTA, N. Y.—The Local Telephone Company, David J. Nichols, president, will improve and extend its lines.

MUSCATINE, IOWA.—The Iowa Telephone Company contemplates improvements here to cost $25,000.

NEW RICHMOND, WIS.—St. Croix Telephone Company is planning to erect a modern telephone exchange here.

WILLIS, TEX.—Edmund Woolridge has purchased the Willis Telephone system from Captain Green, and will make improvements. D.

WINGO, KY.—The Mitchell Telephone Company has been incorporated with a capital stock of $100 by R. K. Johnson and others.

PLANT CITY, FLA.—The City Council is considering an ordinance granting a franchise to Hartline and Sons to establish a telephone system.

RED LAKE FALLS, MINN.—The Grodon Valley Telephone Company will ask for a franchise to extend its line into this city. Address N. L. Rossen for information.

PANORA, IOWA.—The Panora & Jefferson Road Mutual Telephone Company has been incorporated with a capital stock of $10,000 by S. D. Orr and others.

GLEN PERRY, IDA.—J. I. Henton, manager of the Mountain State Telephone Company, will install a new plant here next spring, including new wires, poles and equipment.

STOCKTON, CAL.—The Western Union Telegraph Company will expend $40,000 reconstructing its line from Stockton to Los Angeles, and enlarging its local offices and equipment.

PACIFIC, WASH.—Farmers in this vicinity have organized to install a Farmers Telephone system, and the Pierce County Commissioners have granted them a franchise over County roads. O.

RICHLAND, WASH.—Articles of incorporation have been filed here for the Richland Telephone Company with a capital stock of $5,000 by E. E. Floyd, J. R. Gardner, William Read and others.

EUREKA, MONT.—Directors of the Eureka Mutual Telephone Company have decided to construct an extension of their lines up Sinclair Creek to Gateway. It is understood the work will be commenced early in the spring. O.

RED BLUFF, CAL.—The Tehama Telephone Company has been reorganized with James McCampbell as general manager, and considerable extension work is planned in the near future. All operating and line work is to be under the supervision of P. T. McGovern and W. G. Holt.

BRAINERD, MINN. — The Clear Water & Nokay Lake Telephone Company has been organized by farmers, and the line is to be limited to ten phones. G. F. Edquist was elected president; Andrew Peterson, vice-president; Fred Hanson, secretary, and J. H. Dickinson, treasurer.

OMAHA, NEB.—Dundee and a portion of the Walnut Hill district are to be served by a new telephone exchange to be built in the spring by the Nebraska Telephone Company. The new exchange is to relieve business of the Harney Exchange and will cost $100,000. Address the secretary for further information.

ELECTRIC RAILWAYS.

(Special Correspondence.)

KEYPORT, N. J.—The Jersey Central Traction Company is considering the extension of its main line to the Keansburg beaches, by way of upper Keansburg. A.

SPARTANSBURG, S. C.—In its report to the Legislature the State Hospital Commission recommended that a trolley line be built from Columbia to State Park, eight miles north of the city.

KENDALLVILLE, IND.—The Kendallville & Ft. Wayne Electric Railway Company will expend $30,000 for building steel bridges. The road will be extended. Address W. L. Taylor, Indianapolis, president.

NORTH YAKIMA, WASH.—Surveys have been completed by the Yakima Valley Transportation Company for extension of its branch line into the Wide Hollow District of the Tieton project, and assurance has been given to the ranchers along the line that the line will be built in the immediate future. O.

SEATTLE, WASH.—The rehabilitation of the Highland Park & Lake Burien Street Railway Company, recently accepted by the city as an unencumbered gift, will cost $43,000. Certain extensions at a cost of over $2,000,000 are being considered by the City Utilities Committee, of which Oliver T. Erickson is chairman. O.

MIAMI, ARIZ.—Plans are advancing for the construction of the proposed interurban line between Globe and lower Miami, which is being promoted by W. D. Fisk, of Globe, and associates. The Corporation Commission of Arizona is expected to approve the issuance of $100,000 of bonds proposed by the company. D.

CLARKSTON, WASH.—The committee appointed to secure in Clarkston a $10,000 subscription for stock in the F. L. Sturm Electric Railway Company, which purposes building a line from this city to Lewiston, Idaho, recently announced that the sum had been collected. This means that the line will be constructed immediately. O.

MILWAUKEE, ORE.—An interurban railway from this city to Logan, 18 miles in length, a branch of the Portland & Oregan City Railway, is projected. The Milwaukee Commercial Club is agitating the movement, and other commercial bodies along the line have become interested. The line, if started, will be extended as far as Wilhoit Springs. O.

WAYCROSS, GA.—Directors of the street railway are considering the question of extensions that are needed in several parts of the city. The Board is favorable to completing the line to Gilchrist Park and it is believed work on this part of the improvement schedule will start at an early date. Hebardville is another point to which the street railway will build.

SHREVEPORT, LA.—The Louisiana-Texas Traction Company, represented here by Major A. B. Blevins and Glen N. Walker is considering the project of constructing an interurban electric line from Mansfield, northwardly to Vivian, passing the city of Shreveport and the towns of Blenchard, Oil City and Mooringsport. A committee of Vivian business men and officials, including Mayor Baker, has been named to work on the franchise and rights-of-way details. Eventually the line will be extended to Longview, Tex.

NEW INCORPORATIONS.

BAY CITY, MICH.—Michigan Light Company has been incorporated with a capital stock of $3,000,000 by William H. Barthold, Carl Wilcox and James A. Brown.

PITTSBURGH, PA.—The Braddock Electric Machine Company, of Pittsburgh, will be incorporated by W. J. Nowotny, Anne Nowotny and P. D. S. Remington.

INDIANAPOLIS, IND.—The Hercules Electric Company has been incorporated with a capital stock of $25,000 by Katherine Blake Kurtz, S. H. Kurtz and others.

ELDORADO, WIS.—Wisconsin Light, Power & Milling Company has been incorporated with a capital stock of $10,000 by O. A. Huelsman, A. H. Genrich and L. F. Lurvey.

WATERTOWN, MINN. — The Crescent Electric Company has been incorporated with a capital stock of $50,000 by Guy E. Halgren, James J. Ponsford and others.

TRENTON, N. J.—The Mercer Gas & Electric Fixture Company has filed articles of incorporation with a capitalization of $25,000. The incorporators are Raymond H. Rue, Harris O. Bruner and Chester L. Snedeker.

BAYONNE, N. J.—The Eleco Company has been incorporated with a capital stock of $2,000 to deal in electric supplies. The incorporators are Norman Johnson, Mildred V. Staufer and Joseph Bardate, of New York City.

MANHATTAN, N. Y. — Gotham Electrical Supply Company has been incorporated with a capital stock of $5,000. The directors are Wilfred G. Johnston, George H. Johnston and Helen Johnston, of New York City.

MANHATTAN, N. Y. — Wagga Company has been incorporated with a capitalization of $50,000 to engage in the electrical supply business. The directors are Lyman E. Warren, Charles A. Burr and Oscar H. Caccioloa, of New York City.

CHICAGO, ILL.—Steel City Fittings Company has been incorporated with a capital stock of $2,400 for the purpose of manufacturing and dealing in electrical and mechanical devices. The incorporators are William R. Watson, Arthur N. Thomas and L. O. Holkes.

HAILEY, IDAHO. — The Hailey Electric Company has been incorprated with a capital stock of $45,000. The incorporators are Fred W. Gooding and Frank R. Gooding. This company will own what was formerly the Cramer light and power system.

NEW YORK, N. Y.—The Keith Light Company, Incorporated, has been granted articles of incorporation to deal in electric and gas fixtures, etc. The capital stock is $300,000 and the incorporators are Leigh K. Lydecker, Maywood; Samuel M. Richardson, Westerleigh; and William J. Canary, Brooklyn.

TORONTO, ONT.—The Interurban Company, Limited, a new Toronto company, with the names of the incorporators nominally given as clerks in a Toronto legal office usually associated with Mackenzie & Mann enterprises, has been Federally incorporated, with a capital stock of $5,000,000. The company is empowered to deal in all kinds of bonds and debentures, to develop water powers, establish power plants, etc.

PROPOSALS.

STREET-LIGHTING SYSTEM.—Bids will be received on February 24 for the construction of a street lighting system or "White Way" on Main Street, Luverne, Minn. Address S. C. Rea, city recorder.

ELECTRIC MOTOR.—Bids will be reveived on February 24 for furnishing and placing an electric motor for the East Side sewage pumping station at Columbus, O., addressed to the Director of Public Service, Samuel A. Kinnear.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until March 30 for the lighting fixtures for the post office at Urbana, Ill.; and until March 31 for the lighting fixtures for the post office at Cartersville, Ga.

CABLE.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until February 24 for furnishing under Proposal 689 11 miles paper-insulated submarine armored cable, type 324. For further information address Charles S. Wallace, Captain, Signal Corps, U. S. Army.

WIRE, WIRE STRAND, ETC.—Sealed proposals for furnishing 787,000 pounds of galvanized wire, silicon bronze wire, wire strand, and staples and 30,000 wire rope clips will be received at the United States Engineer Office, Customhouse, Memphis, Tenn., until February 25. Information will be furnished on application to E. M. Markham, major, Engineers.

MOTOR - GENERATOR SETS.—Bids will be received on February 26 for furnishing and delivering two 200-kilowatt motor-generator sets to operate under 60-cycle three-phase 440-volt alternating current and deliver 220-volt direct current at the municipal Reduction Plant of the city of Chicago, at Thirty-ninth and Iron Streets and on the west arm of the south fork of the south branch of the Chicago River, according to plans and specifications on file in the office of the department of Public Works, Room 406 City Hall. Address George B. Young, Commissioner of Health, Chicago, Ill., for further information.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 3 for furnishing miscellaneous cable for use on cranes, as per Schedule 6,420, for delivery at the Navy Yard, Washington, D. C.: one 10-ton three-motor electric gantry crane, as per Schedule 6,401, for delivery at the Navy Yard, Brooklyn, N. Y.; 10 general-alarm gongs and contact makers, as per Schedule 6,429, for delivery at the Navy Yard, Charleston, S. C.; material for miscellaneous switchboard panels, as per Schedule 6,429, for delivery at the Navy Yard, Brooklyn, N. Y.; and one triple-plunger pump, electrically driven as per Schedule 6,399, for delivery at the Navy Yard Boston, Mass. The Bureau will also receive bids until March 10 for a large amount of cable, as per Schedules 6,419, 6,426 and 6,423, for delivery at the Navy Yards, Brooklyn and Philadelphia, and until March 17 for 10 electrically operated potato peelers, of one-horse-power capacity, as per Schedule 6,430, for delivery at the Navy Yard Brooklyn, N. Y.

NEW PUBLICATIONS.

HOLYOKE REPORT.—The annual report of the Gas and Electric Department of the city of Holyoke, Mass., for the year 1913, has been published in pamphlet form.

BUREAU OF LONGITUDE.—The Bureau des Longitudes, Paris, France, has prepared its Annuaire for the year 1914, containing the usual tables. It is published by Gauthier-Villars and the price is 30 cents.

TRANSFORMERS.—Technical Paper No. 211 of the Bureau of Standards is entitled "Accuracy of the Formulas for the Ratio, Regulation and Phase Angle of Transformers," by P. G. Agnew and F. B. Silsbee.

SPECIFICATIONS FOR INCANDESCENT LAMPS.—The Bureau of Standards, Washington, D. C., has issued the sixth edition of circular No. 13 entitled "Standard Specifications for Incandescent Electric Lamps."

GOVERNMENT OWNERSHIP.—The address by Charles P. Brush, vice-president of the Postal Telegraph-Cable Company, on "Government Ownership of Telegraph Lines" at Hartford, Conn., on January 20, has been published in pamphlet form.

COPPER-WIRE TABLES.—The Bureau of Standards, Washington, D. C., has issued a second edition of circular No. 31 entitled "Copper Wire Tables." The data on which the tables are based were adopted as international standards by the International Electrotechnical Commission at its meeting last September.

THE EFFECTS OF ICE ON STREAM FLOW.—The design, installation, and operation of any plant that depends for its success upon flowing water demands a knowledge of the total flow of the stream and its variation throughout the year. The United States Geological Survey has been compiling for years stream-flow records for many streams in the United States and the methods of collecting such records for open-water periods have been standardized, but during the winter the presence of ice affects the flow so much that the laws of flow pertaining to open channels are not entirely applicable, and no standard methods for collecting and interpreting the data at that season have been recognized. In many localities ice persists in the streams for periods ranging from a few days to several months, and although the conditions resulting from ice are most pronounced in northern regions they are prevalent over wide areas, especially at high altitudes.

Recent studies made by the Geological Survey have added much information in regard to the factors influencing stream flow when ice is present, and with a view to standardizing, so far as practicable, the methods for ascertaining winter flow Water-Supply Paper 337, entitled "The Effects of Ice on Stream Flow," by William Glenn Hoyt, has been published. This paper discusses the factors that influence the run-off during the periods of low temperature, the varieties of ice and their effect on the applicability of the laws of open-channel flow, and the collection and interpretation of necessary data. A copy of the report may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

FINANCIAL NOTES

At the annual meeting of New York Edison Company Edward G. Love was elected a director to succeed the late A. N. Brady.

The Northern Ohio Traction & Light Company has filed notice of an increase in its capital stock from $13,000,000 to $15,000,000, the new stock to be all preferred.

H. R. Fehr, president of the Lehigh Valley Transit Company, announces that he has sold $1,000,000 refunding and improvement five-per-cent bonds of the Lehigh Valley Transit Company. Proceeds of this sale will be sufficient to retire the floating debt of the company and to provide funds for additions and betterments for the current year.

Dividends

American Railways Company; regular quarterly of 1.5 per cent on common, payable March 14 to stock ot record February 28.

Atlantic Gas & Electric Company; the regular quarterly dividends of 1.5 per cent on its preferred stock, payable February 14.

Brockton & Plymouth Street Railway semi-annual of $3 on the preferred, payable March 16 to stock of record March 7.

General Electric Company; quarterly of two per cent, payable April 15 to stock of record February 28.

Manhattan Bridge Three Cent Line; initial quarterly of 1.5 per cent, payable March 2 to stock of record February 26.

Pennsylvania Water & Power Company; initial of one per cent, payable April 1 to stock of record March 16.

Plymouth Street Railway Company; semi-annual of $3 on preferred payable March 16 to stock of record March 7.

Tennessee Railway Light & Power Company; regular quarterly of 1.5 per cent on preferred, payable March 2 to stock of record February 14.

Reports and Earnings.

LOUISVILLE RAILWAY COMPANY.

	1913	1912
December gross	$275,321	$270,360
Net after taxes	127,078	122,261
Surplus after charges	56,911	56,261
Net from Interurbans	17,131	21,968
Net income	74,042	78,229
Twelve months gross	3,226,275	3,130,492
Net after taxes	1,377,757	1,340,455
Surplus after charges	539,924	561,122
Net from interurbans	196,814	234,805
Net income	736,738	796,007

MEXICAN TELEPHONE & TELEGRAPH.

(Mexican Currency.)

The Mexican Telephone & Telegraph Company reports for the nine months ended Nov. 30, 1913, compared as follows:

	1913	1912
Gross	$563,191	$528,797
Expenses	284,368	248,171
Net	278,822	280,625

FEDERAL TRACTION COMPANY.

The consolidated statement of the Federal Light & Traction Company and subsidiary companies (excluding the Deming Ice & Electric Company) for the fiscal year ended December 31, 1913, shows net earnings of $903,492, a decrease of $33,307. The income account compares as follows:

	1913	Decrease
Gross earnings	$2,329,164	*$161,657
Net earnings	903,492	33,307
Interest charges	531,821	*88,994
Cent. Ark. Ry. & Lt. pfd. div.	63,000	Unchanged
Fed. Lt. & Tr. div.	150,000	Unchanged
Bond discount	40,716	33,179
Surplus	117,955	89,122

*Increase.

OREGON ELECTRIC RAILWAY.

	1913	1912
December gross	$ 95,882	$ 91,574
Net after taxes	24,857	21,106
Twelve months' gross	1,215,383	953,847
Net after taxes	366,487	284,947

SOUTHERN NEW ENGLAND TELEPHONE.

The report of the Southern New England Telephone Company for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$3,594,560	$3,317,216
Expenses	2,828,208	2,609,912
Net	766,352	707,306
Dividends	706,740	593,514
Surplus	58,612	113,792

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company reports for the twelve months ended December 31, 1913, compares as follows:

	1913	1912
Gross earnings	$4,466,233	$4,256,860
Expenses	123,107	117,657
Net earnings	*4,343,126	4,139,203
Surplus and resources previous year	8,689,292	7,835,726
Total surplus	13,032,419	11,974,929
Cash division on preferred stock	854,172	854,172
Cash division on common stock	1,341,182	1,215,732
Stock division on common stock	1,341,182	1,215,732
Total division	3,536,537	3,285,637
P. & L. surplus	9,495,882	8,689,292

*After deducting preferred dividends of $854,172, the balance, $3,488,954, is equal to 25.08 per cent earned on $13,911,000 common stock, as compared with 26.05 per cent earned on $12,610,200 stock previous year.

TWIN CITY LINE.

The report of the Twin City Rapid Transit Company for the year ended December 31, 1913, shows net earnings of $4,369,695, against $4,010,966 the preceding year. The balance after preferred dividends was equal to 12.9 per cent on the common stock, as compared with 11.3 per cent earned the year previous. The income account compares as follows:

	1913	1912
Gross	$8,870,336	$8,208,968
Expenses	4,500,641	4,198,001
Net	4,369,695	4,010,966
Interest and taxes	1,561,440	1,529,231
Surplus	2,808,255	2,481,736
Dividends	1,416,000	1,416,000
Surplus	1,392,255	1,065,736
Depreciation and ren.	1,060,000	775,000
Surplus	332,254	290,735

NEW ORLEANS RAILWAY & LIGHT.

The report of the New Orleans Railway & Light Company for the twelve months ended December 31, 1913, compares as follows:

	1913	1912
Gross	$6,924,426	$6,628,147
Net after taxes	2,592,848	2,652,264
Surplus after charges	*872,579	995,033

*Equal to 5 per cent on $10,000,000 preferred stock and an additional 1.86 per cent on $20,000,000 common stock. This compares with 2.47 per cent earned on common stock previous year.

DETROIT UNITED.

The report of the Detroit United Railway Company for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$12,723,838	$11,695,530
Operating expenses	8,694,231	7,730,409
Net	4,029,607	3,965,121
Surplus after charges	780,477	825,464

COMMONWEALTH POWER, RAILWAY & LIGHT.

Commonwealth Power, Railway & Light, for year ended December 31, 1913, reports income as follows:

Earnings on stocks owned in subsid's	$2,083,019	$1,197,970
Miscellaneous earnings	320,670	104,490
Total gross earnings	2,403,689	1,302,461
Expenses and taxes	92,583	78,587
Interest charges	397,680	54,823
Net income	1,913,425	1,169,050
Preferred dividend	760,000	360,000
Balance for common stock	1,153,425	809,050
	1913	1912
December gross	$346,530	$153,123
Net after expenses, taxes and interest	286,156	142,211
Balance after preferred division	206,156	112,211

WISCONSIN GAS & ELECTRIC.

The Wisconsin Gas & Electric Company reports for year ended Dec. 31, 1913:

	1913	1912
Gross earnings	$ 753,410	$ 680,793
Net earnings	205,622	201,266
Gross income	211,156	205,665
Surplus after charges	104,315	99.692
Balance after preferred dividends	92,315	89,942
On common stock	9.23%	8.99%

WISCONSIN EDISON.

The Wisconsin Edison Company, Inc., reports consolidated net earnings of its subsidiaries for the twelve months ended November 30, 1913, of $2,626,710, an increase of $66,340. The income statement for November and the fiscal year compares as follows:

November—	1913	Increase.
Operating revenue	$ 722,742	$ 55,459
Net after taxes	228,332	15,305
Twelve Months—		
Operating revenue	8,301,190	622,462
Net after taxes	2,626,710	66,340
*Surplus after dividends	1,134,668	60,353

*Applicable to securities of Wisconsin Edison Company, Inc.

CHICAGO TELEPHONE COMPANY.

The report of the Chicago Telephone Company, for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$16,274,602	$14,538,399
Ex., repairs & maintenance	13,638,048	12,003,986
Net revenue	*2,636,554	2,534,413
Dividends	2,161,000	2,160,000
Surplus	475,554	374,413

*Equal to 9.76 per cent on $27,000,000 capital stock, as compared with 9.38 per cent earned on same stock the previous year. The profit and loss surplus as of December 31, 1913, was $662,763.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 16.	Feb. 9.
American Tel. & Tel. (New York)	120	121
Commonwealth Edison (Chicago)	135⅞	136
Edison Electric Illuminating (Boston)	255	255
Electric Storage Battery, common (Philadelphia)	55	54
Electric Storage Battery, preferred (Philadelphia)	55	54
General Electric (New York)	148	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1⅛
Massachusetts Electric, common (Boston)	11	10½
Massachusetts Electric, preferred stamped (Boston)	62	62
National Carbon, common (Chicago)	150	155
National Carbon, preferred (Chicago)	118	111
New England Telephone (Boston)	140	140½
Philadelphia Electric (Philadelphia)	26⅞	26⅝
Postal Telegraph and Cables, common (New York)	84¾	81
Postal Telegraph and Cables, preferred (New York)	69	69
Western Union (New York)	64⅛	63
Westinghouse, common (New York)	70	70
Westinghouse, preferred (New York)	115	116

PERSONAL MENTION.

MR. LOUIS STEINBERGER, inventor of "Electrose," is the subject of some interesting commentary in an article entitled "Better Business," by William Hand, in the current issue of "Everybody's Magazine." This article dwells particularly upon Patent-Office conditions.

MR. JOHN F. WALLACE has resigned as president of the Electric Properties Corporation to devote all of his time to the management of Westinghouse, Church, Kerr & Company, the stock of which is owned by the first-named corporation. Mr. Wallace is succeeded by MR. A. LUDLOW KRAMER, who has given up the vice-presidency of the Equitable Trust Company.

MR. JOHN W. FOSTER, manager of sales of the Chicago office of the Holophane Works of the General Electric Company, announces that this office has been transferred from 425 South Wabash Avenue to room 715 Mallers Building. The territory covered by this office has been increased to include North and South Dakota, Minnesota and Wisconsin. MR. R. E. PERRY, who has handled Holophane sales in the Cleveland district has been transferred to the Chicago district with headquarters at Minneapolis.

MR. HENRY A. MORSS, vice-president of the Simplex Wire & Cable Company, Boston, Mass., delivered an address before the contract department employees of the Commonwealth Edison Company, at the rooms of the Western Society of Engineers on Tuesday evening, February 17. He described the various processes of insulating rubber-covered, taped, braided and steel-taped wires and cables and discussed the preparation of rubber and rubber compounds, and the use of formula for determining resistance and voltage characteristics of the conductor. The lecture was illustrated with many lantern slides of typical machinery and scenes in the Simplex plant.

PROF. VLADIMIR KARAPETOFF, of the electrical department of Cornell University, has returned from a trip to Washington, D. C., where he delivered four two-hour lectures before the engineer officers of the United States Army, Washington Barracks. The lectures were given on February 5, 6 and 7, and the subjects treated were "Alternating Currents," "Theory of Electrical Machinery," "Design of Electrical Machinery," and "The Fundamentals of the Magnetic Circuit." Lieutenant Atkisson, who is in charge of electrical and mechanical engineering, and his assistant, Lieutenant Lampert, are former students of Professor Karapetoff at Cornell.

MR. CHARLES R. UNDERHILL, electrical engineer of the Acme Wire Company, New Haven, Conn., gave an experimental lecture on "Electromagnets" before the Yale University Branch of the American Institute of Electrical Engineers on the evening of February 11. At the request of Prof. Charles F. Scott, Mr. Underhill repeated the lecture before the senior class on the afternoon of February 12. The subject related chiefly to the effects of magnetic leakage in plunger electromagnets, and Mr. Underhill showed how the ordinary laws of traction, as usually given in textbooks, had to be modified on account of leakage, so that the traction may be accurately predetermined. Experiments were performed with special apparatus to prove each statement.

MR. HARRY C. SLEMIN, sales and advertising manager of the Stromberg-Carlson Telephone Manufacturing Company, of Rochester, N. Y., is leaving the electrical business to become connected with the Yawman & Erbe Manufacturing Company, of Rochester. He will assume the position of advertising manager. Mr. Slemin began telephone work in the Western Electric Company's Chicago plant in 1896. In 1904 he went to Rochester with the new Stromberg-Carlson organization to take charge of the apparatus engineering department. Later he was given full charge of the lead-covered cable business, and in 1910 was appointed advertising manager. In 1911 he was made sales and advertising manager, combining both departments.

MR. J. G. BARRETT has been appointed district manager of the St. Louis office of the Holophane Works of the General Electric Company. This office will be located in the Frisco Building and will direct the sales in the states of Iowa, Nebraska, Missouri, Kansas, Oklahoma, Texas, Louisiana and Arkansas. A complete display room has been equipped and a full line of Holophane products will be on exhibition. Mr. Barrett will be assisted by MR. R. H. LYON.

J. G. Barrett.

MR. E. H. WADDINGTON has been appointed district manager of the Cooper-Hewitt Electric Company, at St. Louis, Mo., with offices at 1408 Central National Bank Building. Mr. Waddington is well known throughout the electrical industry. He was for some time connected with the Western Electric Company in the capacity of illuminating engineer. Later, and until quite recently, he was employed by the General Electric Company in the same capacity. With both organizations he was in charge of the sale of illuminating goods, acting also in an advisory position in connection with their different branches. With this expert knowledge of the subject of illumination and his wide acquaintance, Mr. Waddington will prove a valuable factor in the development of the company's business in the territory he will cover, which will include five states adjacent to Missouri.

OBITUARY.

DR. KARL PICHELMAYER, professor in the Technical Institute at Vienna, Austria, and member of the International Electrotechnical Commission, died suddenly on January 23, in the forty-sixth year of his age.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., and Association of Commerce Building, New Orleans, La. Apply for addresses in letter form, giving file number.)

NO. 12,491. BARBERS' ELECTRICAL SUPPLIES.—One of the largest importers of barbers' supplies in a European city informs an American consulate that he would like to get in touch with American manufacturers of electrically operated barbers' equipment of all kinds, such as hair brushes, face massage, and shampooing machines. Correspondence with the inquirer should be in Italian or French.

NO. 12,500. PUSH-BUTTON DOOR BELLS.—An American consul in Great Britain reports that a local firm desires quotations on push-button door bells, delivered in gross lots, c. i. f. port of entry. There is direct steamship service with New York.

DATES AHEAD.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Central Electrical Railway Association. Cleveland, O., February 26-27. Secretary, A. Neereamer, 308 Traction Terminal Building, Indianapolis, Ind.

American Physical Society. Columbia University, New York, N. Y., February 28. Secretary, A. D. Cole, Ohio State University, Columbus, O.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. H. Fritch, 900 South Michigan Avenue, Chicago, Ill.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Street and Interurban Railway Association, Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Wagner Electric Manufacturing Company, St. Louis, Mo., has opened a branch at Memphis, Tenn., where local and southwestern trade will be looked after. H. W. Briscoe, who has been at the general offices, has been put in charge of the branch.

M. B. Austin & Company, 700 West Jackson Boulevard, Chicago, Ill., in the February issue of the *Austin Post,* describes and illustrates some interesting applications of "Safety Rubicore" insulated wire and "Safety" steel-taped cable.

Oshkosh Manufacturing Company, Oshkosh, Wis., has prepared a new booklet describing the Oshkosh guy anchor. The leading jobbers all over the country are distributing this booklet and also a folder in colors descriptive of the new guy anchor. Detailed information can be secured from the Oshkosh Manufacturing Company or the nearest jobber.

W. N. Matthews & Brother, St. Louis, Mo., are sending out a number of circulars calling attention to the installation of Matthews guy anchors. The simplicity of these anchors is pointed out and a section is shown to make clear the great holding power that they possess. A number of photographs are reproduced showing lines that were improperly guyed and heavy damage resulting thereto from storms.

The Stevenson Company, Pittsburgh, Pa., has issued a booklet on Stevenson molded insulation. This material is made from a number of different mixtures to make it applicable to a wide range of uses. It provides high dielectric property, lightness, high finish, mechanical strength, heat resistance, imperviousness to moisture, oils and chemicals, etc. A large number of molded insulating parts are shown.

Carbolineum Wood Preserving Company, 518 Prairie Street, Milwaukee, Wis., manufacturer of "Avenarius" carbolineum wood preservative, is distributing a very interesting series of letters devoted to information respecting the preservation of lumber. The company has available some highly valuable information respecting the preservation of poles, ties and posts, indicating the methods of application and the cost of the wood preservative. This series of letters will be sent to those interested upon request.

The Esterline Company, 227 East South Street, Indianapolis, Ind., has issued descriptive folder No. 312, which is devoted to the use of Esterline graphic meters, both of the switchboard and portable type. These instruments are used for recording a variety of values and are the means of increasing the efficiency of a plant quite materially. The record is easy to read and the instrument is so arranged that all its parts are readily accessible. The company has also issued a number of loose leaves for its graphic-meter data book and price list.

Central Electric Company, 320 South Fifth Avenue, Chicago, Ill., has published an elaborate circular describing and illustrating a special group of designs showing the Central "Alberyl" semi-white glass for illumination designs of various characters. This special group is just enough for a window display and a complimentary price is made for the purpose of introducing the group. The circular describes 13 shapes and 20 pieces, and the list prices itemize up more than double the special net price which is offered for introduction.

Schweitzer & Conrad, 1770 Wilson avenue, Chicago, Ill., have issued bulletin No. 2, which describes the Schweitzer high-voltage detector. This is a simple and compact device for quickly detecting high voltage and for "phasing out." This firm has also issued bulletin No. 3, devoted to the Schweitzer recording synchroscope. This instrument makes a permanent record of the operation of switch closing when paralleling and thus gives an operator a tangible means of studying his work in order to improve it; the instrument also locates errors in synchronizing and places blame for them.

The Safety Insulated Wire & Cable Company, New York, has been awarded a contract for over $28,000 worth of insulated wire and cable for the construction and installation of a thoroughly modern underground fire-alarm and police-signal system for the city of Cleveland, O. H. A. Bowen, superintendent of Fire-Alarm Telegraph, prepared the estimate, resulting in the securing of the appropriation. Alfred A. Beuesch, director of Public Safety, and Hiram F. Stillman, secretary of the Board of Public Safety, were instrumental in pushing the project to a successful issue. The order for "Safety" wires and cables was secured through M. B. Austin & Company, manager of the Safety Company's western department.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., his issued a number of new publications, of which folder No. 4237, is entitled "The Way to Charge Three Cells;" it describes the mechanical vibrating rectifier for charging small storage batteries for ignition and lighting sets on automobiles; all that is necessary to operate it is to connect the two wires from the binding posts to the battery and turn the switch. "Small Motors No. 18" covers the application of small alternating-current and direct-current motors; a detailed illustrated description is given of the construction of these motors; the application of these motors to various devices, such as washing machines, vacuum cleaners, piano players, pumps, sign flashers, and ironing machines, is discussed. "Westinghouse Electric Vehicle Equipment" is the title of section No. 3,223 of catalog No. 3,002-A; it shows a number of illustrations and gives detailed description of the construction of the electric motor and its application; curves are given of the performance of 60 and 80-volt motors and a convenient equipment for charging electric vehicle batteries is described. "Electric Household Helps" is the title of a little folder illustrating the use of electrical devices in the household; the reading matter describes the cooking of breakfast, dinner, supper and lunches, and also treats of the uses of these devices in the boudoir, sewing room and other rooms about the house; a complete price list is given, showing the watts consumed by each device. Catalog section No. DS1410 covers direct-current switchboard panels for 110 and 220-volt systems; a detailed description is given of the various apparatus and sketches are shown of the arrangement furnished on standard panels. Section No. DS842 of the trolley-line material catalog lists and describes various bracket arms for direct and catenary construction. Catalog section No. DS843 covers catenary line material; it describes and illustrates with considerable detail the different types of insulators, hangers, strain ears, etc., together with diagrams showing the spacing for wheel trolleys and pantograph trolleys.

Record of Electrical Patents.

Issued by the United States Patent Office, February 10, 1914.

1,086,346. Combined Pole and Lamp-Post. C. Barrick, assignor to Union Metal Mfg. Co., Canton. O. Ornamental column for street lighting.

1,086,347. Caplet. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. An insulating cap with diverging openings is arranged to be held to the end of a conduit by a flange ring with lugs connected to a nut.

1,086,350. Receptacle and Conductor for Electric Lighting. J. S. Crossley, assignor to Pass & Seymour, Inc., Solvay, N. Y. Receptacles for mounting at intervals on a pair of flexible conductors.

1,086,368. **Surfacing and Polishing Machine.** F. P. Huyck, assignor to C. E. Haynes, Toledo, O. Motor-driven floor-sandpapering machine.

1,086,396. **Electric Locomotive.** G. F. Perin, assignor to Jeffrey Mfg. Co., Columbus, O. A mining locomotive with separate motor for driving a reel to take up slack cable.

1,086,414 and 1,086,415. **Electric Zinc-Furnace with Integral Condenser.** J. Thomson, New York, N. Y. Has a carbon bed resistor and overhead galleries through which the charge is spread to zones on the upper face of the resistor.

1,086,416. **Electric Zinc-Furnace with Integral Compound Resistors and Compound Condensers.** J. Thomson. Has a rod resistor and a carbon bed resistor, between which resistors the charge is placed.

1,086,417. **Electric Zinc-Furnace with Integral Condenser.** J. Thomson. The space between the resistors is subdivided longitudinally by slabs of insulating material.

1,086,418. **Universal Electric Zinc-Furnace with Integral Condenser.** J. Thomson. Has sumps below the resistors.

1,086,426. **Lighting Fixture.** F. W. Wakefield, assignor to the F. W. Wakefield Brass Co., Vermilion, O. A combined lamp receptacle and shade-holder.

1,086,428. **Manufacture of Electric Filaments.** C. A. von Welsbach, assignor to Welsbach Light Co., Gloucester City, N. J. A filament of osmium or similar metal of the platinum group.

1,086,431. **Controlling Device.** P. H. Zimmer, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A solenoid-operated motor starter.

1,086,437. **Dry-Cell Battery.** W. Broad, Beaver Falls, Pa. A refillable dry cell with adjustable compression device.

1,086,444. **Electromagnetic Shuttle-Operating Mechanism.** E. L. De Long, Plant City, Fla. For a loom.

1,086,486. **Self-Regulating Dynamo-Electric Machine.** C. A. Vandervell and A. H. Midgley, Acton Vale, England. Has unwound supplementary poles between the regular poles and short-circuited brushes on either side of the supplementary poles.

1,086,489. **Treating Steel in Electric Furnaces with Basic Hearths.** W. R. Walker, New York, N. Y. Consists in adding a slag containing about 30% silicon and 70% lime and maintaining the metal and slag molten in the furnace.

1,086,494. **Metallurgical Furnace.** U. Wedge, Ardmore, Pa. Electric heaters are inserted into plugs in the flue.

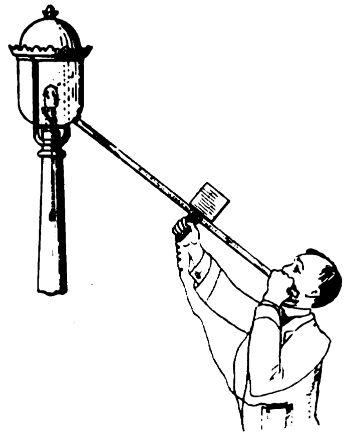
1,086,507. **Electric Switch.** B. L. Bronson, Blairsville, Pa., assignor of one-half to J. S. Baughman. The mechanism includes a ratchet.

1,086,527. **Street-Indicator for Cars.** B. Hamilton and C. C. Timmons, Amarillo, Tex. The separate circuits of a series are closed successively by individual switches.

1,086,530. **Transmitting of Vocal and Other Sounds.** F. P. Herrguth, San Francisco, Cal., assignor to Universal Wireless Telephone & Telegraph Co. The transmitting system includes a Wheatstone bridge having a number of inductances, microphones shunted around these, and a step-up transformer having its primary connected with the coils.

1,086,534. **Artificial Lighting.** H. E. Ives, assignor to United Gas Improvement Co., Philadelphia, Pa. A semi-indirect reflector for a wall lamp of such a shape as to prevent the direct light from the lamp from striking the adjacent walls, though it may pass to the ceiling and floor.

1,086,535. **Photometer.** H. E. Ives, assignor to United Gas Improvement Co. Includes an electric standard lamp and portable battery therefor, the handle of the movable box having a switch and clutch. (See cut.)

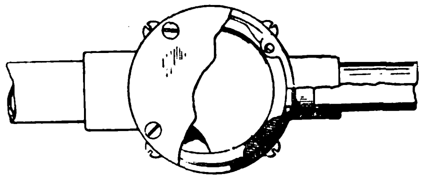


1,086,535.—Portable Photometer.

1,086,537. **Musical Accenting Device.** J. F. Kelly, Pittsfield, Mass. For an electrically operated automatic piano-player.

1,086,543. **Electric Lamp Socket.** W. G. Lindemann, Milwaukee, Wis. Special means for locking the cap and shell.

1,086,546 to 1,086,548. **Operating Mechanism for Washing and Like Machines.** G. N. Meves, Davenport, Iowa. These three patents cover various gear arrangements for motor-driven washers.



1,086,630.—Conduit Box.

1,086,559. **Folding, Portable Electric-Light-Bath Cabinet.** C. F. Reuter, Oakland, Cal. A special arrangement of the walls to permit folding, the inner walls carrying lamps and connections therefor.

1,086,562. **Trolley Mount.** E. Rose, Mamaroneck, N. Y. The yoke is carried on a horizontal pivoted extension to the top of the pole.

1,086,565. **Sparking Device for Gas Engines and the Like.** J. E. Seeley, assignor to High Frequency Ignition Coil Co., Los Angeles, Cal. Includes an induction coil, a condenser and resonators.

1,086,578. **Electric Switch.** T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Release by an electromagnet permits a drum-type switch to open.

1,086,579. **Electrolytic Washing and Bleaching Device.** E. Bess, Hamilton, O.; A. Bess, administrator of said E. Bess, deceased. Within a cylindrical tank is a perforated reversing agitating cylinder and beneath it an electrolytic cell.

1,086,581. **Annunciator or Station-Indicator for Cars.** W. G. Billerman, Cleveland, O. Motor-operated and electromagnetically controlled.

1,086,587 and 1,086,588. **Connecting Device.** F. H. Chapman and O. E. Kinney, assignors to Yost Electric Mfg. Co., Toledo, O. An attachment plug within which is a plunger governing a quick connection with the screw shell of a lamp socket.

1,086,599. **Electric-Switch Device.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. A push-button snap switch in a candle cup under a candelabra lamp.

1,086,600. **Electric Signal for Automobiles.** L. E. Landes, Los Angeles, Cal. Has a series of special push-buttons.

1,086,613. **Trolley.** J. Pfeiffer, P. Olah, and A. G. Falkenstein, Salt Lake City, Utah. A telescopic pole with guard arms on each side of the wheel.

1,086,622. **Knife Switch.** C. Schuster, Bellevue, Pa., assignor of one-half to C. N. Bergmann. A laminated blade with spacing strips between the leaves, both passing through the marble or slate slab.

1,086,623. **Conductor Post.** C. Schuster, assignor of one-half to C. N. Bergmann. A mounting frame surrounds and is riveted through the laminated bars and spacing strips.

1,086,630. **Distributing Box for Electric Conduits.** C. E. Van Duzer, assignor to Adapti Mfg. Co., Cleveland, O. Has interchangeable segmental wall sections with interconnected edges. (See cut.)

1,086,639. **Switch Construction.** H. A. Benedict, Syracuse, N. Y. A rotary snap switch with resistance coil mounted in its base.

1,086,640. **Earth Anchor.** Jasper Blackburn, Kirkwood, Mo. Consists of a flat disk base with central sleeve for the anchor rod and a series of concentric annular ribs of decreasing height as the edge is approached.

1,086,643. **Electric Light Socket.** W. Breidenbach, Indianapolis, Ind. Has a rotatable threaded shell that may be locked.

1,086,646. **Heating Apparatus for Water-Bottles.** H. W. Christian, Longbeach, Cal. A flexible electric heater may be inserted into the water bag.

1,086,647. **Measuring Machine.** J. E. Cochran, Elkhart, Ind. Motor-driven.

1,086,661. **Electric Switch.** G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. For a lamp socket.

1,086,664. **Apparatus for Making Cable-Grips.** H. A. Havens, Syracuse, N. Y. Tapering studs for holding the wire strands of the grip as the braiding work progresses project into a tube through radial openings, and a tapering plunger within the tube gradually moves them out.

1,086,666. **Storage-Battery Electrode and Process of Making Same.** H. C. Hubbell, Newark, N. J. Alternate layers of iron and cadmium are assembled into a plate and the cadmium is then distilled out.

1,086,682. **Automatic Circuit-Closer for Motor-Vehicle Starters.** H. A. Menzel, Santa Clara, Cal. The electric starting motor for an automobile fire engine has its circuit automatically closed by the fire alarm and opened when the engine starts.

1,086,693. Electric Fuse or Cutout. M. Walpole, Providence, R. I. A cartridge fuse with a main and an auxiliary fuse wire and heat-intensifying coils in the latter connected to an indicating fusee.

1,086,695. Printing-Telegraph System. A. H. Adams and A. F. Dixon, assignors to Western Electric Co. Has a number of branch circuits with interconnected relays.

1,086,706. Normal - Danger - Signal System. L. A. Hawkins and E. F. Bliss, assignors to Union Switch & Signal Co. A relay-controlled block-signal system.

1,086,710. Electric Hand-Lamp and Casing. E. A. Hoopes, Des Moines, Iowa. A vented storage battery carries on top a wide reflector and lamp.

1,086,717. Device for Lighting and Extinguishing Lamps. O. Jeidel, deceased, by B. Jeidel, widow of said O. Jeidel, Berlin, Germany. Includes an electromagnetic gas valve.

1,086,718. Master Vibrator. F. B. Johnson, Kansas City, Mo., assignor of one-half to G. Steinhorst. Has a number of induction coils each with an individual vibrator mechanism, a master vibrator and a switch for disconnecting the individual vibrators and introducing the master vibrator.

1,086,726. Resistance Unit. J. B. Opsahl, Madison, Wis. Comprises inner and outer metallic tube terminals and an interposed nonmetallic resistance powder.

1,086,729. Electrical Control Apparatus. J. A. Rey, Paris, France. A remote resistance-control system for a motor.

1,086,752. Block-Signal System. J. Burke, Erie, Pa., assignor to General Railway Signal Co. The signals are controlled by a current of different frequency from that of the propulsion current of the railway.

1,086,759. Apparatus for Producing Vacuum in Electric Lamps. L. A. Fell, Warren, O. Relates to the tube and valve construction.

1,086,765 and 1,086,766. Process for Improving the Magnetic Qualities of Iron-Silicon-Manganese-Aluminum Alloys. R. A. Hadfield, Sheffield, England. Consists, according the first patent, in heating to about 900° C. and then cooling and, according the second patent, in heating to above 900° C., cooling, reheating to below 850° C., and cooling slowly.

1,086,773. Engine-Starter. C. E. Kells, Jr., New Orleans, La. An electric starting motor partly controlled by the transmission-gear lever.

1,086,775. Electric Railway-Crossing Gate. A. S. Kobling, assignor of one-third to S. Toth, one-sixth to T. Bodak, and one-sixth to A. Krajnyak, Wallingford, Conn. Motor-operated.

1,086,787. Hood for Electric Lamps. H. Rithner, assignor to Crescent Glass Co., Wellsburg, W. Va. A glass hood held by fingers on a sheet-metal collar that encircles the neck of the bulb. (See cut.)

1,086,797. Electrically Driven Drill. W. F. Trotter, assignor to Jeffrey Mfg. Co. A motor-driven coal or rock drill.

1,086,798. Mail-Delivery Apparatus. O. H. Voldsness, Eleva, Wis. A motor-driven suspended carriage with self-contained battery and automatic control.

1,086,804. Electrolytic Cell for Generating Hydrogen and Oxygen Gases. J. B. Burdett, assignor to Burdett Mfg. Co., Chicago, Ill. Has a number of cathode and anode compartments and a continuous diaphragm mounted so as to form the separating walls for the compartments.

1,086,818. Dynamo-Electric Machine. A. M. Gray, assignor to Allis-Chalmers Mfg. Co. Special ventilating passages in the end frames prevent the circulation of heated air about the machine.

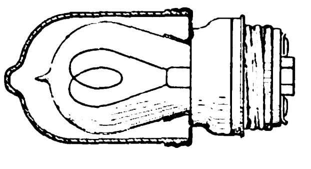
1,086,820. Connector. W. P. Hammond, New York, N. Y. Has a pair of flat cord terminals adapted to engage a binding post.

1,086,832. Portable Telephone Set. R. H. Manson, assignor to Dean Electric Co., Elyria, O. Includes a transmitter and receiver of watch-case form held at opposite ends of a hollow handle.

1,086,836. Target-Practice Apparatus. F. Mitchell, assignor to Atlantic National Bank, Providence, R. I. Includes an electric recording and alarm equipment.

1,086,850. Sparking Plug for Explosive Engines. H. D. Pomije, Olivia, Minn. Has adjustable sparking points.

1,086,864. Retaining Envelop or Cover for Storage-Battery Electrodes. E. W. Smith, Philadelphia, Pa. An insulating tube with longitudinal projecting ribs and elongated small pores.



1,086,787.—Lamp Hood.

1,086,869. Telephone Switching Apparatus. G. Swope, assignor to Western Electric Co. A wall plate with telephone line terminals and a signaling push button.

1,086,870. Cooking Appliance. A. L. Sykes, Covington, Ky. An electric "fireless" cooker with disk stove imbedded below the upper surface of the base, which is filled with heat-insulating material; a heat-insulating hood fits over the tapering sides of the base.

1,086,874. Lighting Fixture. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. A special flattened link-chain suspension for an electric fixture.

1,086,879. Ice-Clearing Trolley. C. G. Woods, St. Louis, Mo. In front of the main trolley wheel is a sleet-scraping wheel with sharp transverse ribs.

1,086,899. Selecting Apparatus. O. A. Danielson, assignor to Western Electric Co. Includes two polarized relays and six secondary circuits.

1,086,909. Refillable Fuse Tube. G. Fisher, Cleveland, O. Has an insulated bar inserted in the casing and metallic springs secured to the bar having their ends overhanging the ends of the bar so as to hold the fuse wire.

1,086,932. Alarm-Clock Attachment. R. P. Packard, Tacoma, Wash. An electric alarm and lamp.

1,086,942. Relay for Strengthening Weak Electric Currents. J. Schiessler, Baden, Austria-Hungary. Includes an electromagnetically oscillated member.

1,086,957. Railway-Traffic-Controlled Apparatus. R. P. Tuttle, assignor to Union Switch & Signal Co., Swissvale, Pa. Includes a trip and electric contact rail adjoining the track.

1,086,958. Power Hoist. A. C. Van De Velde, Chicago, Ill. An electric motor suspended from a trolley rail drives a chain hoist through gearing.

1,086,960. Tablet. W. K. Waterman, New York, N. Y. Electrically illuminated flat wall sign.

1,086,985. Electrical Switch. W. L. Bliss, assignor to United States Light & Heating Co., New York, N. Y. A solenoid plunger switch.

1,086,999. Make-and-Break Device. P. J. Devault, Denver, Colo. Electromagnetically controlled cam and ratchet mechanism.

1,087,044. Electric Display Apparatus. P. Naylor, London, England. Includes electric lamps and resistance control therefor.

1,087,061. Tabulating Machine. H. Hollerith, Washington, D. C. Electrically operated.

1,087,068. Block-Cleaning Machine. F. O. Lueck, Tomah, Wis. Motor-driven.

Patents Expired.

The following United States electrical patents expired February 16, 1914:

577,037. Electrical Switch. C. D. Jenney, Indianapolis, Ind.

577,071. Electric Railway Motor. A. Schmid, Pittsburgh, Pa.

577,077. Electrical Warp Stop-Motion for Looms. A. C. Shuttleworth, Philadelphia, Pa.

577,081. Electric Controller. E. A. Sperry, Cleveland, O.

577,101. Telephone System. W. W. Dean, St., Louis, Mo.

577,102. Party-Line Telephone System. W. W. Dean.

577,119. Electric Brake. E. A. Sperry.

577,128. Signal. P. G. Feuerstein, Milwaukee, Wis.

577,130. Space-Block for Armatures. H. Geisenhoner, Schenectady, N. Y.

577,141. Means for Preventing Destructive Field-Magnet Discharges. F. Mackintosh, Schenectady, N. Y.

577,148. Binding Band for Armatures. H. G. Reist, Schenectady, N. Y.

577,158. Electric Igniter for Explosive Engines. W. F. Davis, Waterloo, Iowa.

577,159. Incandescent Electric Lamp. C. S. Dolley, R. Hawkins and T. M. Lightfoot, Philadelphia, Pa.

577,186. Progress of Electrodepositing Aluminum. C. G. Collin, Woodsburg, N. Y.

577,214. Resonant Electric Circuit. J. S. Stone, Boston, Mass.

577,231. Telephony. W. L. Bradshaw, Cincinnati, O.

577,233. Electrical Attachment for Barbers' Chairs. N. H. Burger, Benzonia, Mich.

577,242. Railroad Switch. J. F. E. Feltner, Leadville, Colo.

577,279. Electric Gas-Lighter. J. T. Armstrong and A. Orling, London, England.

577,307. Fire-Extinguishing Apparatus. H. F. Maxim, Norfolk, Va.

577,317. Electric Furnace. F. J. Patten, New York, N. Y.

577,329. Electrical Casting of Metals. N. Slawianoff, St. Petersburg, Russia.

577,370. Electric Furnace. F. J. Patten, New York, N. Y.

577,371. Electromagnetic Arc-Controlling Device. F. J. Patten, New York, N. Y.

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THE ADMINISTRATION AND THE DEVELOPMENT OF WATER POWERS.

During the last 10 years the question of the development of the water powers of the United States has been given a great deal of consideration by the administrations headed by Mr. Roosevelt, Mr. Taft and Mr. Wilson. On February 17 practically an entire session of President Wilson and his Cabinet was devoted to a discussion of this problem. While the views of the President and Secretary of War Lindlay M. Garrison have been anticipated with some degree of certainty, it is only now apparent what it is hoped by the Administration will be accomplished in the bills which are to be drafted to meet this situation.

On February 19, Secretary of War Garrison addressed to the Hon. W. C. Adamson, chairman of the House Committee, a letter outlining the suggested form of a bill. Secretary Garrison says "The practical situation which has to be dealt with may fairly be summarized as follows: On the one side are those who insist that law and policy indicate the necessity of leaving the entire matter in the hands of the Federal Government, which shall not only indicate the places and authorize the character of work where development of this kind may be undertaken, but shall profit by the avails therefrom; on the other hand there are those who would limit the extent of the National Government's action to the making of such conditions as concern navigation in the streams and would leave all else thereafter to the respective States."

It is well known that between the contending opinions that a deadlock had been reached and that unless some definite opinion was expressed, conditions looked fair for a permanent standstill. It was necessary then to consider not only the law, but also the equities and interests of all concerned. Secretary Garrison continues: "Legally speaking, I do not think there can be any dispute that, with respect to the question of power, the position of the Federal Government is paramount. Nothing can be done without its consent, and only that can be done to which it consents. There is no justification for a policy of do-nothing. Therefore, the question is: What is the wise policy to adopt that something may be done? The interests to be considered and the equities with respect thereto, I view as follows: First, of course, there are the communities which will benefit by the utilization of the water power developed by the placing of dams in navigable streams.

Next is the immediate sovereign over them which would direct this matter and have power with respect thereto, were it not for the paramount power above alluded to, which resides in the Federal Government. Finally, there is the Federal Government with absolute power by reason of its ability legally to prevent the doing of anything without its consent. Therefore, the proper solution seems to me to be to see to it that this great public utility, wherever availed of, should be availed of in a way that will benefit the greatest number under the most favorable terms possible; and in doing so, to recognize the justice (not as a matter of law) of the State entity or sovereignty receiving a revenue from the operation of this public utility within its confines and regulating it for the benefit of its people."

The draft of the bill, therefore, which it will be suggested for introduction into Congress and will constitute a new Public Dam Act, will provide that those who wish to dam a navigable stream and incidentally create water power must, as at present, obtain the right so to do from this State. They must then obtain authority from the Congress. The company seeking this right must be a public utility company and subject to laws regulating public utilities. The State in which a company is incorporated or in which it operates must have provided a commission or body authorized and empowered to properly regulate public utilities of this character. Where the provisions have been complied with the Secretary of War may issue the permit and the franchise or right may be for any period up to 50 years. Provisions will be included retaining power in the hands of the Secretary of War, and in some instances in Congress to prevent any violation of the things which the Act requires the company to do.

In outlining the relation of the State and Federal authorities, so far as the local situation is concerned, Secretary Garrison says: "The local situation will, of course, be dealt with under the laws above alluded to, which the State must have provided before its corporations can receive favorable consideration at the hands of Federal authority. The State, as above mentioned, may make proper provisions for the taxation or receipt of revenue. It has been suggested that the State might properly provide, if it so chose, a scheme by which, in consideration of no imposts, or of slight imposts, the dam and accessory work should, at the end of a fixed period, become the property of the State. In other words, the State might say: 'Instead of taxing you or getting a revenue out of you during the life of this franchise, we will abstain from so doing and take our payment, as it were, in a lump sum, namely, the improvement, which shall thereupon become ours.' By so doing, of course, the State would substitute itself for the previous grantee, and be identically situated with respect to the Federal Government." This latter is thrown out as a tentative suggestion, it is believed, and it is doubtful if it will be written into the Act.

The Act will make the dams and works previously authorized under statutes retaining the power to amend, repeal, etc., subject to its provisions. As to navigation dams erected by the Federal Government at which hydroelectric power may be developed incidentally, the Act will probably place the disposition of such power in the hands of the Secretary of War, who may permit the development and use thereof by companies in states which have complied with the requirements outlined heretofore as public utilities.

The ultimate development of this Act will be in the hands of Congress after thorough investigation of the opinions of every interest concerned. Secretary Garrison has been over the subject with the President, and is authorized to say that Mr. Wilson approves of the general principles underlying the bill and of the methods proposed to bring it into effect. The draft of the bill accompanied the letter of Secretary Garrison, but this has not been given out. It is announced in Washington that hearings are to be held on all the bills before the House Committee, and that there is to be legislation on water power at this session of Congress.

IMPROVED ADMINISTRATION OF THE PATENT OFFICE.

Much interest has been taken in recent years in various efforts to improve the American patent system, both by amendment of the patent laws and by reform of the practices of the United States Patent Office. Respecting the former there has been much controversy, largely because, like other lawyers, patent attorneys are unable to agree on improved practices respecting their profession. As to reform of the Patent Office there is greater agreement and it is on some features connected therewith that these comments are made.

The general concensus of opinion is that the administrative difficulties of the Patent Office are chiefly due to the parsimonious treatment of this bureau by Congress. The crowded condition of the quarters occupied by the Office has continually hampered its work and, since it is housed in a non-fireproof building, many of the extremely valuable records are constantly in danger of being lost or destroyed. Thus there are scattered in various portions of the establishment some 50,000,000 printed copies of patents, which in themselves represent a considerable investment and at the same time clutter up corridors and all available storage space. It has been repeatedly urged that Congress grant an appropriation for the construction of a new building designed particularly for the work of the Patent Office and built in a style appropriate to the importance of this government bureau. Another serious difficulty has been the inadequacy of the working force, as a result of which many needless delays occur in prosecuting an application for a patent through the Office. These conditions are the more anomalous because the Patent Office is one of the few self-supporting branches of government activity; moreover, it has each year a neat surplus, which in 1913 amounted to over $137,000; in fact, the total net surplus to the credit of the Patent Office and which is lying idle in the Treasury of the United States amounts to over $7,300,000. This money has been contributed by inventors and should naturally be used for improving conditions in the Patent Office and facilitating its work.

Although he has held his present position only about half a year, Commissioner of Patents Thomas Ewing has embodied many valuable suggestions in his first annual report to Congress covering the work of the Patent Office for the past year; an abstract of this report is given on another page of this issue. Mr. Ewing has pointed out many ways in which the work of the Office can be improved. Among his recommendations are the need for increased room, reorganization and increase in the examining corps, enlargement and reorganization of the library, a revised publication of the *Official Gazette,* regulations to prevent undue delay in the prosecution of applications, increased facilities for reclassification of patents, and also a number of changes in the patent law to expedite the work of the Office and make it more accurate and equitable.

Respecting these recommendations it is desired here to refer particularly to the proposed change in the manner of publishing the *Official Gazette.* This publication appears every week and gives the list of all patents issued during that week, which number on the average about 700 weekly. Since the title of the patent is in but few cases really descriptive of the patented feature, it has been the custom to publish in the *Gazette* the claims made by the inventor together with one of the drawings accompanying the specifications. The *Gazette* has been continually becoming more and more cumbersome and so a few years ago the practice of printing all of the claims was dropped and only the first five, in case more than five claims were made to any patent, were published. Nevertheless, each issue of the *Gazette* still averages something over 300 pages. Moreover, on reading the claims published a person cannot get even an approximate idea in many cases of what the patent deals with. Some of these claims contain several hundred words and it is extremely difficult to determine what the patented feature is in such a mass of verbiage.

The suggestion has therefore been made that, instead of publishing selected claims, there should be published a brief digest of each patent. Such a digest would be of extreme value to every one interested in keeping in touch with patent developments in any particular line. It would also be of value to the examiners in the Patent Office in simplifying the work of searching prior patents in any class. To put this desirable reform into effect it is necessary merely that a corps of digesters, specially trained in intelligently digesting patents, be provided. Commissioner Ewing points out that the expense of such a corps would probably be almost entirely saved by the decrease in the cost of printing the *Gazette,* since the bulk of that publication could doubtless be reduced by 40 or 50 per cent. It is to be hoped therefore that among the various reforms suggested by Mr. Ewing this one be put into effect at the earliest possible moment.

USING ELECTRIC NOVELTIES FOR ADVERTISING PURPOSES.

It is becoming rather common nowadays to see show-window displays which are enlivened by electric novelties of one kind or another. Window displays are especially attractive when they involve motion or a change of some kind, and the electric current provides an agent for this purpose which can be applied in almost numberless ways.

The most surprising feature about such developments is the fact that these window displays are featured in shops carrying on all kinds of business except that devoted to the sale of electrical appliances. It would seem as if both the dealer in electric specialties and the central station are missing a means for advertising which should be peculiarly their own, and it behooves more of them to make use of electrical means for making their show windows attractive.

In this issue is described a show-window device which was devised by an electrician purely to attract the attention of passers-by, since it bears no relation whatever to the business of the advertiser. It consists of an incandescent lamp which is lighted without connection to any visible electrical conductors. Naturally it puzzles the ordinary observer and suggests the wireless transmission of energy which has lately been heralded in the newspapers.

Aside from the mere use of the electric motor to provide displays involving motion of some kind or the carrying out of a manufacturing or other demonstration process, there are many puzzling exhibits which can be arranged by the electrical expert. Thus a hidden magnet may be made to move objects around over a table top or a plate of glass in a very mysterious manner. An incandescent lamp may be made to light while immersed in a vessel of water by being mounted upon a coil of wire which forms a closed secondary circuit for a transformer whose primary winding and core are out of sight. The same primary winding may serve to heat up an aluminum skillet or other vessel sufficiently to make water boil. The skillet in this case constitutes the secondary.

Many other attractive and puzzling devices may be arranged by the electrician who is familiar with the properties of alternating currents and it is not necessary to enumerate the long list of them here. Such features being dependent upon the electric current are especially suitable for the window of the electrical contractor and dealer; he need not, however, confine the application of them to his own business, but should be able to turn a dollar here and there by rigging up similar displays for fellow merchants. There is a large field here for the electrician with initiative and energy.

Commonwealth Edison Company Elects Staff of Vice-Presidents to Control Different Departments.

The annual meeting of the stockholders of the Commonwealth Edison Company, Chicago, Ill., was held on February 24, and the old directors were reelected. A new policy was adopted which consists in having a staff of working vice-presidents, and the old directors were re-elected as follows: Henry A. Blair, Benjamin Carpenter, Samuel Insull, Robert T. Lincoln, John J. Mitchell, James A. Patten, John G. Shedd, Byron L. Smith, A. A. Sprague.

Immediately following the stockholders' meeting the board of directors met and elected the following executive committee: Samuel Insull, chairman; John J. Mitchell, Byron L. Smith, A. A. Sprague and James A. Patten.

The by-laws were amended to effect the change in organization and make possible the new staff of vice-presidents. The following officers were elected: Samuel Insull, president; Louis A. Ferguson, vice-president, in charge of the contract, operating and construction departments; John F. Gilchrist, vice-president, in charge of the purchasing, stores, transportation and statistical departments; William A. Fox, vice-president, in charge of finances and securities and claims, with supervision over the secretary and the treasurer and their departments; John H. Gulick, vice-president, in charge of accounting, with supervision over the auditors and the auditing department; Edward J. Doyle, secretary and treasurer; George E. Burns, assistant treasurer; Robert L. Elliott, assistant secretary; William S. Kline, assistant secretary; Henry E. Addenbrooke, auditor; R. H. Williams, assistant auditor; Harry A. Weigle, assistant auditor.

Utah Electric Club.

At the regular weekly luncheon of the Utah Electric Club held in the Gold Room of the Commercial Club Salt Lake City, Utah, on February 19, A. A. Knowlton, professor of physics at the University of Utah, spoke on "The Electrical Method of Smoke Prevention." He illustrated with a small experimental model of the Cottrell system of smoke deposition which is now being applied to two of the large smelters in the Salt Lake valley, and which offers to afford a fairly satisfactory solution of the problem of smoke prevention as applied to large stacks, as indicated by the results of the experiments so far.

Dr. Knowlton stated, however, that according to his observations much of the smoke in Salt Lake City in the residential portion is caused by the smoke from the small stacks of residences and apartment houses in that section. He offered a resolution, which was adopted, providing that the Electric Club recommend to the Commission of Salt Lake City that it employ a corps of experts, to be headed by the best authority on the subject to be found in the country, to study the smoke problem as it affects the city.

Ex-Governor Heber M. Wells, who is now commissioner of parks and public property, was present and expressed himself as favoring this move. Mr. Wells was largely responsible for the recent smoke-prevention ordinance passed by the City Commission. He stated that the Commission had studied the ordinances with reference to this subject in all of the principal cities of the country, and after careful consideration, had adopted one patterned after the ordinance now in effect in Chicago, which seems to meet the conditions existing here.

A. I. E. E. Lynn Section Meeting.

The lecture by Elihu Thomson on "Color Photography," given in Burdett Hall, Lynn, Mass., on February 18, was of exceptional interest, and largely attended by members of the Lynn Section, American Institute of Electrical Engineers. In addition to the description of a series of beautiful colored lantern slides which were shown, the lecturer, by means of diagrams and chemical experiments, elucidated his theme thoroughly. The photographs were taken personally by the speaker in various parts of the world, not the least interesting being views of Professor Thomson's flower garden at Swampscott, Mass.

The next meeting in the present course will be given March 4, when W. C. Fish, manager of the Lynn works of the General Electric Company, will speak.

Engineers Dinner in Boston.

A co-operative dinner to be participated in jointly by the local sections of the American Institute of Electrical Engineers, American Society of Mechanical Engineers and the Boston Society of Civil Engineers will be held at the Boston City Club, Wednesday evening, March 4. The speakers will be Guy E. Tripp, who will speak on "The National Government and Business;" Dr. A. E. Kennelly, who has chosen as his subject, "Results for the Electrical Engineering Fraternity Accomplished by the I. C. E.;" and Dr. M. W. Franklin, who will speak on, "Ozone Applied to Ventilation."

This is the fifth annual event of this character held by Boston engineers and as in previous years all interested parties are invited to attend. Reservations should be sent to Harold G. Payne, 12 Pearl Street, Boston.

Westinghouse Electric Veterans Organize.

On the evening of February 21 the employees of the Westinghouse Electric & Manufacturing Company who have been in its employ for a period of 20 years or more held a meeting at the Fort Pitt Hotel, Pittsburgh, Pa., and organized the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company. A regular business meeting was held to formulate the organization, by-laws were adopted, and officers were elected for the ensuing year.

A striking fact was the youthful appearance of these so-called veterans, as the majority of the crowd appeared to be men in the prime of life. About 325 employees of the company are eligible to membership, and approximately 315 of these were present at the meeting. Nor were all these of the male sex, as one woman was present also, she being a foreman of the detail division in the shop.

Following the dinner, an interesting program was carried out consisting of speeches and vaudeville. The toastmaster was L. A. Osborne, vice-president of the company. The speakers were E. M. Herr, president; Charles A. Terry, vice-president, and James J. Barrett, representing the shop. Mr. Herr, in the course of his remarks, promised the support of the company to the organization, and also stated that the officials of the company were working on a pension plan for the employees, details of which will be announced later. Mr. Terry gave a number of interesting reminiscences of the developments which have occurred during his experience of over a quarter of a century with the company.

Guy E. Tripp, chairman of the board of directors, was present and was elected an honorary member of the Association, as was also Mr. Herr, neither of these gentlemen having been connected with the company the required number, 20 years.

A standing toast was drunk to George Westinghouse, who was unable to be present on account of illness.

Society for Electrical Development to Begin Active Work.

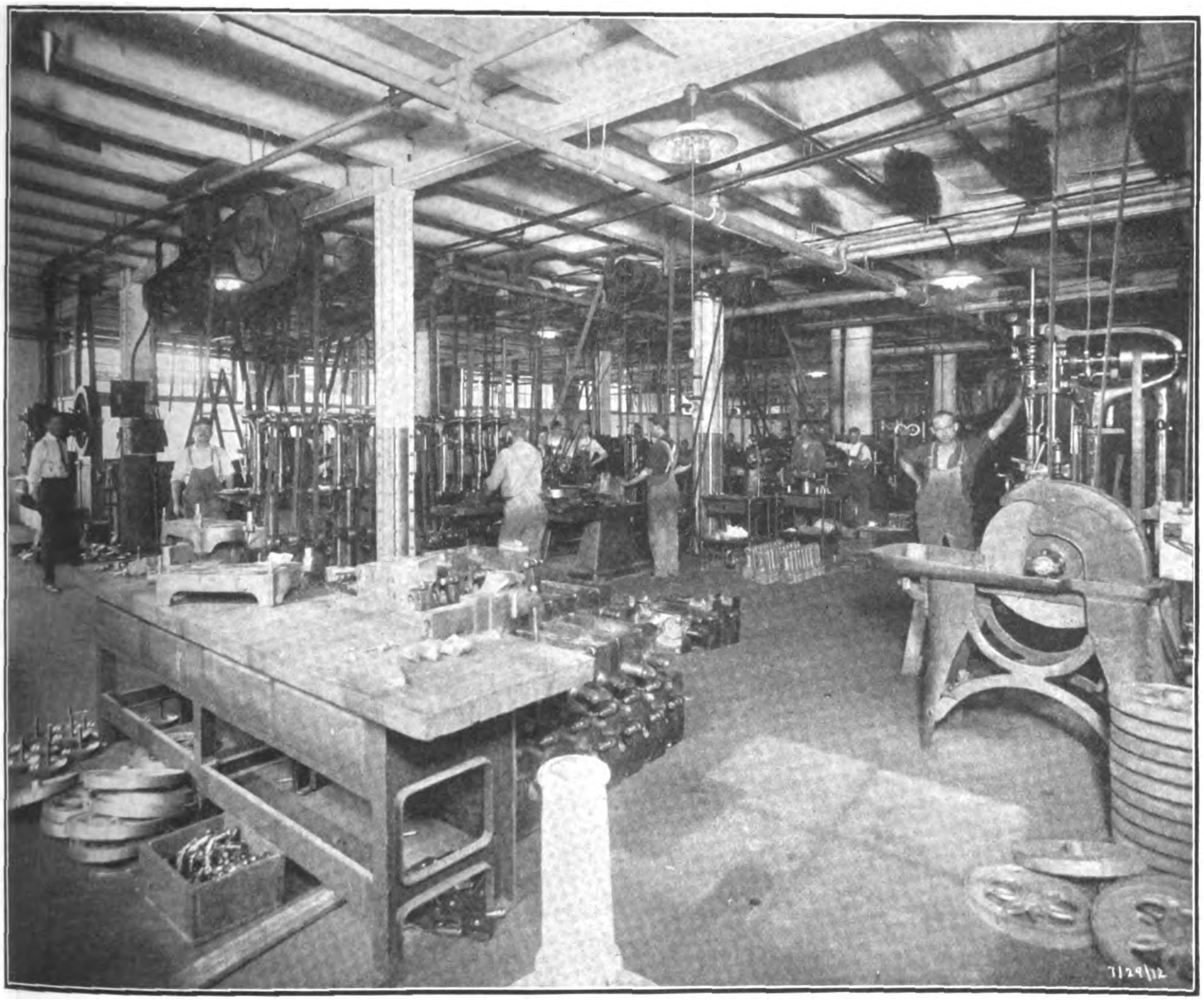
Announcement is made by J. M. Wakeman, general manager of the Society for Electrical Development, Incorporated, that the organization is now officially active. Its minimum fund of $200,000 has been subscribed. The Society will begin its active work of educating the public to "Do It Electrically" about March 1. While the industry is assured of the active work of the Society, it is especially to be desired that those who are not now members will immediately join.

Electricity in Car Shops.

A combination of the problems encountered in electrifying machine shops, woodworking plants, blacksmith shops, etc., must be met in applying motor drive to railway car shops as the modern institution of this character is usually a combination of these industries. The same advantages that apply to these individual branches, however, apply with equal force to car shops.

In recent years railroads have joined with manufacturing establishments in utilizing to the greatest possible extent electricity for all conceivable purposes. The tendency, also, is to purchase power because of the many advantages of central-station service over isolated-plant supply. It is significant that even in the coal fields, where cheap fuel is available, railroads have found it advisable to leave the generation of power to companies established for this purpose.

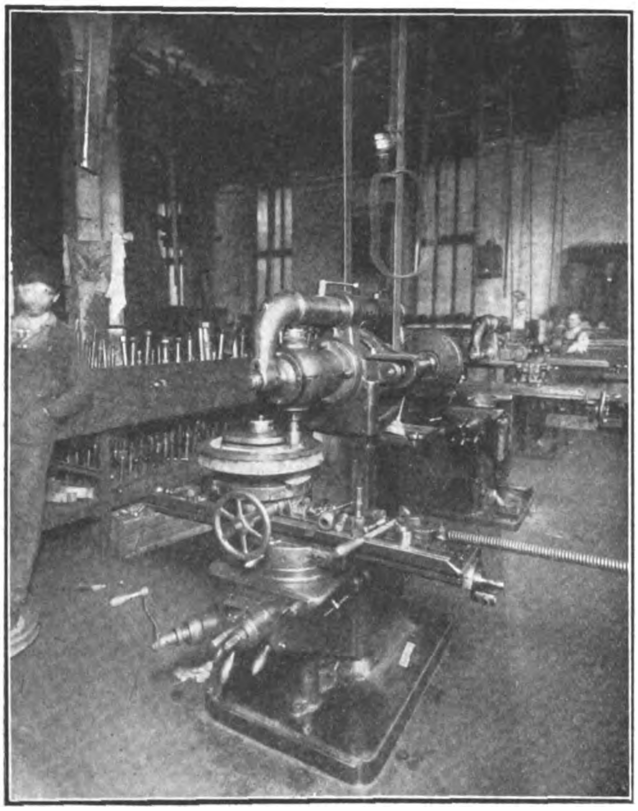
In soliciting the adoption of central-station service by railroad car shops the power engineer should be well provided with facts and figures regarding the economy and advantages of motor drive in machine shops, woodworking plants, blacksmith shops, etc., as the modern car shop is a combination of these. In the following paragraphs is presented details of the electrification of the new shops of the Hocking Valley Railroad which will convey, in a measure, some idea of the problems that have been encountered.



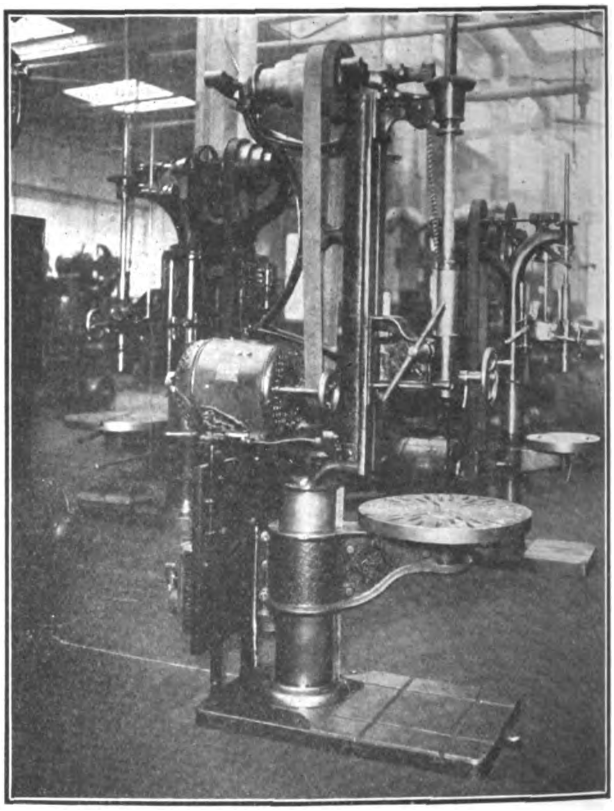
General View of Machine Shop Driven by Electric Motors.

The greatest problem the mechanical department of a railroad has to solve lies in the repairing and renewing of freight cars in such a manner as to keep the number of cars out of service at one time as small as possible and to prevent, as far as practicable, any delays to trains, due to defects which may develop while the cars are in transit. To accomplish this it is necessary to have a modern plant, managed by competent officials, with an efficient force of workmen, so located that cars may be received and delivered without undue haulage and repairs made with the greatest despatch.

For a number of years the Hocking Valley Railway Company did practically all its car repair work in the South Columbus shops of the company; but the facilities there were inadequate for the constantly increasing demand for work of this character and, after a careful consideration of the various details involving the location of a plant to effect economical operations and accomplish the greatest efficiency, a modern plant in every respect was built at Logan, Ohio. This town represents the most advantageous distributing point for the equipment, inasmuch as it is the central station for the four divisions of the Hocking Valley Railway and is also the distributing point for coal cars, which represent 80 per cent of the company's business. The heavy coal tonnage necessarily made repairs for the coal-carrying equipment a large item, but with the shops at Logan the company effects a considerable saving in the transportation of cars; and further, the fact that the cars can be taken directly from the shop and distributed to the various coal properties was another factor in deciding on this location. After determining upon the site, the officials of the Hocking Valley Railway Company made a careful inspection of the most modern practice in the United States, with a view to building a plant not to be surpassed in design and equipment.



Motor Driving Gear Cutter.



Individual Motor Drive in Machine Shop.

The works consist of eight buildings of brick and steel construction, as follows: Car repair and assembly shop, saw shop, office and store room; blacksmith shop; wheel, axle and air-brake shop; lumber storage building; and oil house.

These are concentrated along a traveling crane runway, which serves all of the main buildings beginning with the saw shop building or mill, main repair or erecting shop, blacksmith shop, store room and material platforms. This crane runway is 600 feet long, and the traveling crane which runs upon it is capable of lifting a load of five tons.

At the southeast end of the crane runway is located the saw shop or mill. This structure, 200 feet long, 70 feet wide, is built of paving brick on concrete foundations, and as much of the walls is given to windows as is consistent with strength. The roof, supported by steel trusses, is equipped with 18 large sky-lights glazed with wire-inserted glass. A monitor runs the length of the roof, also to give light and ventilation. Inasmuch as by far the largest percentage of repair work done is on the wooden coal cars, naturally the greatest amount of power utilized is in the saw shop.

In this building all the lumber used in the reconstruction of the cars is worked into the necessary shape and sizes. To accomplish this the shop is equipped with a swing cut-off saw, tenoner, two boring machines, gainer, cross-cut saw, timber planer and matcher, rip and band saws, together with the necessary grinding machines.

These tools are all connected to 60-cycle, three-phase, 1,130-revolutions-per-minute induction motors, fifteen motors in all being employed in this capacity, as follows:

One cut-off saw belted to a 15-horsepower motor.
One timber sizer direct-connected to 50-horsepower motor.
One swing saw belted to a 5-horsepower motor.
One tenoning machine belted to a 15-horsepower motor.
One mortiser belted to 15-horsepower motor.
One rip saw, one gainer, one wood worker and one tenoner grouped on a 15-horsepower motor.
One self-feed rip saw belted to 15-horsepower motor.
One gaining machine belted to 15-horsepower motor.
Two three-spindle boring machines, one single band saw, one automatic knife grinder belted in group to 20-horsepower motor.
One planer and matcher direct-connected to a 50-horsepower motor.
One gainer belted to 15-horsepower motor.
One gainer belted to 10-horsepower motor.
One three-spindle boring machine belted to 10-horsepower motor.

The arrangement of this machinery leaves practically nothing to be desired and was greatly facilitated by application of the electric drive. The timber is received in the rough at the east end of the shop and delivered in a finished condition at the west end ready to go to the dry lumber shed, which is located some distance west of this shop, or to the main car-repair shop, which is located just north.

An extensive dust-conveying system has been installed throughout the shop. To each machine is attached a receiver, into which the shavings, dust, etc., are drawn by a fan belted to a 40-horsepower motor located on the roof trusses. All the dust is then transmitted in the usual way back to the boiler room and fed into the furnaces as fuel. At the end of the saw shop is located a relay fan to help in the transmission, being driven by a 50-horsepower motor. The building is well lighted with arc lamps and each machine has one or more incandescent lamps.

Round House.

The round house located along the right of way has a small auxiliary machine shop, which is driven by a 15-horsepower belted-type motor. The round house was for a time equipped with its own boiler and engine plant as the water storage tanks are also located at this point; however, this plant has since been discontinued and the pump is now driven by a 15-horsepower direct-connected motor.

Wheel, Axle and Air-Brake Shop.

The designation, wheel, axle and air-

Car Shop Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Railway car-repair shop repairing principally freight cars. The main machine and woodworking shops operate independent of each other and also are provided with separate meters.

Machine Shop.

There is a total of 125 men employed, some of whomwork nine hours during the day and the remainder at night.

Total connected horsepower, 98. Total number of motors installed, 8. Average kilowatt-hours per month. 10,012.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
January	9,570	May	8,820	September	8,100
February	11,000	June	7,280	October	10,510
March	8,580	July	7,880	November	10,980
April	16,640	August	9,280	December	11,510

Load-factor, 19 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	7.5	1,700	Belted to a six-foot shaft (two hangers) and two countershafts (four hangers) driving one Beach Manufacturing Company jig saw; one Bentel & Margedant 24-inch pattern lathe.
1	15	1,120	Belted to 120 feet of shafting (22 hangers) and 12 two-hanger countershafts driving one Bradford 14-inch engine lathe; one Jones & Lamson three-inch turret lathe; one Columbia 30-inch boring mill; one Lodge & Shipley 18-inch lathe; one Binssee horizontal boring mill; one Lodge & Shipley 20-inch combination turret and engine lathe; one Laponite No. 2 broaching machine; one Jones & Lamson 2.25-inch turret lathe; one Prentice Tool & Supply Company 16-inch lathe; one Dresses 18-inch turret lathe; one six-inch forming lathe; one Jones & Lamson 2.25-inch chucking lathe; one Baker Brothers 24-inch double-machine drill; one polishing lathe (two 12-inch by three-inch wheels); one 24-inch exhaust fan; one tire bender; three eight-feet by 12-inch tumbling barrels; one automatic punch press (32-inch flywheel, six-inch by 2.5-inch rim); one Woodward & Rogers tapping machine; one G. W. Heartley punch press (19-inch flywheel, four-inch by two-inch rim); one C. S. Shuster wire straightener (18-inch flywheel, 4.25-inch by 2-inch rim); one double emery wheel (9-inch by .5-inch wheels); one No. 1-C punch press (12-inch flywheel, 2-inch by 2-inch rim); two two-spindle special horizontal drills; one spoke leader (30-inch flywheel, 4.25 by 2-inch rim); one thread rolling machine; one Fox rim-drilling machine; one Rockford 18-inch drill; one five-ton screw press; one Fairbank 12-inch sensitive drill; one spoke-shearing machine (16-inch flywheel, 4-inch by 1.5-inch rim).
1	5	1.700	Belted to a 14-inch shaft (four hangers) and three two-hanger countershafts driving one 16-inch cut-off saw; one Witherby, Rugg & Richardson 12-inch jointer; one Hermance 12-inch combination rip saw and horizontal drill; and one 20-inch pony planer.
1	7.5	1,700	Belted to a 30-foot shaft and a two-hanger countershaft driving one J. F. Coffman miller; one eight-inch sensitive drill; one E. W. Bliss No. 2.5 punch press (24-inch flywheel, five-inch by three-inch rim); one Standard Machinery Company No. 2-C punch press (18-inch flywheel, 3.5 by 2.5-inch rim); one 18-inch drill press; one Mossberg No. 2-C punch press (18-inch flywheel, 3.5-inch by 2.5-inch rim); one Rockford 18-inch drill.
1	15	1,120	Belted to a nine-kilowatt 12-volt 750-revolutions-per-minute generator.
1	40	850	Belted to 180 feet of line shafting and five two-hanger countershafts driving special tire rolling department (secret process); one West tire setter; one 150-light 110-volt direct-current generator; one tire expander; one 2,000-pound freight elevator; four Rockford 18-inch drills; two Cincinnati two-inch plain millers; two 12-inch sensitive drills; one Bradford 16-inch lathe; one Michigan Machinery Company size 21 punch press (24-inch flywheel, four-inch by two-inch rim).
1	0.5		Belted to a 16-inch exhaust fan.
1	7.5	1,700	Belted to line shafting driving one Porter 24-inch lathe; one Bradford 22-inch lathe; one Steptoe 16-inch shaper; one 10-inch tool grinder; one V and O No. 3 punch press; two special rolling machines; one E. W. Bliss No. 2½ press.

There are three Thomson welding machines installed taking power from the central-station circuit.

Car Shop Data—Sheet No. 2.

WOODWORKING SHOP.

Total connected horsepower, 125. Total number of motors installed, 8. Average kilowatt-hours per month, 11,490.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
May	16,000	September	9,000	January	9,000
June	17,300	October	6,900	February	10,500
July	14,600	November	8,600	March	11,500
August	14,200	December	8,300	April	12,000

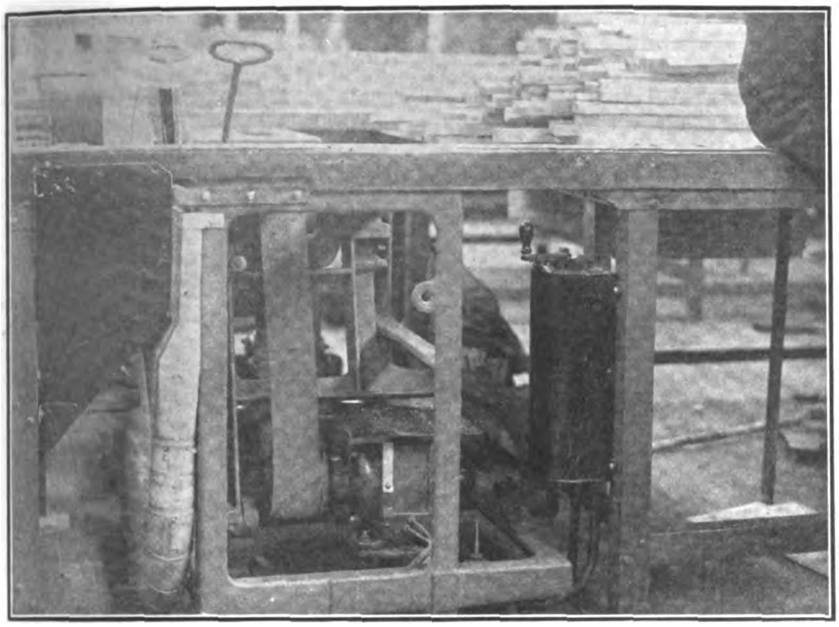
Load-factor, 16 per cent.

Operating-time load-factor, 35.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application.
1	20	710	Belted to an American steel-plate double 40-E exhauster.
1	7	700	Belted to a 20-foot shaft, four hangers and three two-hanger countershafts driving one Berlin No. 225 12-inch rip saw, 4,000 revolutions per minute; one Falls Machine Company tool grinder 10-inch by 0.25-inch stone; one Goedell & Pratt double emery wheel; and two William Menge automatic needlers.
1	15	710	Belted to an American steel-plate double 30-E exhauster.
1	7.5	710	Belted to a 90-foot shaft, 10 hangers and four two-hanger countershafts driving one William Menge 10-inch rip saw; one H. B. Smith three-head four-inch molder; two Pyribil 10-inch rip saws; and one William Menge four-inch cut-off saw.
1	7.5	710	Belted to a B. F. Sturtevant 40-inch exhaust fan.
1	25	720	Belted to a 125-foot line shaft, 20 hangers, and nine five-foot two-hanger countershafts driving four Hansen & Van Winkle No. 3 double emery wheels; one small speed lathe; one W. F. & J. Barnes 20-inch drill; one three-spindle drill; one D. F. Sturtevant 30-inch exhaust fan; three G. H. Walker four-inch cut-off saws; five William Menge four-inch cut-off saws; and two Wysong & Miles belt sanders, belts two inches to six inches wide, speed 2,100 feet per minute.
1	3	1,400	Belted to a 40-foot shaft, nine hangers, and seven two-hanger countershafts driving two A. H. Nilson horizontal boring mills; three William Menge speed lathes; one William Menge three-inch cut-off saw; and one William Menge sticker.
1	40	720	Belted to a 170-foot shaft, 34 hangers, and three two-hanger countershafts driving two G. A. Walker four-inch cut-off saws; one shank roller; four wooden tumbling barrels, 12 inches by 36 inches; one Baldwin metal drill; two Nilson boring machines; one Nilson "sticker" boring machine; one William Menge siding-off machine; one William Menge flange-boring machine, four spindles; one Menge flange-boring machine, two spindles; one A. H. Nilson damper block; one Menge boring machine, three spindles; one Menge damper-boring machine, four spindles; one Frazer butt machine, five spindles; two Menge fly-boring machines, three spindles; one butt frazing-out machine; one fly siding-off machine; one A. H. Nilson butt-boring machine, five spindles; one A. H. Nilson button maker, three spindles; one A. H. Nilson spring rail-boring machine; one Menge Dowell borer, two spindles; three Menge flange borers, four spindles; two Menge tongue borers, four spindles; one Menge fly-flange borer, two spindles; two A. H. Nilson regulating rail borers, two spindles; two A. H. Nilson rail borers, four spindles; one American Blower Company double 35-inch steel plate exhaust fan, 1,550 revolutions per minute; one A. H. Nilson shank machine; one Pyribil 10-inch single-head molder; one 10-inch rip-saw; one eight-inch rip-saw; one 10-inch single-head molder; one four-head eight-inch molder; one 12-inch jointer. One American 14-inch swing cut-off saw. One Berlin 10-inch rip saw. One American 22-inch jointer. One 40-inch by two-inch band saw. One double emery wheel 10-inch by one-inch. One 1,200-watt plating generator.



Motor Driving Slasher in Car Shop.

brake shop, signifies the nature of the repairs carried on in this building. It is 90 feet long and 50 feet wide and is characteristic of the other buildings in respect to light, ventilation and heating. Four motors, aggregating 92.5 horsepower, drive the various machines installed in this shop.

The equipment consists of one hydraulic wheel press driven by a 7.5-horsepower geared motor, which is mounted on the top of the press.

One axle lathe, one boring mill and one small pipe-cutting machine are driven in group from a 40-horsepower 900-revolutions-per-minute motor.

One vertical drill press and one double-end emery grinder are driven in group from a 5-horsepower 1,130-revolutions-per-minute motor.

A 40-horsepower motor is mounted on the wall for driving the larger machines in the wheel shop.

Car-Assembling and Repair Shop.

The car-assembling and repair shop, which is 500 feet long and 160 feet wide, is so located that the material from all the other buildings naturally gravitates to this section of the works. It is of steel construction with a tar and gravel roof. The sides of the building are sheathed with corrugated iron and are so designed that every other panel is a roller door or a window. In the summer the windows may be opened and the doors rolled up so that practically the sides of the building are opened. The natural lighting of the building is increased by wire-inserted glass skylights and a monitor running the full length of the building, the windows of which for ventilating purposes are regulated by a system of levers.

The building contains three ten-ton cranes to assist in the erection work. In front of the building and under a canopy is located a ten-ton crane which is free to travel in front of the blacksmith shop and the saw shop and convey the heavier parts to the car-assembling shop. It is also arranged to take care of the wheels and axles after they come from the wheel shop. The car shop has a capacity of seventy cars, distributed on six tracks running longitudinally. There are also four larry tracks, on which push cars may be operated to increase the facilities for handling material.

The heating system of this building includes two blowers, each driven by belting from a 50-horsepower motor.

The Blacksmith Shop.

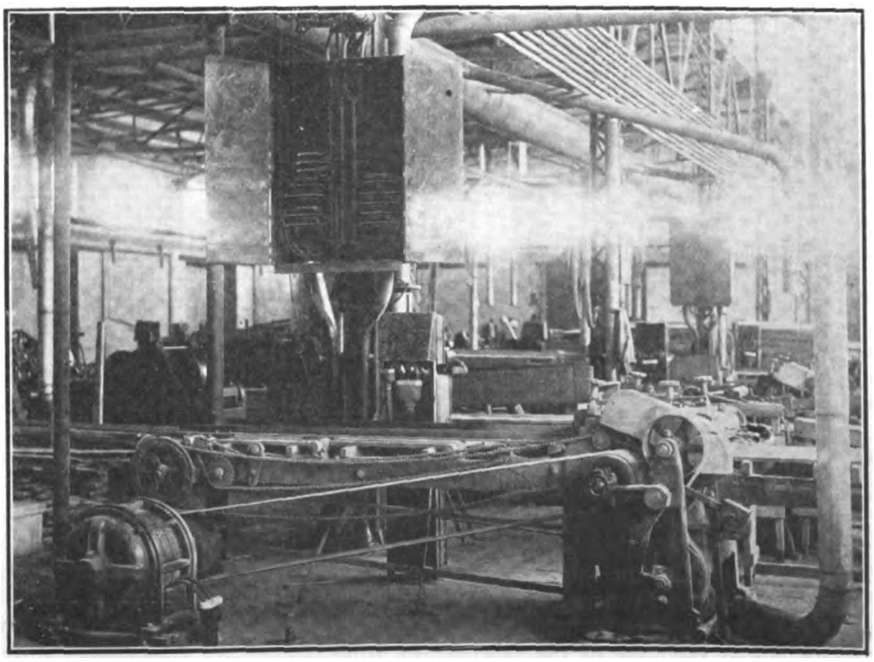
The blacksmith shop, 160 feet long and 70 feet wide, is similar in design and construction to the saw shop. All machines in this building are arranged in groups, as much as possible, and driven from line shaft. There are eight heavy forges installed, the air for which is supplied by a fan belted to a 40-horsepower motor. One combination punch and shear and a bulldozer are driven in a group from a 30-horsepower 900-revolutions-per-minute motor. One double emery wheel, one grinder, one two-drill press and other light tools are driven in a group from a 15-horsepower motor, running at 1,130 revolutions per minute.

Three triple bolt threaders, one punch, one emery grinder, one "I"-bending machine, one 7.5-inch bolt header and one guillotine shears are driven in group by a 30-horsepower motor. All these motors are mounted on the walls of this shop, about six feet above the floor line, so they consume practically no space and are not high enough to be injured by the smoke and dirt, which naturally exist in such a shop.

The blower heating system for the shop is driven from a 15-horsepower motor.

Choice of Motors.

Induction motors are, in all respects, the best type of machine for general power distribution on alternating-current circuits, and they have special advantages for operation in plants of this kind, having no moving electrical contacts and consequently causing no fire risk. They also start under load, run at approximately constant speed regardless of load, and if the load is suddenly thrown off no racing can occur. They are extremely simple in construction, having no commutator or brushes, and this, as above intimated, insures absolute freedom from sparking, flash-



Motor Driving Gang Rip Saw in Car Shop.

ing or burning. The voltage in the rotator part is so low that insulation breakdowns do not occur. Furthermore, an induction motor, when started, does not require synchronizing; and, on account of its simple construction and absence of all auxiliary devices, except starters, the cost of maintenance and attendance is considerably less than for any other type of electric motor.

There are installed in this plant 23 constant-speed Allis-Chalmers induction motors with a combined capacity of 603 horsepower, not including the three ten-ton cranes, which are each equipped with 35 rated horsepower. The Webster vacuum heating system is installed in the entire plant.

The Logan shops of the Hocking Valley Railway represent an investment of $350,000 approximately, but it will readily be realized that the company has improved its service to a far greater degree than that shown by these figures. The shops will employ 450 men and will turn out 5,000 heavy repair cars each year.

Commercial Practice Management, Rates, New Business

Successful Iron Campaign at Fort Worth, Tex.

During a recent campaign in which the Fort Worth (Tex.) Power & Light Company sold General Electric irons for $3.50, on a time-payment plan of 50 cents down and $1.00 per month, practically 5,000 electric irons were sold. Of this number about 2,500 irons were sold by the company and the remainder were disposed of by the local electrical contractors and dealers who entered enthusiastically into the campaign. A cash price of $3.00 was made by the later.

Toward the end of the time alloted for the campaign sales began to decrease so a special cash sale was announced for one month. During this sale irons were sold for $3.50. However, $1.25 was allowed on every old iron brought in exchange for a new one, making the net cash price $2.25. There were 375 irons sold on this basis during the month of the sale.

The fact that the Feeders and Breeders Stock Show was to be held in Fort Worth during the time of the sale, at which the lighting company was to maintain an exhibit, suggested an advertising scheme in which the old irons brought in exchange for new ones could be made a feature. The display shown in Fig. 1 is a result, and shows a few of the replaced irons grouped on a suitable stand. Signs placed on the exhibit stated that these irons are "relics of the past that bring back memories of sad ironing days when thousands of useless steps were taken between the hot stove and the ironing board."

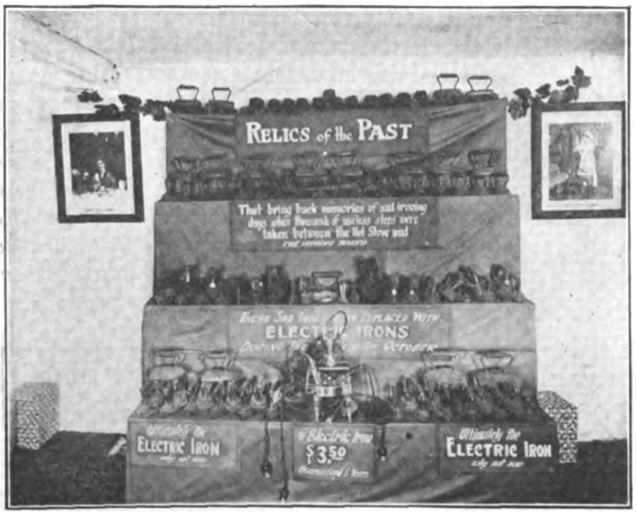

RELICS of the PAST
That bring back memories of sad ironing days when thousands of useless steps were taken between the Hot Stove and
ELECTRIC IRONS
Ultimately the ELECTRIC IRON
Electric Iron $3.50
Ultimately the ELECTRIC IRON

Fig. 1—Display of Flat Irons Taken in Exchange.

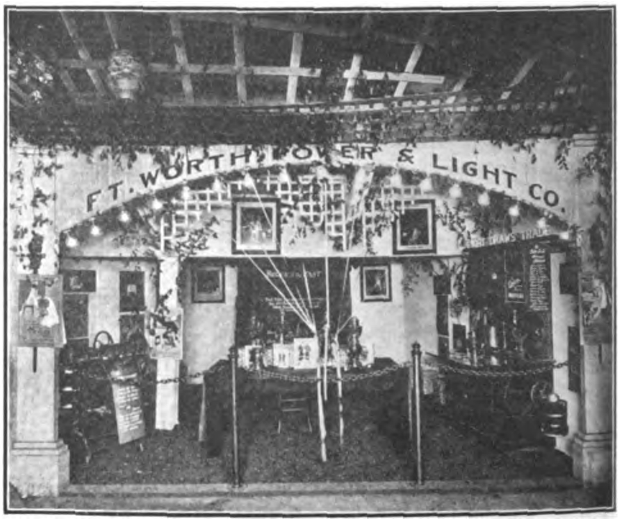


Fig. 2—Exhibit of Ft. Worth Company at Fair.

Fig. 2 is a general view of the company's exhibit with the display of irons in the background.

◆

Women Solicitors Prove Successful in Sheboygan.

The Sheboygan (Wis.) Railway & Electric Company has for some time been carrying out an ingenious plan for securing house-wiring contracts among the laboring classes, that has resulted in many new customers for the company. A lady solicitor, experienced in dealing with buyers of this class, was chosen from one of the department stores and instructed to call on all prospects. The lady of the house if at all interested in central-station service, invariably expressed the desire to have electricity but refers the solicitor to the man of the house who, of course, will not be home until evening. Such cases are immediately reported to the Company and a male representative calls on the prospect the same day the report was made, while the memory of the day's conversation is still in the mind of the house wife. The company's proposition is explained to the man of the house with the explanation that the housewife desired service but left the actual signing of the contract to him.

It is reported by W. B. Voth, superintendent of the company, that this plan of attack seldom fails.

◆

New Office Building for Clarinda.

The Lee Electric Company, Clarinda, Iowa, contemplates the erection of an office building and store room to cost about $15,000. Rufus E. Lee, manager, would be glad to receive suggestions from other companies which have erected similar buildings.

SOME NOTES ON THE LARGE POWER RATE.

By E. D. Dreyfus.

No other single subject has compelled greater attention on the part of the central station within the last decade than the rate question. It has been searchingly studied by specialists and therefore most minds in the electric lighting industry. This endeavor has been a prerequisite to the rapid development of the central-station load which the past few years have witnessed. It will be found that the contributions from the "four corners" on the topic of rates and rate systems have reached great numbers, and in fact comprise in the aggregate a considerable volume, embracing its different phases attacked from various angles.

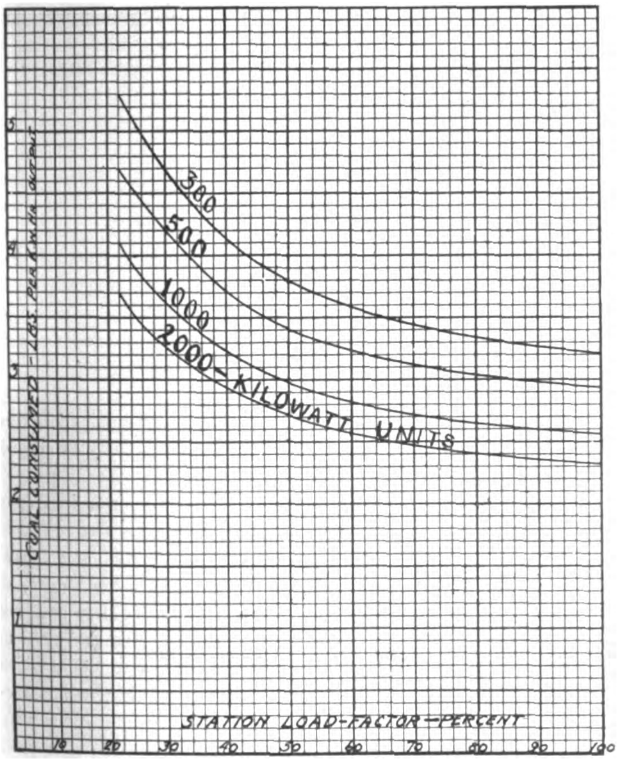


Fig. 1—Ideal Fuel Economies for Steam-Turbine Plants.

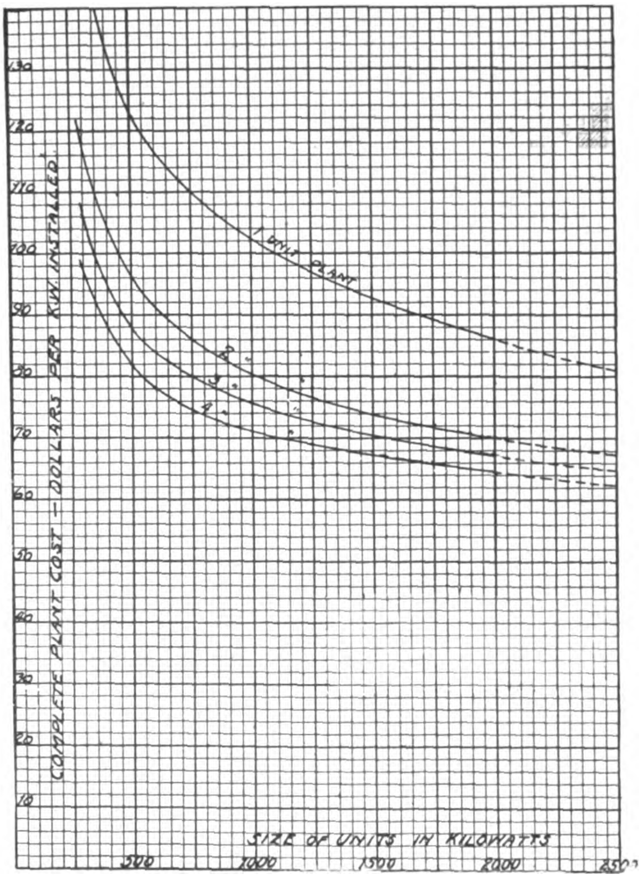


Fig. 2—General Costs of Steam-Turbine Plants.

The rate problem is a comprehensive one. Naturally it is constantly growing in importance as new requirements arise that must be met sufficiently and economically. A very significant movement was launched about two years ago by a body of rate experts centered upon effecting as great a uniformity in rate practice throughout the country as possible. As understood, of course, "identity" of rates for the different classes of service or that of different operating companies is not to be implied but "conformity" in the method of applying and presenting the required schedules is sought. There has been, however, a counter maneuver by opposing interests (the isolated-power-plant manufacturer) to secure the enforcement of strictly uniform rates by the State regulatory bodies, on account of the advantages that will thereby accrue to them, but this must fail by reason of its own defects.

There have been a number of arguments put forward recently, attacking the practice of differentiating between the large and small demand. This has been done entirely by those interested in some way in the installation of isolated power plants. The grounds taken are that the gradation of the charges is unfair, as it gives the large manufacturer the advantage, which it is claimed cannot be justified as it is stated that the only difference in the cost to serve is the proportionately greater expense of meter reading, collecting and inspection of the small consumer compared with the larger one, on the basis of the revenue returned. It is also contended that the adoption of the sliding scale or quantity discount is not in keeping with the spirit of the times, which is founded upon equitable treatment and a fair chance for all.

Let us for a moment test the logic of the following claims: (1) That the consumer who contributes the large volume of business is entitled to a better consideration when all economic factors are reckoned with; (2) the spirit of the time implies, according to proper interpretation, the greatest benefit to and development of the community at large. Plainly this is not to be attained by thwarting an industry in the mere endeavor to improve the situation with a certain class. This is radically wrong, and especially in the case of the electric utility, as the attempt acts to banish this possibility, due to loss of the large business which is responsible for substantial reduction in the average cost of production.

To force equalization of rates and thus place the large and small manufacturer on the same basis is utterly impossible. Either large or small consumer has recourse to the installation of a private plant, and, as clearly shown by the accompanying diagrams, the large user is not to be deprived of his natural advantage by enforcing uniform power rate. So it is immaterial how the rates may be arranged, the small manufacturer cannot be brought to the same level as the large consumer in matter of power costs.

. But this is no calamity, as the rate reformers would have it inferred. In most manufacturing establishments, the power cost is usually less than 10 per cent of the production expense. When it is considered that the overhead in the small shops is relatively much less than in the large corporation, the ability to compete is not destroyed by a possibly small advance in the rate for power, and this is amply exemplified in the survival of the thrifty small industry; and we witness their expansion notwith-

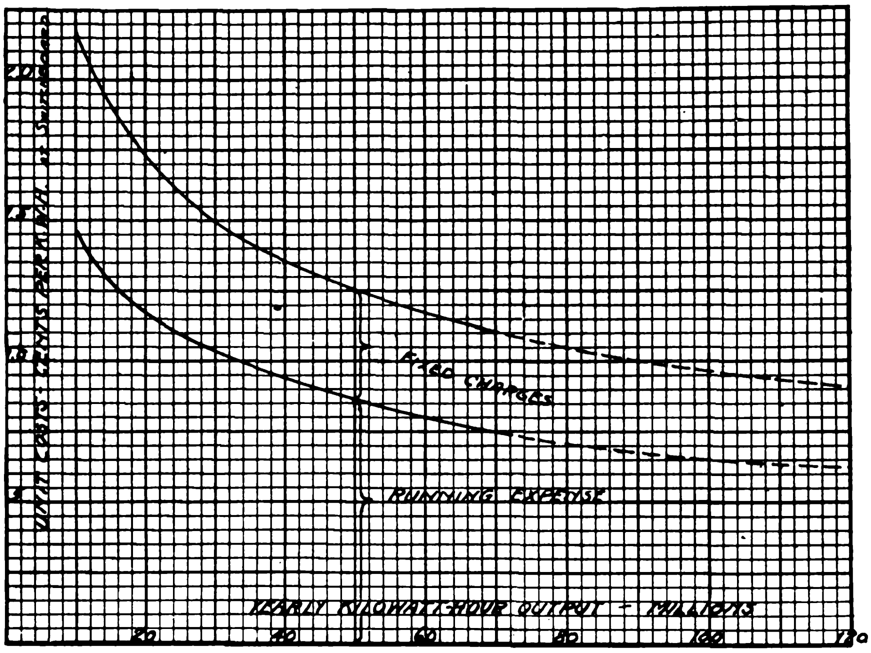


Fig. 3—Costs of a Central Power Station.

standing such differences as they might have to bear in obtaining their power.

A very formidable defense of graded charges, if such defense be necessary, is the fact that the small consumer may resort to the production of his own power if dissatisfied with the electric company's schedules. As already pointed out, the electric company is able to do better by the small manufacturer, by reason of the bulk business it secures through a descending range of prices. No business should be taken the revenue from which does not meet all costs, but the major part of the general and utilization expense may, with justice, be assigned to those classes which are inherently dependent more or less upon the electric company for its power supply, as it is the needs of such consumers for which the electric company must first provide.

To hold that the electric rate system should be reduced to the simple basis employed in the sale of gas and water is untenable for two reasons: first, the much-emphasized fact that in case of the supply of gas and water it is commercially feasible to minimize investment and to obviate standby losses by the employment of the necessary storage capacity which, in the distribution of electricity, is invariably financially prohibitive; second, the same competitive factor does not exist in case of gas and water supply. To drive wells or generate gas on the premises is far less likely or alluring than the operating of a small electric generating equipment. When a broad and reasonable view is taken, it will be found that the present electric-rate practice as herein expounded is a natural and logical outcome of the economic developments in the case.

Not only do we see the number of state public service commissions increase, but their activities and investigations are becoming more extensive. In the trail of these events we find the utility company exercising greater care in formulating its rates and taking pains so that it may justify any schedule or series of schedules it may issue.

Admittedly rate work does not submit itself to any scientific or refined treatment. Nevertheless, it may be prosecuted in a way as to conform with correct principles which will most completely produce the desired commercial and economic results.

On the whole, the rate situation is now being placed upon a most satisfactory basis. Companies are keeping detail accounts of the "outgo" and with a well arranged and selected classification such as adopted by the National Electric Light Association, proper apportionment of charges is secured. which enables the rate question to be intelligently and equitably handled. The principal differentiation of service to be noted is residence, commercial and power, and these again may be subdivided and subclassified. Residential schedules may be simplified to a large extent and likewise the commercial, although to a somewhat lesser degree. There is a gratifying similarity, in the main, of both residential and commercial rates throughout the country, and this will undoubtedly become more marked from time to time. Power service necessarily introduces the widest variation in which the locality, the specific nature of the industry served and the organization and layout of the electric power system have much bearing. In a section where cheap fuel obtains prices must accordingly be low. The factory or the mill with a large and comparatively constant demand necessarily earns lower rates than the small and irregular load. A utility company operating for the most part within the boundary of a metropolitan city may more readily equalize its power rates where its consumers are confined within rather narrow limits than a company consolidating the operation of a group of neighboring properties wherein each plant supplied virtually establishes a distinct cost-to-serve. It is necessary, therefore, that we distinguish these conditions and construct schedules accordingly.

There have already been a number of cases come up before the different state commissions in which the derivation of the base rates were shown, so that this phase of the problem need not be elaborated upon. Proceeding with the fundamental cost, a schedule which will at once be profitable and attractive to the large power consumer may be developed.

The outward character of the rate

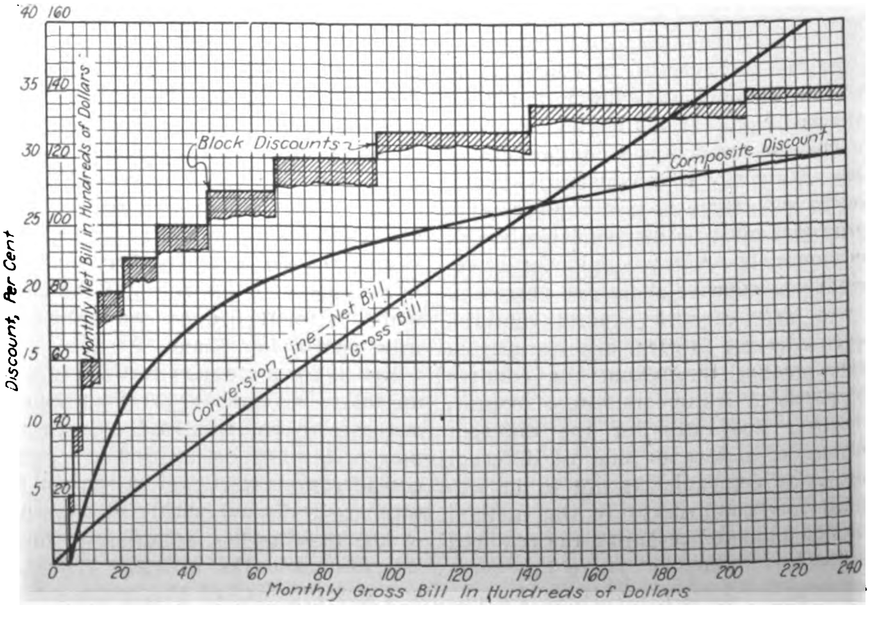


Fig. 4—Discount Diagram.

should have a part in the consideration along with the fixing of the net values that shall obtain. Primarily, two methods are in vogue in the arrangement of the large power schedule: first, successively descending scale of prices for both the demand and energy consumption, proportioned according to the extent of demand and quantity of energy consumed; and secondly, a fixed demand and energy charge with the combined charges subject to an increasing quantity discount; or as sometimes found, a combination of the two schemes is employed.

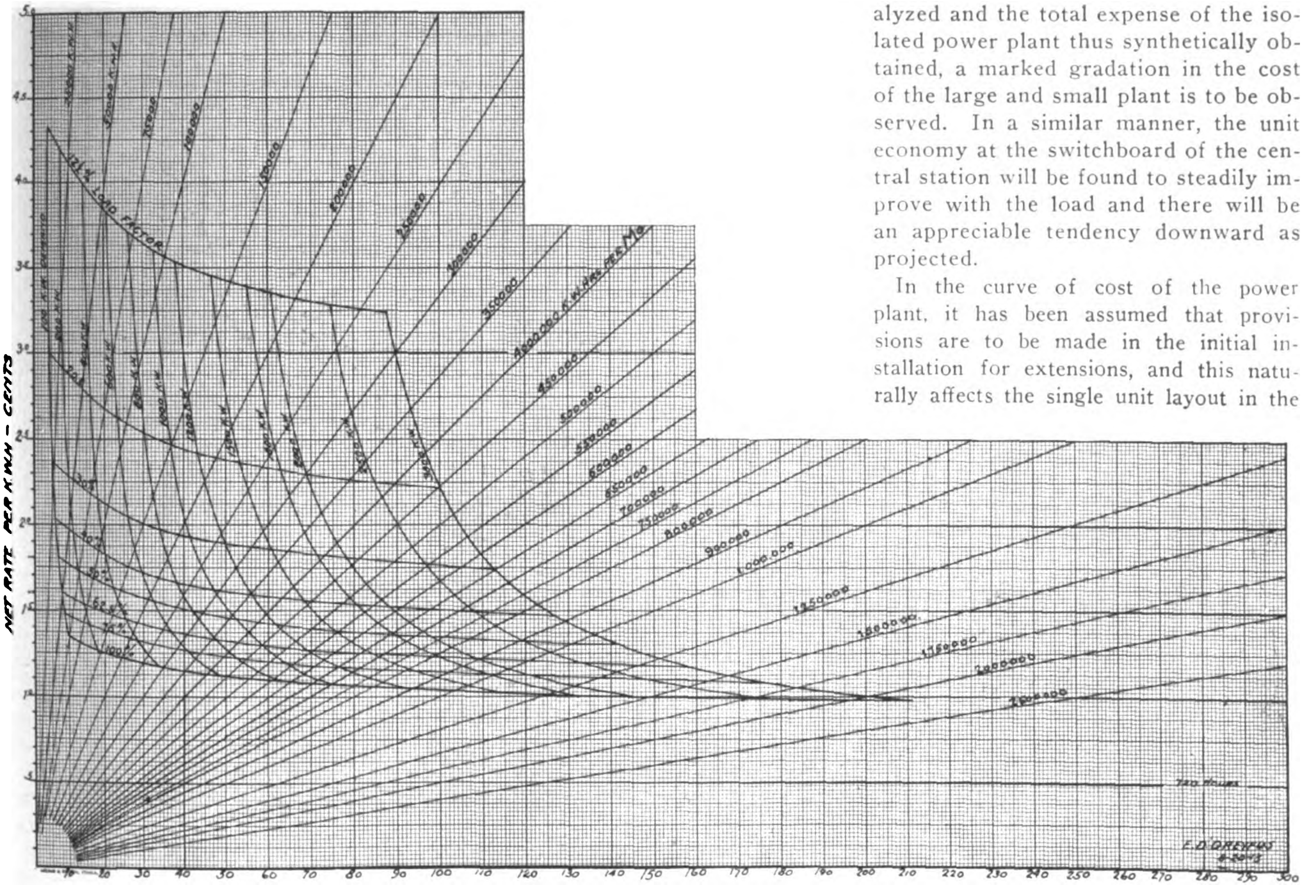


Fig. 5—Rate Diagram.

Both schemes possess merit and may coincide one with the other. The first is possibly in more general use, particularly in and surrounding the larger cities. Here central-station activity has hitherto been the greatest, and the large consumer in such regions is probably more accustomed to the features of such schedules.

The second scheme has this in its favor. In the determination of the gross charges the procedure is reduced to maximum simplicity. For consideration of quantity, block discounts apply, resulting in a uniformly diminishing unit charge. To the business man imbued with the idea of wholesale discounts (which is part and parcel of our commercial fabric) the second scheme will appeal strongly. It is also susceptible to instructive graphical analyses and deductions which shall be made the primary subject of treatment in this article.

Large business must be encouraged, as it has proved itself to be the vital sinew of the strength and growth of the central-station development. On the other hand, the returns from the business must meet all costs and carry a reasonable profit to the utility company.

As already noted, the different rates of the utility company cannot be derived with any great mathematical exactness, but nevertheless they are to be logically determined from the typical costs and general results of the business. Experience, therefore, becomes a necessary part in the selection of rates. It is an established rule that the rates as a whole must range somewhere between the basic cost of rendering the service and the value of the service to the consumer. Thus the margin of profit may vary somewhat between the large and small classes. This is by no means discriminatory as at first may appear, as it is in the supply of large volumes of business that the highest degree of economy may be attained. The general reduction of operating expenses per unit of output following the furnishing of power in bulk directly redounds to the advantage of the smaller consumer.

The development of the business in this manner is fundamentally proper and has accordingly received the approval of the commissions and rate authorities, and is commonly known as the "expediency principle."

The situation is exemplified in the diagrams, Figs. 1, 2 and 3. Fig. 1 represents ideal fuel economies for varying size of steam-turbine stations burning coal. In Fig. 2 we have representative cost of well built and equipped plants of normal rating and possessing the proper reserve capacity. If the labor and supplies required in the operation of the plant are correspondingly analyzed and the total expense of the isolated power plant thus synthetically obtained, a marked gradation in the cost of the large and small plant is to be observed. In a similar manner, the unit economy at the switchboard of the central station will be found to steadily improve with the load and there will be an appreciable tendency downward as projected.

In the curve of cost of the power plant, it has been assumed that provisions are to be made in the initial installation for extensions, and this naturally affects the single unit layout in the greatest proportion, as the diagram, Fig. 2, illustrates.

The ideal results have been employed in Fig. 1 as they naturally present the greatest regularity. Practical values, which are invariably very much in excess of these quantities, fluctuate so widely that unless it is known how the plant is or is to be operated no satisfactory determination may be made. To observe these "bench-mark" values increased 25 per cent or more is not uncommon, nor even doubling them is not necessarily extraordinary.

The "human equation" is a serious factor in the operation of a power plant. As well understood, there are so many conditions which may cause the economy of the plant to decline which are not apparent on the surface, that the results aimed for are not realized, conscientious effort notwithstanding. But let the operating force prove negligent in any way, the efficiency falls off rapidly. Because a plant may run smoothly does not prove to be an indication of efficient operation. Not only faithful but intelligent attention is required in order to attain the desired results. Manifestly the quality of the coal and the character of the equipment are also instrumental in whatever showing the plant may make. These cautionary remarks are embodied herein so that the references the author uses and also their application may be properly understood.

As the subject does not contemplate covering any details of generating costs a discussion of this phase has not been undertaken.

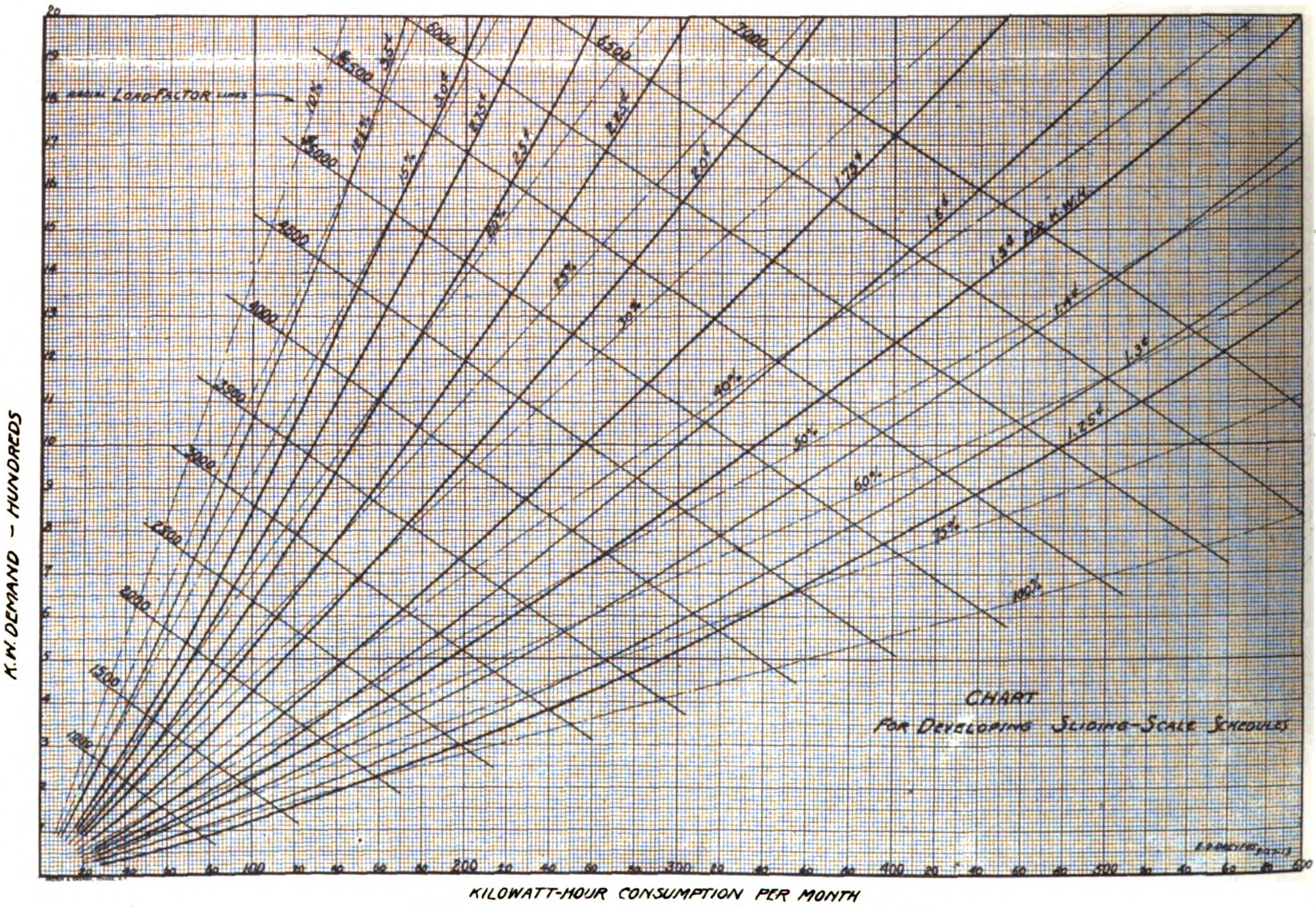


Fig. 6—Chart for Developing Sliding-Scale Schedules.

Similarly the data in Figs. 2 and 3 are to be construed as very general. One only needs to examine the records from different plants and different sections of the county to appreciate the possibility of a wide disparity in such data, but its existence actually is too often very marked. They nevertheless show decided tendencies and therefore serve the purpose of this article admirably.

In Fig. 3 it is to be noted that it is taken for granted that the load-factor gradually improves with the increase in business, due to the diversity obtaining, and this is particularly true when the plant is small, so that the lowering of costs is very marked at this point.

From information of the kind outlined in the foregoing as a foundation, the rate-maker may construct a schedule for the large business. As the amount in dollars obtained from the business is so closely associated with the magnitude of the demand, the regulation of the prices proportioned to the extent of the demand and consumption may be advantageously established by a series of progressive discounts, the effect of which is interestingly exhibited later (see Fig. 5).

It will be assumed that the desirability of employing the two-rate method of charging is fully appreciated, as well as the steps necessary to obtain the demand charge from the investment in the property, the fixed charges thereon and the demand on the system; and the unit cost of the energy delivered, including the production, distribution and general expense. For the sake of illustration we will say that for a certain investment and operating conditions the assumed company finds itself in position to sell power in large quantities at a rate of $3.00 per kilowatt demand and one cent per kilowatt-hour for the energy consumed, which will be its starting point. Then from data of the nature given in Figs. 1, 2 and 3 and supplementary costs, a series of discounts is to be formulated as indicated in the following:

The first $500 of the gross bill, net; next $150, 5 per cent; next $300, 10 per cent; next $500, 15 per cent; next $750, 20 per cent; next $1,000, 22.5 per cent; next $1,500, 25 per cent; next $2,000, 27.5 per cent; next $3,000, 30 per cent; next $4,500, 32 per cent; next $6,500, 34 per cent; all excess, 35 per cent.

These are, of course, a combination of block discounts which will satisfy some one set of conditions, and are to be varied to take care of other requirements.

The preference for the *block* system of discounts over the *step* discount is taken for granted, owing to the avoidance of sudden breaks or depression in the charges when passing from the region in which one discount applies to the region in which the successive discount is in effect. The rate builder should endeavor to obtain smooth and gradual results through the operation of the block discounts. If the successive blocks of discounts bear a progressive and proportional relationship as shown by the shaded areas in Fig. 4, then the flexure of the composite discount curve becomes even throughout its entire range. There is no difficulty experienced in the practical application of these discounts. Short cuts may be employed to quickly obtain the net bill from the gross charges. A conversion line as given in Fig. 4 may be used, or, if great accuracy is necessary, a convenient table may be made up for the purpose.

It will be noted that the illustrations

accompanying the article are simply diagrammatic and the values in one are not absolutely correlated with that of another, except as between Figs. 4 and 5. This is unimportant, as the attempt is to show the method only, and it would be of little consequence to have them reconciled in this article as the permutations by virtue of the different localities and conditions that must be taken into account allow only of generalities in an illustrative case of this kind.

The effect of arrangement above described becomes apparent in Fig. 5. This method of showing the manner in which the schedule in question operates will be found not only instructive but it will substantially assist the prospective consumer in grasping the true significance of the form of schedule discussed. As evident, large demands and high load are properly recognized in these schedules in the way that the cost-to-serve justifies. It may be well to repeat at this point the fact that what might be termed large power and transmission companies (which ordinarily have to extend their circuits and pole lines considerable distances to reach its scattered consumers, in contradistinction to the metropolitan company which serves a concentrated load) must guard their business with more circumspection. Otherwise they may find themselves confronted with a condition where they will have attached unprofitable business. They can not raise the prices to an average or common level as they would stand to lose the large customer who, as already expressed, is needed to improve the general economic conditions of the entire system. In the case of the transmission company a descending scale of charges is warranted for additional reasons than those previously given. The other important item is the fact that the cost of copper may be as low as 50 per cent or less of the total expense of building the line, depending obviously upon what the company is obliged to pay for its right of way and easements, and the topography of the country as it may affect the cost of distributing the poles. Therefore, there will usually be found a large element of cost in the line that is fixed, irrespective of the load on the line. Consequently, the unit cost-to-serve in the case of the larger consumer will evidently be lower than with the smaller demand. Other less prominent factors could be cited, but sufficient grounds have been presented as a rationale for the above distinction in rates.

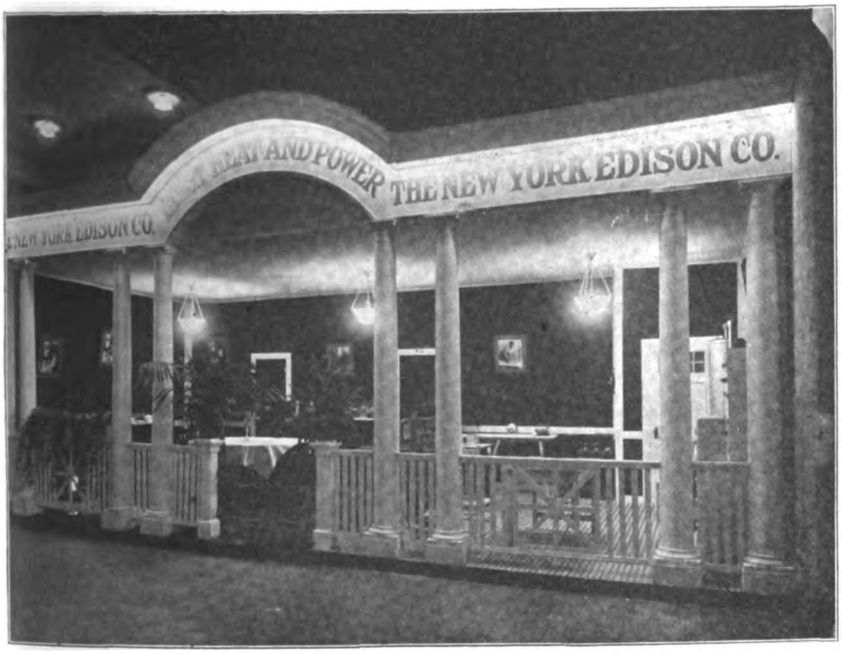


Exhibit of the New York Edison Company at the Woman's Industrial Show and Housewives' League Exhibition.

In plot (Fig. 5) the vertical ordinate has been the scale of net rates per kilowatt-hour, and the horizontal, the monthly net bill in dollars. This allows of these two quantities being read more closely than divisions of kilowatt demand, kilowatt-hours and load-factor.

Should the first consideration be the kilowatt demand and kilowatt-hour consumption, the chart may be rearranged as in Fig. 6.

A more general use of diagrams is recommended, as they impress the mind more vividly than any other form or method. Some of the most interesting work of this kind was contained in an article in the Electrical Review and Western Electrician, February 11, 18 and 25, 1911, by H. E. Eisenmenger, of Cleveland, O. Three-dimension illustrations were employed, which pictured the rates as warped surfaces and which affords a splendid conception and comparison of different schedules. The form herein used is the more convenient for general use. It has a value in rate work analogous to the Mollier's temperature-entropy diagram in the design of heat motors.

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New York Edison Company's Exhibit.

One of the most interesting features of the Edison Company's exhibit at the third annual Woman's Industrial Show and Housewives' League Exhibition held recently at the Grand Central Palace, was an electric doughnut cooking pan. Real just-like-mother-used-to-make doughnuts were cooked by electrically generated heat and the sizzling brown cakes were served to the visitors at the show.

The electrical exhibit included a model kitchen and dining room situated in the Edison Company's booth on the main floor of the Palace. The kitchen was fitted up with an ice box, kitchen cabinet, an electrically heated boiler, several of the best type irons, a washing machine, towel dryers and an electric range. The dining room was furnished with such electrical apparatus as chafing dishes, percolators, toasters and a vacuum cleaner. The lighting in the dining room was particularly attractive. A view of the exhibit is shown herewith.

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A Large Dutch Wind Motor.

It is reported that a wind motor, claimed to be the largest of its kind in the world, has lately been brought into use at Harlingen (Friesland) for draining a "polder" (tract of lowland redeemed from the sea by high embankments) with an area of 1,850 acres. This machine, which has steel sails and is mounted on a steel tower, has a diameter of 50 feet and is said to be capable of dealing with 64,000 to 70,000 cubic feet of water an hour. It is an interesting fact that first the wooden windmills were replaced by explosion motors, but now again the steel wind motors are said to be more and more employed, especially in the draining of "polders."

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Abolishment of Minimum Lighting Rates Proposed in New Jersey Law.

The New Jersey State Legislature is considering a bill recently introduced making it a misdemeanor for any person or corporation to receive, directly or indirectly, any payment of any kind for electrical energy which shall not have been actually used or consumed. The bill is designed primarily to prohibit electric companies from making minimum rates of $1, or other amount, as now generally done in the state, and collecting such amount regardless of whether service was rendered or not.

Electric Sign Data

Notes on Sign Flashers.

The electric-sign flasher has two advantages: it gives movement which attracts attention and enables one to secure spectacular effects; and it reduces the amount of current necessary to operate a given sign.

A moving sign (sign equipped with flasher) takes less current than one that burns constantly, but the maintenance of the flasher may affect this saving. For general guidance it should be estimated that moving sign. saves 40 per cent in current costs—that is to say, a 1,000-lamp sign with a proper and well-designed flashing feature would take about the same current as a 600-lamp sign burning constantly, but the electric light bill will seldom follow this ratio because in all cases where the flasher fails to work the lighting company must keep the sign burning constantly. Also, into any estimate of current cost flasher and lamp maintenance must be figured.

A sign flasher, like any other piece of moving mechanism, requires inspection, oiling and maintenance. It will not run forever unless cared for. This does not mean that a flasher is a delicate instrument, for, as a matter of fact, all standard flashers are extremely hardy; but the sign salesman and the customer must realize that the flasher needs attention and that this attention, while it will save possible dissatisfaction, costs money.

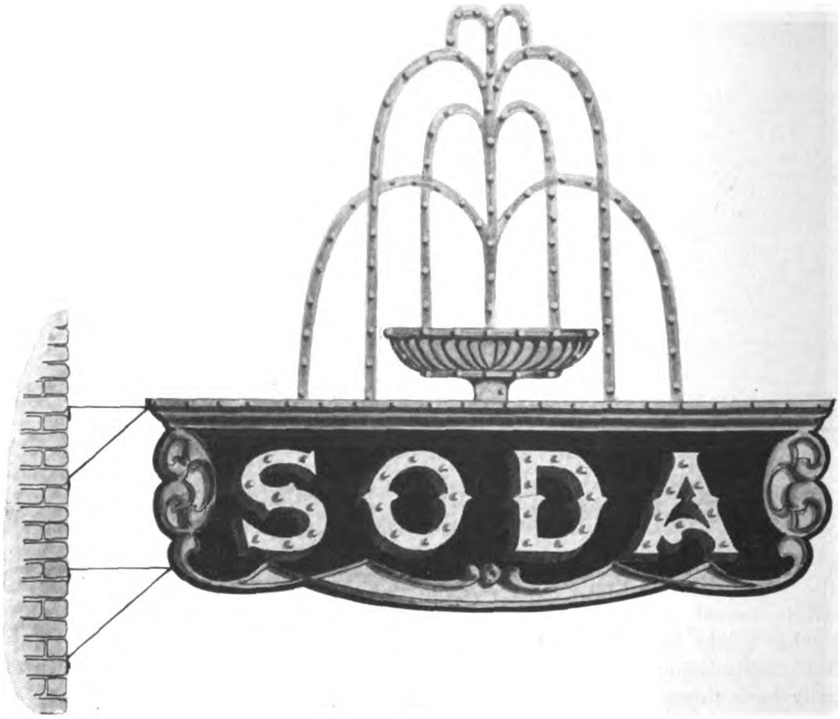
Another point of importance is that the flasher manufacturer can give valuable advice in the matter of securing extraordinary effects, such as playing fountains, border chasers, spelling out of letters, etc. When something extraordinary is desired, it is well to get the advice of a responsible manufacturer. Furthermore, he can tell you a number of things that are impossible. There is a reasonable limit to flasher effects. Almost any effect can be secured at a price and by the use of specially designed machines, but it is obviously unwise to plan elaborate flashing effects for a comparatively small sign. The use of standard apparatus properly adapted to the problem in hand is always the cheapest and most effective.

In adopting a flasher, be sure that it complies with the Underwriters' rule. Violations of the rules may slip past careless inspectors, but "the game is not worth the candle." Here, as in the construction of the sign itself, there is temptation to cut costs, and the customer should be advised as to the exact merits of standard goods and the faults of those which may be secured at a cut price.

Flashers should be installed as directed by the manufacturer. He knows his business or he wouldn't be in it.

As a general principle, it may be said that flashers cannot be too good. Probably 75 per cent of flasher trouble has resulted from trying to use cheap or "amateur" flashers. The obvious thing, then,, is to secure all flashers from established sign manufacturers or flasher manufacturers of known responsibility.

To secure the best operating results do not screw either the flasher or motor down tight to the base. If you screw a flasher down tight, its base usually acts as a sounding board, especially if placed over storm doors or on a light partition. Always leave one-eighth of an inch clearance under the head of a screw that holds the flasher and motor, and put some rubber under both if necessary, otherwise it will be noisy. It is also not advisable to run a tight belt.



Electric sign particularly adapted for use by confectionery and drug stores. Sign as shown was manufactured by the Greenwood Advertising Company, Knoxville, Tenn.

Sign is double-faced, 9 feet wide by 7.25 feet high. 286 receptacles are provided.

The wording, "Soda," is made up of 16-inch raised spur block letters. The sign lends itself to a number of color schemes, the background being finished in imported glass smalt.

The fountain effect is arranged to flow continuously, the wording flashed as desired.

Electrical Construction

HUMOR AND PATHOS OF ELECTRICAL CONTRACTING.[1]

By J. A. Fowler.

PHOTO BY
HARRY F. NORTHRUP CO
MEMPHIS TENN

Group at Recent Convention of Tennessee Electrical Contractor s' Association, Memphis, February 16 and 17.

The president of the National Electrical Contractors' Association has said that the electrical contracting business is a good business, but, like every calling in life, it has its elements of comedy and pathos.

Sometimes one is tempted to say that the fact of certain individuals engaging themselves in this business would be funny if it were not so pathetic.

The editor of the *National Electrical Contractor* presents a cartoon in the current issue describing a contractor who has secured two good contracts at a profit and his success has fired him to such a pitch that he is reaching out for everything else in sight with or without a profit. It very pointedly shows this greedy contractor in his effort to reach the profitless job stepping off the precipice of sound business into the river of adversity below.

Once I made an effort to reconcile two local contractors who had been at outs for a long time over a trivial matter and I had apparently succeeded when, as they were shaking hands, one said to the other, "Well, I wish for you all that you wish for me." Thereupon the other indignantly replied, "Now there you go starting it again."

Once a certain general contractor had occasion to let an electrical contract which figured to cost $8,000. The contractor had used an estimate of $10,000 from a local electrical contractor. After the general contractor had secured the work he proceeded to peddle the electrical work instead of letting it to the electrical man whose bid he had used. Working two electrical contractors against each other until the work reached a point where it had to be begun, he finally let the contract for about $7,400, which was $600 below cost. Had the general contractor more time, doubtless he could have had the electrical work donated. Both of the electrical contractors were large operators and probably had reasons for their conduct.

The habit of doing work below cost is one of the most pathetic conditions in the electrical contracting business today.

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[1] Address at convention of Tennessee Electrical Contractors' Association.

The most common cause finds its origin in the fact that the contractor either does not possess the experience needed to properly estimate his cost or he fools himself by not keeping a record of the work while it is in progress and thereby has no records for future work. But, of course, no one ever saw a contractor who kept no records but imagined he was making money. This method in time ruins the contractor and injures the creditors, but the customer profits, so we have an element of humor along with the pathos.

The second cause is that practice of contractors taking work below cost knowingly—either for advertising, expecting to get the customer's future business, or with an eye to the extras which may arise on the job. The contractor who pursues these methods is a dangerous element in the business. In his efforts to protect his losses he violates the terms of his contract, installs inferior work, thereby cheats his customer and exposes him and others to the attending dangers; or the contractor plans to rob his customer or his tenants on the extras that he expects to receive.

One value of organizations such as ours is being felt in the efforts we are making to rid the business of these dangerous citizens.

It is humorous to come across a condition where a certain building has been declared dangerous because of defective electrical work and the owner contracts to have the defects corrected with either a contractor who does not know or one who is dishonest and tries to get by the inspector, with the result in either case that the remodeled work is as bad, if not worse, than before the condemnation, and the customer has spent his money for naught. This rascality should be exposed and no professional courtesy should protect the guilty parties.

It is a pathetic travesty on our vaunted claim that we stand for "Safety First" when we make no effort to eliminate dangerous wiring conditions in hotels, rooming houses and workshops where the existence of these conditions is more dangerous than the presence of a store of dynamite. The dynamite would be well guarded, but who can guard defective electrical work? It can go off in a thousand places and at any time. Let not the fear that someone will say you have an ax to grind deter you from making public a knowledge of these disgraces. I know a number of property owners who will not patronize my concern because of my activity two years ago before the insurance interests to rid the city of dangerous risks from an electrical standpoint.

In the past one of the great pastimes of the business was the game of hide and seek which the electrical contractor felt he had to play with the inspector and the owner. This practice is now passing, due to the co-operative efforts of honest contractors, and while the time was when the inspector was forever warring, now it is the exception. As a rule, the contractor more than meets the inspector half way in their mutual effort to turn out work that will stand the test of time and be a monument to the honesty and integrity of the contractor.

J. A. Fowler Re-elected Secretary of Tennessee Association.

One of the most active men in the state of Tennessee in the electrical contracting field is Joseph A. Fowler, of Memphis. Mr. Fowler is a native of that city, having been born there in 1883. He started early in the electrical business and has now been following it for 17 years. For four years he has been conducting his own business in electrical contracting under the name of the Joseph Fowler Electric Company.

J. A. Fowler,
Secretary, Tennessee Electrical Contractors' Association.

Mr. Fowler takes an active interest in the various contractors' organizations and is one of the leading spirits in his field. He has just been re-elected secretary of the Tennessee Electrical Contractors' Association, and is a director of the National Electrical Contractors' Association, representing his state upon the board of that body. He is also chairman of the Committee on Labor and a member of the Executive Committee of the National Association. He is a Jovian, and takes a prominent part in the activities of the local Jovian League.

It is not only in electrical affairs, however, that Mr. Fowler is active. He is one of the prominent business men of Memphis, and is a director of the Business Men's Club, as well as other local organizations.

Among the Contractors.

The Panama Theater in Philadelphia, Pa., has been wired by the Grossman Electric Company, of that city. The moving-picture parlor is one of the largest of its kind in the city.

The Beaver Engineering Company, Newark, N. J., has been awarded a sub-contract by the Essex Construction Company, contractor, for electrical work and elevators in the new Center Market building at a cost of $30,000.

J. C. Kinney & Company, electrical contractors of San Antonio, Tex., have recently finished the installation of the electric lighting plant for W. L. Crawford at Dilley, Tex. The Kinney Company has found it necessary to move into new and larger quarters at 233 East Houston Street.

The name of the Katterjohn & Dalbey Electric Company, Paducah, Ky., has been changed to the S. D. Dalbey Electric Company. The concern has purchased the building it is occupying and will remodel and enlarge it. The company plans to enter the jobbing trade, covering most of Western Kentucky. It also does a large contracting business.

The Seiffert Electrical Company, Evansville, Ind., has decided to establish a branch store at Henderson, Ky., across the Ohio River from Evansville. The concern plans to put into effect a motor-maintenance service in Henderson.

One of the most active electrical contractors in Chicago is J. L. Burgard, whose office and shop are at 751-753 West Fifty-fourth Place. Among the more important contracts now engaging his attention is the wiring and complete installation of nearly 400 ornamental tungsten cluster posts along Clark Street between the river and North Avenue. An apartment building with 60 three-room apartments at Drexel Boulevard and Forty-second Place is being electrically equipped in an exceptionally complete manner with lights, utility outlets and private telephones. A new four-story factory building for B. Kuppenheimer & Company is being completely wired at Western Avenue and Twenty-second Street. A new five-story factory at Ashland Avenue and Thirty-ninth Street will be wired for the P. A. Starck Piano Company. Other contracts recently completed or almost completed by Mr. Burgard's organization are a theater at Wilmette, Ill., a theater, hotel and store building at Lake Avenue and Hyde Park Boulevard and a theater and store at Seventy-fifth Street and Railroad Avenue.

A Unique Show-Window Device.

Fig. 1 illustrates a show window at 402 South Dearborn Street, Chicago, in which a unique advertising device has been installed by R. J. Suvan & Company. It consists of a flashing electric lamp mounted upon a plate of glass and without any visible metallic connection to any source of electric current.

Mr. Suvan is an electrical contractor who began business in Kalispell, Mont., and has done much work in various cities of the Canadian Northwest, but who is now devoting himself to the development of the new townsite at Biggar, Can. In this connection he is acting as sales manager for A. F. Brown & Company at the above address.

The show window here described has attracted a great deal of attention on account of the clever way in which the lamp has been mounted, and the lighting and extinction puzzles many a passerby. Like many other electrical advertising novelties, the action is simple enough when the arrangement is once understood.

In this case there are two paths by which current reaches the lamp and these operate in parallel to carry the current. The sheet of glass, while perfectly transparent, is coated with an invisible film of conducting material. This film is made by mixing up powdered blue lead, a compound similar to white lead, with shellac until a rather thick liquid results. This is applied to the surface of the glass and allowed to dry, when it will be found to be conducting. At the bottom of the sheet of glass, as will be seen in Fig. 2, this film makes contact with nails driven into the floor of the show window. These nails not only serve to hold the glass in a practically vertical position, but make contact with the films on the front and rear sides and convey current through the floor of the show window to wires which are connected below. This film, however, is not alone depended upon to carry current to the lamp. Fine copper wires of size No. 32 B. & S. gauge are run up along the edges of the glass from the floor to the porcelain receptacle which carries the lamp. By gold plating these wires are given additional carrying capacity and also protection. These wires are also covered in a coating of shellac on the edge of the glass, so that they are not noticeable. The porcelain receptacle was mounted upon the edge of the glass by sawing a slot in the base. This can be done by an ordinary hacksaw lubricated with turpentine. The lamp is a 40-watt tungsten lamp and the flashing is done by a motor flashing device concealed beneath the floor.

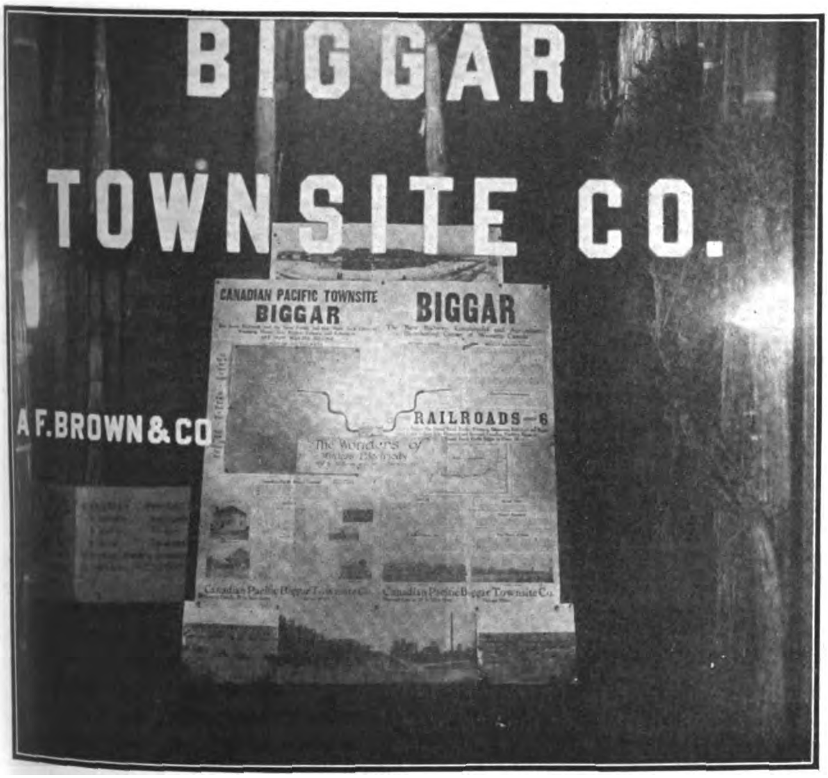

Fig. 1.—Show Window With Electrical Display.

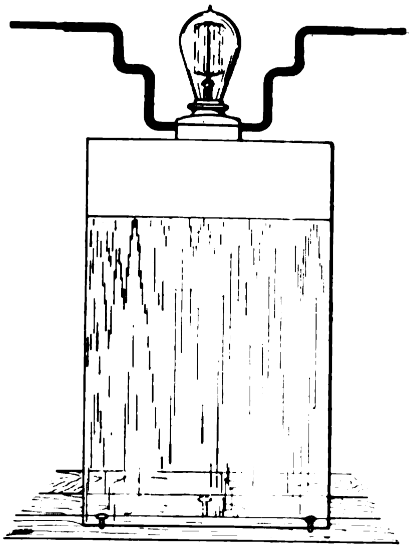

Fig. 2.—Lamp Mounted on Pane of Glass.

Other methods, of course, might be used for flashing, such as an electromagnet which breaks its own circuit and is made to operate slowly by means of a dashpot. Devices depending upon expansion by heat can also be used for this purpose, the circuit being broken when current has flowed long enough to heat a certain piece of metal which is included in the circuit, and being closed again when this has cooled down sufficiently to permit it.

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Removing Static Charge from a Belt.

I read with much interest William T. Estlick's letter concerning the removal of a static charge from a high-speed belt, in which the static electric charge was so great that it slightly deflected the course of the belt.

Another excellent way to eliminate static, and at the same time improve the pulling qualities of a belt, is to fill the belt with a harmless lubricant that will maintain proper moistness and at the same time make the belt so pliable that the pulleys will be firmly gripped. Castor oil and neatsfoot oil are sometimes used, but their action is in time deleterious to the belt. I use "cling-surface."

Slip on the pulleys and internal friction in the belt are the usual causes of static. Eliminate the causes and the effect will also be eliminated.

N. G. Near.

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Detroit Inspectors Meet.

The second annual meeting and banquet of the Electrical Inspectors Club of Detroit, Mich., was held at the Hotel Richter on Thursday evening, February 5. Plates were set for 24.

The guests of the evening were F. R. Mistersky, city electrician, and A. T. Benallack, manager of the Michigan Inspection Bureau. Mr. Mistersky gave a very interesting talk on the evolution and efficiency of electrical inspection and Mr. Banallack spoke on fire hazards from electrical sources.

A report of the ninth annual meeting of the Western Association of Electrical Inspectors, held at Cincinnati, was then read by Ben. W. Clark, president of the association.

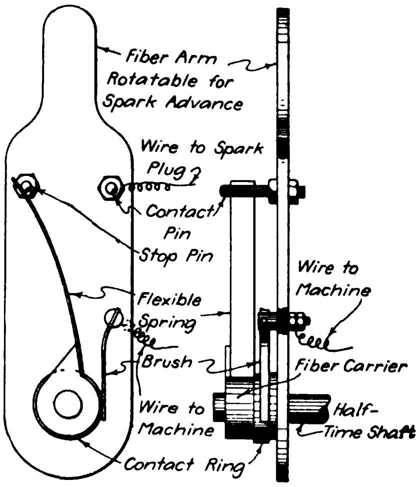
Contact Maker for Spark Plug.

Having had considerable trouble with battery and coil ignition on the single-cylinder stationary motor which I use in my workshop to furnish power for the lathe, drill press, grindstone, etc., I decided to replace the battery with a more dependable source of ignition current. My first thought was, of course, a high-tension magneto, but the high cost of an ignition device of that sort prompted me to think up a scheme to obtain magneto results without incurring magneto expense. Stored away with a number of other pieces of experimental apparatus I had a very simple frictional electric machine, and it struck me that the device when in condition gave a spark with practically the same characteristics as the high-tension magneto spark and equally efficacious for igniting combustible gases. I was, therefore, led to experiment with the machine in an endeavor to fit it for the purpose in hand and the results have exceeded my expectations.

The greatest difficulty was the provision of a suitable contact maker. The fact that the machine, rotated even at comparatively low speed, generated current at a potential sufficiently high for it to jump a gap many times as wide as the space between the plug electrodes necessitated the fitting of a "quick-make" device, so that the contact would be established practically before the spark had time to jump across the closing gap between the contact points. This was accomplished by fitting a flexible spring to the half-time shaft of the engine and arranging a stop pin to interfere with its progress until the spring was flexed to a degree where it would snap with great rapidity against the contact pin when the end slipped past the stop pin. How this was done is shown herewith.

A fiber arm was mounted on the half-time shaft in such a manner that it could be rotated through an arc suitable to accommodate the spark to any position between full retard and full advance; means were provided to hold the lever at the point set. Fastened to the half-time shaft so that it would rotate with it was a fiber carrier, in form somewhat similar to a cam and to which the flexible steel spring was fastened. This carrier was turned with a boss on the side facing the fiber arm and a brass ferrule or contact ring was driven on and connected to the spring by means of a short piece of wire; a brass brush supported by means of a post on the arm contacted with this ring, serving to conduct the current from the electric machine to the spring. Up above on the arm were mounted two pins or posts. The first one was the stop pin which served to retard the progress of the spring. It was so mounted that when the spring—a straightened piece of clock mainspring —first brought up against it, the length of the spring was a half-inch greater than the distance from the post to the other end of the spring on the carrier. Naturally, with this condition, the spring would lag behind the shaft every time it touched this pin until it was flexed enough for the end to slip past, when in an endeavor to make up for the lost time it would increase speed and bring up sharply against the contact pin. This latter was connected directly to the spark plug, so that when the spring hit it the circuit was established and the spark jumped the gap in the combustion chamber.

I found that it was not advisable to rotate the plate of the electric machine too fast, since the potential was enough to produce too large a spark. I also found that very much better results were obtained when a Leyden jar was used with the machine. In this connection, I might add that the condenser made starting quite easy, for it was simply necessary to give the plate a couple of quick turns by means of the hand crank, slipping the belt, of course, when the energy stored in the jar was sufficient to produce the first good spark irrespective of the speed of the machine. J. Naveman.



Contact Maker.

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Alliance Electric Company Takes Over Mr. Eidlitz' Business.

The Alliance Electric Company, New York City, has taken over the business formerly conducted by Charles L. Eidlitz. Mr. Eidlitz, who was the first president of the National Electrical Contractors' Association and has been in the business for 26 years, has retired from contracting work, but the new company will continue the business at 1170 Broadway.

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The Russell Electric & Machine Company, of Tucson, Ariz., has been awarded the contract for the electrical work in the new $100,000 Y. M. C. A. building to be erected in that city.

LETTER TO THE EDITOR.

Regarding Catalog Numbers and Designations.

To the Editor:

Will not some one please devise a system of numbering and naming articles which are as staple as sugar and which every one of the "57" miscellaneous manufacturers and the many jobbers each has a separate number for; why not, if nothing more can be done, list this material, like new Code cutouts and fuse material, as outlet boxes are listed with the same general reference and then have each maker's number so that one does not have to spend so much time looking up catalog numbers and what these numbers apply to; this could be done until some better plan could be devised to eliminate waste of valuable time.

Many manufacturers may object to this on the ground that their article is just a little better than that made by their competitors. Well, then let us establish a sort of "Good Housekeeping Institute" where all devices may be given a fair trial and a report rendered on same; if any device fails in any particular requirement, this defect could be corrected and finally a standard reached whereby the words "60 ampere New Code two-pole cutout" would mean one with a good solid porcelain base and phosphor-bronze contact clips and pure copper pressed lugs, and not a flimsy base and cheap brass or copper-plated metal work mounted on it to just pass the Underwriters' requirements and no more. They must try and be fair in the matter and cannot condemn an article on general principles, but if some standard were set and maintained it would not be long before every maker would be glad to bring his article up to this standard and the "cheap man" would not get a "look in" on the legitimate manufacturer who is trying to put out a good article at a right price.

E. M. Raetz.

Rochester, Minn., January 19, 1914.

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A lease has been closed by the Avery-Loeb Electric Company, 114-116 North Third street, Columbus, O., for the entire five-story building which it now occupies, thus doubling its present floor space. The company secures possession on June 1. Through recent arrangement it is handling Westinghouse goods and orders from this territory are now filled here. To relieve congestion, the company has put in a mezzanine floor on which is accommodated part of the offices and a retail department. Among large contracts now under way are, a six-story building for the Hanna Paint Company, of Columbus, the Elkins, W. Va., and the Delaware, O., high schools.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

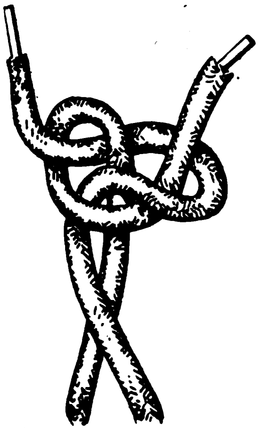
Fishing Wires.

A scheme that I have found useful in finding wires in different places is to use a magnetized hook for feeling around and a fine iron wire attached to a weight for drawing the lead string down. With this magnetized hook one can easily feel the wire when close to it and it is drawn in without difficulty.

N. G. Near.

Knot For Lamp Cord.

A knot that will pull tight and lie flat like a washer slipped over the cord is valuable in wiring up lamp sockets and ceiling rosettes. An appropriate knot for this purpose is shown in the accompanying illustration. If pulled up evenly it will form a flat, solid knot.



Knot for Lamp Cord.

Charles M. Stern.

Warped Cabinets.

I have experienced a great deal of trouble owing to steel cabinets which I have installed having their sides warped out of shape by lathers and bricklayers. The latter force their material against the cabinet and throw the holes in the lugs out of alinement with the holes in the trim, thus necessitating the redrilling of the holes, or at least filing them out on one side.

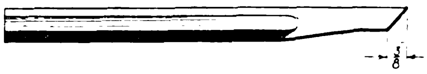
To overcome this, when roughing in I place the trim on the cabinet and then cut two pieces of wood about one inch square which will just fit inside the cabinet. These are forced into place vertically and horizontally, so that they keep the sides of the cabinet from being bent in. After the wire has been pulled in these sticks can be removed and the trim will be found to fit accurately.

A better method is to use metal strips with holes corresponding to those in the lugs and fasten these in place with the screws which will eventually be used to keep the trim in position.

John Shortt.

Drilling Holes in Concrete.

I have found the best way to drill large holes in concrete is to first drill a small hole with a three-quarter-inch star drill and then enlarge it to the desired size with a drill shaped something like a cape chisel. It is made from either a five-eighth-inch star drill or an ordinary piece of five-eighth-inch octagon tool steel forged out and dressed up as shown in the accompanying illustration.

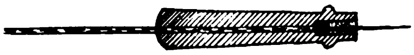


Special Drill.

H. W. Parsons.

Device for Testing.

The accompanying illustration shows a device that I find almost indispensable in testing work. When testing for open circuits, grounds or short-circuits it saves stripping the insulation from the conductor. The device is made from an old 100-ampere-switch handle bored through its whole length to the diameter of a flexible lamp cord. The switch end is then bored to a larger diameter. A large sewing needle is then procured and the eye end is soldered to a length of lamp cord. This cord is drawn through the handle and the needle made secure by filling the large hole flush with the end with sealing wax or cement of the kind that is used in fixture work.



Needle Contact for Testing.

Robert Oster.

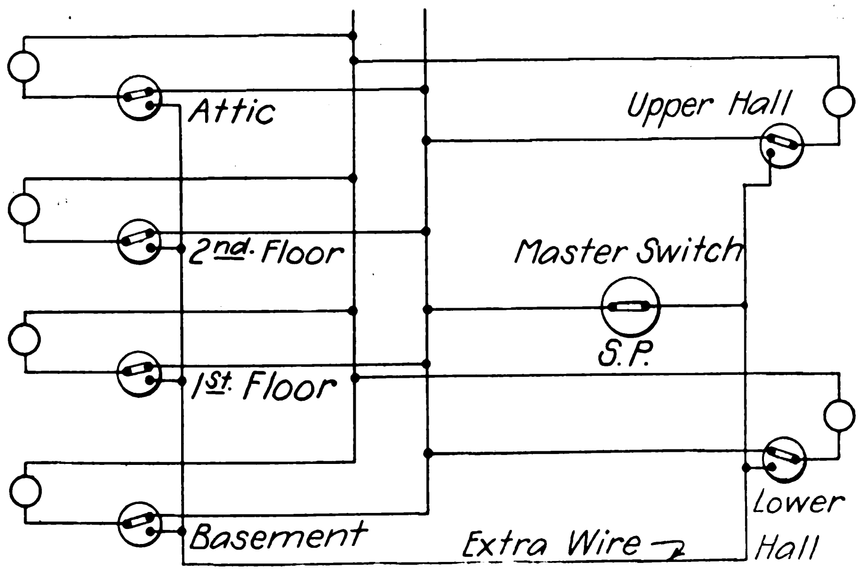
Making up Split Knobs.

A great deal of time can be saved by having split knobs made up beforehand ready for use. This is done by placing a leather head on a ten-penny nail; then put it through the knob and place another leather head on the projecting end, which holds the pieces of the knob together until ready for use. The shop boy can put these parts together in spare time.

P. H. Krantz.

Control Switch.

A master control switch can be put in a house which is already wired without excessive cost by replacing the single-pole switches by three-way switches and running one extra wire, as shown in the accompanying diagram.



Wiring for Control Switch.

W. C. Dee.

Removing Meter Pivots.

In the issue of October 25 George W. Martin gave a method for removing the pivots of meters when they are held up on account of the pivot or shaft being magnetized. I have tried this method, also spinning the disk, jarring the shaft, forcing the pivot in a wooden plug, and other ways, but find that none of them is as good as the following:

I use a short hook on the end of a meter seal or other convenient piece of wire and insert it into the jewel support, and upon turning the wire the pivot will fall out.

Charles E. Rietz.

Public Service Commissions

ILLINOIS.

Chief Engineer Appointed. Robert M. Feustel has been appointed chief engineer of the Illinois Commission. Mr. Feustel has been with the engineering department of the Wisconsin Commission, and has done independent construction work in many states as a member of the firm of Sloon, Huddle, Feustel and Freeman of Madison, Wis.

The Chicago & North Western Railway Company is authorized to issue $11,184,000 bonds for the purpose of paying of indebtedness and $10,000,000 equipment trust certificates to be used in paying for new equipment.

The Central Illinois Public Service Company was authorized to cross overhead with an electric distribution line the tracks of the Baltimore and Ohio Southwestern Railroad Company. It was ordered that a bill be presented to the Public Service Company in the sum of $5.00 for the expense of the Commission in making examination of such crossing.

INDIANA.

Arguments are being heard before the Commission in the Indianapolis Arbitration case between the streetcar company and former employees. This case is occupying the Commission's time and little progress is being made in other matters.

Sale of Public Utility Bonds. In an opinion given the Commission, Attorney General Honan held that the Public Service Commission has no authority, under the Indiana Utility Statute, to authorize the sale of bonds of a public utility at less than 75 per cent of their face value, excepting only bonds authorized prior to February 1, 1913 and not issued. These may be sold, if the Commission so authorizes, at not less than 65 per cent of their value. The opinion also states that no utility can be authorized by the Commission to pledge its bonds as collateral for less than 75 per cent of par value.

MASSACHUSETTS.

Cambridge Electric Light Company. The Board of Gas and Electric Light Commissioners has approved the issue of 500 shares of new capital stock of the par value of $100 a share, at the price of $200 per share. The proceeds of 425 shares are to be applied to the payment of the Company's notes outstanding December 31, 1913, and of 75 shares to the payment of the cost of additions made subsequent to that date. At the beginning of the present year the company had notes outstanding to the amount of $85,000 on account of expenditures for additions to plant. The cost of further additions already determined upon will exceed the remaining proceeds of the stock approved by the Commission.

Haverhill Gas Light Company has been authorized to extend the gas service to the towns of Groveland and Merrimac, adjacent to the City of Haverhill. The selectmen of the two towns have voted to grant the company the necessary permission to open the streets. It appeared at the hearings that the company proposes to build at once distributing systems in Merrimac and Groveland, and to supply the former town by a high-pressure system and the latter by an extension of the present low-pressure distribution system in Bradford.

NEW YORK.

The Third Avenue Railway was authorized by the Public Service Commission First District to issue $4,000,000 in four-per-cent first refunding mortgage bonds, maturing January 1, 1960. The bonds are to be sold to net the company not less than 82 per cent of par value. An allowance is made of $720,000 for expenses in sale of bonds and for discount, but this amount is to be amortized by payment each year into a separate fund sufficient cash to accumulate the amount of $720,000 by January 1, 1959. Action was deferred in the additional $2,650,000 of bonds applied for by the company.

OHIO.

The Ashtabula Rapid Transit Company has been authorized to issue $40,000 of bonds to pay back money spent for betterments and improvements to the property. E. W. Doty, commissioner, dissents from the majority ruling holding that the capitalization is out of proportion to the needs of the road.

OKLAHOMA.

Gas and Electric Utilities. The Corporation Commission has issued its revised order requiring gas and electric utilities to report original cost of their properties and to file profiles and plates. The order contains the requirements as to classification of property accounts and the instruction to the company as to making the reports. These reports are to be filed with the commission July 31, 1914, as of June 30, 1914.

PENNSYLVANIA.

Free Passes. Administration Ruling No. 1 holds that the issuing of free passes to officers and employees of a railroad or street-railway company is not to be regarded as a violation of the provisions of the Public Service Company Law. This ruling gives some indication of the probable attitude of the Commission toward reduced rates for employees of gas and electric companies.

Telephone Investigations. The Commission has been working on telephone rate hearings and has adjourned until March 3.

RHODE ISLAND.

Narragansett Electric Lighting Company. Complaint has been made to the Commission alleging discrimination in electric power rates against manufacturers in Cranston.

WISCONSIN.

Mosinee Electric Light & Power Company. The Commission has issued an order readjusting the rates for lighting and power, changing the form of schedule. The minimum bill is reduced from 75 cents to 50 cents.

Village of Withee applied for authority to increase electric rates. The village is operating an electric plant which is privately owned, the object of such arrangement being that the city wishes to determine the cost of operation of the plant. It was ordered that the new rates be put in effect as fixed by the Commission.

Wisconsin Public Service Company of Fond du Lac was granted permission to purchase the property of the Minahan Electric Company also of Fond du Lac, and was authorized to issue $110,000 of first mortgage refunding five-per-cent gold bonds to be exchanged for a like amount of bonds previously issued by the latter company.

Madison and Janesville Traction Company was authorized to issue $10,000 in stock, the proceeds from which are to be used in defraying the preliminary engineering and organization expenses incident to the construction of a line of interurban railway to connect Madison and Janesville.

The La Fayette County Telephone Company was authorized to issue $30,000 capital stock, $6,000 of which is to be exchanged for property of the White Oak Telephone Company.

The Richland Telephone Company was authorized to issue $20,000 of stock. The stock is to be sold for money only, and not less than the par value thereof as required by the statute. The proceeds of the sale of stock are to be used as partial payment of certain notes now outstanding against the company, such notes having been incurred on account of the construction of the telephone exchange and system.

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American Telephone & Telegraph Arranges for Disposition of $30,000,000 of Western Union Stock.

The American Telephone & Telegraph Company has arranged with Kuehn, Loeb & Company, New York bankers, to underwrite the sale of $30,000,000 of stock of the Western Union Telegraph Company, held in its treasury. The stock will be offered to present holders of Western Union shares, and it is understood that Kuehn, Loeb & Company stand ready to take any portion for which subscriptions are not received.

By giving Western Union stockholders an opportunity to increase their holdings of telegraph shares the American Telephone & Telegraph Company officials maintain that no question can be raised of their sincerity in separating the two companies. The $30,000,000 of stock held by the American Telephone & Telegraph Company represents less than one-third of the outstanding Western Union capital, and the sale will mean a distribution of a minority interest among the owners of the majority stock interest in the company.

The sale of the shares will be accompanied by a promise that the dividend soon will be increased from three per cent to four per cent. The further hope will be held out of an increase later to five per cent, if the earnings of the company continue to increase as they have in the last few years. The American Telephone & Telegraph control of the Western Union brought with it a policy of making liberal application of earnings to the property for upkeep and additions.

Convention of Electrical Supply Jobbers' Association.

The midwinter meeting of the Electrical Supply Jobbers' Association was held in Washington, D. C., February 17, 18 and 19. Sessions were held at the Hotel Raleigh with Franklin Overbagh, general secretary, in the chair. An unusually large attendance was on hand and considerable interest was shown at all of the sessions.

An open session was held on Wednesday afternoon, at which J. E. Latta, of the Underwriters' Laboratories, Chicago, Ill., presented a paper entitled, "The Education of the Public in the Use of Standard Electric Wiring Materials." This paper, which makes a strong plea for the use of approved wiring devices and electrical supplies of all kinds, will be published in full in an early issue.

On Wednesday night Oscar W. Underwood, congressman from Alabama, addressed the meeting on the subject "Relation of Politics to Business."

One of the important matters taken up at the meeting was the question of applying for membership in the Chamber of Commerce in the United States. The Association decided by unanimous vote to become a member of the chamber, this action following an address by W. E. Robertson, of Buffalo. In his address Mr. Robertson touched upon the advantages to be gained from membership in the organization, representing, as it does, the principal business interests of the country. He stated that through membership the Electrical Supply Jobbers' Association would have the right to ask for a referendum of opinion among the business interests of the country in matters that may arise.

On Tuesday evening a rejuvenation of the Jovian Order was held at the Hotel Raleigh at which about 50 candidates were initiated into the order. The ceremony was in charge of Robert B. Patterson, statesman, Arthur Dunlop, statesman-at-large, John C. McLaughlin, secretary, W. B. Hadley, secretary, and C. A. Peterson, treasurer, of the local Jovian organization, assisted by the following committees:

Membership committee: Arthur Dunlop, Louis D. Carroll, George H. Maynard and C. A. Paterson.

Entertainment committee: John C. McLaughlin, Alan J. Bachrach, and Robert B. Patterson.

Rejuvenation committee: E. S. Marlow, Arthur Carroll, M. Du Perow, John R. Galloway, E. Gramm, W. B. Hadley, George H. Maynard, Julius M. Schneider and G. G. Webster.

Joviation committee: Thomas J. Fisher, Leo Brooks, Oscar Evans, Paul Lamberton, Arthur Dunlop, J. H. Finney, and T. L. Townsend.

Panama Canal Switchboards Described for Chicago Electrical Engineers.

A joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, was held in the room of the latter society on the evening of February 23, D. W. Roper presiding. E. W. Hewlett, engineer of the switchboard department of the General Electric Company, was scheduled to make an address on the electrical control of the lock machinery for the Panama Canal. In the absence of Mr. Hewlett, who had been called back to Schenectady, C. H. Hill, who was associated with Mr. Hewlett in the design of this equipment, made the address.

Mr. Hill described the general operation of the lock machinery and the reasons for making its control entirely electrical and of the remote-control type. The use of purely mechanical, hydraulic or compressed-air methods was not deemed feasible because of the lower efficiency of the equipment and the large operating force that would have been required. It was decided to concentrate the control equipment for each lock in a central control station in which there would be associated with the control switches a complete model of all parts of the locks. In this way interlocking of the control apparatus could be readily secured, the operations simplified so as to require the minimum number of employees and responsibility for all features of the operation centralized.

With the aid of numerous lantern-slide illustrations Mr. Hill described at length the various features of the electrically controlled equipment for the lock groups. He referred particularly to the control for the chain fenders, to the control of the valves in the culverts used for filling and emptying the locks, to the operation of the mitering gates, to the special position indicators and to the elaborate system of interlocks. The entire control equipment for the lock machinery was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 27, 1913, and will therefore not be referred to at length in this brief report.

Before closing his address, Mr. Hill had a series of moving pictures displayed in which the operation of one of the control equipments, that for the Miraflores locks, was made clear. The sequence of operations and the perfection of the interlocking system was thus demonstrated. The discussion of the subject was confined almost exclusively to a series of questions referring to details of the control equipment.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 200. — Electrically Operated Phonograph.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played: has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 202. — Rewinding Motor. — What size wire should be used to rewind a one-half-horsepower, 220-volt, direct-current, bipolar, shunt-wound motor to be used as a generator to deliver 15 amperes at 30 volts? How many turns should there be in each armature coil? How many feet of wire in the field coils?—G. R. L., Sioux Falls, S. D.

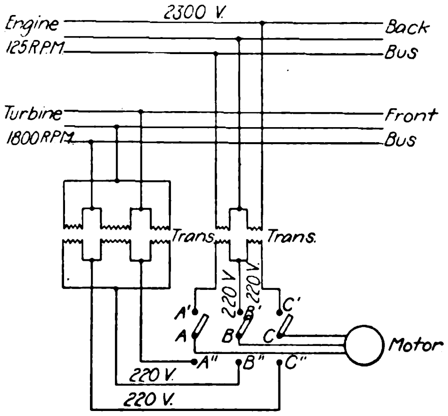
No. 203.—Service-Entrance Conduit.—When the wires of service companies are run aerial, would the Code require sealing the ends of the conduit that runs down the side of the pole and from the base of the pole underground into the basement?—G. R. L., Sioux Falls, S. D.

No. 204.—Highest Voltage.—What is the highest known voltage ever developed in any electrical apparatus?—M. L., Oak Park, Ill.

No. 205.—Lamps for Blue-Printing Machines.—What kind of lamps are best to use for blue-printing machines, carbon arc lamps or mercury-vapor lamps?—H. I. N., St. Louis, Mo.

Answers.

No. 194.—Motor Circuit.—In operating a hot-well pump, we use a 220-volt three-phase motor, which derives its energy from a bank of three five-kilovolt-ampere transformers that are in turn fed fom an outgoing power circuit. Any outside disturbance on this particular line would always drop the switch and consequently shut down the pump. In order to avoid this difficulty we used two transformers of 7.5-kilovolt-ampere capacity which were fed from the back bus-bars, the leads being clamped to them. The secondary leads were run to the upper and lower terminals of a triple-pole double-throw knife switch, using the hinge terminals for the leads to the motor, as per diagram herewith. At the time of phasing out so as to keep direction of rotation the same, one turbine-driven generator was operating on the front buses, and an engine-driven generator on the back buses. In testing we used two 110-volt lamps in series and from terminal *A'* to *A''* there was no light, from *B'* to *B''* no light, and from *C'* to *C''* no light, but from *A'* to *C''* the two lamps burned dimly. We could not secure any light from any other connection. Thinking possibly that the dim burning of the lamps between *A'* and *C''* was caused by the generators coming up to synchronism, we inserted the plugs, but they were nowhere near that point, as the lamps on the synchronoscope and the instrument itself plainly showed. I have tried this over a great many times with the same result, which I cannot account for. Can some of your readers explain it?—R. J. H., Mason City, Iowa.



No. 194.—Motor Circuit Diagram.

The writer begs to differ with E. J. R.'s answer to this question in the February 14 issue. In the first place he states that the maximum voltage would be 380 volts, whereas when the machines are within a quarter of a cycle of synchronism the voltage across the clips would be 440 volts. This I am inclined to think would hardly cause any current to creep across the switchboard through the dust thereon; if a metallic vein existed in the marble, it would be almost certain to show up. I believe that some connection will be found between some phase of the two machines, possibly in the synchronizing connections, that will cause this condition, either through a condenser action or through some metallic path.—J. H. M., San Francisco, Cal.

No. 196.—Speeding Up Street Cars.—If an electric street car designed for a maximum speed of 25 to 30 miles per hour is to be run part way in a rapid-transit subway at a speed of 40 to 45 miles per hour, can the motor and control equipment be readily adapted to the higher speed desired or must a motor equipment designed for the higher speed be substituted? Could this be accomplished satisfactorily by changing the ratio of the reduction gear?—B. F., Chicago, Ill.

You do not give enough data to answer your question, but as you are from Chicago I presume that you are interested in the project to run the present surface cars through the downtown district in subways. This project does not contemplate a rise in maximum speed of the cars, but an increase in the average schedule speed. The present maximum speed is 30 miles per hour. The average schedule speed is 9.25 miles per hour. By running the cars through subways in the downtown district the stops per mile and the headway could be reduced, causing an increase in schedule speed, which, in turn, would mean more seats per hour; under this condition the schedule speed would more nearly approach the maximum speed. With a maximum speed of 30 miles per hour, a loaded 25-ton car will require approximately 140 horsepower; to increase this to a maximum speed of 40 miles per hour would require about 200 horsepower if the heating effect was to be the same as before. The only means that can be used in your case to increase the maximum speed is to change the gear ratio. Having determined this, see if it is possible to operate the old equipment at the new loading without excessive heating. In the majority of cases this will be found impossible. An increase of gear ratio causes an increase in speed with a corresponding decrease in tractive effort with the same value of current or it gives an increased available maximum speed with an attendant increase in current, and consequently increased heating of the motors. As a rule, the tendency is to gear motors too high, causing heavier motors to be required and giving an excess speed that is hardly ever used. It is frequently the case that the motors are required for mixed service, and it is desired to operate at higher speeds in one part and lower in another; the motors are therefore geared for the higher speed, regardless of the fact that most of their operations are in the part where high speed is impossible. It can be easily proven that the maximum speed can not be economically increased without a change in motor equipment. At any rate in this particular case increased service will be had by reason of the decreased stops and slowdowns through use of the subway.—H. E. W., Chicago, Ill.

No. 197.—Long-Distance Telephones.—In order to have satisfactory conversation over a very long telephone line, is it necessary that the telephones used at the ends of the line be of exactly the same make, or is it sufficient to have them of the same general type and built for long-distance service?—U. S. P., Cedar Rapids, Iowa.

It is very evident that as the length of the line increases the sensitiveness and accuracy of transmission is decreased. This is also the case where cable is used in place of open lines for the same distance. It is also evident that, if the lines are of any length and are loaded, there will be less distortion of the voice waves.

The consequence of this would be that instruments of different make could be used. As a rule each manufacturer of telephone instruments has his own particular values of resistance, inductance and capacity in designing talking circuits. The induction coil has been the part to have the widest difference in design. If two instruments with induction coil designs that differ greatly in resistance and inductance are used, talking will be difficult even on common long-distance lines. If the instruments to be used are of different make I would advise checking them up as to similarity of induction coil, receiver and wiring. In long-distance telephony the attenuation must be reduced as much as possible, but especially so where the line has a number of distributed telephones of different type. Attenuation means the reduction of power during transmission, so that only a portion of the energy supplied to the line at the sending end will arrive at the receiving end. It is not only necessary to reduce the attenuation as much as possible but to also make the distortion a minimum. The sound to be transmitted is the superposition of many fundamental sounds of different pitches; correspondingly the current impressed on the line can be resolved by Fourier's theorem into a series of sine waves of different frequencies and phases. If these different sine waves are not attenuated all in the same proportion, the sound received at the receiving end will be distorted. To be on the safe side use instruments of the same make, if more than one is used per line or if there is no means of testing them. This would be my advice, too, if the line were very long.—H. E. W., Chicago, Ill.

No. 198.—Wiring for Electric Ranges.—In wiring up for a number of electric ranges and hot plates in a small hotel kitchen, is it necessary to run a separate circuit for each outfit or can several of the smaller stoves be put on the same circuit? The larger ranges would each take about two kilowatts and the smallest about 600 watts. My plan would be to put three of the small stoves on a circuit and make each circuit heavy enough for two kilowatts. Would it be necessary to put a pilot lamp on each circuit?—G. S. T., Winnipeg, Can.

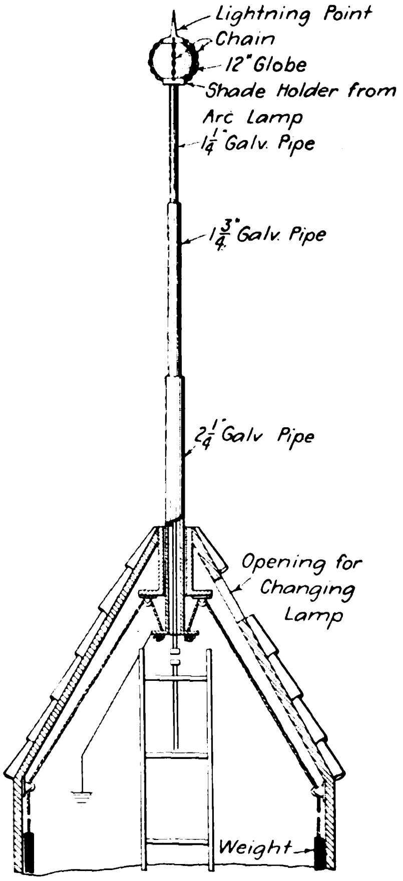
Your plan of putting three small ranges on a circuit and making all circuits heavy enough to carry two kilowatts is very good. If you wire each range separately it will mean a lot of extra wiring and expense. On the other hand, if you put too many on one circuit, in case a fuse blows or trouble appears on the circuit it will mean that all those stoves will be out of commission. Again, wiring all circuits very nearly alike will do away with carrying a stock of different sizes of fuses. A pilot lamp would be a desirable indication as to whether the current is on or off. In my opinion you have the right plan in mind.—W. T. E., Seymour, Conn.

In wiring for electric ranges for a kitchen the National Electrical Code states that "Each heater of more than six (6) amperes or 660 watts capacity must be protected by a cutout and controlled by a switch or plug connector plainly indicating whether 'on' or 'off' and located within sight of heater." If small heaters are grouped so that they do not require over 660 watts they can be protected by a single cutout and fused to 10 amperes. The proper method and the one costing the least would be to run a set of three wires as feeds (if a three-wire system is used) to a central point in the kitchen and distribute to each range or group of heaters with a separate feed protecting each feed with a knife switch and cutout. Switches should be in plain view of the range and it would be well to install a small red lamp in the circuit so same will burn when the heating device is in use. A main switch should be inserted in the main feed so that the entire equipment can be disconnected. All feeders should be of ample size so that when the whole equipment is in use the voltage will not be less than that for which the apparatus is designed.—C. T. P., San Francisco, Cal.

As each of the heating devices would consume energy amounting above the Code lighting-circuit limit it would be in violation of the Code to connect them on a lighting-circuit branch. Hence a special heater circuit would be used, and it is immaterial whether the heaters are all put on one branch or a branch run for each individual heater or group of heaters, if the wire is large enough to be protected by the fuses used. The advantage of separate branches for each heater is that in case of trouble in one heater it can be isolated from the others and not cripple the entire service. There would also be an advantage in that a smaller fuse would be used to protect each heater, which, in case of trouble, would prevent as great a flow of current through the fault as would be the case were several of the heaters on one branch. Considering the size of the heaters and that they would probably be under a close watch I would not use a pilot light, but would insist that an indicating switch be used and mounted in plain view from any point where the chef might be.—H. E. W., Chicago, Ill.

No. 199.—Steeple Lights.—We have a proposition of putting an electric light on top of a church steeple which is extremely high. The nearest opening to the top of the steeple is 30 feet below the apex. I should like to inquire through your columns whether any contractor ever had a job of this kind and as to how he arranged things so that the lamp would be protected from hail and easily lowered for replacement, so as not to require the frequent services of a steeple jack. Being a church tower, any device installed must, of course, be of sightly nature.—F. W. R., Freeport, Ill.

We have installed a light pole on our new fire station which extends 25 feet above the top of the tower; the problem was somewhat similar to that of F. W. R., but we could make an opening near the top. When an alarm comes in from any of the boxes or telephones the red lamp on top of the pole is automatically lighted and continues to burn until it is known that the fire is extinguished. As shown in the accompanying sketch, the pole is made up of three pieces of galvanized pipe to give it strength and a tapering effect. The pole is slightly overbalanced by having steel ropes pass from the flange at the bottom of the pole over pulleys to counterweights that hang in the tower. The lamp is near the middle of a heavy 12-inch alabaster glass globe that is secured in a shade holder from an old Fort Wayne arc lamp. On top of the globe is a lightning point connected by four chains with springs to the shade holder, which is tightly connected to the top of the pole. Near the bottom the pole is connected to a well grounded copper lightning rod protected all the way by one-half-inch conduit. The latter is not shown in sketch. The wires for the lamp in the pole end in a receptacle at the bottom which is connected by a short flexible jumper with plug to the lighting circuit coming up from below. A small opening, like a porthole, gives access to the globe and lamp when the pole is disconnected from the jumper and lowered.—P. O. H., Sioux Falls, S. D.



No. 199.—Steeple Light.

The Public and the Telephone Service of a Big City.

In a recent issue of the *Tribune,* of Chicago, Ill., several articles have appeared relating the difficulties and complaints which are made from time to time in the relation of the telephone company to its patrons in Chicago. These articles have been written by Henry M. Hyde, who has published the following interview with H. F. Hill, general manager of the Chicago Telephone Company in the *Tribune,* setting forth the company's side of the question:

"It will always be the easiest thing in the world to attack the service of the Chicago Telephone Company in the newspapers.

"The average daily number of telephone calls in Chicago is 1,800,000. These calls come from more than 340,000 separate telephones. Each of them is handled by two of our more than 6,000 operators.

"If each operator makes one mistake in every hundred calls she handles the total number of errors will be 36,000 a day.

"In other words, if the work of our operators was 99 per cent perfect there would still be 36,000 people every day who would have a more or less legitimate reason for complaint.

"We have not yet succeeded in reaching such a high standard, though we are working towards it and we keep continually trying to cut down the number of avoidable errors.

"Since last October our careful tests show a slight, but steady, improvement in the service. At present we have set our standard at 94 per cent perfect. If, for any reason whatever, we find that more than six per cent of errors are made in handling our 1,800,000 calls per day we feel decidedly uncomfortable. If we succeed in cutting down the number to below six per cent we are correspondingly encouraged.

"We have several ways of keeping daily track of the quality of our service. The most important is the observation switchboard. It is located here in the main offices of the company and is manned by our most expert and accurate operators.

"Fifty or 60 of the busiest lines in one exchange after another, all over the city, are switched on to this observation board and every call going over them is watched and recorded. With a stop watch before her the observation board operator keeps a record of the exact time elapsing between the calling of a number and the completion of the connection. If there is delay we investigate the cause and take steps to prevent its recurrence.

"As a result of this careful work, which goes on continually, we are able to get 96 per cent of all our calls answered in 10 seconds or less. The average time occupied in completing a connection is only four seconds.

"It is interesting to recall that not many years ago a telephone connection that was completed in 30 seconds was called speedy. And I can recall when a minute was not considered an unusual time in which to get the desired number. The public demand for prompt action grows with the improvement in our service. We are doing our best to keep pace with it.

"At the same time the observers keep track of every error which is made in handling the calls going through the board and trace each to its source.

"The most common error is that which results in the subscriber getting the wrong number. Our tests, carried on over a series of years, show that about one-third of such errors result from the subscriber giving the wrong number, or the wrong exchange, to the operator. The other two-thirds are due to the mistakes of our operators. This percentage is just what would be expected when one knows that in each call one subscriber and two operators are involved.

"The chance for error in selecting the exact number wanted out of 350,000 possible numbers is enormous and it is, it seems to me, remarkable that 'wrong numbers' result in only three and one-half per cent of the total number of calls.

"Altogether we put from 12,000 to 15,000 calls under the microscope every month, and in the course of a year we are able to get a very fair check on the service in each of the territories served by the thirty branch exchanges in Chicago.

"A telephone company is under a great disadvantage in working to improve its service. The product of an ordinary factory can be put on the table, weighed, measured, and tested by the inspection department to determine exactly how close it is to the desired standard.

"A telephone company sells facilities for conversation, which is completed in a few minutes and which leaves no traces behind it. The tests must be applied while the connection is being made. And there are few, if any, lines of business in which 1,800,000 transactions are completed every 24 hours, in each of which there are three human factors involved—one subscriber and two operators.

"The telephone company cannot, of course, control the action of the subscribers—except to point out, as we have done, the various ways in which it is easy for a subscriber to make a mistake. So far as our 6,200 operators are concerned, we exercise the greatest care in their selection and training and we have left nothing that we can think of undone to make the conditions under which they work conducive to accuracy and speed.

"Incidentally, I feel that the young women who operate our switchboards will average as high in intelligence and devotion to their work as any similar number of employees in the world.

"As an evidence of how careful we are in selecting operators I may say that out of 4,800 applicants for positions in our service during the last year only about half were able to pass the searching mental and physical tests to which all candidates are subjected. And before the school term was over about 800 more dropped out, leaving 1,600 of the most fit to complete the course.

"All the pupils admitted to our training school are paid from the start. We furnish to them and to all our operators—simply as a matter of good business—a warm luncheon during the noon hour. The young ladies work eight hours a day with 15 minutes for recreation at the end of each two hour period. We employ six visiting nurses, whom the operators are invited to call on for assistance in case of even the most trifling ailment. Many of our exchanges are equipped with roof gardens, where the operators may catch a breath of fresh air during the summer recreation hours. At other exchanges we have fitted up outdoor gardens, with benches, swings and other facilities for recreation.

"We employ no young ladies who are not at least 16 years old, and the average age of our operators is 20 years.

"We should be glad to have suggestions as to what we can do to further improve the efficiency of our working force. We invite the co-operation not only of the public but of the municipal complaint bureau.

"It is impossible that prompt and perfect service should be of more importance to any of our subscribers than it is to the Chicago Telephone Company."

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Prizes for Fiftieth Anniversary Celebration of Columbia School of Mines.

Three prizes have been offered by the Committee on the Celebration of the fiftieth anniversary of the School of Mines, Columbia University, two of which are open to all graduates of Columbia, and the other open to all. The prize open to all is $100 for a poster which shall fittingly indicate the anniversary, and the judges will be

Austin W. Lord, dean of the School of Fine Arts at Columbia, Edward H. Blashfield, and Robert W. Chanler; designs must be submitted on or before March 15. The other prizes are $50 each for a Columbia song, and a Columbia poem, for which entries will close May 1. All competitors must send their work to Frank D. Fackenthal, secretary to the Committee, at the University. The judges of the poems and songs will be John Kendrick Bangs, Brander Matthews, John Erskine, Frank Dempster Sherman, Walter Henry Hall.

Plans are practically completed for the celebration, which begins on May 28 with a reception in the gymnasium at which the alumni will be welcomed by the president of the University, the dean of the School of Mines, the senior professor (Henry S. Munroe), the chairman of the Celebration Committee, and others. In the forenoon of May 29 there will be a big meeting in the gymnasium at which President Nicholas Murray Butler will preside, and degrees will be given to prominent alumni of the School of Mines. It is also expected that there will be sectional meetings of the various engineering graduates in the afternoon, with the first lecture in the Charles F. Chandler Foundation by an eminent chemist, at which Dr. Chandler, the last survivor of the founders of the School of Mines, will preside. The celebration will close with a banquet at the Waldorf-Astoria at which prominent graduates will speak.

N. E. L. A. Exhibit Committee Formulates Convention Exhibition Plans.

A meeting of the exhibition committee of the National Electric Light Association was held at the offices of the Association, New York City, on Monday, February 16. Those present were J. W. Perry, H. W. Johns-Manville Company; W. M. Skiff, representing S. E. Doane of the National Lamp Works of the General Electric Company; L. W. Shugg, representing F. H. Gale of the General Electric Company; W. C. L. Eglin, representing President J. B. McCall of the National Electric Light Association; T. Commerford Martin, secretary of the National Electric Light Association, and secretary of the Exhibition Committee, H. G. McConnaughy.

The proposition of the Bellevue-Stratford Hotel was accepted for the meetings of the National Electric Light Association and headquarters, also for the exhibit of the Class D members.

Contracts were let for the decorations of the roof of the Bellevue-Stratford for exhibits. These will be the most unique and artistic ever attempted by the Association. It is considered that the top floor of the Bellevue-Stratford Hotel, which will be used exclusively for exhibits, and the restaurant is the most complete and artistic roof in the world. Many of the rooms are 30 feet high, all enclosed, with a view for miles over Philadelphia from any of the windows. The decorations as planned by the exhibition committee will be in keeping with the beautiful decorations of the various rooms.

The exhibition committee will send out a general letter together with duplicate information cards and it is hoped that every prospective exhibitor will fill out these cards and return them promptly to the secretary of the exhibition committee. Application blanks and plans with details will go forward as soon as they have been completed.

The Philadelphia Electric Company will make every effort to complete details looking to the comfort and satisfaction of the visitors. Mr. McCall is giving all plans for the convention his personal attention and is looking forward to a banner convention.

Controversy Over Power Sites in National Forests.

The Beaver River Power Company and L. L. Nunn were made codefendants in a suit in equity instituted at Salt Lake City, Utah, by the Federal Government on grounds similar to those which formed the basis of the suit still pending against the Utah Power & Light Company. The action involves the right of the power company to occupy and hold possession of lands within a national forest reserve for the development and transmission of hydroelectric power without having obtained permission from the Department of the Interior and the payment of a rental.

It is alleged that since July, 1911, the defendants have engaged in the operation of hydroelectric power works located on what is now designated as the Fillmore National Forest without having secured permission from the government to do so. Its existance on the land is alleged to be a trespass.

The camplaint asks that the defendants be required to secure permission for the possession of the lands and also to reimburse the government for a reasonable amount as rental during the period of the past occupancy.

The case opens up the whole subject of federal and state control of the public domain. The power companies hold that they are entitled to the lands under the federal act of 1866, while the government contends that the provisions of this act which provided for the occupancy of the public domain for power sites were repealed by implication contained in the later federal act of 1896, which laid down regulations by which easements for limited terms of years could be secured.

The first case to be brought under the government's construction of the law governing such power sites on the public domain was that against the Utah Power & Light Company. The decision rendered in the United States District Court at Salt Lake City was in favor of the defendant company, but on an appeal to the United States Circuit Court of Appeals, the decision of the lower court was reversed last October. The case is still pending on a motion for a rehearing before the Court of Appeals.

Railway Electrification in England.

On February 12 the Institution of Electrical Engineers held the first of a series of meetings arranged for the discussion of various aspects of electric traction, at London, Eng. The subject was opened by Roger T. Smith who generalized on some of the railway conditions governing electrification, especially in England, and covered in turn, (1) urban and suburban passenger services, (2) fast passenger service, and (3) freight and mineral traffic. The next meeting (February 26) will consider "Motor and Control Equipment for Electric Locomotives," by F. Lydall, and "Rolling Stock and its Design and Influence on the Energy Consumption of Trains," by H. E. O'Brien. March 12 will be occupied by Professor Miles Walker with "The Design of Traction Motors for Alternating and Continuous Currents;" April 2, with "Electric Signallig on Railways," by H. G. Brown; and the series will be brought to a conclusion on April 23 by "Electrification of Railways as Affected by Traffic Considerations," by H. W. Firth.

Electric Cooking in Boston.

The Edison Electric Illuminating Company of Boston, Mass., is making a rate of three cents per kilowatt-hour for heating and cooking load when connected on a separate meter. The company has recently issued folders to its customers calling attention to the advantages of electric ranges and stating that the average cost is about $1.00 per person per month. The cost of operating at the above rate is said to be equivalent to cooking with a gas range with gas at $1.10 per thousand cubic feet.

One customer who is using the Simplex range has stated that 165 kilowatt-hours were used in preparing 216 meals, or about 2.3 cents per meal.

THE HYDROELECTRIC POWER SITUATION IN THE NORTHWEST.

By J. J. Wettrick.

By way of introduction, a short resume of the situation in the United States as a whole would, perhaps, not be out of place.

In a report prepared in 1908 for the National Conservation Commission, the United States Geological Survey estimated the total water power of the United States on bases of what are practically equivalent to maximum continuous power for the average year, and the maximum continuous power for six months of the average year, at 40 million, and 67 million horsepower, respectively. This estimate makes no allowance for storage.

An analysis of the estimate on the above basis shows that it is very likely too high and the Survey states expressively that its estimate be interpreted for future availability, rather than present possibility:

"The schedule shows, therefore, what will be the maximum possibilities in the day when our fuel shall have become so exhausted that the price thereof for the production of power is prohibitive, and the people of the country shall have been driven to the use of all the power that can reasonably be produced from the streams."

Anticipating future improvements in water wheels, the estimate is based on the assumption of 90 per cent efficiency of power on the turbine shaft as against the usual rating of 75 or 80 per cent. A further probability of error when viewed in the light of present conditions and practice, exists in the use, in calculating the theoretical power of the various streams, of 90 per cent of the total fall in the section or sections constituting units for development into which the streams were divided. Taking, then, the latter at 80 per cent and the former at 75 per cent, we get a value equal, approximately to 74 per cent of the above amount or approximately 30 million horsepower for maximum continuance for the average year, and 50 million horsepower for maximum continuance for six months of the average year. It must be borne in mind that these figures do not include storage possibilities.

Various estimates have been made of the total water-power possibilities of the United States based on storage, but none of them are of a nature to inspire confidence in their accuracy, due to the fact that they are based on insufficient data. An estimate based on storage is dependent upon so many factors, such as storage capacity, value of land to be submerged, possibility or feasibility of constructing dam, cost of dam, stream flow, etc., that any reasonablly correct estimate would involve a careful survey of every project in the country. Probably the best estimate available is one contained in the report of the United States Geological Survey above referred to, and is by M. O. Leighton, chief hydrographer of the Geological Survey. He says, after some explanatory remarks as to how he arrives at the amount, "It may be assumed with confidence that, were all practical storage sites utilized and the water properly applied, there might be established eventually in the country a total power installation of at least 200 million horsepower." It is not clear from the statement, but this probably does not mean continuous power, but the total installation that under common practice would be considered economical.

The total rated capacity of all the "prime movers," steam, gas, waterwheels and electricity used in all the manufacturing industries in the United States in 1909 was 18,657,000 horsepower. Assuming that every one of these prime movers at some time during the year is running at full capacity, which, however, is hardly probable, and using a diversity-factor of 1.5, we get a result of 12,450,000 horsepower as the required central-station capacity to furnish all the power consumed in the manufacturing industries in the United States in 1909. This does not take into consideration the power loss between central station and consumer, which would probably nearly balance with the excess of the total rated capacity of the prime movers over the power actually developed.

Comparing this result with the 200 million horsepower as above stated, it will be seen that the total waterpower of the United States, if developed, could furnish 16 times the power now consumed in all the industries in the United States, except those of lighting and transportation, and the lighting industry may be disregarded because the power consumed therein can be generated with installations that would otherwise be idle, due to the fact that the great majority of other industries are idle, while power is consumed for lighting.

Coming now to the subject matter of the paper, the term "Northwest" is generally held to include the states of Oregon, Washington, Idaho, Montana and Wyoming, but with the exception of a few general statements, this paper will deal with a more restricted Northwest, namely the northwestern part of the State of Washington, or the Puget Sound region.

The United States Geological Survey places Washington first among these states as well as among all the states of the Union, arranged in order of amount of waterpower possessed, with 10,376,000 horsepower on a basis of maximum continuance for six months of the average year. Next is California with 9,382,000 horsepower, then follow in order Oregon with 7,935,000 horsepower, Montana with 5,197,000 horsepower, and Idaho with 3,080,000 horsepower. The maximum continuance power for the entire year in each case is approximately one-half of these amounts. These states in the order named head the list of all the states in the Union. These amounts are subject to correction as above described and for the reasons given, but the foreging and following comparisons will hold true nevertheless. The total for these five states is 58 per cent of the total given for the entire United States, and the amount allotted to Washington is almost 17 per cent of such total. It should be remembered again that these figures do not include storage possibilities, and they constitute for the greatest part a very rough estimate, due to lack of accurate data.

The water power tributary to the Puget Sound region I have arbitrarily assumed to be the power found in the streams of the western slope of the Cascade Mountains from the Columbia River to British Columbia, the eastern slope of the Olympics, the Klickitat River and one-half of that in the Columbia River between Celilo and the mouth of the Cowlitz River. There are many good power sites capable of large development on the Yakima River itself that are nearer Seattle and Puget Sound than some of those included in the above territory, but it is thought that this power can readily find profitable employment in the commercial and irrigation industries in the great region to the east of the Cascade Mountains.

In the region above described, reports of the United States Geological Survey (on bases of maximum continuance power on the turbine shaft) give the rivers flowing into the Columbia, including the Klickitat, White Salmon, Little White Salmon, North and South forks of Lewis River, the Toutle and Cowlitz Rivers a total of 494,550 horsepower. Investigations show that with economically possible storage this amount could be doubled, making a total of approximately 989,000 horsepower continuous.

The Nisqually, White, Puyallup and Cedar Rivers are given totals of 215,970 and 127,280 horsepower, according as they are considered with or without storage. Continuing on north are the Snoqualmie with 60,000 horsepower, Sultan River with 25,000, the Whitechuch, Sauk, Skagit, Nooksack, Stillaguamish, Skykomish and other small rivers for which no government estimates are avilable, but which would in all probability furnish in the neighborhood of 300,000 horsepower.

On the eastern slope of the Olympic Mountains is the Lake Cushman project which has been estimated to be capable of development anywhere from 30,000 to 150,000 horsepower continuous. The Elwha River, on which an 8,000-horsepower plant is now practically completed, according to estimates of competent engineers, is capable of development to the extent of furnishing 35,000 horsepower continuous. Other streams in the eastern portion of Clallam and Jefferson Counties have been estimated to be capable of furnishing 50,000 horsepower continuous.

Then there is the Columbia River, the greatest of them all. At one point on this river, between Celilo and the Dalles, it is estimated that 30,000 electric horsepower continuous can be developed and generated at a cost of $7.00 per horsepower-year, and an additional 236,000 horsepower for eight months of the year. These estimates are by John H. Lewis, state engineer of Oregon, and he makes the further statement that "an additional one million horsepower can be developed at this site, at a cost of $44.00 per horsepower and furnished at cost of $4.50 per horsepower-year," thus making a total of approximately one and one-half million horsepower for this one site. Assuming that one-half of this, or 750,000 horsepower, is available for Washington, letting the other one-half go to Oregon, and adding to this the various other amounts above mentioned, we have the amazing total of 2,455,000 horsepower available in the Puget Sound region. This total, while based for the greater part on comparatively rough government estimates, can be said to be a very conservative estimate. Such government estimates as can be compared with more detailed investigations of private engineers are thereby shown to be usually very much too small. Furthermore, these figures represent continuous power throughout the year, and are therefore based on the minimum flow of the streams augmented by possible storage, and it is common practice to install machinery from 50 to 100 per cent in excess of the minimum amount of power available, because the average demand for power is not often more than half the maximum. And when it is remembered that the period of maximum demand usually nearly coincides with the period of maximum flow, and that the time of maximum flow of the different streams in this region varies to a considerable extent, the possibilities of the situation are still further increased.

Then, there is the further possibility of operating a number of plants conjunctively in such a manner as to use those plants where the storage possibilities are large, to augment during the low-flow period those where storage possibilities are small, but the flow is large during the greater part of the year, and in this way enable them to overcome each other's deficiencies. For instance, Robert Howes, in his report on the White River project, commonly known as the Hebb site, shows that while in the extremely dry year of 1911 the average regulated flow with possible storage would have produced 34,250 electric horsepower continuous, for all except about 100 days of that year it would have produced nearly twice that amount, and that by providing 32.5 per cent from some other source for the 100 days, this plant could be run at twice its actual continuous capacity throughout the driest year on record. But during the average year and all years above the average, it could be run at double its 1911 continuous capacity for the entire year from its own supply of water, and for nine months of these years at a still greater capacity.

Commenting on this feature of the above power site, A. H. Dimock, city engineer of Seattle, in his report to the mayor remarks as follows: "For nine months of the year, and sometimes nearly the entire year, the White River has a flow exceeding 1,000 second-feet. If additional storage could be provided either on the White River or elsewhere, a still further installation would be desirable. The Cedar River power site will provide a storage of 180 square-mile-feet or nearly four times the storage which now seems possible in the White River. By installing two additional water wheels, bringing the total up to 120,000 horsepower, the large flow of the winter, spring and early summer months of the White River could be utilized for running the plant to its full capacity, while preserving the large storage in the Cedar River for use during the late summer and early fall. If, in addition, still further storage could be obtained, the possibilities of the White River proposition would be still further enhanced. Such a storage system may be obtained at Lake Cushman, the amount of water available by storage at this site being about 350 square-mile-foot, which is equivalent to 315 second-foot for the entire year. The available head at this site is also about 600 feet. The possibilities opened up by the operation of these three plants in connection with each other are very tempting."

Of course there is the element of cost to be considered, and a very important element it is. In the absence of detailed knowledge of any or all sites included in this estimate, no accurate cost data can be computed. But a comparison of a few of the most important developments here and in other parts of the United States, particularly the eastern part, will show that this is the region of cheap power, by comparison at least.

The Mississippi River Power Company has constructed a plant at Keokuk, Iowa, with an ultimate rated capacity of 240,000 electric horsepower. The installation cost, computed from the rated capacity and the estimated cost of the plant is $104 per horsepower. This company has contracted to supply 60,000 horsepower to a public-utility company in St. Louis, 140 miles away, at $18.00 per horsepower-year at a 60 per cent load-factor. The cost of 140 miles of transmission line at $3,000 a mile brings the total installation cost of this portion of the system to $116 per horsepower, exclusive of substations.

A project is now being financed in Eastern Canada which proposes to generate one million horsepower from the great St. Lawrence Rapids, about 25 miles from Montreal. The estimated cost of this plant, exclusive of transmission lines and substations, is $100 per horsepower.

The Dix River Power Company is building a 24,000-horsepower hydroelectric plant on the Dix River near its confluence with the Kentucky River. The total cost of this plant with transmission lines to Louisville and Lexington, Ky., Cincinnati, O., and some smaller cities enroute is estimated at $3,000,000, or $125 per horsepower.

In contrast to the above there may be cited the proposed plant of the Pacific Power & Light Company at Priest Rapids on the Columbia River, with an estimated ultimate capacity of one million horsepower, same as the St. Lawrence River plant, but costing, instead of $100,000,000, from 6 to 10 million, including a transmission system for supplying energy to the eastern part of Washington.

The Tacoma municipal plant installation cost, including transmission lines and substation, is $83 per horsepower.

The Seattle municipal plant, including duplicate transmission lines and city substation, cost $86.71; exclusive of transmission lines and substation, $52.91, on the basis of continuous capacity.

These figures, when compared with the $116 of the Mississippi River Power Company's plant, the $100 of the St. Lawrence River plant, and the $125 of the Dix River plant, make a showing that is gratifying, to say the least, and we must not forget the proposed Columbia River plant, where, as stated above, it is estimated 1,500,000 horsepower can be developed at an installation cost of $44 per horsepower.

It is generally held among engineers, and it is susceptible of demonstration, that with a favorable load-factor such as is obtained from a large and diversified custom, power can be sold per horsepower-year at a reasonable profit at from 12 to 15 per cent of the installation cost per horsepower.

Summing up, then, it may be confidently stated that the development in the Puget Sound region, at a cost enabling its sale at a price that may be afforded by any industry now known, of an amount of power sufficient to supply a connected load of 3 million horsepower is well within the range of possibilities.

To generate this amount of power from steam would require the annual consumption of coal valued at $100,000,000, figuring 17 tons of coal per horsepower-year and coal at $2.00 per ton.

This amount of power is 90 per cent of the total power consumed by all the industries except transportation in the states of New York and Pennsylvania, the two largest power-consuming states in the United States, and is more than twice the amount consumed in all the industries except transportation in the cities of New York, Chicago, Philadelphia, Pittsburgh, St. Louis and Cleveland. In other words, with this amount of power we could, if they were located on Puget Sound, supply all the industries of these five cities and have enough power left to light the cities and run their street cars The present development on Puget Sound is approximately 100,000 electric horsepower maximum capacity, or about three per cent of the total amount available.

Assuming that the possibility and feasibility of generating this enormous amount of power has been established, we are confronted with the problem of its profitable employment or use, for it is quite obvious that, whatever the amount, it is of no economic value unless put to a profitable use, and this is really the most difficult problem. Profitable use, however, is not necessarily a direct dividend-paying use. I am treating the situation from the standpoint of the greatest good to the greatest number. The answer to this problem is *Industrial Development.*

Cheap power is the chief factor of success in numerous industries which I will include in the broad general terms of the manufacturing industry, iron and steel-refining industry, and the electrochemical industry.

When it is remembered that iron ore can be obtained from China and California as cheap or cheaper than it can be had at Pittsburgh, that copper, tin and lead exist in large quantities in Alaska, British Columbia and some in Washington, it can be safely said that with the transportation facilities now existing, those to be added by the opening of the Panama Canal and the electrification of the mountain divisions of the railroads, the only other requisite to place the Puget Sound region in a position at least equal if not superior to that of the Atlantic Coast in the matter of manufacturing and industrial development is cheap power.

It is in the electrochemical industries, probably, that this region will witness the most rapid advance and the greatest increase in power consumption. Most of the electrochemical industries are comparatively new, but these have made such rapid progress that in European countries, particularly Norway, which is also a cheap power region, they take first rank among all the industries in value of products.

One of the oldest of these is the cement industry. A barrel of cement in the finished product represents an expenditure of 24 horsepower-hours. The state of Washington is known to possess the purest and most extensive deposits of limestone and clay suitable for the manufacturing of cement found anywhere on the Pacific Coast, and it is stated by men who are in a position to know, that if power were available, this industry would at once mount to one of the greatest importance. The amount of Portland cement manufactured in the United States in 1912 is estimated at 81,943,000 barrels, showing an increase over 1911 of 43 per cent. The curve of the production of Portland cement, in the face of a prolonged general stagnation of all trades and industries, is still rising and has yet to show its first downward course. The development of the cement products or concrete industry is one of the marvels of the last decade. The next decade will witness extensive road-building operations in Washington, and every mile of good road will require from 2,500 to 3,000 barrels of cement. There is every reason why every barrel of this cement and all other cement used in the State of Washington should be manufactured within the state, and then some.

The chemical engineer has done much for the benefit of his fellow man and his profession, though young, is rapidly becoming one of first rank. Nowhere is the value of his work more forcibly shown than in the development of the nitrate industry. Within the last four or five years, this industry has been developed by Samuel Eyde, in Norway, from one of merely experimental proportion to one requiring upwards of 250,000 horsepower continuously and employing 1,500 men. This industry has numerous branches, the most important being the manufacture of fertilizer. Part of the product is worked up into nitric acid which is used in the manufacture of dynamite, gun-cotton and smokeless powder.

The main portion, however, is worked up with limestone to form nitrate of lime. This nitrate is an exceedingly effective fertilizer. Large quantities have been imported into California and Hawaii for use in orchards and sugar plantations.

Another industry requiring a large amount of power is the manufacture of ammonia from the nitrogen of the air and pure hydrogen. An ammonia plant in Norway of 40,000 tons annual capacity requires 25,000 horsepower continuously.

Other chemical industries requiring large amounts of electric power are the manufacture of alloys, oxygen, hydrogen, carbide, graphite and gypsum products and the electrical distillation of wood. For all of these industries, this state possesses the required raw materials in unlimited quantities, and all require large quantities of electric power with daily and yearly load-factors of from 95 to 100 per cent.

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Students Design Power Station.

In order to give students in the senior class of the College of Mechanical and Electrical Engineering of Kentucky University at Lexington an opportunity to do more practical work than is usually assigned, arrangements have been made by the university to have the class design a power plant at Hazard, Ky., in the heart of the Eastern Kentucky coal fields. The plant as designed will be intended to serve coal mines all over that general section, and though it is merely a theoretical proposition, it is hoped to interest capitalists in the matter of carrying out the plans. The students have made trips to Hazard and gone over the ground so as to make their plans with exact reference to the physical conditions. A number of manufacturers of electrical equipment, including the General Electric Company, are co-operating with the students and assisting them in their work.

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It is now estimated that there is invested in the various electrical plants of all kinds in Japan about $280,000,000. Ten years ago this investment was only about $14,000,000. Thus this Japanese industry has increased twenty fold in a decade.

Industrial Research in America.

In his presidential address before the American Chemical Society at Rochester, N. Y., September 9, 1913, Arthur D. Little, speaking on the subject of "Industrial Research in America," said among other things:

Germany has long been recognized as pre-eminently the country of organized research. The spirit of research is there immanent throughout the entire social structure.

The virility and range of German research were never greater than they are today. Never before have the superb energy and calculated audacity of German technical directors and German financiers transformed so quickly and so surely the triumphs of the laboratory into industrial conquests. Never has the future held richer promise of orderly and sustained progress, and yet the pre-eminence of Germany in industrial research is by no means indefinitely assured. A new competitor is even now girding up his loins and training for the race, and that competitor is strangely enough the United States,—that prodigal among nations, still justly stigmatized as the most wasteful, careless, and improvident of them all.

To one at all familiar with the disdain of scientific teaching which has characterized our industry, and which still persists in many quarters, this statement is so contrary to the current estimate that its general acceptance cannot be expected. It will have served its purpose if it leads to a consideration of the facts which prove the thesis.

The country of Franklin, Morse, and Rumford, of McCormick, Howe, and Whitney, of Edison, Thomson, Westinghouse, and Bell, and of Wilbur and Orville Wright, is obviously a country not wholly hostile to industrial research or unable to apply it to good purpose. It is, however, not surprising that with vast areas of virgin soil, of which a share might be had for the asking, with interminable stretches of stately forest, with coal and oil and gas, the ores of metals, and countless other gifts of nature scattered broadcast by her lavish hand, our people entered upon this rich inheritance with the spirit of the spendthrift, and gave little heed to refinements in methods of production and less to minimizing waste. That day and generation are gone. Today their children, partly through better recognition of potential values, but mainly by the pressure of a greatly increased population and the stress of competition between themselves and in the markets of the world, are rapidly acquiring the knowledge that efficiency of production is a sounder basis for prosperity than mere volume of product, however great.

The long continued and highly organized research which resulted in the development of American agricultural machinery has led to the general introduction of machines which reduce the labor cost of seven crops $681,000,000, as measured by the methods of only fifty years ago.

The superhuman dexterity and precision of American shoe machinery, which has revolutionized a basic industry and reduced competition to the status of an academic question, present American industrial research at its best.

You need not to be reminded that the ubiquitous telephone is wholly a product of American research. New York has 450,000 instruments—twice the number of those in London. Los Angeles has a telephone to every four inhabitants. Our whole social structure has been reorganized. We have been brought together in a single parlor for conversation and to conduct affairs, because the American Telephone & Telegraph Company spends annually for research, the results of which are all about us, a sum greater than the total income of many universities.

The name of Edison is a household word in every language. The Edison method is a synonym for specialized, intense research which knows no rest until everything has been tried. Because of that method and the unique genius which directs its application, Italian operas are heard amid Alaskan snows and in the depths of African forests: every phase of life and movement of interest throughout the world is caught, registered, transported, and reproduced, that we may have lion hunts in our drawing-rooms and the coronation in a five-cent theater. From his laboratory have come the incandescent lamp, multiplex telegraphy, new methods of treating ores, and a thousand other diverse inventions, the development of a single one of which has sometimes involved millions.

To no chapter in the history of industrial research can Americans turn with greater pride than to the one which contains the epic of the electrochemical development at Niagara Falls. It starts with the wonderful story of aluminum. Discovered in Germany in 1828 by Wöhler, it cost in 1855 $90 a pound. In 1886 it had fallen to $12. The American Castner process brought the price in 1889 to $4. Even at this figure, it was obviously still a metal of luxury with few industrial applications. Simultaneously Hall in America and Heroult in Europe discovered that cryolite, a double fluoride of sodium and aluminum, fused readily at a moderate temperature, and, when so fused, dissolved alumina as boiling water dissolves sugar or salt, and to the extent of more than 25 per cent. By electrolyzing the fused solution, aluminum is obtained.

On August 26, 1895, the Niagara works of the Pittsburgh Reduction Company started at Niagara Falls the manufacture of aluminum under the Hall patents. In 1911 the market price of the metal was 22 cents, and the total annual production 40,000,000 pounds.

A chance remark of Dr. George F. Kunz in 1880 on the industrial value of abrasives turned the thoughts of Acheson to the problem of their artificial production, and led to the discovery in 1891 of carborundum and its subsequent manufacture on a small scale at Monongahela City, Pa. In 1894 Acheson laid before his directors a scheme for moving to Niagara Falls. To quote his own words:

"To build a plant for one thousand horsepower, in view of the fact that we were selling only one-half of the output from a 134-horsepower plant, was a trifle too much for my conservative directors, and they one and all resigned. Fortunately, I was in control of the destiny of the Carborundum Company. I organized a new board, proceeded with my plans, and in the year 1904, the thirteenth from the date of the discovery, had a plant equipped with 5,000 electrical horsepower, and produced over 7,000,000 pounds of those specks I had picked off the end of the electric light carbon in the spring of 1891."

The commercial development of carborundum had not proceeded far before Acheson brought out his process for the electric-furnace production of artificial graphite and another great Niagara industry was founded. In quick succession came the Wilson process for calcium carbide and the industrial applications of acetylene, phosphorus, ferro-alloys made in the electric furnace, metallic sodium, chlorine and caustic soda first by the Castner process, later by the extraordinarily efficient Townsend cell, electrolytic chlorates and alundum.

Perhaps even more significant than any of these great industrial successes was the Lovejoy & Bradley plant for the fixation of atmospheric nitrogen, which was perforce abandoned. It is well to recall, in view of that reputed failure, that the present-day processes for fixing nitrogen have made little, if any, improvement in yields of fixed nitrogen per kilowatt-hour over those obtained in this pioneer Niagara plant.

In Acheson and Hall have already been named two recipients of the Perkins medal, the badge of knighthood in American industrial research. The distinguished and thoroughly representative juries which award the medal annually had previously bestowed it upon Hershoff for his work in electrolytic copper refining, the contact process for sulphuric acid, and the invention of his well known roasting furnace, and upon Behr for creative industrial research in the great glucose industry. In 1912 it was received by Frasch, and this year was awarded Gayley.

Chemistry in America is essentially republican and pragmatic. Most of us believe that the doctrine science for science's sake is meaningless and mischievous as that of art for art's sake or literature for literature's sake. These things were made for man, not for themselves, nor was man made for them. Most of us are beginning to realize that the major problems of applied chemistry are incomparably harder of solution than the problems of pure chemistry, and the attack, moreover, must often be carried to conclusion at close quarters under the stress and strain induced by time and money factors. Under these circumstances it should not excite surprise that a constantly rising proportion of our best research is carried on in the laboratories of our great industrial corporations, and nowhere more effectively than in the research laboratory of the General Electric Company under the guidance of your past president, Dr. Whitney. As to the laboratory method, Dr. Whitney says in a personal letter: "We see a field where it seems as though experimental work ought to put us ahead. We believe that we need to get into the water to learn to swim, so we go in. We start back at the academic end as far as possible, and count on knowing what to do with what we find when we find it. Suppose that we surmise that, in general, combustible insulation material could be improved upon. We try to get some work started on an artificial mica. Maybe we try to synthesize it, and soon come to a purely theoretical question, for example: Is it possible to crystallize such stuff under pressure in equilibrium with water vapor corresponding to the composition of real mica? This may lead a long way and call in a lot of pure chemistry and physical chemistry. Uusually we just keep at it, so that, if you haven't seen it on the market, we're probably at it yet."

In striking contrast to the secrecy maintained between individual workers in large German research laboratories is the almost universal custom in America to encourage staff discussion. In the General Electric laboratory, as in many others, the weekly seminars and constant helpful interchange of information have developed a staff unity and spirit which greatly increases the efficiency of the organization, and raises that of the individual to a higher power.

Many evenings could profitably be spent in discussing the achievements of this laboratory. Their quality is well indicated by the new nitrogen tungsten lamp, with its half-watt per candle, which combines the great work of Dr. Coolidge on ductile tungsten with the studies of Langmuir and others of the staff on the particular glass and gas and metal which are brought together in this lamp.

Any attempt to adequately present the enormous volume of research work, much of which is of the highest grade, constantly in progress in the many scientific bureaus and special laboratories of the general Government or even to indicate its actual extent and range, is of course utterly beyond the limits of my attainments or of your patience. The generous policy of the Government toward research is unique in this, that the results are immediately made available to the whole people.

In the United States Patent Office Dr. Hall has developed a remarkably comprehensive index to chemical literature, which now contains 1,250,000 cards and which is open to every worker. The Bureau of Fisheries devotes $40,000 to a single study, and the Geological Survey $100,000 to the investigation of the mineral resources of Alaska. It spent in 1913 $175,000 for engraving and printing alone.

The superb Geophysical Laboratory of the Carnegie Institution of Washington is also constantly engaged in the most refined researches into the composition, properties, and mode of genesis of the earth's crust. The Smithsonian Institution is honored throughout the world for the efficiency of its effort to increase and diffuse useful knowledge among men.

Perhaps no better evidence could be adduced of the present range and volume of industrial research in America than the necessity, imposed upon the author, of such a general survey as I am attempting, of condensing within a paragraph his reference to the Bureau of Standards of the Department of Commerce. Its purpose is the investigation and testing of standards and measuring instruments and the determination of physical constants and the properties of materials. To these objects it devotes about $700,000 a year to such good effect that in equipment and in the high quality and output of its work it has in ten years taken rank with the foremost scientific institutions in the world for the promotion of industrial research and the development and standardization of the instruments, materials, and methods therein employed. Its influence upon American research and industry is already profound and rapidly extending. The Bureau coöperates with foreign governments and institutions, and is constantly consulted by state and municipal officials, technical bodies, commissions and industrial laboratories, as a court of highest appeal.

In view of the evidence offered by Germany of the far-reaching benefits resulting from the close coöperation which there obtains between the university laboratory and the industrial plant, it must be admitted with regret that our own insitutions of learning have, speaking generally, failed to seize or realize the great opportunity confronting them. They have, almost universally, neglected to provide adequate equipment for industrial research, and—which is more to be deplored, since the first would otherwise quickly follow—have rarely acquired that close touch with industry essential for familiarity and appreciation of its immediate and pressing needs. There are happily some notable exceptions. Perhaps foremost among them stands the Massachusetts Institute of Technology with its superb engineering and testing equipment, its Research Laboratory of Applied Chemistry, and the meritorious thesis work of its students in all departments. The Biological Department has been especially active and successful in extending its influence into industrial and sanitary fields, while unusual significance attaches to the motor-vehicle studies just concluded and the more recently inaugurated special investigations in electricity, since both were initiated and supported by external interests.

Several of the great universities of the Middle West, notably Wisconsin and Illinois, have placed themselves closely in touch with the industrial and other needs of the community, and are exerting a fundamental and growing influence upon affairs. In the East, Columbia has recently established a particularly well equipped laboratory for industrial chemistry, and is broadening its work in this department.

The Universities of Kansas and of Pittsburgh are carrying forward an especially interesting experiment in the operation of industrial research fellowships, supported by the special interests directly concerned.

Reference has already been made to the highly organized, munificently equipped, and splendidly manned laboratories of the Du Pont Company, the General Electric Company, and the Eastman Kodak Company. There are in the country at least fifty other notable laboratories engaged in industrial research in special industries. The expenditure of several of them is over $300,000 each a year. The United States Steel Corporation has not hesitated to spend that amount upon a single research, and the expenses of a dozen or more laboratories probably exceed $100,000 annually. One of the finest iron research laboratories in the world is that of the American Rolling Mills Company. Equally deserving mention from one aspect or another are the laboratories of the Fire Underwriters, the National Carbon Company, the Solvay Process Company, the General Bakelite Company, Parke, Davis & Company, the Berlin Mills Company, the United Gas Improvement Company, the National Electric Lamp Association, Swift & Company, the Pennsylvania Railroad, and many others.

The steel industry in its many ramifications promotes an immense amount of research, ranging from the most refined studies in metallography to experimentation upon the gigantic scale required for the development of the Gayley dry blast, the Whiting process for slag cement, or the South Chicago electric furnace. This furnace has probably operated upon a greater variety of products than any other electric furnace in the world. Regarding the steel for rails produced therein, it is gratifying to note that after two and one-half years or more no reports of breakage have been received from the 5,600 tons of standard rails made from its output. The significance of this statement will be better appreciated when we consider that in 1885 the average total weight on drivers was 69,000 pounds. It had risen to over 180,000 pounds in 1907, and reached a maximum of 316,000 pounds in that year. The weight of rails during the same period had increased from 65-75 pounds to 85-100 pounds. In 1905 conditions were so bad that out of a lot of 10,000 tons 22 per cent was removed the first year because of depressions in the head. In 1900 the American Railway Engineering Association took the matter in hand, and studied the influence of segregation of specific impurities.

There could well be a further great enlargement of the field of industrial research in special industries through the initiative and support of national trade associations, to the great benefit of their membership. The American Paper and Pulp Association, for example, should subsidize studies in the utilization of waste sulphite liquors, the paper-making qualities of unused woods and fibers, the hydration of cellulose, new methods of beating, the yields from rags, the proper use of alum, and so on. The American Institute of Metals could not do better than initiate investigations into zinc losses, the physical properties of alloys, and the production of alloys to specifications defining the properties desired, the application of the electric furnace to the industry, and the preparation of new alloys by electric or other methods. A similar opportunity knocks at the door of the American Foundrymen's Association. Some few associations, like those of the bakers and the laundrymen, are already active to good purpose; others, like the Yellow Pine Lumber Manufacturers' Association, are aroused; but, to the great majority of those powerful organizations, research is still an academic question to be discussed by their members individually if they so choose. Every industry has, however, its broad research problems, and its points especially vulnerable to research attack, among which it should be easy to select those of general interest to the industry as a whole.

Industrial research is applied idealism. It expects rebuffs, it learns from every stumble, and turns the stumbling-block into a stepping-stone. It knows that it must pay its way. It contends that theory springs from practice. It trusts the scientific imagination, knowing it to be simply logic in flight. It believes with F. P. Fish, that "during the next generation—the next two generations—there is going to be a development in chemistry which will far surpass in its importance and value to the human race that of electricity in the last few years,—a development which is going to revolutionize methods of manufacture, and more than that, is going to revolutionize methods of agriculture;" and it believes with Sir William Ramsay that "the country which is in advance in chemistry will also be foremost in wealth and general prosperity."

With these articles of faith established in our thought, let us consider where they lead us. Within the last few days Frank A. Vanderlip, than whom no one speaks with more authority upon financial matters, has told the assembled representatives of the electrical industries that they are facing a capital requirement of $8,000,000 a week for the next five years, —a total within that period of $2,000,000,000. As chemists, we are ourselves entering upon an era in which the capital demands of industries now embryonic or not yet conceived will in the not distant future be equally insistent and even more insatiable. Have we as chemists given a thought to this aspect of the development of our science or planted the seeds of the organization which may some day cope with it? In the electrical and other established engineering professions it is significant that the great industrial applications of the sciences involved have been in large part due to the activities of firms and organizations like Stone & Webster, J. G. White & Company, Blackwell, Viehle & Buck, and the United Gas Improvement Company, which by an orderly but inexorable evolution passed from the status of engineers to that of engineers and bankers. Our own profession has not yet evolved the chemist and banker, but such an evolution, or at least the close alliance of chemistry and banking, is a fundamental prerequisite if the results of industrial research are to find their full fruition in America. Let me add that no field within the purview of the banker is more ripe for tillage or capable of yielding a richer harvest.

We need a multiplication of research laboratories in special industries, each with an adequate staff of the best men obtainable and an equipment which gives full range to their abilities. In nearly every case this equipment should include apparatus of semicommercial size in which to reduce to practice the laboratory findings. Nothing is more demoralizing to an industrial organization, and few things are more expensive, than full-scale experimentation in the plant.

These laboratories should each be developed around a special library, the business of which should be to collect, compile, and classify in a way to make instantly available every scrap of information bearing upon the materials, methods, products, and requirements of the industry concerned. Modern progress can no longer depend upon accidental discoveries. Each advance in industrial science must be studied, organized, and fought like a military campaign.

Pennsylvania Electrification.

In announcing that it will establish schools of electrical instruction for its employees at Conemaugh, Derry, Gallitzin, Cresson, Pitcairn and Pittsburgh, Pa., the Pennsylvania Railroad has given rise to the report that the intention is to electrify the Pittsburgh division, which extends from Pittsburgh to Altoona, a distance of 119 miles. In this stretch is the big mountain range at the summit of which is the Gallitzin tunnel, and at the eastern end of the tunnel begins the big descent that is known as the famed "Horseshoe Curve." This 119 miles from Pittsburgh to Altoona is considered one of the most difficult problems in steam railroading in America. Should the Pennsylvania Railroad install electric power on this division it would be only a question of time until the entire system would be electrified.

The new schools are to be equipped with all the apparatus used in the electrical operation of trains and the various phases of the method will be explained in theory and practice. Among transportation men in Pittsburgh this move upon the part of the Pennsylvania is regarded as peculiarly significant. In some quarters it is looked upon as marking the first vital step in the movement that ultimately will bring about the complete electrification of the entire Pennsylvania system.

Pennsylvania Railroad officials, although reticent regarding the project, admit that plans for electrifying the Pittsburgh terminal are under consideration. Eight miles of the main line of the Pennsylvania, from the Union Station in Pittsburgh, to Braddock, Pa., are being elevated. This work will be completed about the time that the electrification of the Philadelphia terminal is completed. Then, it is said, the forces employed on that job will be transferred to Pittsburgh. More to the point is the fact that the new steel equipment used at Pittsburgh is being constructed with the car bodies sufficiently elevated above the trucks to permit the installation of motors on them later.

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The Arkansas Hydro-Electric Company has been incorporated to construct a 10,000-horsepower development on the Little River, near Heber, Ark. The plans call for an expenditure of $2,000,000.

Annual Report of the Commissioner of Patents.

The annual report of the commissioner of patents covering the business of the United States Patent Offices for the calendar year 1913 has been made public by Commissioner of Patents Thomas Ewing.

There were received during the year 68,117 applications for patents on inventions, 2,060 applications for patents on designs and 190 applications for reissues of patents. There were issued 35,624 patents, including designs, and 164 patents were reissued, making a total of 35,788 patents; 30 patents were withdrawn. Of the net total of 35,594 patents, 31,382 patents were issued to citizens of this country and 4,212 patents were issued to citizens of foreign countries. During the year 21,867 patents expired. The total receipts of the Patent Office from all sources were $2,084,417.79 and the total expenditures were $1,947,388.28, leaving a surplus of $137,034.51 of income over outlay; the total accumulated surplus to the credit of the Patent Office in the United States Treasury at the close of business on December 31, 1913, was $7,297,052.46. There are on hand about 47,000,000 printed copies of patents, which are for sale at five cents each. Last year there were sold 2,340,867 copies of patents.

Commissioner Ewing makes many pertinent comments on the status of the Patent Office and its work and makes a number of recommendations for improvement. The crowded condition of the building, although repeatedly called to the attention of Congress, is steadily growing worse. New plans have been prepared for a practically fireproof two-story addition under the present level of the court. This will greatly relieve physical congestion.

The examining corps now is composed of 2 law examiners, 43 principal or primary examiners and 334 assistant examiners. This disproportion of the number in the lower grades to those in the higher grades slows down promotions and induces ambitious young men to leave the Patent Office after they have been admitted to the bar. It is urged by Commissioner Ewing that the examining force be reorganized in the following particulars: (1) by restoring the grades of first, second, third and fourth assistant examiners; and (2) by increasing the number in the higher grades and reducing the number in the lower grades, so as to make them equal. It is suggested that each of the four grades of assistant examiners comprise 86 men, thus making an increase of 10 assistant examiners over the present number. There should also be an increase of two members of the board of examiners-in-chief. At present the board consists of three members, two of whom constitute a quorum.

The valuable library of the Patent Office is in present need of reorganization and enlargement. The collection of books, periodicals, and foreign patents is of the utmost value to the examining corps, inventors, manufacturers and attorneys interested in investigating the novelty of inventions, but the material is not and never has been in condition for ready reference. Much of it is practically unavailable. There has been started the work of reclassifying and indexing, with a view to meeting more nearly the peculiar needs of those who use the library. This library of about 75,000 volumes of scientific works and about 2,000,000 foreign patents, used, as it is, by people who are doing work which is almost identical with that of the examining corps, requires a librarian of special training and ability.

It has been suggested that instead of publishing in the *Official Gazette* selected claims, as is now the practice, there should be published a brief digest of the patents. These digests would be valuable to the examining corps and aids in searching. It would be necessary, however, to employ a corps of digesters large enough and highly trained enough to digest intelligently more than a hundred patents a day. The expense of this work would be largely, if not entirely, saved by the decrease in the cost of printing, since the digests would not be as extensive as the claims now printed.

A serious problem is to bring the work of the Patent Office up to date, so that there shall be no unreasonable delay in passing upon an application after it has been filed. At present there are awaiting action as many new applications as are filed in two months and as many old applications as are amended in one month. An examination has been made to ascertain the number of applications filed as much as 15 years ago; 79 such applications have been reported as pending. Commissioner Ewing has issued an order that all cases which have been pending before the Patent Office for more than eight years shall be made special, and to the end that there may be a uniform ruling applied to all such cases he has directed that no amendment filed in any such application after June 1 of this year shall be entered without his approval. Thereby he hopes to make it impossible for an applicant to prosecute his application by dilatory or time-consuming amendments, by refusing to enter amendments which are not proper responses to Office actions and in appropriate cases holding the applications to be abandoned. Mr. Ewing is also considering the propriety and wisdom of making these old applications public. The statute contains no provision against it. There is, however, a rule of the Office, under which they have all been filed, which declares that the applications shall be preserved in secrecy. Mr. Ewing believes that with proper administration it is possible to limit the time during which an application may be kept pending in the Office to less than five years, and perhaps to less than three years, without unduly reducing the applicant's right to consideration of his case. Few applicants who deliberately keep their cases in the Office for many years are entitled to favorable consideration. On an average, applications are in the Office about two years, and in the vast majority of cases this length of time is sufficient for thorough consideration of the applicant's claims.

Commissioner Ewing urges the need of more energetic work in reclassifying and indexing the vast number of American and foreign patents. This work was started several years ago but needs a larger force to push it more promptly. A revision is needed of the fees for recording assignments and an index of assignees should be established. Clerks of federal courts should be required to file a copy of all patent decrees with the Patent Office. The protection of designs should be put on a registration basis. Mr. Ewing points out a number of objections to the act which has been passed by Congress for the protection of exhibitors at the Panama-Pacific International Exposition next year; he believes that this act should be modified by limiting it to designs and articles embodying designs or patents protected abroad and by adding the provision against suits for infringement based upon exhibits.

Congress Expected to Appropriate $100,000 to Investigate Valuation of Washington, D. C., Utilities.

For the work of making a physical valuation of the telephone properties, gas and electric-light plants and street-car lines in the District of Columbia Congress is expected to immediately appropriate the sum of $100,000.

According to District of Columbia Commissioner Harding, who explained to Congress last week the necessity of money for valuation of public utilities, the first survey to be undertaken will include the properties of the Chesapeake & Potomac Telephone Company, the Washington Railway & Electric Company, the Potomac Electric Light & Power Company, and the Capital Traction Company.

New Electrical and Mechanical Appliances

Cable and Loom Clamps for Steel Wall Boxes.

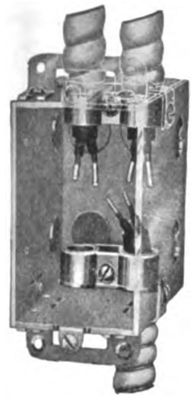

Fig. 1—Wall Box Fitted with Clamps for Armored Cable.

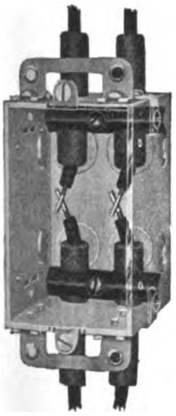

Fig. 2—Box with Clamps for Loom.

The increasing use of flexible armored cables has called attention to the rather troublesome manner in which this type of conductor is usually fastened to outlet boxes. To meet this difficulty the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa., has added a valuable feature to its Unisectional steel wall boxes, which were described in a recent issue of this journal. As shown in Fig. 1, one of these clamps is prepared particularly for use with flexible armored cable. It has the distinction of combining in one simple device both a cable clamp and a bushing. This clamp effectively holds all makes of armored cable securely to the box. At the same time the ring or bushing, which forms part of the clamp, protects the insulation from injury and abrasion. The clamp is heavily brass-plated to insure making a good electrical contact and also to protect it from corrosion. The Unisectional wall boxes are furnished complete with clamps at slightly additional cost. These clamps will take one or two cables as needed. Since all of the material is combined in one fitting the trouble from shortage of parts on the job is obviated. By giving the clamp binding screw a few turns the cable is permanently held in place.

A similar type of clamp designed for use with circular loom or similar flexible armoring is shown in Fig. 2. This type of clamp has proven a very convenient and effective means of fastening the loom in switch boxes, saves the trouble of using tape for this purpose and makes a more secure job.

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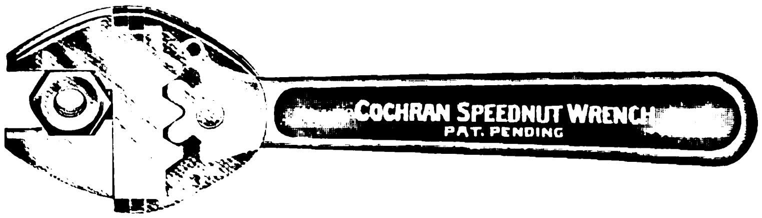
The Cochran Automatic Nut Wrench.

A very convenient nut wrench has been placed on the market by the Cochran Pipe Wrench Manufacturing Company, 7800 Woodlawn Avenue, Chicago. This wrench, on account of the speed with which it can be operated for various sizes of nuts from one-quarter to three-quarter inch has appropriately been called the "Speednut" wrench. As shown in the illustration, the movable jaw is attached to a short rack. This engages a few teeth on the swiveled end of the handle. By placing the movable jaw against the near side of the nut and pulling on the handle it is evident that a very tight grip is obtained on the nut without preliminary adjustment; thus the ordinary thumb screw adjustment of a monkey wrench is eliminated. The harder one pulls the tighter does the wrench grip the nut; this prevents slipping and wearing off the edges of the nut. The wrench is very compact and light in weight. Its construction is simple, since it contains but three pieces. Thus it has no complicated parts to get out of order and is always ready for immediate use. A patent on this wrench has been applied for.



Automatic Nut Wrench.

◆

Small Transformer for Bell Ringing and Miniature Lamps.

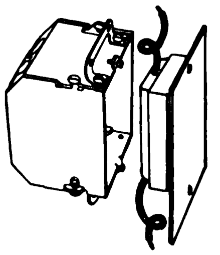


Fig. 1—Transformer Fitting Switch Box.

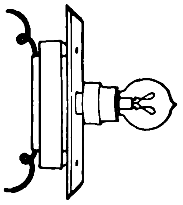


Fig. 2—Used with Special Plate and Miniature Lamp.

The A. E. Rittenhouse Company, Honeoye Falls, N. Y., has recently placed on the market something new in the way of a bell-ringing transformer, which can also be used to light small six-volt lamps. The unique feature of this transformer is that it is made to fit the standard single-gang switch box. The plate which covers the opening is black-enameled and is drilled and tapped so that any standard iron-box bell may be mounted thereon. This not only makes a very neat job, but almost eliminates line troubles as the only secondary wiring necessary is the

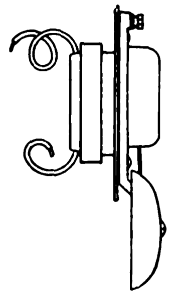


Fig. 3—Bell Mounted on Transformer Plate.

push-button loop. The transformer plate is also tapped to take a standard switch plate and one of the accompanying illustrations shows the transformer used in conjunction with a type "O" Perkins switch plate and two-candlepower six-volt lamp. This makes a good outfit for a night light, as the power consumption is less than three watts, including transformer loss. The transformer may also be used for surface mounting.

◆

The Schweitzer Cable-Fault and High-Voltage Detector.

When a primary or high-voltage main forming part of a "tree" system of mains connecting to the feeder becomes defective, the oil switch, high-potential fuse, or similar disconnecting device in the station operates. The entire circuit is then dead, and it is necessary to disconnect all of the branches which can be disconnected, and these must be reconnected, one branch at a time, commencing with the branch or main or feeder nearest the station.

As each constituent part is reconnected there is danger that the service on all the parts without fault will become affected since the branch last connected may prove to be the faulty one. To prevent the shutting down of the circuit when connecting additional branches, each additional branch must first be tested for faults. Hitherto a variety of makeshift devices have been used for testing additional branches before connecting. Chief among these has been the use of a bank of lamps connected in series for 2,300 volts or the use of a small transformer or fuses. Practical experience has clearly demonstrated that these makeshifts are entirely unsuited for this class of testing. For safety to the man and to the system they require that the lineman be an expert in this line of testing. Even then the testing is accompanied by considerable danger both to the man and to the system.

To meet the demand for a simple and reliable device that can be used with complete safety on overhead and underground cable and similar installations, the Schweitzer cable-fault and high-voltage detector has been designed. This detector consists of a simple combination of incandescent lamps and resistance rods, the terminals of which are connected directly across the line to be tested. The glowing of the lamps indicates the presence of potential. The rods and lamps are inclosed in a case of insulating material and provided with the necessary lead terminals, selector switch and carrying strap.

By means of this device a cable under test can be subjected to approximately the wave shape under which it must operate and a potential rise of about 100 per cent will occur, but with the energy flow limited, at the time that the cable is connected. This is the usual limit of potential rise when connecting an unloaded cable to the cable system and is a good test value to show whether or not the cable should be connected. The detector discriminates and tells whether charging current or fault current flows. This it does in a very simple fashion and it may be safely placed in the hands of an ordinary lineman. The directions for its use (see Fig. 2) are far simpler than those which are regularly given for ordinary classes of work done by linemen.

This device eliminates the need of two men carrying a heavy and easily puncturable transformer and lead connections from one overhead substation to another and of having one man climb the pole with the leads trailing about his legs. The Schweitzer detector is light and easily carried in the lineman's raincoat pocket. All exterior parts are made of insulating material. As its name implies this device can be used as either a high-voltage detector or as a cable-fault detector. It is made in two sizes, 600 to 6,600 volts and 6,600 to 13,200 volts.

The instrument described and illustrated above is known as the type A detector. Similar instruments as regards general design, but intended for use in central stations or substations, are also made by the designers and manufacturers of these devices, Schweitzer & Conrad, 1770 Wilson Avenue, Chicago, Ill.

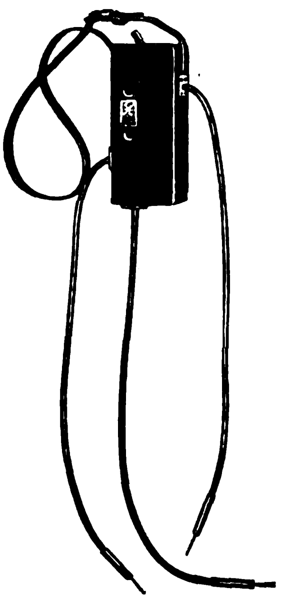


Fig. 1—High-Voltage Detector.

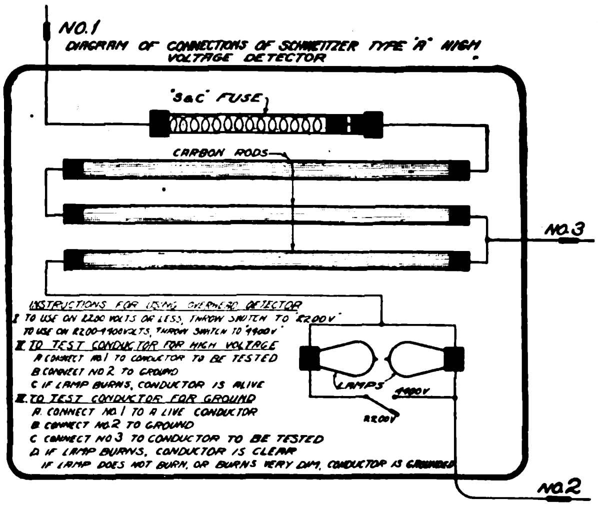

NO. 1
DIAGRAM OF CONNECTIONS OF SCHWEITZER TYPE "A" HIGH VOLTAGE DETECTOR
"S&C" FUSE
CARBON RODS
NO. 3
INSTRUCTIONS FOR USING OVERHEAD DETECTOR
I TO USE ON 2200 VOLTS OR LESS, THROW SWITCH TO "2200 V"
TO USE ON 2200-4400 VOLTS, THROW SWITCH TO "4400 V"
II TO TEST CONDUCTOR FOR HIGH VOLTAGE
A CONNECT NO 1 TO CONDUCTOR TO BE TESTED
B CONNECT NO 2 TO GROUND
C IF LAMP BURNS, CONDUCTOR IS ALIVE
III TO TEST CONDUCTOR FOR GROUND
A. CONNECT NO 1 TO A LIVE CONDUCTOR
B CONNECT NO 2 TO GROUND
C CONNECT NO 3 TO CONDUCTOR TO BE TESTED
D IF LAMP BURNS, CONDUCTOR IS CLEAR
IF LAMP DOES NOT BURN, OR BURNS VERY DIM, CONDUCTOR IS GROUNDED
LAMPS
4400 V
2200 V
NO. 2

Fig. 2—Connections and Directions for Detector.

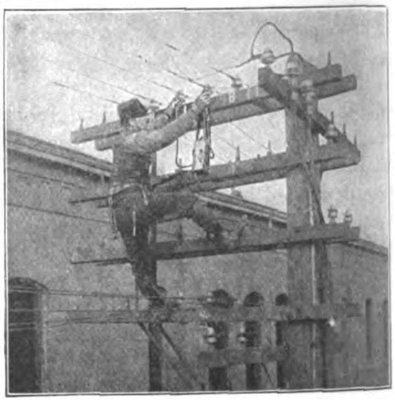


Fig. 3—Detector Used on Pole Line.

◆

Short-Circuit Test of a Large Generator.

In the presence of a number of representatives of central stations, the engineers of the Westinghouse Electric & Manufacturing Company recently deliberately short-circuited a 16,700-kilovolt-ampere, 8,800-volt generator running at full speed and without resistance or any other protection in the circuit. Oscillogram records showed that a current of 21,000 amperes, or 12.5 times normal, flowed through the generator.

With generators designed some years ago such a test would have wrecked the machine, but in the present instance no damage whatsoever was done. The only visible effect was a static flash between the field and the armature.

The test was performed to prove the fact that generators are being built that require no outside protection from outside short-circuits, the generator itself being so designed as to be self-protecting. Unless the generator is properly constructed a complete short-circuit tears out the armature coils, which, coming into contact with the revolving field, causes extensive wreckage. Furthermore, the static flash, which always occurs under such circumstances, will destroy inferior insulation. With generators of the type tested, however, both results are guarded against by firmly securing the armature coils and bracing their ends, on one hand, and by the use of mica insulation on the other. In consequence even so severe an ordeal as this test was withstood without harm, although it has been repeated many times with the same machine.

In connection with this test several others were carried out in order to prove the reliability of circuit-breakers and reactance coils for protecting the feeder circuits. The generator was repeatedly short-circuited through these devices which stood up admirably under the enormous stresses to which they were subjected.

The practice recommended by the Westinghouse engineers is to protect the feeders and not the generators. If the generators are protected and a short-circuit occurs on any of the feeders, even a poorly designed generator will not suffer, but the voltage will fail on all the feeders, all synchronous motors will be thrown out of step, and an overwhelming overload will be thrown on the circuit-breaker of the short-circuited feeder, since it will carry the total current of all the generators in the station. If, however, protective reactances are placed in each feeder circuit, and a short-circuit in a feed occurs, only that feeder will be affected and even then its reactance coil will prevent the current in it from rising to too high a value. The voltage will be maintained at the busbars and no disturbance will be felt in the remaining feeders. This happens, of course, provided that the generators are self-protective; if not, such an event may seriously injure them.

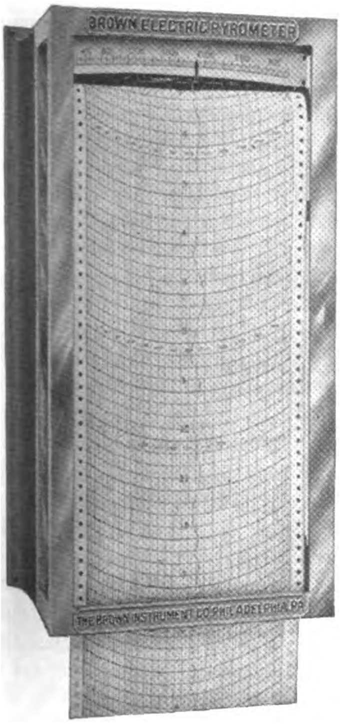


Fig. 1—Continuous-Chart Recording Instrument.

It is, of course, possible to protect non-self-protecting generators by reactances, but as the test described above shows, such a proceeding is unnecessary since generators can be supplied that are immune to the worst conditions of load that can be imposed upon them.

◆

A New Continuous-Chart Recording Instrument.

The Brown Instrument Company and the Keystone Electrical Instrument Company, of Philadelphia, Pa., are placing on the market a new type of continuous recording instrument for use as an electrical pyrometer for recording temperature, and also as a recording voltmeter or ammeter. Great efforts have been made to produce an instrument as simple in construction as possible and of the most compact form. The case of the instrument is only 15 inches high by 8 inches wide, and projects from the switchboard or wall 7 inches. The space occupied by the instrument has been largely reduced by placing the clock mechanism behind the record chart instead of to one side, and the record chart is the only part shown on the face of the instrument.

A two-months' roll of record paper is used which can be supplied with an ink ribbon to make a dotted ink record, or the record can be made on coated paper, which does away with the use of ink or ribbon entirely. It is only necessary to wind the clock once a week and change the roll of record paper once every two months.

Fig. 1 shows the complete instrument with 10 hours' record on the recording chart. One scale is placed above the record so that the indications are clearly visible at all times, and the paper has the scale printed on it for direct reading. Fig. 2 shows the instrument with the door open and the interior construction can be clearly seen. This case need only be opened once every two months to renew the roll of paper.

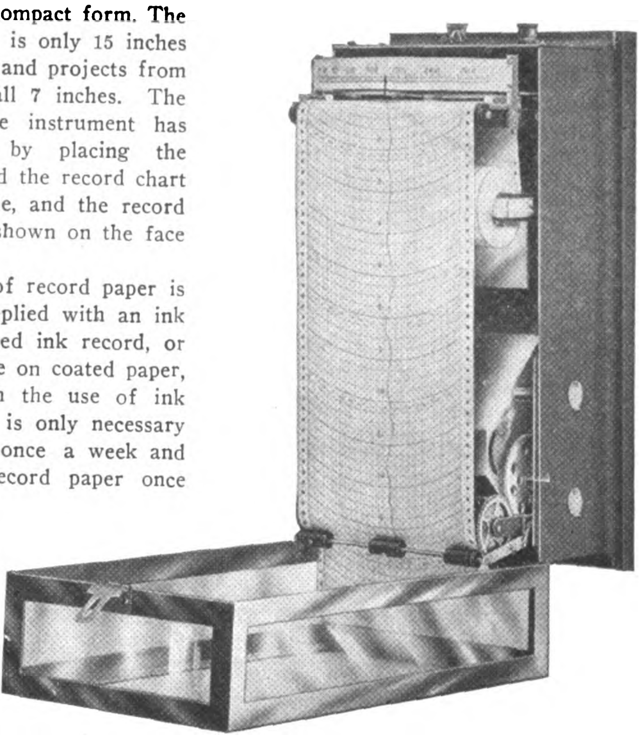


Fig. 2—Front Cover Opened to Show Interior Arrangement.

This new continuous recording instrument will prove particularly advantageous for use as an electric pyrometer in conjunction with thermocouples, for resistance thermometers for measuring low temperatures, or for recording volts or amperes. As the D'Arsonval type of direct-current instrument used is of the frictionless type to prevent lag in the readings, a particularly sensitive and accurate instrument is secured by this arrangement.

Brown-Boveri System of Phase Compensation for Improvement of Power-Factor With Induction Motors.

The Brown-Boveri method of phase compensation will prove of interest to power users in factories and elsewhere on account of the fact that it enables the size of motors to be reduced for a given power, or in other cases to obtain much more power out of existing motors, thus often making it unnecessary to increase the size of a factory plant. This apparatus is manufactured in France by the Compagnie Electro-Mécanique, of Paris.

The poor power-factor which is so often found in three-phase plants is chiefly due to the use of induction motors, and mainly to large-size motors running at low speed. However, even the high-speed motors can have an unfavorable effect if they run at light load or no load. To make the matter clear, it is known that all motors require to be excited. In the case of synchronous motors the exciting current is supplied by a source of direct current, while non-synchronous motors must take their exciting current from the three-phase mains themselves. The latter motors require two kinds of current, one for the work and the second for exciting or magnetizing. The magnetizing current is called watless, as it does no work and lags 90 degrees behind the working current. In the well known victor diagram, the total current is shown to be the resultant of the two component currents, and a certain phase angle or power-factor is produced thereby.

The exciting current has a value which is nearly independent of the load, so that when the load (or work current) is lessened, the phase angle increases. At no load, the energy component reaches a minimum and the power-factor drops to 0.10 or 0.15 and the motor takes about 40 per cent of the full-load current. The less the motor is loaded, the less will be the power-factor. Practical tests show that in industrial plants having three-phase motors the power-factor is generally between 0.6 and 0.85, and this high limit is rarely exceeded. The exciting current for non-synchronous motors must be furnished by the central-station machines at the same time as the work current, so that a low power-factor for the motors, say 0.5, means the use of but half the current capacity of the station. It is found that the necessary exciting current can be supplied through the rotor of the induction motor just as well as through the stator.

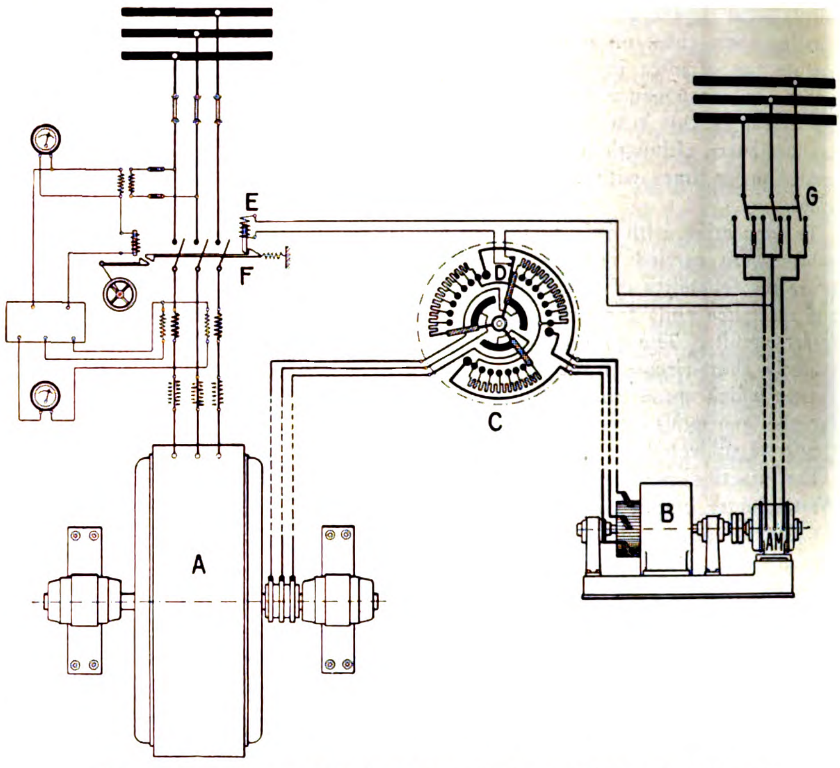


Fig. 2—Connections of Main Motor, Starter and Phase Compensator.

Methods of improving the power-factor of motors come under two classes. A single machine can produce the exciting current for all of the motors on the line, or each motor can have a separate compensating device. The first class comprises the over-excited synchronous motor, the synchronous motor-generator set and the rotary converter. All such machines can be overcompensated when they are sufficiently excited and when they are liberally enough designed in size, so that they send a magnetizing current to the line which compensates the lag therein. Should this be impracticable, a synchronous motor can be used which runs at no load and serves altogether for compensating the lag. But this solution means considerable cost of plant and upkeep and is not entirely satisfactory. Such machines in fact bring in their inherent defects, such as difficulty in starting up, danger of hunting and uncoupling. Besides, for a given excitation the synchronous machines produce a constant magnetizing current, but the same value of this current is not always required by the line.

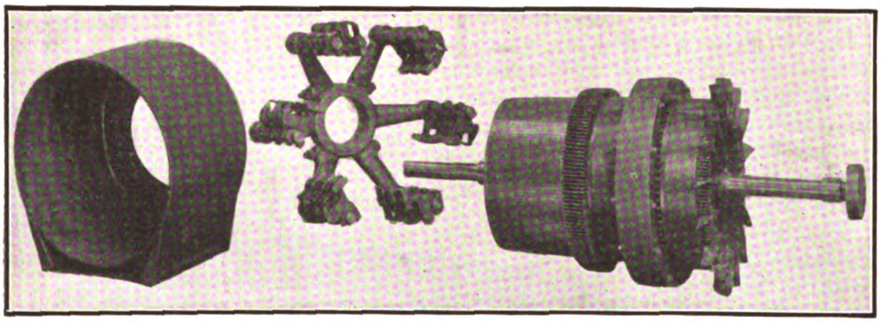


Fig. 1—Three Main Parts of the Phase Compensator.

The Brown-Boveri method belongs to the second class, that is an individual compensator for each motor. It requires that the plant possess one or several large motors which are constantly running. The new method is claimed to have none of the drawbacks of the first-mentioned one, and an induction motor thus equipped possesses in itself all the advantages of both synchronous and non-synchronous motors without the drawbacks of either. The phase compensator is a special machine (with commutator of polyphase type) which is coupled preferably to a small motor, or can be coupled to the principal motor. The rotor (see Fig. 1) has a drum winding and commutator, the bars of the winding being lodged in slots in the laminated core. If a polyphase current is sent through the brushes, for instance the current from the rotor of the main motor, the device in a stationary position acts as an induction coil and thus produces a reactance and a lag of the current. For a given current, this reactance depends on the frequency, i. e.,

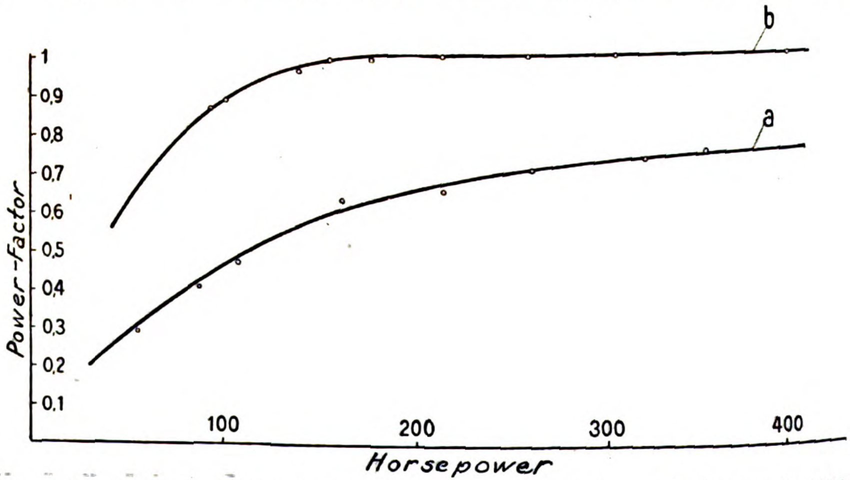


Fig. 3—Power-Factor of a 400-Horsepower Motor; (a) Without Compensator, (b) With Compensator.

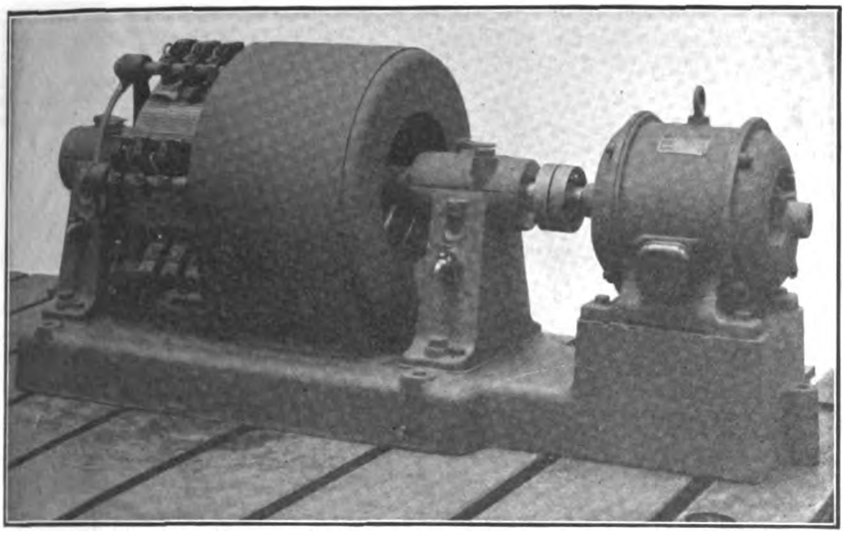


Fig. 4—A 12-Kilovolt-Ampere Compensator for a 600-Horsepower Motor; Driving Motor Is One Horsepower.

the speed at which the revolving field cuts the winding in the device. If we reduce the relative speed of field and winding by turning the latter in the same sense as the field, the reactance and accordingly the lag decrease. At synchronism the zero value of reactance is reached. Should the speed exceed that of synchronism, the reactance takes a negative value, and the device acts as a capacity and produces a leading current. Considering that the current brought to the device has a frequency corresponding to the slip of the principal motor, or from one to three cycles, while the speed of the device is chosen so that its frequency of rotations reaches 30 to 50 cycles, it is seen that there is produced a current with a large lead. Such current serves as a magnetizing current for the main motor, and this latter takes only the energy or working current from the lines.

One unusual point about the rotary compensator is that in principle it does not require a stator. However, in order to have a closed path for the lines of force, there is used a solid iron ring around the rotor.

Fig. 2 shows the principal wiring connections for a motor which is compensated in this way. The main motor *A* is connected to the mains through the usual apparatus. The compensator *B* is coupled to the last contacts of the starter *C* so that when once the start is made, the rotor of the main motor is connected to the compensator by working the starter handle. For heavy currents, or when the compensator is used on an existing motor, a special collector is necessary. An electric interlock device *E* prevents starting the main motor before the compensator group rotates and before the starting box is in the start position, avoiding all false moves in this way. In general, a small separate driving motor *AM* is mounted on the same base with the compensator.

The principal advantages of the Brown-Boveri system are its simplicity and safety of operation; also that its good ventilation allows of designing it to take a large overload, hence it has a small size compared with the power it has to take care of. It is to be noticed that an induction motor compensated in this way keeps all the properties of a non-synchronous motor, so that the slip increases with the load, preventing hunting oscillations and uncoupling. The power-factor remains practically equal to unity for all loads and without any supplementary adjustments, see Fig. 3. The system is especially applicable for use with slow-speed induction motors. In ordinary cases, to obtain a relatively high power-factor, the motor must be more liberally designed than its heat limit would call for, so that for this reason it has not been possible to build motors for every slow speeds above a certain size.

For use in factory plants where the motors are working on a poor power-factor the Brown-Boveri method is a most practical one. It should be noted, however, that if the slip rings of the main motor have to take all the current of the rotor, such rings should be reinforced in some cases. In the case of very large motors where an extra amount of slip is desired, for instance for rolling-mill motors in order to work well with the masses of the flywheel, it is preferable to provide the device with a stator winding, and here the compensator has two commutators on account of the heavy current used. This construction is also employed with advantage in the cases where it is desired to use the compensator to provide for the power-factor of a whole set of mains. In such case the device not only has to provide the magnetizing current for the principal motor but for all the other motors connected on the mains. The present method is not to be applied when the speed of the main motor is to vary between wide limits, but outside of this, it has already received numerous applications, especially for factory-motor work.

It is very peculiarly suitable for compensating heavy motors running at slow speed, such as for operating piston pumps, compressors, defibrating machines in paper and cellulose works, rolling-mill sets, and others. In one instance a 400-horsepower motor was coupled direct to a wood-defibratig machine, and its power-factor was brought to unity by the use of a small motor and compensator set.

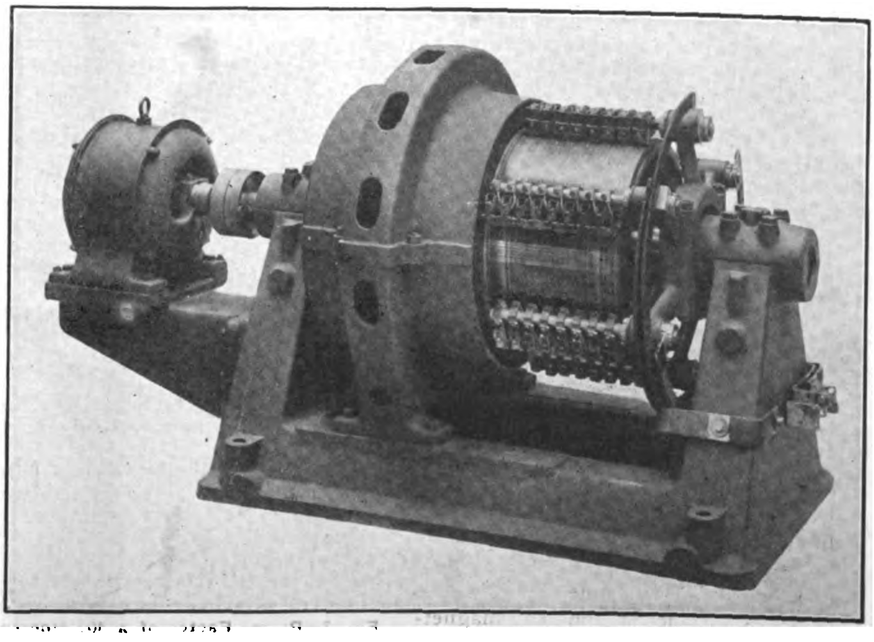


Fig. 2—A 30-Kilovolt-Ampere Compensator for a 1,200-Horsepower Motor.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

GROUND CLAMPS.—Ernest Klein & Brother, 44 Fulton Street, New York, N. Y.

"Klein Adjysto" ground clamp.

A two-piece clamp of copper having the ends secured by a single bolt and provided with a lug for soldered connection to the ground wire. In three sizes, adjustable for use with armored cable, metal molding and pipe or conduit up to three inches in diameter.

Approved February 4, 1914.

HEATERS, Electric.—American Electrical Heater Company, Woodward, Burroughs and Cass Avenues, Detroit, Mich.

Radiators, 250-4,000 watts; catalog No. 6,126.

Glue pots, 500-650 watts; catalog No. 145.

Approved January 17, 1914.

HEATERS, Electric.—American Electrical Heater Company, Woodward, Burroughs and Cass Avenues, Detroit, Mich.

"American Beauty" portable heating devices for voltages up to 250. Equipped with approved heater cord and detaching plugs.

Tea samovar, 450 watts; catalog No. 2,306.

Approved January 19, 1914.

INSULATING MATERIALS.—Mitchell-Rand Manufacturing Company, 99 John Street, New York, N. Y.

Sealing compounds.

"Leverite," melting point in excess of 200 degrees Fahrenheit.

"M R-50," melting point in excess of 150 degrees Fahrenheit.

Standard for sealing screw heads, nuts, bolts and other live metal parts of electrical fittings where such sealing by compounds having these melting points is required by the rules of the National Electrical Code.

Approved February 2, 1914.

INSULATING MATERIALS.—Mitchell-Rand Manufacturing Company, 99 John Street, New York, N. Y.

Sealing compounds.

"M R-40," a non-plastic material having a melting point below 150 degrees Fahrenheit. For battery sealing and for similar purposes, but not for sealing live parts in electrical fittings.

Pothead compound, a black, plastic compound, having a melting point of about 150 degrees Fahrenheit. For use in potheads, cable terminals and for battery sealing but not for sealing live parts in electrical fittings.

Approved February 3, 1914.

LAMP ADJUSTERS.—Adolph Cohn, 552 Summit Avenue, West Hoboken, N. J.

The "Rela" lamp adjuster, consists of a spring socket holder hooked to a short chain which in turn is secured to the end of an adjustable steel rod.

Approved February 9, 1914.

PICTURE MACHINES AND APPLIANCES.—Thomas A. Edison, Incorporated, Orange, N. J.

Edison kinetoscope, model D. A hand-driven motion-picture machine.

Approved February 3, 1914.

RECEPTACLES, for Attachment Plugs.—E. H. Freeman Electric Company, Trenton, N. J.

Sign-letter connector, catalog No. 103.

A porcelain outlet-box cover with two contact sleeves and individual plugs for the terminal wires of the letter.

Tea Samovar.—American Electrical Heater Company.

Standard for use with stranded rubber-covered wire not smaller than No. 14 B. & S. gauge for the purpose of connecting interchangeable letters or other portions of electrical signs to the supply circuits.

Flush wall receptacle, 660 watts, 250 volts; catalog No. 4,354.

Approved January 17, 1914.

RECEPTACLES, Standard.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" brass-shell, closed or slotted bases, for use on metal ceilings.

Key; catalog Nos. 4,554 and 7,554.

Keyless; catalog No. 7,555.

Pull; catalog No. 4,555.

Also all of the above types with shadeholders attached; key type with composition or insulated metal key.

Approved February 4, 1914.

SIGNS, Electric.—American Sign Company, Fifteenth and Washington Streets, Portland, Ore.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each sign.

The manufacturer is equipped to supply these signs so labeled.

Approved January 21, 1914.

SWITCHES, Push-Button Flush.—Chelten Electric Company, 314 Armat Street, Philadelphia, Pa.

The following switches are approved and labeled:

Single-pole, 5 amperes, 250 volts; 10 amperes, 125 volts; catalog Nos. 4,000-A, 5,000-A.

Double-pole, 10 amperes, 250 volts; catalog Nos. 4,001-A, 5,001-A.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts; catalog Nos. 4,002-A, 5,002-A.

Also above types with lock attachment.

Approved January 27, 1914.

SWITCHES, Push-button Flush.—Cutter Electrical & Manufacturing Company, Nineteenth and Hamilton Streets, Philadelphia, Pa.

The following switches are approved and labeled:

"S. F. Improved."

Single-pole, three-way and four-way, 10 amperes, 125 volts; 5 amperes, 250 volts.

Double-pole, 10 amperes, 250 volts.

Also above types with lock attachment.

Approved February 2, 1914.

SWITCHES, Surface Snap.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

The following switches are approved and labeled:

Single-pole, 5 amperes, 125 volts; 3 amperes, 250 volts; catalog Nos. 7,109-14, inclusive.

Approved February 4, 1914.

SWITCHES, Surface Snap.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

The following switches are approved and labeled:

Single-pole; catalog Nos. 5,121-24, inclusive.

Double-pole; catalog Nos. 5,125-28, inclusive.

Three-point; catalog Nos. 5,129-30.

Four-point; catalog Nos. 5,131-32.

Two-circuit; catalog Nos. 5,133-36, inclusive.

Three-circuit; catalog Nos. 5,137-40, inclusive.

Approved February 3, 1914.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

BELLINGHAM, MINN.—An electric light plant will be established here by L. F. Clark. C.

LOHRVILLE, IOWA.—A municipal lighting plant will be established. Address the city clerk.

MINATARE, NEB.—The question of a municipal lighting plant is now being agitated. Address the city clerk.

CORDELE, GA.—J. J. Williams and J. W. Canon are members of a committee appointed to secure improved lighting.

NOONAN, N. D.—George Todd, of Minot, has a contract to install a "White Way" lighting system at this place. C.

THATCHER, ARIZ.—March 14 the question of granting an electric franchise will be submitted to a vote. Address the city clerk.

ISANTI, MINN.—Allenn & Lovic, of Pine City, have made a proposition to the Council to extend the power line from Grandt to this place.

HAVANA, ILL.—Officials of the city of Havana are figuring on the advisability of building a municipal lighting plant. Address the city clerk.

TEXAS CITY, TEX.—The merchants are planning to install ornamental lighting on Sixth Street. Address the mayor in regard thereto.

LA CROSSE, WIS. — Wisconsin Railway, Light & Power Company will erect a new substation to cost $15,000. Peter Valier is general manager. C.

McARTHUR, O.—The McArthur Brick Company will erect a power house and install two boilers and a 300-horsepower engine and generator according to reports. R.

MEDICINE HAT, ALTA.—Plans are being made at the office of the City Engineer for an electric distributing system to cost $10,000 and a street-lighting system to cost $20,000.

LOWELLVILLE, O.—The Mahoning & Shenango Railway & Light Company has contracted to build a $100,000 power house here. The company is in the market for new machinery and general equipment. R.

CARLSBAD, TEX.—Plans are being made by the State Board of Managers of the State Tuberculosis Colony here for a heating and electric plant costing $10,000, and additions to the power house. D.

DALLAS, TEX.—The Commissioners' Court of Dallas County has ordered the erection of a power plant to supply the new county jail and the court house with power and light. It will cost about $25,000. D.

ELK RIVER, MINN.—F. D. Waterman, owner of the Elk River Water Power Company, will begin operations in the spring to develop the water power, generate electricity and provide light and power for this village if arrangements can be made. C.

PHOENIX, ARIZ.—The Pacific Gas & Electric Company of this city has just informed the Arizona Corporation Commission that it will in the near future set aside $100,000 for extensions and improvements to its system. T.

CHELSEA, MASS.—A bill introduced by Representative Beck authorized the Metropolitan Park Commission to construct and maintain a plant for furnishing electric lights for use on the parkways under its jurisdiction.

CANTON, O.—Mayor Stolberg is going to take up and consider plans for the installation of a municipal lighting plant within the next five months. He has so advised Engineer H. Whitford Jones, of Cleveland, who has prepared a tentative plan. R.

URBANA, O.—The Urbana Light Company plans to extend its lines between Cuyahoga Station and Mechanicsburg to furnish power to the 250-horsepower motors there and light to the residents along the line. A contract for the turbine engine is to be let. R.

JACKSONVILLE, FLA.—The Council will build a pump house and electric substation. Plans have been prepared by Architect Sargent Hamilton and bids will be advertised for. The estimated cost is $35,000. Address Frank Richardson, chairman of the Board.

ALTON, KANS.—The firm of Rollins & Westover, consulting engineers, of Kansas City, has been engaged to furnish the approximate cost of installation, maintenance, revenue, procedure, etc., of the proposed waterworks system and electric light plant. The bonds will likely call for $25,000.

NEWPORT, R. I.—A committee on the budget of this city has recommended to the city government the installation of 100 luminous arc lamps, with artistic fixtures, on Belleview, Harrison and Ocean Avenues and Ridge Road, six new arcs on Third Street and a general improvement of lighting Thames Street in the business section. W.

COLORADO SPRINGS, COLO.—A plan to construct a large power plant in the Cripple Creek district to supply power and light for its own use and for other large consumers is under consideration by the Portland Gold Mining Company. The estimated cost of the plant is from $200,000 to $250,000. If it is decided to build work will start immediately.

EAST WORCESTER, N. Y.—The Great Bear Light & Power Company is making arrangements to improve its plant by building a new dam at the Ferris pond in the town of Decatur early in the spring. It will also build a line through to Schenevus and operate the Schenevus plant from the main plant at East Worcester, giving an all night service to the villages of East Worcester, Richmondville and Schenevus.

RIVERSIDE, CAL.—Residents of Seventh Street, the main inlet to this city on the west, are preparing to establish along that thoroughfare a system of ornamental electroliers to cost about $4,000. Assessments are now being collected for the lighting system on Tenth Street, which amount to approximately $4,000. T.

NEWPORT, ORE.—A. Welsh has purchased the Yaquina Electric Company's plant at Newport, and has secured water rights on the Siletz River in Lincoln County. Mr. Welsh intends to begin the construction of the first unit of a $150,000 hydroelectric plant to supply Newport and surrounding country with electricity and power. The first unit will be built to develop 2,500 horsepower.

HADLEY FALLS, MASS.—The special committee on the acquisition of a municipal electric light plant has received propositions from companies in western Massachusetts to furnish energy. It is reported that several mills in the town will operate by electricity when the plant is put in operation. Among them is the Lynch & Ranger brick yards, which proposes to use motors for running the machines.

SOUTH PASADENA, CAL.—All of the public utilities corporations of this city have been informed that an ordinance, which will be rigidly enforced, has just been passed ordering them to remove all of their poles from the streets, putting them either in alleys or running the lines in underground conduits. It is understood that the underground method is favored by most of the corporations.

SAN FERNANDO, CAL.—The San Fernando Mission Land Company and John T. Wilson have made application to the State Railroad Commission for the authority to consummate deals whereby they will sell to the Pacific Light and Power corporation their holdings at this place. After these deals are completed the new owners will make extensions and improvements to these particular sections of the system.

VESTABURG, MICH.—A move is on foot here by the Alma Illuminating Engineering Company, a copartnership of Alma, to erect a power plant near Riverrdale to utilize the Pine River power developed at the J. W. Robinson dam. H. S. Connor, manager of the company, says that arrangements have been made for the erection of pole lines to carry the current for light and power to Vestaburg, Riverdale, Elm Hall, Sumner, Elwell, Winn, Cedar Lake and possibly to Edmore and Alma. The possibilities in the power line are great enough to warrant the resurrection of the old Coldwater and Marshall Railroad Company, whose roadbed was graded from Coldwater to a point within one-half mile of this dam nearly 40 years ago.

DRESDEN, TENN.—A $27,000 light and water system will be established. Address the mayor.

FOREST LAKE, MINN.—C. E. Stewart is interested in establishing an electric light plant here. C.

GREER, S. C.—Bids will be received for the construction of an electric light plant here. Address the mayor for particulars.

HOOPER, NEB.—A new company is being organized to furnish the town with electric light. Address Harris & Pope for information.

LEESBURG, GA.—An election will be held to vote on issuing bonds for establishing an electric light plant here. Address the mayor.

NEW GERMANY, MINN.—An electric light system will be installed here and the New Germany Auto Company will furnish the power. C.

HARMONY, MINN.—The Council is considering a bond issue for an electric light system. Ornamental lighting will be installed on three blocks of Main Street. C.

QUENEMO, KANS.—In its second referendum vote the town of Quenemo voted to grant a franchise to an Ottawa Electrical Company to extend an electric light line from Ottawa to that town.

LOS ANGELES, CAL.—Articles of incorporation have been filed here for the International Electric Lighting Company, with a capital stock of $500,000, by T. L. Croom, B. T. Wilson, D. W. Shoemaker, M. W. Janicke and Mary W. Croom.

MASON CITY, IOWA. — Mayor John Stanton has called a special election for March 26 to vote on the proposed $65,000 bond issue. About $50,000 is wanted for equipping the municipal electric plant.

GLENDIVE, MONT.—A new heat, light and power plant which will represent an investment of $75,000 will be constructed during the coming summer by the Glendive Heat, Light & Power Company. The plant is owned by the Hughes Brothers.

INDIANAPOLIS, IND.—The Muellerschoen Home Electric Light Company has been incorporated at $50,000 for the purpose of operating individual electric lighting plants. The incorporators are Charles Muellerschoen, John M. Ahlgren and H. V. Royal.

SPRINGFIELD, ILL.—A petition for the erection of an ornamental street-lighting system in Adams street from Lewis to Tenth Streets was filed by Mayor Schnepp with the Board of Local Improvements. The petition calls for five-lamp standards in the business district and for three-lamp posts in the residence district.

GREENVILLE, O.—The stockholders of the Greenville Electric Light & Power Company voted an increase of $40,000 in their capital stock. This will be used in making further extensions of lines and other improvements. The plant in this city is now furnsihing light and power to seven other towns and cities. It is expected that they will add other towns to their service.

WILMOT, MINN.—The City Council has approved the plans of the Water and Light Commission to replace the present electric equipment with the latest machinery with the added capacity needed to take care of the increasing demands of the patrons of the city plant. The expenses of this improvement will reach about $14,000. Address the city clerk.

BISHOP, CAL.—The State Water Commission has granted preliminary permits to C. O. Poole, acting for the Southern Sierra Power Company, to appropriate 300 second feet of water on Big Pine Creek and the same amount on Baker Creek. The power company filed an estimate of the cost of the Big Pine project at $1,300,000, and of the Baker Creek project at $550,000.

LOS ANGELES, CAL.—The Southern California Edison Company has just been granted permission by the State Railway Commission to issue bonds to the amount of $1,500,000, the money derived from the sale of these bonds to be used in improving and extending the company's system. The delivery of these bonds is being cared for by R. H. Ballard, secretary and assistant general manager of the company, and H. H. Trowbridge, counsel.

MILLSBURY, MASS.—The Connecticut River Transmission Company is to construct a new line of poles and wires from the substation of the company on Providence Street to the south works of the American Steel & Wire Company, Worcester, to furnish additional electric power for the concern. Plans are all made to begin the work as soon as weather conditions are favorable. The line will be five miles long, and will be what is known as the three-phase circuit. A representative of the company has stated that the rights of way and pole locations have been secured, and all is in readiness to start work early in the spring. He also stated that work will be started.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

OSKALOOSA, IOWA.—The Home Telephone Company is preparing to install an underground conduit system.

ALEXANDER, N. D.—The Dakota Northwestern Telephone Company will install a telephone exchange here in the spring. C.

HICKORY, N. C.—The Sandy Ridge Telephone Company has been organized here. G. C. Pickard is president and J. E. Huffman, secretary.

MENAHGA, MINN.—The Latona & Twin Lakes Telephone Company has been incorporated with a capital stock of $5,000. A. Burt is president.

MASON CITY, IOWA.—The Way Martin Telephone Company has been incorporated with a capital stock of $5,000. B. C. Way is president.

DENTON, N. C.—The Denton Telephone Company has been incorporated with a capital stock of $25,000 by J. F. Cameron, J. W. Cashatt and others.

PORT BYRON, N. Y.—The Port Byron Telephone Company has purchased the Warren property and will immediately erect a new office building.

THREE FORKS, MONT.—The Farmers Telephone Company has been incorporated with a capital stock of $40,000 by R. S. Rutcher, R. A. Young and others.

EUREKA, MONT.—Directors of the Eureka Mutual Telephone Company are considering building an extension up St. Clair Creek and to Gateway.

CHARLESTON, ILL.—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $1,300 by F. H. Rehue, A. S. Ingram and others.

STREETMAN, TEX.—The Streetman Telephone Company has been incorporated with a capital stock of $5,000 by C. A. Elliott, R. M. Thompson and S. G. Ward.

MARSHALL, MINN.—The Sodus Rural Telephone Company has been organized with A. O. Killius, president; Hugh Edwards, vice-president, and S. E. Boyle, secretary. C.

LORIMORE, IOWA.—The Macksburg & Lorimore Mutual Telephone Company has been incorporated with a capital stock of $6,000 by A. Leonard, A. Nitzsche and others.

MILLVILLE, N. J.—The City Commission has made an appropriation of $2,200 for the installation of a police and fire-alarm system. Bonds for this and other municipal improvements have been approved. A.

WARROAD, MINN.—Warroad Telephone Company is making plans to extend its line from Clementson to International Falls, work to begin in spring. Messrs. Fox and Jewett are the owners. C.

DAYTON, O.—The Dayton Home Telephone Company has directed the engineering firm of McMeen & Miller to prepare plans for extending the service. Address A. McL. Marshall, director.

THOMASVILLE, GA.—The Consolidated Telephone & Telegraph Company has been incorporated with a capital stock of $250,000 to acquire and erate telephone systems. R. L. Stewart is general manager.

STEELTON, PA.—The Council has voted to establish a central police station and to install a system of red lights and telephones throughout the borough to increase the efficiency of the police department. Address T. J. Nelly, chairman of the Police Committee, for further particulars.

INTERNATIONAL FALLS, MINN.—Border Telephone Company has been incorporated with a capital of $10,000. A. H. Hanson is president; Albert Schonsby, treasurer. It is proposed to build a line from Loman to Clementson, a total distance of 45 miles. C.

TAMPA, FLA.—The Peninsular Telephone Company will improve the system. A bond issue of $250,000 has been made. Extension of the lines to Bartow, the Manatee section and to the west coast has also been under discussion and the lines will be extended in these directions as the work of improving the entire system goes along. Address J. H. Detwiler, director, for further information.

SIDNEY, MONT.—The Water Users Electric Company, of Sidney, will build a telephone line to Lambert and Enid. Work will commence early in the spring. Address President Kemmis for particulars.

VALDEZ, ALASKA.—Lieut. Dougherty, U. S. A., here, in charge of the Military cable and telegraph line, has been instructed to construct a telegraph line from this city to Fort Liscum. Master Electrician Stocker will have charge of the installation, which will be a combination telephone and telegraph line. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

LEWISTON, IDAHO.—The Nezperse & Idaho Railway Company is preparing to build 12 miles of line out of this city.

STURGEON BAY, WIS.—E. W. Olberg is preparing surveys for the construction of a proposed electric railway to connect Sturgeon Bay and Liberty Grove.

SARNIA, ONT.—The Sarnia Street Railway Company is preparing to extend its line along the river bank of Sarnia. William Williams is chief engineer.

NATCHITOCHES, LA.—The citizens of this place are backing the construction of an interurban railroad between Natchitoches and Campti, La., on the Red River, south of Shreveport. D.

MADISON, IND.—L. S. Cook has plans for the construction of an interurban line to Cincinnati, Ky., covering a farming district in the Ohio Valley at present is without rail facilities.

EVANSVILLE, IND.—The Evansville Railway Company is planning to construct an electric railway to connect with the Evansville-Rockport line. Address William A. Carson, general manager.

UVALDE, TEX.—The Uvalde & Leona Valley Interurban Railway Company will construct an electric railway from Uvalde to Batesville, about 22 miles. Address J. H. Gearhart, general manager.

COLORADO SPRINGS, COLO.—An electric line from Colorado Springs to Florence and Canon City, with a branch from Florence to Pueblo, may be built this spring. Address E. W. McClung, chairman, for information.

NORRISTOWN, PA.—A new trolley road from this, the county seat of Montgomery, to Doylestown, the county seat of Bucks, is rumored as a contemplated extension to the tracks of the Reading Transit Company.

SAN FRANCISCO, CAL. — The Ocean Shore Railroad Company has applied to the Railroad Commission for permission to issue $200,000 in bonds, the proceeds of which are to be used for the electrification of its road from this city to Halfmoon Bay.

BARABOO, WIS.—The Baraboo, Devil's Lake & Western Railway Company expects to start operations to extend its line from Portage to Baraboo, Devil's Lake, Kilbourn and The Dells. T. E. Mead and T. F. Risley are interested.

SANTA ROSA, CAL.—Surveying has begun on a new electric line to run from Graton to Camp Meeker in connection with the present Petaluma and Santa Rosa Electric Railway. The road will be seven miles in length, and will cost in the neighborhood of $200,000.

BRENHAM, TEX.—The Young Men's Business Association of Brenham is promoting the construction of one or more interurban lines out of Brenham to other points in Washington County. Frank Eberle is secretary of the Association.

CONCORD, N. H.—It is reported that Boston capitalists will finance the building of the proposed Concord, Northwood and Dover street railway in New Hampshire. The town of Northwood has at present no railroad facilities, and contains two extensive shoe factories. The survey of the line skirts Suncook pond, in that town, where about 75 summer cottages are being built. The line is designed for freight traffic as well as for passengers, and it is the object of the promoters to utilize it for the transportation of coal from the seaboard to interior New Hampshire points. W.

SHELBYVILLE, KY.—At a meeting of directors of the Business Men's Association of Shelby county, the project for an electric line between the Shelbyville and Mt. Eden was revived and steps taken to put the proposition on a business basis.

SHERIDIAN, WYO.—An interurban electric railway from Sheridian up the Big Goose Valley to Absaraka Park may be built in the near future. Secretary Steele of the Commercial Club may be addressed in regard to the project.

EVANSVILLE, IND.—A survey for the extension of the Evansville and Rockport traction line from Kincaid, Ind., to a point opposite Owensboro, Ky., is being made. It is expected the spur will be built some time this year. The estimated cost of construction is $250,000.

MADISON, WIS.—The Janesville & Madison Traction Company has been incorporated with a capital stock of $25,000 by Dr. Gustav Pickhardt, Frank Weston, J. W. Pepper and J. H. Aubey. An interurban road is to be built from Janesville to Madison. It is understood that a considerable portion of the road is to be completed by the summer.

PETALUMA, CAL.—What will mean a new era of development to western Sonoma County, and a boon to practically every section of Imperial Sonoma, has been inaugurated by the surveying of a new electric railroad from Graton to Camp Meeker. This road will connect with the Retaluma & Santa Rosa Railroad at Graton and will run for a distance of seven miles westward.

HARRISBURG, ILL.—Information was given out from the general offices of the Southern Illinois Railway & Power Company here that work on the extension of the road from here to Marion, Whiteash, New Virginia, Johnson City, West Frankfort, Benton and Herrin will begin April 1. Address the general manager, this city, for further particulars.

PACKETTSTOWN, N. J.—The opening of the trolley connection to Lake Hopatcong will no doubt soon be followed by construction to connect with the system from Hackettstown, and a journey by trolley to Harrisburg will soon be practicable. The route now available is extremely attractive, passing through Summit, Chatham, Madison, Morristown, Dover, to the Lake thus opening to the public at a low rate some of the pleasantest sections of New Jersey and some scenery that is not excelled for general charm anywhere.

PITTSBURG, PA.—Active operations will be started early in the spring on the building of an electric line from Williamsport, Md., through Martinsburg, Winchester, Strasburg, Woodstock and southward as far as Harrisonburg Va. The syndicate which is known as the Shenandoah Valley Railway Company is also contemplating running a spur of the road into Washington, D. C., making connection with the southern terminal of the Washington & Old Dominion Electric Railway at Bluemont.

PROPOSALS.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 1 for furnishing the interior lighting fixtures of a one-story building for the postoffice at Clarksville, Tex.; and until April 3 of a one-story building for the postoffice at Sycamore, Ill., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites or the Supervising Architect.

ELECTRIC DISRIBUTION SYSTEM.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., enddorsed "Proposals for an Underground Electric Distributing System," until March 14 for an alternating-current electric distributing system and transformers, cables, motors, and two feeder panels for the Naval Training Station, Newport, R. I. The estimated cost is $8,100. Plans and specifications may be obtained upon application to the Bureau or to the Commandant of the Naval Station named.

NEW INCORPORATIONS.

DALLAS, TEX.—Carroll Electric Company has been incorporated with a capital of $5,000 by E. A. Corley, W. M. Jones and W. G. Carroll.

BROOKLYN, N. Y.—Louis Kalischer, Incorporated, has been incorporated with a capitalization of $20,000 to engage in electrical contracting. The incorporators are Louis Kalischer, Joseph Milbouer and Louis Florance, of Brooklyn.

NEWARK, N. J.—The American Metal Moulding Company has been incorporated with a capital of $50,000 to manufacture metal conduits for electric wires. C. A. Reibovitz, G. A. Johnson and Clarence Hanson are incorporators. A.

WARREN, O.—The Luse Electric Company has been incorporated with a capital of $5,000 to do a general installation business. The incorporators are Howard M. Luse, Mary A. Luse, J. E. Beebe, George T. Fillius and J. G. Bates.

NEW YORK, N. Y.—Bateman & Miller Electrical Company, Incorporated, has been incorporated to engage in the electrical-contracting business. The incorporators are Charles E. Bateman, John Miller, of New York City; and Charles F. Hulseman, Brooklyn.

ANDERSON, IND. — Powell & Dorste, Incorporated, has been granted articles of incorporation with a capital stock of $25,000. The company will engage in the electrical and heating supply business. The directors are Walter H. Powell, Robert Forste and Louis T. Dorste.

CLEVELAND, O.—The Cleveland Electrical Exposition Company has been incorporated with a capital stock of $4,000 for the purpose of conducting electrical expositions. The incorporators are William G. Rose, Hubert C. Mohr, Harry L. Weiss, B. Grebe and M. E. Turner.

NEW YORK, N. Y.—Electro-Acoustic Company, Incorporated, has been incorporated with a capital stock of $100,000 to manufacture electrical devices for receiving and recording sound. The incorporators are Richard S. M. Mitchell, Newark, N. J.; Henry W. Showers and Bayard Stevens.

FINANCIAL NOTES.

The National Carbon Company has been authorized to increase its preferred stock from $4,500,000 to $5,600,000 and the common from $5,500,000 to $12,000,00.

A committee of Philadelphia electric stockholders has been formed to ask the United Gas Improvement Company to reopen the lease offer made a year ago, and to negotiate this time direct with the shareholders of the electric company.

The Third Avenue Railway Company has received permission from the New York Public Service Commission to issue $4,000,000 bonds to replace money expended in obtaining control of the Belt Line Railroad and the New York City Interborough Railroad Company. The company's original application called for an issue of $6,650,000. The remaining $2,650,000 has not been refused, but is held in abeyance pending further hearing and investigation.

J. P. Morgan & Company have sold $10,000,000 Interborough Rapid Transit first and refunding mortgage fifty-three-year five-per-cent bonds to the distributing syndicate, consisting of Lee, Higginson & Company, William R. Read & Company, Harris, Forbes & Company, Kissel, Kinnicutt & Company, and White, Weld & Company. To cover the Interborough's requirements under the dual subway plan, the company sold to J. P. Morgan & Company and through them to the above syndicate, $170,000,000 of the new first-mortgage bonds, to be taken and paid for in four yearly installments, viz: In 1913, $78,000,000; in 1914, $30,000,000; in 1915, $30,000,000, and 1916, $32,000,000. The amount of the bonds already sold to the public is $30,000,000, and the new issue will bring it up to $40,000,000.

Announcement is made by Kelsey, Brewer & Company, of Grand Rapids, Mich., operators of the American Public Utilities Company, that they have acquired for that corporation the Electric Railway properties of the Chippewa Valley Railway, Light & Power Company, operating street railways in Eau Claire and Chippewa Falls, together with an interurban line connecting these two towns, a distance of 22.5 miles. It is also announced that other properties have been acquired, including the Chippewa Falls Waterworks & Light Company, the Menominee Electric Light & Power Company, the hydroelectric plant at Menominee and power rights along the Red Cedar and Chippewa Rivers and other public utilities in Menominee, Elmwood, Spring Valley and other small towns in Minnesota. The deal involves about $3,000,000, and the new properties will be taken over and operated by the American Public Utilities Company. Some new financing by the American Public Utilities Company will be announced soon in connection with the acquisition of these properties.

Kelsey, Brewer & Company, operators of the American Public Utilities Company, Grand Rapids, Mich., have closed a deal whereby they now control practically all the public utility rights in the Mississippi Valley between La Crosse, Wis., and St. Paul, Minn., thus furnishing an outlet at the twin cities for the immense capacity of the Mississippi Valley between the cities mentioned, a territory rich, prosperous and growing. In addition to the already extensive holdings of the American Public Utilities Company in Minnesota, the new deal takes over all the trolley properties of the Chippewa Valley Railway, Light & Power Company, which operates the street railway in Eau Claire and Chippewa Falls, together with the interurban line between these two cities, a distance of twenty-two and a half miles; the Chippewa Falls Water Works & Light Company, the Menominee Electric Light & Power Company, the water power plant at Menominee, and rights along the Red Cedar and Chippewa rivers with a capacity developing approximately 100,000 horsepower of electric current, together with other public utilities in Menominee, Elmwood, Spring Valley and other small towns which represent extensive gas and electric plants and manufacturing interest. The deal covers an approximate investment of $3,000,000. These new holdings will be operated by Kelsey, Brewer & Company in addition to those already controlled in Minnesota and Wisconsin.

Dividends.

Central Mississippi Valley Electric Company; initial of $1.50 on preferred, payable March 2 to stock of record February 21.

Cities Service Company; monthly of 0.5 per cent on preferred and 0.5 per cent on common, payable March 1 to stock of record February 15.

Electric Storage Battery Company; quarterly dividends of one per cent on both the common and preferred stocks, payable April 1 to stock of record March 23.

El Paso Electric Company; quarterly of $2.25 on the common, payable March 16 to stock of record March 4.

National Carbon Company; a 50 per cent stock dividend, payable on March 20. The company's surplus recently was increased substantially by the liquidation of certain assets.

Philadelphia Company; regular quarterly of 1.75 per cent, payable March 14 to stock of record February 21.

Philadelphia Electric Company, regular quarterly of 1.75 per cent, payable March 14 to stock of record February 21.

West Kootenay Power & Light Company, Limited; a quarterly dividend of 1.25 per cent, payable March 2.

Reports of Earnings.

REPUBLIC RAILWAY & LIGHT.

(Subsidiary Companies.)

	1914	1913
January gross	$ 257,978	$ 244,340
Net after taxes........	105,699	95,774
Surplus after charges.	62,610	49,958
12 months' gross......	3,011,306	2,710,157
Net after taxes........	1,163,630	1,076,851
Surplus after charges..	630,093	546,865

DETROIT EDISON COMPANY.

	1914	1913
January gross	$ 603,326	$ 500,573
Net after taxes........	281,468	238,732
Surplus after charges.	216,439	175,249
Depreciation	43,350	43,350
Balance	173,089	131,899

MILWAUKEE ELECTRIC.

The railway department of the Milwaukee Electric Railwav & Light Company reports for the year ended December 31, 1913, compared as follows:

	1913	1912
Gross	$ 4,221,311	$ 4,131,811
Net after taxes	1,057,011	1,218,600
Other income	11,927	29,463
Total income	1,068,938	1,248,064
Surplus after charges	570,278	691,694

The earnings of the light and power department of the Milwaukee Electric Railway & Light Company for the year ended December 31, 1913, compared as follows:

	1913	1912
Gross	$ 1,795,606	$ 1,550,545
Net after taxes	753,470	533,694
Other income	33,252	31,726
Total income	786,722	565,420
Surplus after charges	552,059	406.583

GRAND RAPIDS RAILWAY.

	1913	1912
December gross	$ 121,731	$ 106,978
Net after taxes	50,140	41,370
Surplus after charges	37,719	27,118
12 months' gross ..	1,294,347	1,233,588
Net after taxes	497,796	533,358
Surplus after charges	331,163	358,133
Balance after preferred dividends ..	256,163	283,133

NEW YORK TELEPHONE COMPANY.

The report of the New York Telephone Company for the year ended December 31, 1913, compares as follows :

	1913	1912
Phone revenue	$46,831,034	$43,223,623
Expenses and tax ..	34,834,428	31,276,208
Net telephone earnings	11,996,606	11,947,415
Dividends and interest	5,770,395	5,356,176
Miscellaneous earnings	15,278	9,579
Total net earnings ..	17,782,279	17,313,170
Interest charges	3,494,695	2,951,845
Balance	*14,287,584	14,361,325
Dividends	10,000,000	10,000,000
Surplus	4,287,584	4,361,325

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*Equal to 11.43 per cent on $125,000,000 capital stock, as compared with 11.48 per cent on same stock previous year.

President U. N. Bethell says:

"On Dec. 31, 1913, there were 1,082,765 stations in the system directly operated by your company and its local connecting companies, an increase during the year of 96,985. Including the associated and connecting companies, there were in service in the whole system at the end of the year 1,931,984 stations, an increase during the year of 175,641 stations.

"Under the plan for enployee's pensions, disability benefits and insurance, adopted January 1, 1913, there has been paid out from the fund during the past year $224,439. The interest added amounted to $76,358, leaving a balance of $148,081, which has been appropriated to restore the fund to its original amount of $2,000,000."

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 23	Feb. 16
American Tel. & Tel. (New York)..............................	121	120
Commonwealth Edison (Chicago)..............................	136	135⅞
Electric Storage Battery, common (Philadelphia)..............	53¾	55
Electric Storage Battery, preferred (Philadelphia)............	53¾	55
General Electric (New York)..................................	149¼	148
Kings County Electric (New York).............................	120¼	120
Manhattan Transit (New York).................................	1	1
Massachusetts Electric, common (Boston)......................	11	11
Massachusetts Electric, preferred stamped (Boston)...........	62¼	62
National Carbon, common (Chicago)............................	158	150
National Carbon, preferred (Chicago).........................	117	118
New England Telephone (Boston)...............................	139	140
Philadelphia Electric (Philadelphia).........................	26¾	26⅞
Postal Telegraph and Cables, common (New York)...............	86½	84¾
Postal Telegraph and Cables, preferred (New York)............	70	69
Western Union (New York)	64½	64⅛
Westinghouse, common (New York)..............................	71⅛	70
Westinghouse, preferred (New York)...........................	116	115

PERSONAL MENTION.

MR. CONRAD HUBERT has been elected a vice-president of the National Carbon Company, succeeding Webb C. Hayes.

MR. HENRY MADISON, formerly with the Newton Gas and Electric Company,, Newton, N. J., has been appointed chief electrician at the new municipal lighting plant, Franklin Borough, N. J.

MR. GEORGE P. TRAYNER has resigned his position in the commercial department of the Utah Light & Railway Company and has gone on the road for the Lambert Paper Company of Salt Lake City.

MR. C. R. FAIRCHILD, district manager of the Bell Telephone Company at Trenton, N. J., gave a stereopticon lecture on the uses of the telephone at the Grange meeting, Pennington, N. J., February 14.

MR. W. L. OVERMAN, representative of the Hughes Electric Heating Company, was recently in Salt Lake City, effecting arrangements with the Western Electric Company's local house to handle that line of electric ranges in this territory.

MR. T. L. BISSELL has resigned his position in the commercial department of the Utah Light & Railway Company, and has taken the agency for several lines of contractors' machinery for the state of Ohio. Mr. Bissell has returned to the East to take up this line of work.

MR. J. O. PRESBY, representative of the Holophane Works of the General Electric Company, with headquarters in San Francisco, has recently been in Salt Lake City covering the trade in this territory. He reports business conditions here strong and improving.

MR. THOMAS A. EDISON has gone to the Everglades of Florida, where, with Mrs. Edison, Miss Madeleine and Charles and Theodore Edison, he will spend a vacation of six weeks. Headquarters will be at Fort Myers, where a temporary laboratory has been set up.

MR. HOMER E. NIESZ, Jovian Statesman for Chicago and president of the Chicago Jovian League, was the speaker at the luncheon meeting of the St. Louis League of Electrical Interests-Jovian Chapter on Tuesday, February 24. His subject was "Practical Jovianism."

MR. RAY KAUFFMAN, well known in Ohio electric circles, and a graduate of the Case School of Applied Sciences, Cleveland, O., class of 1904, has accepted a position with the Electrical Maintenance Company, of Youngstown, O. His last connection was with the Western Electric Company.

MR. O. P. WILSON has accepted the position of assistant general manager of the Norma Company of America, New York, N. Y., manufacturer of ball-bearings, roller-bearings, precision instruments, etc. He was connected with the Westinghouse Electric & Manufacturing Company for 14 years, for the last 10 years in the purchasing department.

MR. W. E. BLODGETT, assistant secretary of the Utah Light & Railway Company, has returned from a trip to Los Angeles and San Francisco. He took occasion while there to investigate the progress in the lighting, power and street railway development, and was particularly impressed with the rural distribution of the systems there and the high voltage of the main transmission lines.

MR. J. H. W. REES has been made general manager of the United Electric Lamp Company, Brooklyn, N. Y. Mr. Rees is well known in commercial and industrial fields and brings to the company a wide experience and aggressive personality. He was until recently advertising manager of Denth & Company, importers of incandescent lamps, and was formerly executive advertising manager of the National Progressive party.

MR. JAMES B. DUKE, president of the Southern Power Company, and MR. SAMUEL McROBERTS, vice-president of the National City Bank, New York, have completed a tour over the Piedmont & Northern Railway, in North and South Carolina. The lines of this property have been opened as far south as Spartanburg, over which the officers made the initial trip, accompanied by Mr. W. S. LEE, vice-president and chief engineer of the Southern Power Company. This interurban company connects most of the cotton manufacturing towns in the Piedmont districts of the two Carolinas.

MR. S. T. WHITAKER, local manager of the Utah Light & Railway Company at Ogden, has returned from a two-week trip to California points. While the main objects of his journey were rest and recreation, Mr. Whitaker spent considerable time looking into matters pertaining to the electric light, power and gas business. Owing to his previous position as director of the special exhibit of the State of Utah at several large fairs, he was particularly interested in the progress of the Panama-Pacific Exposition and reports that according to his observation, the Exposition management is further behind in its preparations than were most of the other big fairs at the corresponding time.

OBITUARY.

MR. WILLIAM D. LANDON, foreman of construction for the Western Union Telegraph Company in the Boston district, and for 34 years in the service of the company, died at Somerville, Mass., February 15. He was a native of Vermont and was 54 years old.

MR. THOMAS JEFFERSON EMERY, an early experimenter in telephony, died in Somerville, Mass., February 17. He was born in Charlestown 73 years ago. As a youth he, with a brother, connected two dwellings with a line with batteries attached, modeling their apparatus on the telegraph, then in use.

MR. WILLIAM HENRY BOARDMAN, for many years president of the *Railroad Gazette,* now the *Railway Age Gazette,* and for eight years its editor, died at Ridgefield, Conn., aged 67, on February 17. Mr. Boardman became connected with the *Railroad Gazette* shortly after his graduation from the University of Michigan, in 1869. As a pioneer of lawn tennis in America he designed the once famous "Franklin" racquet. He was former president of the Adirondack League Club and a member of the Century, Camp Fire and St. Andrew's Golf clubs of New York.

NEW PUBLICATIONS.

RAILWAY ASSOCIATION PROCEEDINGS.—The Proceedings of the American Electric Railway Engineering Association for 1913 has come from the press. It contains a complete report of the eleventh annual convention held at Atlantic City, N. J., last October. The frontispiece is a portrait of President Martin Schreiber.

WATT-HOUR METERS.—Technical Paper No. 207 of the Bureau of Standards is entitled "A Comparative Study of American Direct-Current Watt-Hour Meters," by T. T. Fitch and C. J. Huber. This considers the performance under test, the details of construction, the effect of friction losses upon the load curve, and a bibliography of the subject. Six makes of American meters are included in the tests.

DATES AHEAD.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Iowa.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. H. Fritch, 900 South Michigan Avenue, Chicago, Ill.

Minnesota Electrical Association. Annual convention, Minneapolis, Minn., March 18-20. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

Society of Efficiency, New York, N. Y. April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Delta-Star Electric Company, Chicago, Ill., is distributing an illustrated flyer showing several types of modern outdoor high-tension substations; copies of this will be sent on request to the company.

A. Hall Berry, New York, N. Y., announces ready for distribution a new bulletin on Hartford time switches for electrical supply jobbers. This gives technical information, sizes, capacities, type, list and discount price.

North Electric Company, Cleveland, O., has been placed in the hands of receivers upon the application of an employee, Joseph S. Blake. Common Pleas Court Judge Collister has appointed Dean C. Talbott and John T. Scott receivers.

Central Electric Company, 320 South Fifth Avenue, Chicago, in the February issue of *Electron*, publishes some interesting information on the lighting of bank buildings. B. J. Kacin contributes an article entitled "Commerically Educating the Young Men." Another interesting article is entitled "What One Cent's Worth of Electricity Will Do."

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued a 30-page well-illustrated book entitled "Difficult Drilling and Boring Made Easy." It describes the Pawling & Harnischfeger horizontal drilling and boring machines and gives views in many machine shops in various parts of the country in which these machines have been very successfully used in facilitating work of this kind.

Duncan Electric Manufacturing Company, Lafayette, Ind., has issued bulletin No. 27. This is devoted to Duncan direct-current watt-hour meters for lighting and power service. These instruments are made in a variety of types, each of which is illustrated and described at some length. The parts of the meters are also similarly treated. A number of valuable hints on the care of meters are included in the bulletin.

The F. W. Wakefield Brass Company, Vermilion, O., has issued catalog No. 14 of Wakefield electric lighting fixtures. This catalog contains 78 pages, on each of which are several designs of various fixtures, including bracket, chandelier, short-stem ceiling fixtures, showers and a great variety of other fixtures. Brief data are given for each design. Several of the more distinctive lines of fixtures are described somewhat at length.

Siemens & Halske Aktiengesellschaft, Berlin, Germany, has issued a 24-page reprint of the lecture delivered by Dr. A. Franke on "High-Speed Telegraphs," which was presented before the Elektrotechnischer Verein. This publication, which is designated as bulletin No. 171, is very completely illustrated and describes the completely developed Siemens & Halske system of high-speed printing telegraphy which has been so successfully adopted in Europe.

National Carbon Company, Cleveland, O., has filed an increase in its capital stock at Trenton, N. J., from $10,000-000 to $17,600,000. The net income of the company for the past fiscal year was $1,476,641. The following directors have been elected: J. S. Crider, E. Hackenberg, J. L. Severance, M. T. Herrick and Andrew Squire, of Cleveland; John S. Bartlett, Boston; John P. Wilson, Chicago; Conrad Hubert and F. C. Walcott, New York; Barker Gummere, Jr., Trenton, N. J.; and James Parmelee, Washington, D. C.

The Emerson Electric Manufacturing Company, 2024 Washington Avenue, St. Louis, Mo., announces in the February number of its house organ, *The Emerson Monthly,* that it is prepared to send samples of Emerson fan motors of the new oscillating type on 30 days' trial to any responsible dealer in this country. The five-year guarantee on Emerson fans is also emphasized. Extracts from the new ordinance on the ventilation of moving-picture theaters recently adopted in New York City are given; these requirements should create an active demand for exhaust fans and for bracket, ceiling or similar fans for keeping the air of the theater in motion.

Century Electric Company, St. Louis, Mo., has ready for distribution bulletin No. 22, describing and illustrating its alternating-current fans for 1914. Century fan motors are what are generally known as the split-phase induction type of single-phase motor. Both the disk and oscillating types of fans are constructed for all frequencies between 25 and 140 cycles and for any voltage between 100 and 250 volts. All fans (excepting 133-cycle) are provided with a five-point switch and speed coil located in the base of the fan. Another new bulletin, No. 21, describes and illustrates Century single-phase self-starting motors of the repulsion-induction type. These bulletins will be furnished to those interested upon request.

The Richardson-Phenix Company, Milwaukee, Wis., has issued bulletin No. 57, which is devoted to the Phenix sight flow indicators. This publication illustrates and describes how this device can be inserted in any pipe line carrying a liquid and how it shows at a glance or indicates electrically by lighting a lamp or ringing a bell when the flow of liquid is interrupted. Among the uses for such an instrument are installation in the water line of a water-cooled transformer and in the supply line to the water jacket of a gas engine or air compressor. The bulletin also points out a number of recent improvements in the instrument, by means of which it gives an alarm before the liquid stops flowing entirely or when the flow drops to some predetermined minimum. Copies of this bulletin may be obtained by addressing the company.

The Standard Paint Company, New York, N. Y., is celebrating the thirtieth anniversay of its organization. The manufacture of its P. & B. insulating paint and compound has been carried on since 1884, and regardless of the developments in the severity of service requirements it is stated that the component parts of the material are almost idential with what they were when this material was first offered to the industry. The P. & B. insulating paint and compound has certainly stood the test of time. In the January issue of *Exchange*, the bulletin published by the company for its selling organization and agents, the company states: "The applause that greeted P. & B. paint and compound in 1884 has reverberated through all of the 30 years intervening between then and now. Success was great and that success has not been dimmed by time. P. & B. stood absolutely alone in 1884 and it stands not only without a peer, but without an equal in 1914.

Record of Electrical Patents.

Issued by the United States Patent Office, February 17, 1914.

1,087,109. Scraper for Electric Rails. A. Demmler, Forest Park, Ill. A link-supported frame carries a number of oscillatable scrapers.

1,087,113. Machine for Receiving Electric Waves. R. Goldschmidt, Berlin, Germany. Includes two interconnected commutators driven asynchronously to receive high-frequency electromagnetic waves.

1,087,115. Recording Attachment for Pianos. N. Goodrich, Detroit, Mich. A pedal-controlled electromagnetically operated printing arrangment.

1,087,120. Indicating Means for Inclosed Fuses. C. Hooker, assignor to Johns-Pratt Co., Hartford, Conn. Two fine wires connected to the fuse have their ends on opposite sides of an external paper film that is punctured by the circuit voltage when the fuse has blown.

1,087,126. Arrangement for Producing Slightly Damped Electrical Oscillations. B. Macku, Brünn, Austria-Hungary, and L. Mandelstam and N. Papalexi, Strassburg, Germany. A quenched-spark system with three oscillation circuits.

1,087,127 and 1,087,128. Telephonic Receiver. A. Marr, Manchester, England. The first patent relates to the diaphragm mounting; the second patent to a special cup for the pole pieces of the magnet.

1,087,131. Electric Contact Device. H. McQuown, assignor to A. A. Kent, Philadelphia, Pa. Includes a rotating arm and cam.

1,087,143. Primary Battery. A. L. Saltzman, assignor to New Jersey Patent Co., West Orange, N. J. A frame for supporting the elements from the cover of the jar.

1,087,166. Dynamo-Electric Machine. A M. Gray, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. The rotor of an induction motor having special ventilating blades.

1,087,170. Controller. A. J. Loguin, assignor to Allis-Chalmers Mfg. Co. Push-button control for the handle of a drum-type controller.

1,087,180. Apparatus for Amplifying or Detecting Electrical Variations. G. W. Pierce, Cambridge, Mass. Includes a vacuum tube, two main and two auxiliary electrodes therefor, a battery and induction coils.

1,087,189. Measuring Instrument. E. O. Schweitzer, Chicago, Ill. A frequency meter comprising a galvanometer and a number of tuned reeds of graduated natural vibration rates.

1,087,198. Electric Heating Unit. C. S. Steward, Chattanooga, Tenn. For a rotatable disk plate, the current entering through trunnions.

1,087,189. Electric Stove. C. S. Steward. Has several disk units on top and compartments beneath them.

1,087,200. Electric Oven. C. S. Steward. Has heat-insulated and vented walls, a heating unit on top and one on the bottom.

1,087,221. Trolley-Wheel Support. L. W. DeYoung, Lebec, Cal. A special harp construction.

1,087,231. Automatic Controlling Device for Heating Apparatus. E. E. Gold, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Electrical thermostatic control.

1,087,236. Storage-Battery Electrode and Process of Making Same. H. C. Hubbell, Newark, N. J. Consists of alternate layers of cadmium oxide and of a metal electronegative to cadmium in an alkaline electrolyte.

1,087,237. Process of Making Storage-Battery Electrodes. H. C. Hubbell. Consists in uniting into a plate alternate layers of nickel, cobalt and copper, dissolving out the copper layers and oxidizing the cobalt layers.

1,087,238. Electric Switch. G. L. Hughes, Chicago, Ill., assignor of one-half to R. E. Cooper. Electromagnetically operated.

1,087,251. Electric Switch. J. A. Meaher, Cleveland, O. Includes a double truncated conical guide, a switch lever and a spring-pressed plunger pin longitudinally movable in the switch lever and in contact with the cone-shaped parts.

1,087,276. Car Fender. D. Chew, Philadelphia, Pa., assignor of one-half to E. G. Idell. Electromagnets are adapted to hold the scoop in lowered position.

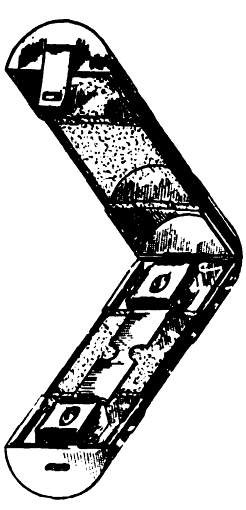
1,087,277. Toy. D. P. Clark, Dayton, O. A reversing toy electric locomotive.

1,087,278. Wardrobe. C. J. Coleman, New York, N. Y. Includes an electric heater automatically controlled to keep the temperature between certain limits.

1,087,288. Gearing. E. A. Halbleib, Rochester, N. Y., assignor to North East Electric Co. For connecting a motor-generator to an automobile engine.

1,087,289. Storage-Battery System. E. A. Halbleib, assignor to Northeast Electric Co., Rochester, N. Y. A gas-tight casing with diaphragm for the battery is connected to a circuit-breaker to cut off the charge when a certain gas pressure has been developed.

1,087,300. Coin-Controlled Switch for Electric Circuits. T. McA. Knox, U. S. Army, and F. W. Brockhoff, Jefferson Barracks, Mo. Includes a cam disk with which a part of the switch engages and gearing for rotating the disk into a set position.



1,087,417—Fuse-Holder.

1,087,301. Bracket Arm. F. P. Kobert, New Haven, Conn. For a cable rack; has a deep longitudinal groove to the bottom inner end of which a heel piece is welded.

1,087,302. Electric-Cable-Supporting Bracket. F. P. Kobert. The heel pieces of the arms fit into sockets in a vertical channel bar.

1,087,322. Apparatus for Actuating Conduit-Covers and Collector-Plows of Electric Railways. D. D. Samaia, Milan, Italy. Compressed-air cylinder for opening the conduit and raising or lowering the contact shoe.

1,087,328. Wheel Mount. F. Siwak, Clifton Heights, Pa., assignor of one-third to S. Siwak and one-third to P. Hnatszn. For a trolley pole.

1,087,329. Apparatus to Indicate the Stoppage of Carriers in the Transmission-Tubes of Pneumatic-Dispatch-Tube Systems. J. F. Skirrow, East Orange, N. J. An electric alarm adjacent the receiving terminal of the tube.

1,087,355. System of Control. L. Dreyfus, assignor to General Electric Co. Includes a polyphase machine with a commutator and brushes and an induction regulator mechanically connected to the brush yoke, the regulator having a secondary winding connected to portions of the stator winding and to the brushes.

1,087,357. Cutout and Fuse Mechanism. E. B. Ellicott, assignor to General Electric Co. Carries a terminal frame and switch blade on top of the insulator and a fuse holder in a tubular passageway.

1,087,377. Arc Lamp. C. C. Hughes, Philadelphia, Pa., assignor to Hughes Universal Arc Lamp Co., Philadelphia, Pa. The clutch mechanism is controlled by the contraction and expansion of a long wire.

1,087,381. Brush for Dynamo-Electrical Machines. E. C. Ketchum, Boston, and D. H. Andrews, Newton, Mass. Composed of a number of separate plates having thin conducting material between corresponding ends thereof.

1,087,383. Device for Preventing Formation of Burs in Electric Welding. W. A. Kilmer and A. T. Weaver, assignors to American Steel & Wire Co. of New Jersey, Hoboken, N. J. Includes two sets of welding clamps, a pair of brushes between them and adapted to surround the wire at the point of weld and means for rotating the brushes around the wire.

1,087,384. Method of and Apparatus for Preventing Formation of Burs on Electric Welds. W. A. Kilmer and A. T. Weaver, assignors to American Steel & Wire Co. of New Jersey. A modification of the above.

1,087,396. Trolley Wheel. A. Perry San Francisco, Cal. Has a special oil chamber.

1,087,417. Fuse-Holder. H. W. Young, Chicago, Ill. The tubular casing is longitudinally split into two parts hinged together at one end and carrying semicircular bridges near the ends of the replaceable fuse link. (See cut.)

1,087,445. Calculating Apparatus. A. B. Herrick, Ridgewood, N. J. A planigraph chart with scales and slides for working electrical problems.

1,087,453. Electric Distributing Device. R. H. Manross, Forestville, Conn. Comprises stationary and movable contacts, the latter mounted on a disk.

1,087,454. Control Device for Automobile Self-Starters. A. L. McMurtry, Sound Beach, Conn. Movement of a piston actuates both the battery switch and spark control.

1,087,461. Current-Controlling Mechanism. L. T. Rhoades, Mont Clare, Pa. Engine-driven cam-controlled contact device.

1,087,485. Safety Device for Automobiles. E. Favary, New York, N. Y. Comprises chauffeur-controlled means for operating a commutator, means for applying the brake, and means controlled by the passengers and auxiliary to the first-named means for advancing the ignition and applying the brake.

1,087,494. System of Electric-Motor Control. H. D. James, assignor to Westinghouse Electric & Mfg. Co. A relay switch co-operates with the drum controller to govern the accelerating switches.

1,087,500. Circuit-Breaker. H. G. MacDonald, assignor to Westinghouse

Electric & Mfg. Co. Has special toggle mechanism.

1,087,507. Movable-Target System. M. A. Palen, U. S. Army. Includes electric operating means.

1,087,518. Electric Heater. J. G. Wallman, Oakland, Cal. For a long boiler.

1,087,531. Battery-Tray Connection. J. N. Davis, Denver, Colo. A special drain in the bottom of the tray.

1,087,532. Optical Instrument. H. L. De Zeng, Maple Shade, N. J. Opthalmoscope with a reflector, lenses, electric lamp and battery, and light filters.

1,087,537. Circuit-Changer for Electric Railways. B. F. Hutches, Jr., Allendale, N. J. A trolley-circuit-changer with several electromagnets and an oscillated contact arm.

1,087,548. Combination Tail-Light, Sign-Plate, and Holder Therefor for Vehicles. E. E. Poole, Boston, Mass. Includes an electric lamp.

1,087,549. Receiver for Wireless-Transmission Signals. V. Poulsen, Copenhagen, Denmark. Provides means for intermittently connecting wave detector to the antenna.

1,087,556. Electric Motor. H. K. Sandell, assigner to Mills Novelty Co., Chicago, Ill. An oscillatory motor.

1,087,574. Illuminated Sign. J. L. Dawes, Pittsburgh, Pa. Comprises two metallic rings hinged together at one side, a convex lens in each of the rings and a lamp extending into the sign at the side opposite the hinges. (See cut.)

1,087,592. Electric Heater. F. Kuhn, Detroit, Mich. An armored heating unit is within an air heat-insulated chamber.

1,087,593. Electrically Heated Foot-Warmer. F. Kuhn. The heating element is inclosed within a case which has a fabric covering.

1,087,594 and 1,087,595. Electric Heater. F. Kuhn. Has a disk-shaped heating unit in contact with the bottom.

1,087,596. Circuit-Opening Switch for Electric Heaters. R. Kuhn, Detroit, Mich. A special connector plug and socket.

1,087,607. Electric Steam-Heater. C C. Ponting, Medford, Oreg. A self-contained steam radiator with an electric heating coil in the bottom circulating pipe.

1,087,612. Dry-Cell Battery. C. W. Simmons, East Cleveland, O. Consists of a zinc plate inclosed within an absorbant envelop and having indentations in both sides to form reservoirs for the electrolyte, cathodes on both sides of the plate and a depolarizing mixture between the cathodes and zinc plate.

1,087,623. Insulated Rail-Joint. H. L. Wood, assignor to Rail Joint Co., New York, N. Y. Has both fiber and wood-block insulation.

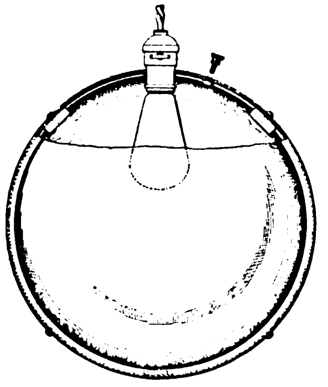
1,087,630 and 1,087,631. Timing Mechanism. B. C. Batcheller, New York, N. Y. Electrical time control for the electric motor that drives the air compressor for a pneumatic-tube dispatch system.

1,087,637. Separator for Storage-Battery Plates. C. C. Carpenter, assignor to United States Light & Heating Co., New York, N. Y. A thin sheet of wood having an outer layer of rubber vulcanized thereon.

1,087,651. Spark Collector and Distributor. M. Gerardy, Wathena, Kans. A distributor and timer for an electric ignition system.

1,087,673. Steady-Strain Device for Trolley Constructions. O. S. Lyford, Jr., New York, N. Y. For a catenary trolley line.

1,087,699. Attachment for Moving-Picture Apparatus. A. Szeliga, New York, N. Y., assignor to one-fifth to P. Müller, one-fifth to E. Mauthberger, and one-tenth to F. Tichy. Ignition to the film opens the circuit of the driving motor and of the projecting lamp and causes de-energization of an electromagnet to release a film-severing knife.

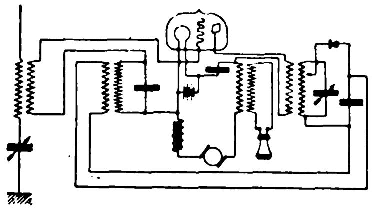


1,087,574—Electric Sign.

1,087,701. Interrupter for Electrical Ignition Apparatus for Internal-Combustion Engines Having a Device for Adjusting the Time of Sparking. G. Unterberg, Durlach, Germany. An arrangement of cams and levers.

1,087,704. Head-Support for Telephone Receivers. C. Adams-Randall, Boston, Mass. An adjustable head band for holding a receiver to each ear.

1,087,716. Printing Machine. G. M. Breckenridge, Chicago, Ill., assignor of one-third to J. P. McManus. Special switch control and clutch for a motor-driven press



1,087,892—Wireless Receiver.

1.087.807. Telephone Support. K. B. Miller and C. G. Ashley, assignors to McMeen & Miller, Chicago, Ill. A supporting arm for a desk set is adjustable around a horizontal and a vertical pivot.

1.087,808. Telephone Support. K. B. Miller, assignor to McMeen & Miller. A modification of the above.

1,087,834. Machine for Cutting Fabric Along the Edge of Embroidery. E. Schelling, Zurich, Switzerland. Has electrical means to reverse the direction of travel of the carriage.

1,087,853. Renewable Cartridge-Fuse. N. D. Urquhart, Glenwood Springs, Colo. .The knife-blade terminals are of a strip bent upon itself with V-shaped internal extensions fitting into the caps of the case.

1,087,876. Machine for Making Bead Chains. G. W. Goodridge and W. J. Gagnon, assignors to Bryant Electric Co., Bridgeport, Conn. Comprises means for drawing a ribbon into a tube and for shaping it into a series of connected dumb-bells, also means for forming a tool into hollow balls over the dumb-bells

1,087,880. Electrical Controller. D. J. Hauss. Aurora, Ind. A double-ended resistance-adjusting arm is arranged to also connect the machine to the resistance as a motor or generator.

1,087,887. Electric Water-Heater and Steam-Generator. A. P. Nichols, Seattle, Wash. A boiler with tubular electrodes.

1,087,889. Exhibiting Apparatus. A. P. Roesener, New York, N. Y. Includes an electric lamp and solenoid slide control.

1,087,892. Means for Receiving Electrical Oscillations. W. Schloemilch and O. von Bronk, Berlin, Germany. Includes a vacuum tube containing a permanently ionized gas and a supplementary detector. (See cut.)

1.087.897. Spark Plug. C. E. Talbert, assignor to E. C. Henn, Cleveland, O. Has a number of sparking surfaces.

1.087.902. Bill-Printing Mechanism. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Combined with two normally disconnected printing wheels is a solenoid for operating one wheel, a switch and a connecting device brought into position to connect the two wheels by operation of the switch.

Patents Expired.

The following United States electrical patents expired February 23, 1914:

577,427. Alternating-Current Motor. L.Gutmann, Pittsburgh, Pa.

577,447. Automatic Circuit-Breaker. G. F. Packard, Fort Wayne, Ind.

577,450. Electric-Railway System. C. F. De Redon, New York, N. Y.

577,480. Electric Transformer. L. Gutmann.

577,493. Electric Furnace. F. J. Patten, New York, N. Y.

577,499 Filament for Electric Lamps. J. H. Douglas-Willan and F. E. W. Bowen, London, England.

577,501 Electrically Operated Ship's Log. W. S. Alexander, New York, N. Y.

577,526. Electropneumatic Brake. F. Chapsal, Paris, France.

577,534. Submarine Telegraphy. A. Muirhead, London, England.

577,540. Telegraph Transmitter. H. A. Taylor, London, England.

577,550. Electric and Gravity Pleasure-Railway. J. A. Griffiths, Philadelphia, Pa.

577,635. Electric Signal for Highway Crossings. W. W. Alexander and M. C. Gillham, Kansas City, Mo.

577,636. Apparatus for Producing Ozone. E. Andreoli, London, England.

577,644. Electrical Elevator. J. P. Casey, Philadelphia, Pa.

577,704. Electrical Insulator. T. W. Young, Washington, D. C.

577,741. Trolley for Electric Railways H. N. Gale, Bristol, Conn.

577,760. Electric Arc Lamp. G. M. Lane, Asbury Park, N. J.

577,771. Secondary Battery H. G. Morris, Philadelphia, Pa.

577,816. Device for Controlling Light Effects. H. V. Arnold, New York, N. Y.

577,822. Electric Cutout. J. F. McElroy, Albany, N. Y.

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THE PROPOSED ELECTRICAL CODE OF WISCONSIN.

The State of Wisconsin, true to its progressive tendencies in recent years, is about to take an important step aiming at minimizing electrical life hazards. This is to be accomplished by the adoption of an electrical code, a preliminary draft of which has been made public and is published substantially in full in another part of this issue. A public hearing on this code is to be held at the State Capitol at Madison on March 13. Since the time for study of the matter is very short before this meeting and since the proposed code is the first one of its kind to be formulated by a state body and will probably, therefore, serve as a precedent for other states, it is desirable that electrical interests give immediate consideration to the subject.

At the suggestion of the Industrial Commission of Wisconsin, a committee of capable Wisconsin electrical men has studied this matter for several months and the proposed code is the result of its labors. The code is preceded by a number of definitions of electrical terms. The main part of the code consists of thirty "Orders for Safety in Electricity," which are to be promulgated by the Industrial Commission by virtue of legal authority granted it by the State Legislature. Without reviewing the proposed rules at length, it may be said that they deal for the most part with the safeguarding of circuits and apparatus for 300 volts and over, which are considered to be dangerous to life. They provide for the grounding of machine frames and conduits, also the neutrals of three-wire distributing systems where the voltage to ground does not exceed 150 volts; the grounding of transformer secondaries is not specifically required, however. Insulating gloves, mats, stools and similar safety appliances must be provided in practically all cases where dangerous apparatus or circuits must be handled. Nearly half of the rules relate to safeguards in overhead line construction. In general, the aim of the rules is to protect both employees and the public from electrical life hazards, this being done by broad installation rules suitable for general application.

Supplementing the main part of the code are three sets of more detailed rules for employees regarding the operation and maintenance of electrical equipment and general conduct in the vicinity of same. One set of these rules applies to wiremen, engineers, operators, helpers and oilers in electric stations, and substations; another is for linemen of overhead distribution systems; another set is for the employees of electrical departments in industrial plants. A final supplement consists of the now standardized rules for resuscitation from electric shock which were drafted primarily at the suggestion of the National Electric Light Association.

There may be some difference of opinion respecting the wisdom of promulgating an electrical code of installation rules when we already have a much more comprehensive and, on the whole, quite satisfactory set of such rules in the National Electrical Code, which is being recognized more widely every year as representing the best opinion of practically all branches of the electrical industry. Thus it is followed by engineers, architects and contractors throughout this country and Canada, and forms the basis for most municipal ordinances regulating electrical construction work. However, the evolution of the National Electrical Code from a set of fire-prevention rules has been rather slow and it was only recently that consideration of life hazard was taken into account in revising the Code. The bulk of the proposed Wisconsin electrical code does not supplant the National Electrical Code, but it supplements it by requiring numerous safeguards, partly in installation and partly in operation of electrical apparatus and circuits, to reduce the life hazard to a minimum. Thus its installation rules are aimed primarily at elimination of life risks. Its requirement of safety devices and its regulation of overhead construction are not touched on in the National Code.

The supplementary rules to develop the "Safety First" habit among employees, even though given in only tentative and not sufficiently general form, form the basis of an admirable code of electrical safety rules that should be adopted by every employer that uses electrical equipment exceeding, say, 300 volts, as the Industrial Commission seems to imply. The standard rules for resuscitation should be posted in every electric plant. Every effort should be made to further the safety movement and the plan of the Industrial Commission of Wisconsin to promulgate an electrical safety code should therefore be heartily commended.

THE MIDWINTER CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The scope of the activities of the American Institute of Electrical Engineers has been increasing rapidly in the past few years and one evidence of this is found in the constitution of the standing committees, which underwent a general revision under the present administration. Another evidence is the increasing number of meetings. These consisted formerly of the monthly gatherings in New York City and the annual convention held during the summer. Of late years such meetings have been supplemented by occasional gatherings in other cities and last year saw the innovation of a midwinter convention in New York City. It met with such success that the convention was repeated this year and is likely to become one of the regular annual events on the Institute program.

Last year's midwinter convention was held under the auspices of the Standards Committee and was chiefly concerned with matters affecting the revision of the Standardization Rules, which was then in progress and is still continuing. The convention this year was under the auspices of the Electric Power Committee, and again was a decided success, although comparing rather unfavorably in some respects with last year's convention. While the registration was somewhat larger than the total for last year's convention, the average attendance at sessions was not over 100, and the discussion was not marked with the virility, interest and weight which were so evident last year. Nevertheless a number of the papers were of much value and importance and much of the discussion was well worth while. A full report of the proceedings of the convention is given in this issue.

THE USE OF PROTECTIVE REACTANCES.

The discussion on the paper by Messrs. Lyman, Rossman and Perry was unfortunately somewhat incomplete. Anyone unfamiliar with the history of the development of current-limiting reactances might have concluded from the paper and the discussion that such reactances are panaceas for all operating ills. In fact the impression might very easily have been gotten by inference that it was more advantageous to put a given investment into reactances than into the bus structures. It is, of course, better engineering practice in large power stations to build in the switches and bus structures so solidly that a fault in this part of the system is a very remote possibility. Many bus reactances will then be found entirely unnecessary. This is rather well illustrated in the system of the Commonwealth Edison Company at Chicago, the experiences on which some five or six years ago first emphasized the need for current-limiting reactances, and where the pioneer installations of such reactances were made.

The generators in the power plants of this system have reactance coils or autotransformers for high reactance, but no bus reactances are used except in the tie lines between the Fisk and Quarry Street stations. These tie lines, having ample capacity and being very short, are practically extensions of the buses. The buses are thus divided into three sections through reactances, each section being connected to approximately 60,000 kilowatts in generating capacity. No feeder reactances are used, nor has the need for them as yet arisen in this system.

The paper referred to presupposes radial operation of transmission lines. It is a fact, however, that the engineers of the larger systems are planning transmission lines in parallel at their receiving (i. e., substation) end as soon as protective relays for such operation give sufficient promise of success. Reactances between individual units would then, of course, be out of the question. The very interesting suggestion made by Mr. Stott has, of course, this same objection, that it makes parallel operation of transmission lines from different units impracticable. Feeder reactances may, in many cases, be desirable, especially as an aid to the better operation of protective devices, but their installation, particularly on feeders of existing plants, would in most cases be a rather expensive undertaking and one not easily carried out.

In general, while current-limiting reactances have a very real function and their use was thoroughly discussed by the authors, a warning should be sounded against "over reacting" and attention called to the fact that a proper design of the important parts of the system is usually better engineering than the addition of ameliorating devices which may render a poorly designed system fairly immune against disastrous wrecks.

THE FATIGUE OF PORCELAIN.

One of the important subjects brought up at the convention was the increasing number of failures of porcelain insulators on high-tension lines. The pronounced development of this feature of operation, which is attested by abundant evidence, has given rise to the idea that the material of which the insulators is made has undergone some change chemically or physically which results in a lowering of those mechanical and electrical properties which are essential to the best operation of the insulators and which have been assumed in their design.

Several of those participating in the discussion on this matter—men who have made a study of porcelain and its performance—expressed the opinion that porcelain which has been properly fired and completely vitrified does not undergo any change of this kind and that the failures have been due to the use of imperfect porcelain. This imperfect material may be in such a form that it is not disclosed by the ordinary test to which all insulators are subjected before installation on the line. Such imperfections may consist, for instance, of incompletely vitrified porcelain which is covered with a glaze which protects it from moisture, and its properties when new may be such as to withstand the ordinary tests. If, however, in the course of time cracks develop in the surface glaze, moisture may be admitted to the unvitrified material beneath and its properties will then deteriorate to the point where puncture results. If a method of test could be devised which would disclose the existence of such imperfect porcelain before putting it in service, it would be a great advantage to the users of this material and would obviate many future replacements.

THE EFFICIENCY OF VEHICLE TIRES.

The energy applied in driving an electric vehicle is expended in overcoming a number of mechanical resistances, such as bearing friction, air resistance, weight on up-grades, etc. Among the items which thus dissipate energy must be reckoned the tires, at least when these are not made of rigid material. With either the pneumatic tire or the solid-rubber tire there is a deformation of the tread of the tire as the weight of the machine comes upon it, and as the elasticity of the material is not perfect there is a transformation of energy into the form of heat, which goes to raise the temperature of the tire. This tire deformation is not merely a radial one nor a transverse one, but there is a displacement in the direction of motion as each point of the tread approaches the ground, and this gives the ground a wiping motion as the given point in the tire rises again. It is probably this motion which is largely responsible for the wear of the tire.

The amount of energy expended in the tire may vary greatly according to its material and method of manufacture. In this respect there may be great differences in different tires and the importance of this feature should be kept firmly in mind by vehicle users and vehicle manufacturers in selecting their tires. Until lately this feature of the electric vehicle has received little consideration, but manufacturers are now alive to the importance of the matter and are endeavoring to turn out tires which shall be as efficient as possible, with due regard to durability; since efficiency at a sacrifice of durability might result in the end in higher combined operating and maintenance costs.

Tests of tire efficiency have been largely neglected in the past, but the paper read last month at the meeting of the Electric Vehicle Association of America is evidence that this indifference is to continue no longer. Mr. Whitney has shown what can be done along the line of tire testing, and the accumulation of data of this description will not only be an aid to the purchaser of tires, but will help the manufacturer of them to develop a better product.

The question of tire efficiency is of importance not only to the user of the vehicle but to the maker of vehicles and the manufacturer of storage batteries as well. The more energy losses can be eliminated in any part of the operating mechanism, the farther can a vehicle operate with a given battery capacity; or the smaller the battery which will suffice for a given mileage. A reduction in battery size means at once a reduction in weight and this again means a greater mileage. Or again, the advantage may be utilized in the direction of increasing the load while the other conditions are kept the same. It is only by attention to all of the details which go to make up the greatest perfection of parts that the highest usefulness of the electric vehicle will be reached, and with each step in the evolution a greater success for the electric car will be attained and the more popular will its use become. Definite quantitative tests greatly aid such improvements.

Boston Teaming Problem.

A meeting of the New England Section, Electric Vehicle Association of America, was held at the Boston Edison Company's building, Boylston Street, Boston, February 25. In the absence of J. A. Hunnewell, chairman, Edward S. Mansfield presided, and introduced W. W. Scott, editor of *The Motor Truck,* Pawtucket, R. I., who spoke on the teaming problems presented in the city of Boston. From a map of the city, he discussed the transportation routes from terminals to business centers, pointed out the points of congestion and suggested some methods of alleviating them, and spoke of the relation of the automobile truck to the situation, specifying the various advantages of this type of vehicle, in smaller space requirement, facility of loading and unloading, and in economy of operation. Mr. Scott advocated a more general trucking at night.

Novel Electrical Exhibition by Ohio University Students.

Ohio State University, at Columbus, O., with a student body of over 4,000, is to have a novel electrical exhibition on April 16, 17 and 18. It will cover the whole range of appliances, from small household articles to electric locomotives and mining machinery. Manufacturers all over the country are being invited to take part. In addition to showing usual processes, all sorts of freak demonstrations will be in evidence. The enterprise is in charge of the students in the electrical department of the University.

New York Electrical Society Meeting.

The New York Electrical Society held its 326th meeting on the evening of February 27 at the new generating station of the United Electric Light & Power Company, at 201st Street, New York City.

President H. H. Barnes, Jr., called the meeting to order at 8:30 p. m. After routine business, an illustrated review of the history of alternating-current development in the city was given by Frank W. Smith, vice-president of the company.

H. W. Leech, electrical superintendent of the plant, then gave an illustrated description of the station. Following this the station was thrown open for inspection and guides took the visitors through all parts of the building.

Peoria Stormswept.

The recent heavy storm that passed over Illinois was more severe in and around Peoria than anywhere else. The storm started on February 22, and continued all night. The wind at times rose to a velocity of 38 miles an hour, drifting the snow into the cuts and stalling the cars of the Illinois Traction system at Allentown. Not a train left the Union Station in Peoria on Monday, as all trains were annulled for the day.

The telephone and telegraph companies did not suffer very much, as the snow was light and dry and did not stick to the wires. The city railway company had trouble, but by running sweepers all night was able to give good service.

Utah Electric Club.

At the regular luncheon of the Utah Electric Club at the Commercial Club, Salt Lake City, on February 26, J. E. Cosgriff, president of the Continental National Bank, discussed "The New Banking Law."

In clear and concise terms Mr. Cosgriff gave the members of the Electric Club a brief history of American banking institutions and compared them with those of European nations and pointed out how the new banking law will retain practically all of the advantages of the American de-centralized system of control and obtain practically all of the advantages of the European systems contralized control.

Coming Meetings of Electrical Engineers.

The thirty-first annual convention of the American Institute of Electrical Engineers will be held in Detroit, Mich., June 22-26, 1914. Convention headquarters will be at the Hotel Cadillac. The Meetings and Papers Committee requests that authors desiring to present papers at this convention will notify the committee to this effect promptly and submit their manuscripts before April 1.

The 292nd meeting of the Institute will be held in the Engineering Societies Building, New York City, March 13. The meeting will be under the auspices of the Telegraphy and Telephony Committee, and the Institute of Radio Engineers will participate in this meeting.

Three papers will be presented: "A Comparison of the Telegraph with the Telephone as a Means of Communication in Steam-Railroad Operation," by M. H. Clapp, superintendent of the Northern Pacific Railway Company; "Traffic Studies in Automatic Switchboard Telephone Systems," by W. Lee Campbell, general superintendent of the Automatic Electric Company, Chicago; "The Goldschmidt System of Radiotelegraphy," by E. E. Mayer.

Other meetings will be held in Pittsburgh, Pa., April 9 and 10; Washington, D. C., April 24 and 25; Pittsfield, Mass., May 29.

Exhibit of Physical Apparatus.

In connection with the joint meeting of the American Institute of Electrical Engineers and the American Physical Society, to be held in the new electrical laboratory of the Bureau of Standards, Washington, D. C., on April 24 and 25, it is planned to have an exhibit of physical apparatus. The necessary arrangements will be made by a local committee, of which S. W. Stratton is chairman, appointed by the president of the American Physical Society.

The main purpose of the exhibit is to present an opportunity for those interested to inspect and see in operation new apparatus which is available from manufacturers or which has been arranged by those engaged in research. The exhibit will be limited to recently developed lecture, laboratory and research apparatus, together with illustrative photographs, charts, etc. Similar exhibits have been prominent and interesting annual features of physical societies abroad. Exhibits may be made by manufacturers and dealers in apparatus, by universities and other laboratories, and by individuals whether members of the Society or not. Applications should be made at once to the secretary of the committee, F. A. Wolff, Bureau of Standards.

Peoria Electric Club.

The Peoria Electric Club held its semimonthly meeting and luncheon at the Jefferson Hotel at 1 p. m. on Saturday, February 28. There was a good attendance. A musical program, in which the members joined in the singing, was given. Buck Ahrends gave a good talk on the development of the incandescent lamp, starting at the old carbon-filament lamps and continuing down to the half-watt Mazda. He exhibited a sample of the nitrogen-filled lamp.

A rejuvenation will be held at Peoria on March 13 and a good class is in sight for initiation into the Jovian Order. The evening of the same night the club will give a dance.

Electric Club of Chicago.

At the meeting of the Electric Club of Chicago on February 26, T. B. Lambert, of the Chicago Telephone Company delivered a very interesting address on Mexico, illustrated by lantern slides.

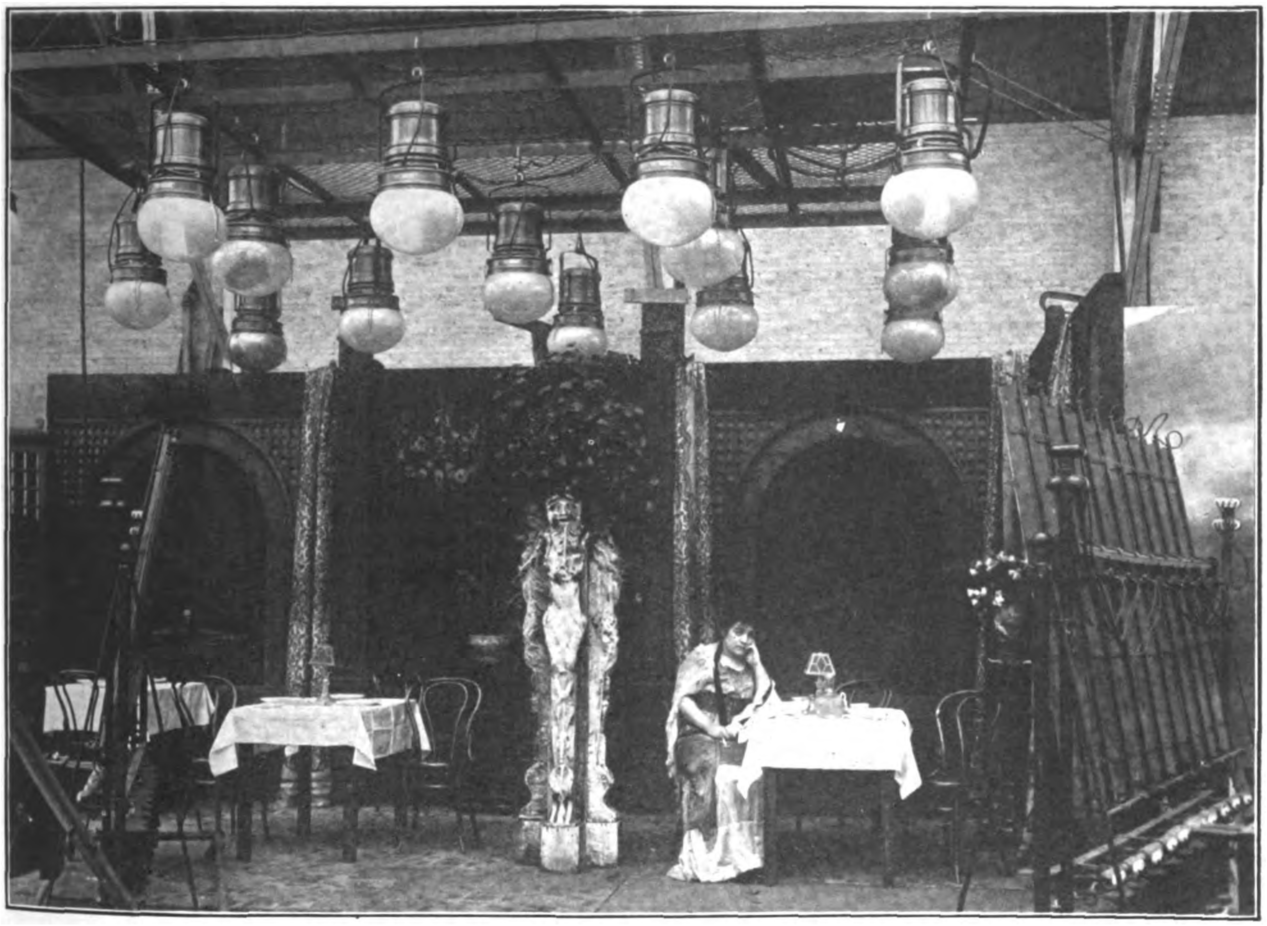
Preceding the meeting President Bone was presented with a solid-gold fob as a reward for his efforts in securing new members. A. A. Gray made the presentation speech.

The names of ten new applicants for membership were read at the meeting.

Electricity in Moving-Picture Plants.

Little conception is had of the magnitude of the moving-picture industry from the producing standpoint, although taken altogether it ranks among the most important industries in the country. The complete electrical equipment of the Selig Polyscope Company's establishment is described in this article.

The marvelous, universal popularity of moving pictures is one of the wonders of the present age and, likewise, the scientific development necessary to make the production of moving pictures possible on the present scale ranks with the achievements in other rapidly developing industries. The countless thousands who daily view moving-picture plays have but little conception of the magnitude of the industry, from the producing standpoint, or of the work and equipment involved in taking even the most modest pictures.



Scene Set in Main Studio of Selig Polyscope Company, Showing Quartz-tube Lamps Above and Banks of Lamps on Sides.

From the electrical standpoint it can be stated without fear of contradiction, that no other single element contributes more to the success of the business of producing than electricity. Without artificial light, permitting work to be carried on day and night and under any weather conditions, the business would be seriously handicapped. Also, electric power is indispensable in the studio for operating perforating machines, printing machines, fans, etc. Before taking up a detailed description of a modern plant, it may be of interest to comment briefly on some of the more important operations carried on in the typical American studio.

It may be stated, by way of introduction, that the idea of producing apparent animation by means of pictures is by no means new. The origin of the most primitive form of moving-picture device is lost in the mists of antiquity, but it is certain that long before photography was conceived animated pictures were in vogue.

It seems, according to a book on moving pictures by F. A. Talbot, that the development of the industry really dates from the perfection of the continuous celluloid film, by Mr. Eastman, in 1889 and the almost co-incident development of the "kinetoscope" by Thomas A. Edison. This was the first commercial appliance to show pictures in natural movement.

Without going into a description of the manufacture of films it may be of interest to state that one firm alone, the Eastman Kodak Company, produces over 7,300,000 lineal feet of film per week. The principal ingredients of the film are gun cotton and alcohol.

The studio receives the film from the manufacturer, generally in lengths of 165 feet which is approximately the capacity of the average film box. Before it can be used in the camera it has to be perforated on either side in order that successive areas of film 0.75 inch deep can be siezed and brought into position behind the lens. This perforation is of an elongated form, measuring about one-eighth of an inch in width by approximately one-sixteenth of an inch in depth. There are 64 perforations to the inch.

The preliminary operation is carried out with a machine which stamps the holes by means of specially hardened steel punches. Extreme care has to be taken to carry out the task with mathematical accuracy, in order that the film may be used with any type of camera and projector. Without it steadiness of the picture upon the screen is absolutely impossible.

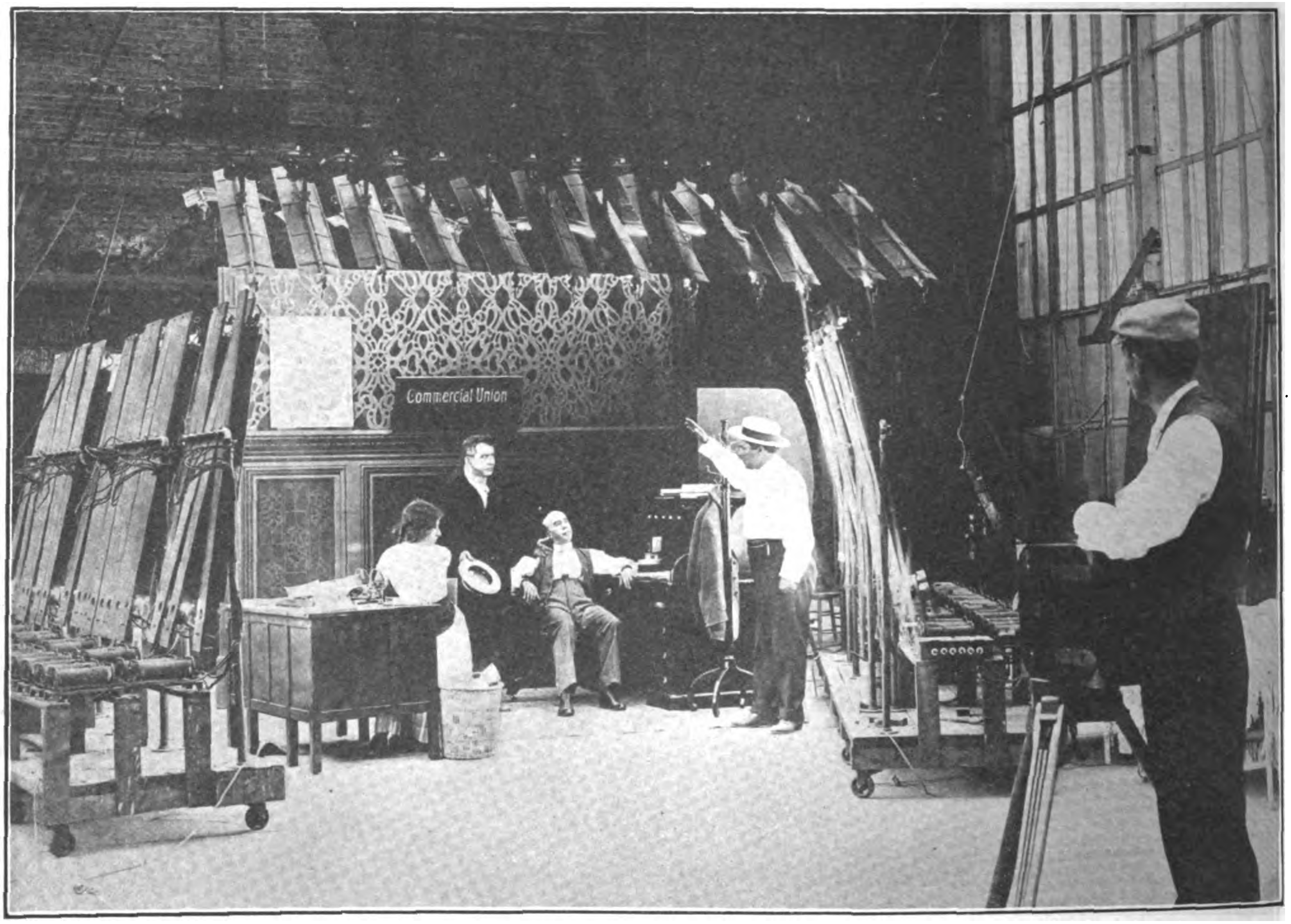
As this operation has to be carried out in the dark room in the dim light of a ruby lamp, it is imperative that the machines should be of the most simple design and operation, demanding the minimum of labor on the part of the operator. Electric motors have come to be the most satisfactory and economical method for driving these machines and are now universally employed.

From the perforating machines the films are used in the camera, and the developing and printing are the next operations where electric power are employed. As may be supposed different factories employ different methods in carrying out these operations, particularly developing. A film may be 300 to 400 feet long, and consequently special practice is necessary. In some establishments developing is carried on on an extensive scale, the films as withdrawn from the camera film box being wound at once upon a large wooden reel, seven feet or so in length, suspended upon brackets above the developing bath. When the drum has received its full length of film it is lowered into a deep tank containing the desired solution, and then kept revolving slowly until the treatment is completed. The film when developed is then wound on a drying drum. In addition to motor-driven pumps, electricity is used in the developing room for handling films on the drums mentioned, and, of course, motor-driven fans are relied upon to furnish drying breezes in the dry room.

When completely dried the film is then ready for the printing machines. Printing is carried out by contact, that is the sensitized surface of the positive film is pressed tightly against the emulsion side of the negative film at the instant the exposure is made. The various printing machines used all work on the same principle, namely, unwind both the negative and positive films, bring the two together at the aperture admitting the light and rewind both films after contact has been made. Printing speed, of course, varies according to the density of the negative and the intensity of the light and for this reason individual motor drive, using a direct-current variable-speed motor is recommended. The power required by printing machines is approximately one-twelfth horsepower.

The intensity of light is varied by mounting the lamp on an adjustable frame which is controlled by the operator. Concentrated-filament Mazda lamps are being exclusively used for printing purposes.

In the modern studio or plant many motor uses will be found in addition to those already mentioned. Perhaps the best exemplification of present-day practice in this regard will be found in the modern establishment of the Selig Polyscope Company, of Chicago.

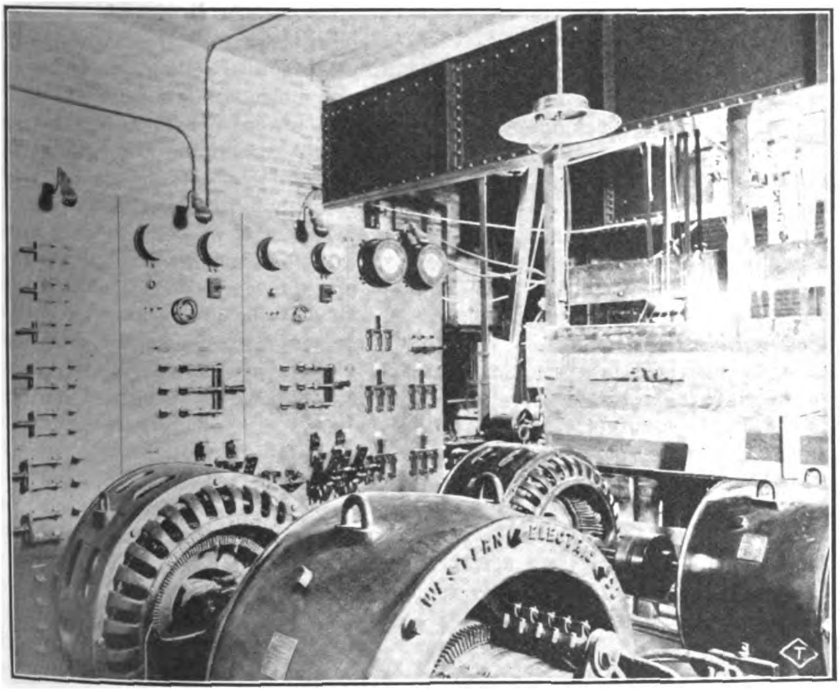


Selig Studio Showing Use of Mercury-Vapor Lamps on Sides and Overhead. Quartz-tube Lamps Are Now Used Above.

When moving pictures made their bow to the public the latter were satisfied with the reproduction in animation of scenes and incidents associated with every-day life. But the popular taste changed in the course of time. The audience became fastidious, and demanded novelty. There was a clamor for picture plays and the public saw no reason why dramas, tragedies, comedies, etc., should not be produced. This popular demand was by no means easy to meet. Obviously plays could not be photographed upon the ordinary stage of the theater owing to difficulties of lighting. Open air theaters were then constructed but again difficulties were encountered as the taking of pictures then depended upon favorable weather conditions. From these makeshift affairs the studio has developed to its present proportions, when plays of practically any magnitude can be staged. It is difficult to realize the proportions which these plants have attained.

Main Studio Building at the Selig Plant Showing Glass Top and Side.

The Selig plant in Chicago is especially noteworthy owing to its great size and the remarkable plays it produces. It is devoted exclusively to making films and employs in excess of 400 hands.



Substation at Selig Plant. Four Motor-Generator Sets Are Installed.

The main studio in which there are two stages, measures 179 feet in length by 80 feet wide. The large stage is of sufficient size to permit of 7 or 8 scenes being set at one time. In addition to this indoor establishment there are between two and three acres of surrounding land which have been inclosed for outdoor work.

The Selig organization is one of the largest in the United States, having, in addition to the Chicago establishment, another theater at Los Angeles, Cal.

Of course the lighting is the most important feature in the studio. While the inherent advantages of daylight for photographing must be admitted it is a fact that in many of the studios artificial lighting is depended upon entirely. This is due to the fact that with uniform artificial light the photographer can obtain uniform results, knowing exactly what length of exposure must be made. Sunlight is decidedly variable and frequently costly delays in photographing a play have been necessary because of clouds, etc.

In the Selig plant the studios are arranged so that photographing can be done by natural or artificial light, or both. One of the accompanying illustrations shows the exterior of the studio building and it will be observed that the roof and one entire side is of glass.

The artificial lighting equipment comprises quartz-tube and mercury-vapor lamps, manufactured by the Cooper-Hewitt Electric Company. Of the former there are 15 in each studio. In the large studio these lamps are hung from a traveling frame, the base of the lamps being about 10 feet above the floor. The tracks for the frame are arranged along the center of the room so that the lamps can be placed over any desired scene. Each of these lamps gives approximately 4,500 candlepower directly underneath. The lighting of the quartz lamps is supplemented by banks of mercury-vapor lamps arranged on portable frames, 10 800-candlepower lamps to the frame. Usually four of these frames are employed, two being placed on each side of the scene being photographed. The tubes of these lamps are 50 inches long and they are placed in a vertical position, arranged to be raised or lowered as occasion demands. The combined light from all lamps approximates 100,000 delivered candlepower, which is the amount necessary to give the desired intensity.

Portion of the Property Room at Selig Plant.

Leads from the main supply feeders are run to portable distributing boxes where connections are made for the various banks of lamps. The boxes as well as the banks of lamps are on rollers and can be easily moved to any desired location.

The lighting equipment of both

studios is exactly the same. In both cases spot lights are employed when scenery or other obstructions would prevent both sides of the stage to be illuminated by the mercury-vapor lamps.

The types of illuminants used at the Selig establishment are admirably suited for the work in question because of the uniform distribution of light, preventing the shadows inseparable from the sun light; because of the actinic quality of the light; low intrinsic brilliancy; and its steadiness and uniformity. Performers working in this light continuously for a number of years have been caused no ill effects which is not true when arc lamps are used.

One of the important features of any moving-picture studio is the property room. One corner of this department at the Selig plant is shown in one of the illustrations. Two motors are used in the woodworking shop where a full equipment of woodworking machines will be found. Cannon, battleships, houses, and countless other articles are constructed and the feature that impresses the visitor most is the permanent construction of these various articles, although they play but a small part in sometimes only one scene of a single production.

A completely equipped machine shop also forms part of the equipment of the Selig factory and in this shop cameras are constructed and all machinery repaired. One five-horsepower motor drives a line of shaft to which is connected most of the machines, while a milling machine, lathe and drill press are individually driven by two-horsepower direct-current motors.

Other motors are used for operating pumps, elevators, ventilating fans and miscellaneous apparatus. There are 30 one-twelfth-horsepower motors driving printing machines and two 1.5-horsepower motors drive two batteries of perforating machines.

Energy for all purposes is purchased from the Commonwealth Edison Company and converted from alternating to direct-current by means of motor-generator sets, as direct current is required throughout the plant, for all but a few of the machines.

There are three sets installed, one comprising a 150-horsepower induction motor direct-connected to a 100-kilowatt generator which supplies energy for the lamps. The other two sets comprise 60 and 75-horsepower motors direct-connected to 40 and 50-kilowatt direct-current generators, respectively.

Commercial Practice
Management, Rates, New Business

PLANS FOR SECURING NEW BUSINESS IN SMALL CITIES.[1]

By H. G. Bonner.

This subject is so broad that it is impossible to mention, much less describe in detail in a paper of this kind all possible plans for securing new business. The object of this paper is merely to hit some of the high spots of this question and to describe in detail only one definite plan, a wiring campaign for already built houses not equipped for electric service.

The question today is not shall central stations in small cities have a sales department, but rather what methods shall this department use to get up the best results. This is the age of system, and while too much red tape is almost as bad as none at all, the best results can not be expected if the central-station's representatives are simply assigned a territory in which to work and are then turned loose in this territory by their manager with the simple instruction of "get the business" First of all, the new-business department should be thoroughly organized under a new-business manager who should have entire charge of this work. Even if there are only two men in the department one of them should be at the head.

There are two general classes of business, lighting and power. These are subdivided under other headings, such as residence lighting and commercial lighting. Commercial lighting is also subdivided into several classes, such as store and window lighting, sign and outline lighting, etc. The first step therefore in planning a campaign for new business is to find out exactly how much of each class of business is available and then map out a definite plan for securing each class. There is only one way to secure this information on which the new-business manager must base all his selling plans, and that is by a house-to-house canvass. The city should be divided into territories and a representative assigned to each territory. He should go from door to door and get complete information on each house, store, etc. This information should include the street and number and name of the occupant of the building, the name and address of the owner, whether the building is located on the distributing lines of the company or not, the use to which the building is put, that is whether it is a residence, dry goods store, etc., whether it is wired, whether electric service is used, if not what illuminant is used and if electric service is used, what lighting equipment and appliances are in use, etc. In short he should get all the information that may be of any value in future selling campaigns. The representative should keep this information for his personal use in a loose-leaf book containing printed forms for recording this information and each evening should transfer the information secured during the day to cards, using a separate card for each customer or prospect. These cards should be kept by the new-business manager and when completed give a complete card index of the entire city. It is, of course, rather expensive to make a complete canvass in this manner but usually the representative will be able to sell enough irons, etc., to present customers to largely off-set their expense, and the canvass when completed is a mine of information that is invaluable. Right here let me state that these canvass books and cards should always be kept up to date, for if they are not they will soon become of litle value. A canvass of all the industries should also be made and detailed information secured on the kind of power used, the approximate horsepower, method of drive, names of officers, etc.

All canvass cards should be divided into two classes, customers and prospects, and the latter into three general classes, i.e., industrial residence and commercial. The residence cards are then divided into three classes, those not on the distributing lines of the company, houses on the lines owned by the people living in them and rented houses on the lines. Each of these classes should be filed separately with a street index. This may seem rather complicated but while it requires considerable work, when completed this canvass is the foundation upon which is built the superstructure of systematic selling plans.

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[1] Paper presented before the Toledo meeting of the New-Business Committee, Ohio Electric Light Association.

Taking up first residence lighting, a system that has proved very successful is as follows:

The first step is to adopt a schedule of prices for wiring old houses. The central station here has one of two courses to follow; either to go into the house-wiring business itself or else secure the co-operation of the local wiring contractors. If at all possible the later scheme is very much the best. In Elyria we have followed the system that has proven so successful in Cleveland and Toledo. The various responsible wiring contractors have a schedule of prices for wiring old houses. Of course our prices are lower than in the cities mentioned, as work is done more cheaply in a small city. It is the central station's duty to see that these prices are as low as is consistent with good work and a reasonable profit for the contractor. The wiring schedule should provide for a small payment down and the balance in say ten equal monthly installments, with a cash discount if the whole amount is paid on the completion of the work. When the wiring schedule has been adopted, a set of cheap but good fixtures should be selected and photographs of these fixtures, with price list should be mounted in a small folder for use by the representatives. This folder, a list of prospects and a bunch of wiring contracts which contain the wiring schedule are all that the representative needs to carry.

The wiring schedule, fixtures, etc., should be decided upon while the representatives are making the canvass so that when it is completed an active house-wiring campaign may be begun.

The first step in this campaign is to make up three mailing lists from the canvass cards. These lists are first, home owner's list; second, renter's list, and third, landlord's lists. A series of three form letters should be prepared for each of the three classes. The advertising appeal to each class is of necessity entirely different. The home owner should receive letters relative to the safety, convenience and cleanliness of electricity. The tenant should be requested to speak to his landlord relative to having the house wired. The landlord should receive letters telling him the advantages of an electrically equipped home, from both a renting and selling point of view. With each letter should be inclosed a return post card which when filled out by the prospect will be a request to have a representative call at a certain address at a certain time, to explain the details of the wiring plan and to give an estimate. A small piece of advertising matter, such as is put out by our friends, the lamp manufacturers, should also be inclosed.

It is recommended that each piece of advertising matter be mailed approximately one week apart preferably the first of the week.

It is recommended that one-cent postage be used, the letters not being sealed. It has been ascertained by experienced advertisers that where letters are sent to residential prospects one-cent postage is as effective as two-cent postage.

A call made by one of your representatives after the advertising material has been mailed is very important in this campaign. Otherwise the direct results obtained from the advertising matter unassisted by personal solicitation may be discouraging. The advertising matter serves merely to introduce your proposition to the prospect and to arouse his interest. In accomplishing this it opens up the way for a personal interview by your salesman.

Striking and effective window displays will be found to contribute very materially to the general success of the campaign.

Newspaper advertising in this campaign is thoroughly recommended. It is advisable that an advertisement appear two or three times each week in the leading newspapers. I would suggest that the size of the advertisements be two columns wide and eight or ten inches deep.

During the house-wiring campaign, and in fact at all times, morning meetings of all the representatives should be held. These meetings should be short and to the point. It is a well known fact that the morning is the best time for new-business work, and the object of these meetings should be to send each representative out on his territory not later than 8:30 a. m. filled with enthusiasm and a determination to bring back at least one order before the day is done. Nothing succeeds in any sales work like enthusiasm. In the small city there will be only a few representatives and these morning meetings give the manager an opportunity to train his men and take up with each one individually his work and results and to advise him regarding his problems.

It should be borne in mind in this house-wiring campaign that the main object is to get old houses wired and using service and not to sell fixtures, and where the prospect wants more of a selection of fixtures than the one set the representative can show him, the proper method for the representative to follow is to secure the wiring contract and advise the customer where to go to get better fixtures. If such a prospect is tipped off to a fixture dealer, the dealer will be glad to follow it up.

So much for old house wiring. A sales system of this kind once started may be kept going indefinitely and the number of lighting customers will grow in proportion to the energy spent as each new customer is another advertisement.

A similar campaign may be worked out for store lighting. In this case, however, it will be found impracticable to attempt to adopt a wiring schedule. It will also be necessary to depend more on newspaper advertising and personal calls than on circular letters to arouse interest in this line. Good snappy businesslike letters with two-cent postage, however, will help a lot to arouse interest among the merchants.

Sign and window lighting should come in for a great deal of attention and a very determined effort made to get this class of business, as it is highly profitable long-hour business and does much to advertise electric service to all classes of prospects. The proper method of procedure is to adopt a flat rate for dusk to midnight service for such installations, the company to turn on and off the lights, and furnish lamp renewals. As this is advertising lighting only, this puts it on a strictly advertising basis and you can approach your prospect with a definite dollars and cents proposition. An experienced lighting solicitor can handle interior and show-window lighting, but sign business is a class by itself and requires special training.

In most small cities it will be found necessary to train one or more of the representatives in this work. In this training and in subsequent sign work, much help can be secured from the sign builders. The electric sign builder is, of course, looking for business and will gladly send one of his salesmen to any city where there are prospects of getting business. The central station should not expect the sign manufacturer to do all the work, however. There should be a list of live prospects for the sign salesman to work on when he makes his first visit to your city.

The representative who is to be trained in this work should go with the sign salesman in calling on these prospects and in this way absorb some of the sign salesman's experience. In a short time he should be able to handle this work entirely except for the actual making of finished sketches and working up quotations on the cost of the signs themselves. All that is necessary in this regard is to send the sign manufacturer an idea of the type and price of sign that the prospect needs and from the designs that the sign builders submit, the representative can sell the signs.

With regard to sign designs, these should be original. If John Smith puts up an electric sign that is novel and atractive, his competitor will want a better sign. If, however, John Smith buys a sign that is like hundreds of others all over the country, it would be pretty hard to sell his competitor one like it.

Much has been said on the power question and it is useless for me to attempt in a paper of this kind to lay down any rules for getting this business. It is a question of salesmanship pure and simple and to get results must be handled by a power salesman. In the small city, this usually means that the new-business manager must be able to handle this work.

Much of the central station's success depends on its dealings with the public. Fair and courteous treatment of customers at all times, by all employees, will do more toward the success of the new-business department of any central station, large or small, than any other one thing.

Newspaper advertising should be freely used. The central station in a small city cannot afford the services of a special advertising man and consequently the new-business manager should handle this and give it careful attention. The advertisements should be carefully written and copy changed frequently. Make your advertising distinctive. It is advisable to use cuts in your newspaper advertisements. Good cuts may be obtained from the various manufacturers of electrical apparatus and from some of the advertising agencies, but the reading matter, which usually accompanies such cuts should be rewritten to suit local conditions. Avoid "canned advertising.' The central station should strive for the reputation of being the smartest advertiser in town.

Safety Meetings in Indiana.

The United Gas & Electric Company, New Albany, Ind., organized safety committees among its employees at a meeting February 27, at which James Harmon, in charge of safety work for that company and associated corporations, was in charge. Discussions of ways to handle electric shocks and asphyxiation will be given a prominent place by the committees, and at the next meeting the use of the pulmotor will be demonstrated.

New-Business Men Hold Convention in Toledo.

A very profitable and enthusiastic meeting of Ohio new-business men was held at Toledo, on February 25, under the auspices of the Committee on New Business Co-operation of the Ohio Electric Light Association. This was the first of a series of three meetings to be held by this committee and over 100 were in attendance, including many contractors who were invited to participate.

Sessions were held in the morning and afternoon with Thomas F. Kelly, chairman of the committee, presiding. The first session was called to order promptly at 10 a. m. and Frank P. Coates, president of the Toledo Railway & Light Company, called upon for the welcoming address.

H. G. Bonner then presented a paper entitled, "Plans for Securing New Business in Small Cities." This paper is published elsewhere in this section. The discussion resolved itself into an experience meeting which lasted until noon.

Lunch was served at the Elks Club, where the meetings were held, following which Ben Baum, of the Toledo Railway & Light Company entertained the visitors with a monologue. George Hardy, secretary of the Toledo Commercial Club, then addressed the gathering, laying particular stress upon the part the Toledo utility takes in civic affairs and in boosting the town. Mention was also made of the slogan sign which the company has recently donated to the city.

The afternoon session was convened at 2 p. m. and a paper by P. L. Miles, of the National Lamp Works, entitled, "How the Electrical Manufacturer is Prepared to Assist the Electrical Contractor in Large or Small Cities, and Suggestions Whereby Through the Co-operation of the Electrical Contractor and Central Station New Business can be Secured," was presented. Mr. Miles considers a house-wiring campaign as an example, and shows how the co-operation between contractor and utility is essential if the greatest amount of business is to be secured. Many excellent suggestions were advanced for co-operative advertising, window displays, etc.

A paper by E. L. Callahan of Chicago, entitled, "Suggestions to Assist Central-Station Salesmen to Secure New Business," was postponed until the April meeting because of Mr. Callahan's absence.

The next meeting will be held in Dayton early in April and another will be held in Cleveland during the Electrical Show there. T. F. Kelly, of Dayton, will have charge of all arrangements.

The following were in attendance at the meeting:

Thomas F. Kelly, Dayton Power & Light Company; D. L. Davis, Salem Electric Light & Power Company; Otto E. Wessel, Columbus Railway, Light & Power Company; Dean Emerson, Wagner Electric Manufacturing Company; Charles A. Roberts, United Service Company; H. V. LaBar, Toledo Railway & Light Company; R. H. Wright, The Cleveland Electric Illuminating Company; E. R. Gillet, F. Bissell Company; P. L. Miles, National Lamp Works; W. S. Bissell, F. Bissell Company; L. C. McKenzie, Toledo Railway & Light Company; J. E. North, Springfield Light, Heat & Power Company; G. H. Oliver, J. H. Paff, Emil Grah, Western Gas Fixture Company; Earl F. Miller, Earl F. Miller & Company; E. Garland, C. T. Beck, Federal Sign System; H. E. Adams, The W. E. Nagel Electric Company; A. K. Young, J. J. Cooney, David E. Nims, Toledo Railway & Light Company; H. C. Warren, Toledo & Indiana Railroad; S. F. Messer, Kent Water & Light Company; F. R. Fox, Toledo & Indiana Railroad; H. W. Brook Westinghouse Electric & Manufacturing Company; C. E. Mattison, Toledo & Indiana Railroad; F. M. Knierim, F. Bissell Company; F. E. LaFrance, LaFrance Electric Company; Fred M. Schafer, Electrical contractor; Ear H. Cobb, Toledo Railway & Light Company; James M. Darst, A. M. Seeger, C. Felker, Charles Bay, Ned Braunschweiger, James Fagen, Robert H. Carson, T. B. McMillan, Fred C. Cory, Lewis J. Lemen, Joseph K. Bauer, F. J. Boyle, Charles A. Huber, James L. Stone, N. F. Corcoran, Toledo Railway & Light Company; W. B. Wilkinson, The Ohio Light & Power Company; G. T. Groff, Groff Electric Company; F. E. Morrison, Ohio Light & Power Company; H. L. Montgomery, Ohio Light & Power Company; P. A. Staples, Sandusky Gas & Electric Company; E. R. Kelsey, Ben Baum, Toledo Railway & Light Company; L. C. Anderson, Middletown Gas & Electric Company; L. C. Anderson, Franklin Electric Light Company; R. C. Heston, Toledo Railway & Light Company; A. A. Pointer, Antwerp Electric Plant; W. J. Young, Toledo Railway & Light Company; C. M. Lott, Hicksville Electric Light Company; A. G. Hester, Toledo Railway & Light Company; E. A. Geauque, Edgerton Light Company; Augustus Kneisel, Toledo Railway & Light Company; G. F. Evans, Columbus Railway, Power & Light Company; J. W. Cushman, Fostoria Lamp Works; Fred Bissell, F. Bissell Company; H. G. Bonner; and B. Baker.

LIBRARY OF THE UNIVERSITY OF CALIFORNIA

Electric Sign Data

Recent Noteworthy Sign Installations.

The Turner Moving & Storage Company, Denver, Colo., has installed an electric sign on the top of its office and warehouse, 135 feet above the ground. The field is of wire attached to an iron frame 40 by 40 feet. The sign contains 1,800 lamps in three colors.

The central figure, in white, represents the world revolving on its axis, within which the outlines of the Western Hemisphere are shown in red lights. Around the border, alternating with the lights in the central symbol, streaks of forked lightning dart out in zig-zag form; a close imitation of natural forces in action.

During the intervals between the other colors, green lights in each of the four corners flash out the company's address, telephone number and the slogan, "The World Moves, and So Does Turner."

The Davis & Shaw Furniture Company, also of Denver, have placed a unique electric light sign upon the roof of their building. The sign is 54 feet high, by 37 feet wide and contains 1,204 lights in six colors.

The central figure of the sign represents a lady seated in an easy chair, rocking to and fro, surrounded by evidences of luxury and refinement. Lights forming the name Davis & Shaw, are extinguished and relighted in a manner that suggests a group of school children rushing to their places in a favorite game.

Around the margin, lights are so arranged that the effect of the combination, as viewed by the spectator on the sidewalk, is that of a painting set in a heavy, gilt frame; the inner edge of which is interwoven with scrolls, wreaths, and filigree.

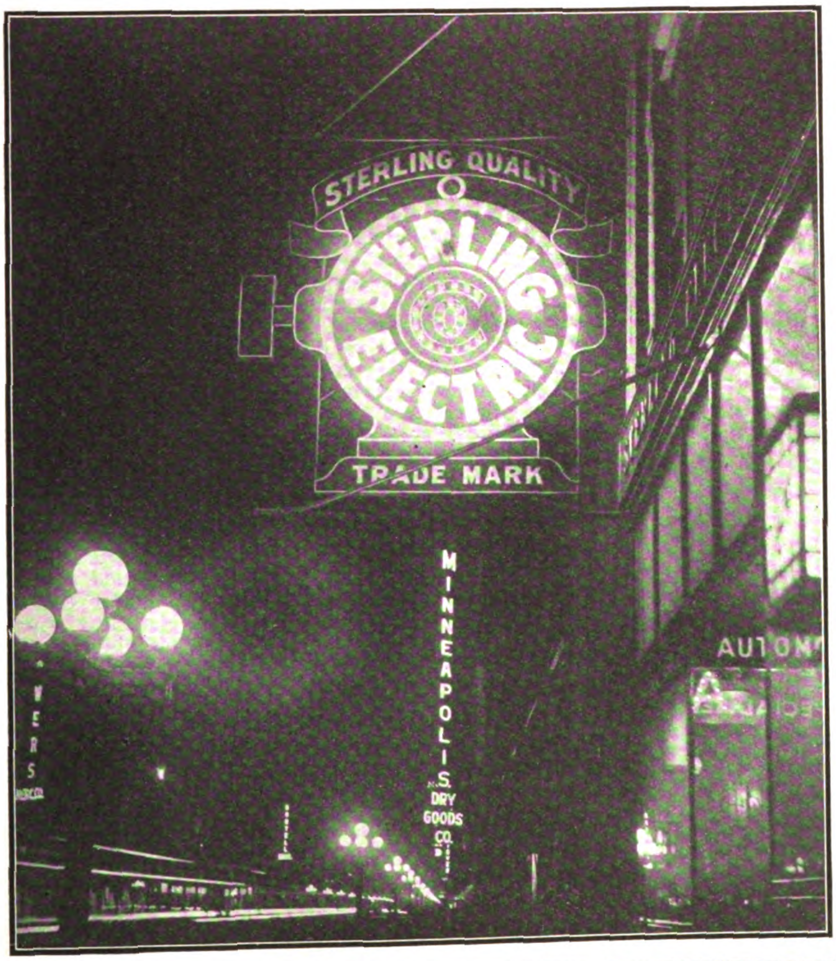
In Tennessee the Nashville Railway & Light Company and the Herbrick & Lawrence Company, a contracting firm of Nashville, Tenn., are working on an electric sign campaign in conjunction with the Federal Sign System (Electric), which is handling the matter from its offices in Louisville. The development of electric sign business in Nashville has been rather backward, but with the energetic efforts which are being made it is expected that a large number of new contracts will be added in the near future.

In Buffalo, N. Y., work is progressing on what is claimed will be one of the largest temporary electric signs ever erected in the United States. It will be erected on the roof of the Elmwood Music Hall and will advertise the Buffalo Electric Show to be held the week of March 9-14, in this building. The sign will stand 24 feet high by 40 feet wide.

A border consisting of 800 25-watt lamps will inclose the entire sign. The wording of the sign is "Electric Show," in script letters 10 feet high. About 1,200 25-watt Mazda lamps are used.

It is said by the builders that as far as the eye can reach the sign will be perfectly readable. The sign, because of its intense brilliancy will mark the location of the show from all parts of the city.

The design submitted this week is of a sign erected by the Sterling Electric Company, of Minneapolis, Minn., for its own use. It illustrates in a striking manner how electric signs can be used to advertise a trade mark, the sign in question being a reproduction of the Sterling Company's emblem. The central portion of the design represents a rapidly revolving motor. The sign is so connected that when the words, "Sterling Electric" are not burning the black spots travel and look as though they were spokes.



Sign of the Sterling Electric Company, Minneapolis, Minn. Dimensions, 10 feet high, 9 feet wide.

Motor is outlined with a circle of lights covered with green color caps. Operated by a flasher giving effect of revolving. The words, "Sterling Electric" have white color caps and "Company" red. There are 400 10-watt lamps used.

Electrical Construction

PROPOSED ELECTRICAL CODE OF THE STATE OF WISCONSIN.

Rules to Insure Safety in Electrical Installations.

The Industrial Commission of Wisconsin has for several years been making very successful efforts to promote the safety of employees in industrial establishments of all kinds throughout the state. The Commision is an official state body created through legislative enactment; its members are C. H. Crownhart, chairman, J. D. Beck and Fred M. Wilcox; its secretary is Paul J. Watrous; its headquarters are at Madison, Wis.

Feeling the need of some concerted effort to minimize the dangers to life from electrical circuits and apparatus, the Commission asked a committee of prominent Wisconsin electrical men representing various interests, to consider the question and draw up a set of rules in the nature of an electrical safety code. These rules have not yet been officially adopted; a public hearing is to be held at which they will be considered. As far as known, this is the first code of this nature proposed by a public body. To give it publicity among electrical men it is therefore published below practically in full as made public by the Commission.

Introduction.

The following tentative rules governing the installation and maintenance of electrical equipment in the state of Wisconsin have been drawn up by the following committee:

Thomas E. Barnum, Cutler-Hammer Manufacturing Company, Milwaukee.
Charles Dietz, Commonwealth Power Company, Milwaukee.
W. F. Gute, Milwaukee Federated Trades Council, Milwaukee.
Walter Nield, Illinois Steel Company, Milwaukee.
P. A. Schroeder, Henry Newgard Company, Milwaukee.
S. B. Way, The Milwaukee Electric Railway & Light Company, Milwaukee.
C. W. Price, assistant to the Industrial Commision, Madison.

The committee has given several months of careful study to the subject and has consulted all the available authorities in order to fix a Wisconsin standard. It is the desire of the committee and of the Industrial Commission, however, to afford ample opportunity for the offering of suggestions and criticisms that will make the code more perfect. To this end manufacturers and all other interested persons are invited to attend a hearing on this proposed electrical code. This hearing will be held in the rooms of the Industrial Commission in the Capitol at Madison, at 10 o'clock on March 13, 1914.

The procedure for carrying the electrical rules into effect will be issued when the Industrial Commission issues its general electrical rules after public hearing. This procedure will be adopted under the authority conferred upon the commission in Chapter 485, Laws of 1911, and Chapter 587, Laws of 1913.

The Industrial Commission wishes to acknowledge its sincere thanks for the conscientious and patient work of the electrical committee, each member of which has attended practically all of the meetings, running through several months, and all of whom will be recognized as competent experts on the subject.

PROPOSED ELECTRICAL CODE.

Definitions of Terms.

Alive and Live. Terms that mean "charged with electricity," and are used in speaking of conductors, circuits, and machines that are in a condition to give an electric shock.

Automatic. A term applied to devices and equipment to denote mechanical instead of manual control.

Dead. A term used to denote that any part of an electric circuit or apparatus is not in operation or is not charged electrically.

Electric Circuit is a system of electrical conductors joined together so that electric current may flow through them.

Exposed to Contact means that an object is not insulated, located or guarded in such manner as to prevent accidental contact by workmen in the ordinary course of employment.

Grounded. A term used to denote that an electrical conductor or machine is electrically connected to ground. Such connection may be permanent or accidental.

Guarded means so covered, fenced or enclosed that a person in the course of his employment is not liable to come in contact with the point of danger and be injured.

Isolated. A term which means that a thing is so placed apart or separated as to be alone and out of the way of persons while in the course of their employment.

Insulation. A material which is a nonconductor of electricity and which will prevent the flow of an electric current. Insulation is employed to surround or cover conductors for the purpose of preventing the escape or leakage of electric current.

Insulated. A term used to denote that apparatus or conductors have been separated or covered in a manner to prevent a flow of electric current at the rated voltage of the apparatus.

Manual. A term used to denote that a device requires to be manipulated by the effort of the operator or workman.

Master Controller. A device, such as a push button or switch, used for operating main controlling apparatus and by means of which such controlling apparatus is made subject to the will of the operator.

Motor Control Boards, or Motor Controlling Switchboards. Terms used to denote manual or automatic devices employed in the control of electric motors.

Panel Board. A small switchboard controlling inside distributing circuits.

Remote Control Apparatus. Apparatus for controlling electric equipment which is remotely situated from the point of manual operation or control.

Secondary. A term used in referring to a circuit in which the current is generated by the magnetic action of another circuit. This term is usually applied to the circuit in a transformer in which the current has been generated by the action of the circuit connected to a source of energy.

Switchboard. A term used in referring to apparatus usually employed for controlling and measuring electrical energy at a given point.

Voltage. A term used to denote electric pressure. Electric pressure applied to a completed circuit will cause a current of electricity to flow just as water pressure will cause a stream of water to flow.

ORDERS FOR SAFETY IN ELECTRICITY.

Order 600. Dangerous Circuits. All circuits where exposed to contact and where the voltage exceeds 300 volts, are considered dangerous and must be guarded as such.

Order 601. Danger Signs. On all electrical apparatus located inside of buildings and carrying a voltage in excess of 300 volts, signs giving warning of danger must be placed.

Note. The most effective sign which has been adopted consists of a skull and cross bones with the word "Electreka" printed in white or aluminum letters on a red background. Practically all nationalities understand this sign.

Order 602. Grounding Electrical Apparatus. All motors, generators, transformers and starting or auxiliary equipment connected therewith and rated at 300 volts or over must have frames or cases permanently and effectively grounded. Where impractical to ground such apparatus the same must be effectually guarded. If metal guards are used they must be permanently grounded.

Note. It is recommended that the frames of all motors and generators be permanently and effectively grounded.

Order 603. Switches and Switchboards. All switchboards must be constructed of incombustible, non-absorbent material and must be supported upon a metal frame rigidly and substantially braced and effectively grounded. Where not so placed as to be isolated, as in a separate room or upon a gallery, switchboards must be guarded at the rear with a metal screen which must be grounded, provided with a door hung upon self-closing hinges and equipped with automatic catch capable of being operated from either side of the door. No shelves, cabinets or other means for storing material will be allowed behind the switchboard and the space behind the switchboard must be kept clear at all times. Single-throw switches must be so mounted as to tend to open by gravity.

Order 604. Clearance Back of Switchboards. All new installations of switchboards, rated 300 volts or less and having a width in excess of 3 feet, must be provided with a space of not less than 2 feet actual clearance between the equipment mounted upon the back of the switchboard and the wall or other structure which determines this dimension. Switchboards rated more than 300 volts must be erected so as to provide a clearance of not less than 3 feet in a similar manner.

Order 605. Switchboards Equipped with Mats. The front of all switchboards rated at 300 volts or over, with exposed live parts on the face of the board, unless constructed on floors of insulating material, must be equipped with rubber mats or hardwood racks.

Order 606. Protection for Switchboards. All switchboards rated from 300 to 6,000 volts must be provided with the following safety equipment: (a) Insulating stools equipped with insulators rated at not less than 4,000 volts. (b) Two pairs of rubber gloves tested to 6,600 volts alternating current. (c) Proper insulating tongs for handling potential-transformer fuses. (d) Six rubber blankets not less than 20 inches square and one-eighth inch thick. (e) If ladder is required the same must be of special construction and of a non-collapsible pattern.

Order 607. Safeguarding Remotely Controlled Electrical Apparatus Driving Machines. All devices which control electrical machinery or apparatus must be so located that a man can see the working parts of the machine controlled by the device. Where this is not possible, a disconnecting switch must be placed at the machine or a remote-control apparatus must be provided with safety switches placed at all necessary points around the machine.

Order 608. Exposed Live Parts Guarded. All apparatus rated at 300 volts or over must have all live parts exposed to contact insulated or guarded to prevent accidental contact.

Order 609. Man in Charge of Generators. A competent man must be kept on duty where generators rated in excess of 300 volts are operating, unless the generators are located in a locked room, or are otherwise adequately guarded.

Order 610. Neutral of Three-wire Systems Grounded. The neutral of all three-wire distributing systems, where the voltage does not exceed 150 volts to ground, must be permanently and effectively grounded.

Order 611. Panel Boards Enclosed. All new installations of panel boards, motor controlling switchboards and similar electrical apparatus, where the voltage between parts on the front of the panel exceeds 300 volts, unless otherwise isolated, must be entirely enclosed in a cabinet made of non-combustible material or such apparatus must be adequately guarded.

Note. It is recommended, where possible, that the bottom of such cabinets be made to slope outward at an angle of not less than 30 degrees, so that the cabinet cannot be used as a storage place. Ample space should be allowed between the live parts and the case.

Order 612. Switch-Handle Insulation. All manually operated switches must be provided with handles insulated to withstand at least three times the rated voltage. Operating handles may be made detachable if desired.

Order 613. Arc Lamps—Construction. New installations of lamps of the arc type must be constructed as nearly as practicable of non-combustible material, and must be kept supplied with globes. No exposed portion of the lamp, with the exception of the terminals, must form any part of the circuit of the lamp.

Order 614. Safety Appliances. Every employer operating overhead or underground lines must provide for the use of employees required to work upon such lines, a sufficient number of the following safety appliances:

(a) Rubber gloves of quality and texture to withstand a test pressure of 6,600 volts alternating current, applied for a period of not less than five minutes.

(b) Rubber blankets of good grade of sheet rubber, which must measure not less than 20 inches square and one-eighth inch thick.

(c) Rubber boots, which must be constructed without nails or other metal in any part.

(d) Insulating stools equipped with standard line insulators rated at not less than 4,000 volts.

(e) Employers must post in conspicuous places, where workmen congregate, notices advising the employees that the foregoing safety appliances have been provided by the employer for the use of the workmen and directing the workmen to make use of such appliances when working upon lines or apparatus operating, or exposed to other lines operating, at a voltage of more than 200. Such notices must also advise employees to exchange promptly any such safety appliances which appear defective. All employers operating overhead electric distributing systems shall require all employees who have occasion to work upon poles, to be provided with tool belts and safety straps. No employee shall be permitted upon poles unless so equipped.

Order 615. Conduits and Metal Moldings Grounded. On old and new installations of circuits carrying over 300 volts, rigid or flexible metal conduits, metal moldings, and metallic sheathing of wires and cables, must be permanently and effectively grounded.

Order 616. Live Wire in Manholes. No insulated wire or connections will be permitted in manholes or tunnels regardless of the voltage of the circuit of which the wire forms a part, except ground-return wires. Lighting sockets must be of the weatherproof type.

Order 617. Lightning Arresters. All overhead circuits must be provided with lightning arresters. Lightning arresters must be so arranged as to be easy of access for inspection or repair; must be connected to the line wires in a manner so as to avoid as far as practicable turns or angles in the connection between the line wire and the lightning arrester, and must be connected to suitable ground pipe or other satisfactory ground connection by means of a copper wire not less than No. 6 B. & S. gauge, which wire must be enclosed in a wooden molding from the point of connection at the ground to a point not less than 12 feet above the ground.

Order 618. Arc-Lamp Supports. All arc lamps must be suspended by an insulating hanger, the insulation resistance of which must withstand a voltage twice that of the circuit upon which the arc lamp is operated. Arc lamps suspended over streets or driveways must not be placed at a height less than 15 feet above such streets or driveways. Arc lamps suspended over sidewalks or passageways must not be suspended at a height less than 8 feet above such sidewalks or passageways. New installations of arc lamps operating upon series arc-lighting circuits will not be permitted inside of buildings except in electric generating stations.

Order 619. Spacing of Poles. New installations of wooden poles in cities and villages must be spaced at distances not greater than 150 feet. Poles must be not less than 5.5 inches in diameter at top, and must be reasonably straight, free from large knots, windshakes and rot.

Order 620. Crossarms. Crossarms must be of well seasoned straight-grained timber, free from large knots, wind-shakes and rot and must be attached to the pole by means of a bolt not less than five-eighths inch in diameter by passing entirely through both crossarm and pole. Each crossarm must be equipped with at least one metal brace with not less than 1.5 inches by one-fourth inch cross section, and same must be attached to crossarm in a substantial manner either by clamp or carriage bolt, and to the pole by means of a lag screw not less than one-half inch by four inches. Sidearms must be suitably braced with heel braces constructed of angle iron, wrought-iron pipe, or round wrought iron and same must be attached to crossarm by means of carriage bolts or clamps and to pole by means of two lag screws not less than one-half inch by four inches. At terminals, corners, curves and points of excessive strain, double crossarms or their equivalent must be employed.

Order 621. Spacing of Crossarms. In all new installations, crossarms must be spaced not closer than 18 inches center to center and must be so arranged that all lines must be maintained with a safe clearing both from the pole and from other lines.

Order 622. Poles to be Stepped. All poles carrying branch cutouts, incandescent lamps or other devices requiring frequent attention, must be provided with steps beginning at a point not more than 12 feet and not less than 10 feet above the ground.

Order 623. Guying. All pole lines must be equipped with guys so arranged as to take the strain caused by line wires at terminals, corners and curves. Pole lines must be head guyed at least four times per mile. Guy wires must consist of galvanized-steel strand and where carried across roadways or footpaths must be maintained at a height of not less than 18 feet above the crown of roadways, and not less than 12 feet above footpaths. Guys running to anchors buried in the ground must be equipped with guards to make them readily visible. Each guy wire must be equipped with at least one strain insulator of a type which will not allow the guy to part in case of breakage of the insulator and which will withstand a test voltage of 5,000 volts when wet. Strain insulators in guy wires must be not closer than 8 feet from the ground.

Order 624. Line Wires. Line wires must be carried upon insulators of a design to provide proper insulation for the rated voltage of the wire supported upon the insulator. The factor of safety in such insulators must in no case be less than 2.

Order 625. Clearance of Lines. Line wires must be erected at a height not less than 20 feet above streets and public driveways and not less than 15 feet above walks and private grounds. Line wires carried upon viaducts, bridges and similar structures must be placed entirely beyond the reach of persons having occasion to use the bridges or viaducts as passageways, and as far as possible beyond the reach of workmen generally employed in the operation or maintenance of such structures. Where line wires must be placed in such a position that workmen may come in contact with the same, they must be protected, insofar as may be practicable, and warning signs must be erected and maintained by the owners of such wires, such signs in all cases to state the voltage of the wires.

Order 626. Insulation of Overhead Wires. All overhead wires within cities and villages operating at less than 5,000 volts (except trolley, telephone, telegraph or guy wires) must be equipped with triple-braid weatherproof insulation. Wires must be so strung as to be not closer than 10.5 inches and must be kept clear of all other objects, such as poles, trees, buildings and other lines. Overhead wires leading to a building must be so arranged as to avoid as far as practicable the possibility of contact on the part of the occupants of the building or with any awnings, shutters, signs, etc. Wires crossing roofs must be arranged to provide a clearance of not less than 8 feet above the highest point of flat roofs, and not less than one foot above the ridge pole or highest point of pitched roofs. Supporting structures for wires mounted on roofs must be substantially constructed and securely attached to buildings. Wires leading down the sides of buildings must not be brought closer than 12 feet from the ground and must in all cases be so arranged as to prevent accidental contact on the part of the occupants of the building. Insulation is not required on line wires of any voltage outside of the corporate limits of cities and villages.

Order 627. Electric Light or Power-Line Crossings. Where electric light or power lines cross over telephone, telegraph or other low-voltage lines in cities or villages, the distance between the supports of the electric light or power lines at the point of crossing must not exceed 150 feet, unless such power lines constitute a part of a power-transmission system in which the supports, insulators and line wires have all been designed for longer spans with proper factor of safety.

Order 628. Trolley Wires—Insulation From Ground. All trolley-wire supports must have a double insulation from the ground. In wooden-pole construction the pole will be considered as one insulation. The strain insulator must withstand a test voltage of not less than twice the rated voltage of the trolleys supported.

Order 629. Wires Crossed by Other Conductors. At all points where trolley wires are crossed by other conductors efficient means must be employed to prevent contact between trolley wire and other conductors through trolley pole.

RULES FOR STATION AND SUBSTATION ENGINEERS, WIREMEN, OPERATORS, HELPERS AND OILERS.

Suggested by S. B. Way, The Milwaukee Electric Railway & Light Company.

1. Read these rules each day when you come on watch until you have committed them to memory. After having been in the service of the company for a reasonable time, you will be examined as to your knowledge of the rules and failure to pass such an examination satisfactorily will be cause for discharge from the service.

2. Oilers and helpers must not enter high-tension compartments or enclosures unless accompanied by foreman, wireman or operators and by his direct order, or to afford relief to an injured person.

3. Oilers and helpers must not clean live machinery, switchboards, transformers, regulators, wires or cables operating at a voltage of more than 300 volts.

4. Apparatus and equipment of any kind operating at a voltage of 6,000 or over shall not be cleaned or repaired when alive.

5. When performing any kind of work on live wires, cables, transformers, motors, generators, busbars, switches, lightning arresters or other apparatus operating at voltages over 300 and under 6,000, rubber gloves and insulated stools must be used. Refuse to work without them. Use one hand only and keep the other in your pocket where possible.

6. In handling live electrical apparatus or working around moving machinery of any kind, think before you move and be certain you are safe and that you know what you are doing before beginning your work.

7. When high-voltage switches, compartments, buses, wires or cables have been disconnected for cleaning, see that they are short-circuited and grounded before proceeding with work. Make ground connection first when applying ground wire. Remove ground connection last, when removing grounding wires. Be sure switches, etc., are "dead" before applying ground connection.

8. Never open a disconnecting switch in series with an oil switch until you have made sure that the oil switch is open.

9. Never open or close a switch of any kind until you are sure it is the right one. Think twice before you act.

10. In placing generators or motors back in service after work has been done in connection with them, make sure that electrical connections are properly made. If you are not certain, take no chances but call your foreman or superintendent for instructions.

11. In replacing potential-transformer fuses, have the generator, line or cable, to which the potential transformer is connected, disconnected and made "dead" before proceeding, if possible. In every case use wooden tongs and rubber gloves and stand upon insulated stool.

12. In working around control or instrument wiring, be careful never to open the secondary circuit of a current transformer. It is dangerous.

13. Never lean against any electrical apparatus or supporting structure or enclosure. Be wide awake and on your feet squarely when around electrical equipment or machinery of any kind.

14. Be careful of your tools. Use no defective tools or equipment. Never lay your tools down on busbars, switchboard frames, scaffolds or ladders or around electrical machinery. Place tools in pocket, belt or tool bag when not in use.

15. In working on ladders or scaffolds, be sure they are safe and sound. Take time to prepare a proper and safe place to work.

16. If you notice any condition which you think unsafe, correct it at once if possible. If you cannot correct it, report at once to your foreman or superintendent.

17. Avoid all loose and temporary wiring. Never carry extension cords around switchboards or in switchboard enclosures. If light is needed, use permanently installed lights or use lanterns.

18. These rules are issued to be obeyed. No one has authority to amend or alter them. You will be held strictly accountable for your complete knowledge of them and the care with which you observe them.

RULES FOR EMPLOYEES OF CONCERNS OPERATING OVERHEAD DISTRIBUTING SYSTEMS.

1. Before ascending a pole be sure you have your safety belt and rubber gloves.

2. Be careful that all your tools are securely fastened in your belt when working on pole or ladder and in handling tools or other equipment have a proper regard for persons walking or driving below.

3. When you have reached the point on the pole where you are to work make use of safety belt and other safety appliances which you have been directed to use.

4. In working upon overhead wires be careful to stand so that if you should slip or receive an electric shock you will fall in your belt rather than upon the wires. All overhead wires must at all times be treated as though they were alive or grounded. This means that you must not touch two wires at the same time.

5. When working upon overhead wires always arrange, if possible, to stand upon the pole and work from below rather than above the wires. Before standing upon or using a crossarm for support for hand or belt make sure that crossarm is sound and securely fastened to pole.

6. Examine all tools, safety appliances, ropes and blocks, both your own and those furnished by your employer, before starting your work. Do not use any tools, safety appliances or other equipment which you do not think is in good order. Your own safety as well as that of your fellow

workman and of the public may be jeopardized by using faulty tools or other equipment.

7. Always report at once to your foreman or superintendent any defective material or work or other dangerous condition which you may notice.

RULES FOR ELECTRICAL DEPARTMENT EMPLOYEES IN PLANTS.

Suggested by **Walter Nield, Illinois Steel** Company.

1. All employees should at all times be careful in their work to guard against accidents, such as shocks, short-circuits and grounds.

2. Do not get careless or take any uncalled-for chances. See that the lines or apparatus on which you are to work are "dead" if possible (not electrified).

3. Be sure to use your danger signs on switches or apparatus on which you are to work and see that the sign is firmly affixed on the switch controlling this apparatus so that it will not be displaced by the wind.

4. It is a good idea to notify all parties present or near the place where you are working so that your presence is known, which will oftentimes prevent somebody from throwing in a switch or starting a piece of apparatus on which you are working, if perchance the danger sign becomes displaced.

5. Always remove the fuses from the blocks and put same in your pocket when working on a circuit.

6. Think twice before doing any work with electrical apparatus. In starting, testing or handling motors be sure to look about first and see that everybody is through with his work and away from danger before you close the switch which controls.

7. Don't go up among circuits or wiring of which you are not sure as to the voltage or kind of power they are carrying. Go to your foreman if you are in doubt.

8. Never fuss, fool or tamper with electrical apparatus or wires, as it is extremely dangerous.

9. Always see that conditions where you are to work are perfectly safe, not only to yourself but to those that are working with you.

10. Never trust to the insulation of wires. If you are called upon to work among them, see that additional protection is used, such as "Linemen's Protectors," etc.

11. When necessary to make hot taps or joints, always see that you are well insulated from the earth or any metal structure, also make only one tap at a time and insulate this carefully before making the remainder. Never expose or bare more than one wire at a time so as to avoid short-circuits. Overhaste is dangerous.

12. Remember that all new construction must be installed carefully and conform to the company's rules and must be safe to persons working around and in the neighborhood of same. Take pride in doing your work well and always with the idea that it must pass inspection.

13. When working around high-voltage wiring, etc., avoid the use of both hands as much as possible, as it is extremely dangerous and ofttimes a short-circuit is established from this cause. Keep one hand behind you or in your pocket.

14. When working upon electrical apparatus never hand anything to another person or lay anything down, as death may result.

15. See that all material left over from installing new work is cleaned up and brought back to the shop.

16. When a circuit is to be pulled at the main power station or otherwise, send a man in person to the operator and when work is completed the same person should report as before (phone conversation likewise). This avoids possible confusion and accident.

17. When putting in or working on incandescent lamps at any time, especially at night, do not expose your eyes any more than necessary as lamps are sometimes defective, mistakes are made and a bad flash results.

18. Never look at an arc or intense light for any period of time, as your eyes will become overstrained and sore as a result. Always go to the doctor and get some drops put in your eyes if exposed to a flash, though you do not at once feel the effects of the flash and think that your eyes have not been harmed, as artificial light will bring out the bad results and a painful and sleepless night will be experienced.

19. If you see any person tampering with electrical apparatus who has no right to do so, stop him at once and report him to his foreman.

20. If you see any operator of any piece of electrical apparatus who shows by his operation that he is ignorant of the correct way to operate such piece of apparatus, instruct him in its use and otherwise help to keep things running smoothly. If you see any electrical conditions that are unsafe or need repairing, or lighting conditions that need correction, correct them yourself if you are able, otherwise report them to the chief electrician.

21. In extinguishing motor fires, water should not be used except in extreme cases, but the fire should be put out with powder extinguishers, opening the motor to the atmosphere as little as possible. Always pull the main switch controlling any piece of electrical apparatus before attempting to put out the fire.

22. After 4 p. m. of each and every day, men at large and those working on high-tension circuits, such as alternating-current arc circuits, etc., must be on their guard and careful of said circuits as the engineer or attendant is instructed to connect up the high-tension panel ready to plug up all circuits on which there is no one working. If at any time men are sent to do any work on any of the above-mentioned circuits, they must report to the engineer or station attendant *first* and *in person* before going out on the circuit; and when work is completed, they must again report to the engineer or station attendant *in person* that they are off the circuit and that everything is safe and ready for the circuit to be put on. If any man or men who are sent out to do any work on any of the above-mentioned circuits do not know about or are in doubt in regard to any part of it, they must immediately report same to assistant electrician or foreman in charge, who will give them the information required.

23. When working on a 6,600-volt circuit, always short-circuit the three-phase wires with a chain or cable, after having pulled the disconnecting switch, and ground the end of same, to protect from static induced voltage from other lines.

24. When through with a piece of work, be sure that you replace all safety appliances and if you cannot do this, report to assistant electrician, who will arrange to have the work done.

25. Above all be on your guard for personal safety and that of your fellow workmen. Do your work with this aim in view as well as take pride in a good-looking and substantial job. Make yourself familiar with all of these rules and the general "Book of Rules."

ELECTRIC SHOCK AND RESUSCITATION.

Electric Shock Defined.

A man's body is an electric conductor, although a rather poor one, and current will flow through the body if it is part of an electric circuit. The amount of current that will flow through a man's body depends upon the voltage of the circuit, and the completeness of the contact between the man's body and the circuit.

Where a man takes hold of a circuit, carrying 5 or 6 volts, the current that will flow through his body is too small to be felt. A 110-volt circuit will cause more current to flow through the body, and a slight shock will be felt. A 220-volt circuit will cause a still greater current to flow, and severe but not dangerous shock will be felt. When the voltage is 440 or higher, a very severe shock is felt, and death often follows directly.

The best way to avoid electric shock is to keep away from live parts of the machine or device. Great care should always be taken when working around electrical machinery or apparatus. Wherever possible the machine should be disconnected from the line before touching any uninsulated parts. Insulated tools should not be trusted to give entire protection. Rubber gloves in good condition without metallic fastenings, will protect fairly well. Defective gloves should never be worn; they are dangerous. Where it is necessary to touch live parts of the machine, use but one hand, and protect the body by standing on an insulating platform, such as a dry board free from nails. Care should also be taken to place the body so that the involuntary recoil from a possible shock will remove the hands from the apparatus, instead of causing them to grasp it, and will not cause you to lose your balance and fall.

The code is concluded with the now standardized rules for resuscitation from electric shock drafted by a joint committee representing the American Medical Association, the National Electric Light Association and the American Institute of Electrical Engineers. These rules were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of October 26, 1912, pages 802 to 804.

* * *

The wiring contract for the pumping station of the new Lima, O., State Hospital for Criminal Insane has been let to the McKeever Electric Company, 99 North Third street, Columbus, O. Over $50,000 of electrical work has gone into this institution, which will be completed this year.

THE EDUCATION OF THE PUBLIC IN THE USE OF STANDARD ELECTRIC WIRING MATERIALS.[1]

By J. E. Latta.

It has not been long since it was rather generally true that the man who had his house wired for electricity felt that in doing this he was preparing to undertake something in the nature of an experiment. Apparatus for the generation and distribution of electric current had not been developed to such a degree as to make it always certain that electric service would not be subjected to frequent and annoying interruptions; the prevailing rates for power were high; electric appliances, other than motors and lamps, were comparatively few; and the efficiency of even the best type of incandescent lamp was so low as to give it a rather poor showing when the cost of lighting was compared with other illuminants. Hence, it was not unnatural that the person adopting electric service should feel that he might soon have to discontinue it, and that he should object to spending much money on his wiring. Without doubt this, in a measure, accounts for the crudeness of many of the older installations of electrical work.

But the time when the desirability of electric service was an experiment is now passed. The property owner knows these days that the wiring in his building will be needed as long as will the walls themselves. Why, then, should the installation of flimsy, unstable wiring continue to be so common? Why is it that it is still easy to find a market for sub-standard wiring materials? The question is one that some of us have heard discussed frequently and sometimes at great length. It has been asserted that the cheap contractor is largely to blame. That he is wholly blameless none of us would undertake to deny.

Some of our friends would have us believe that the zeal of the central-station manager for connecting up new business likewise contributes to the disorder. While such a contention is not wholly without foundation, my own feeling is that this matter is made more of than the facts justify. For example, I know personally of towns where the lighting company, without any local ordinance to demand it, refuses to connect to any building in which the wiring has not been inspected and found to comply with the specifications of the National Electrical Code.

After all, is it not true that the real cause of the trouble is the ignorance of the public as to what constitutes standard electrical work, and that the real remedy is to be sought in the education of the public in this matter? In purchasing other things than electrical supplies the average citizen seldom makes low price the principal consideration; quality, not price, is the first thing taken into account, as a rule. Is it at all reasonable to insist that this would not be the usual procedure in the purchase of electrical materials, if the purchaser really knew the meaning of quality in goods of this class?

It has to be admitted, however, that it is much easier to convince ourselves of the necessity of a more general education of the public in the use of standard wiring materials than it is to work out definite plans for accomplishing such education. It is a question, in fact, as to whether the desired degree of education is possible at all or not. The time will probably never come when even the most intelligent layman will be able to distinguish between the better and the less desirable grades of electrical goods in a satisfactory way. He will probably always have to depend largely upon some other authority than his own judgment. The greater his confidence in a properly constituted authority the better. One who has made any considerable study of existing conditions cannot but feel, therefore, that the thing most needed is a more wholesome and more general appreciation of the National Electrical Code.

Although, like all other terrestrial things, the Code falls short of perfection, it is probably not too much to say that lack of confidence in it can arise from no other cause than ignorance as to how its rules are made and revised. The committee in charge of revising the Code has on it representatives of practically every branch of the electrical industry making any serious claims to engineering skill. Suggestions as to changes in the rules may be submitted by anybody who cares to submit them. Suggested changes are passed upon by the committee, and its recommendations are reported to an open meeting. It is here that the final adoption or rejection of any proposed amendment occurs, and any man who so desires may attend this meeting, join in the discussion and vote. It seems to me that there could be no more satisfactory way of making a set of rules. The Code is, to my mind, the most democratic of documents.

This recital about the National Electrical Code is gone into here not because it is new to all of you gentlemen, but rather for the reason that I have so often encountered the opinion, even among well informed electrical people, that the Code was the findings of some autocratic body with power to impose its wishes upon a helpless public.

The foregoing is a story that the public ought to know better. Why not have your advertising and your salesmen help to make the nature of the Code more popularly known, and thus make the road rougher for the pirate dealer in electrical supplies—the dealer whose principal claim to consideration is the fact that he can undersell his competitors—the fellow who is always ready to push the sale of sub-standard materials?

When I have called upon municipal officials with a view to convincing them that it is a mistake for any town to permit the use of old-Code wire, I have had no trouble in showing them the difference between the old wire and the new, but the bare statement that the Code specifies 1911 wire for concealed work has by no means always been convincing; there has been a demand for information as to what this source of authority, the so-called Code, was.

I know of a town where sub-standard wiring and the use of nondescript, hazardous fittings was for years the rule. Finally there went into this place an electrical contractor who put on a campaign of advertising. In the daily newspapers he told the public, in boldfaced type, what standard wiring means. He is now getting a large share of the wiring business in that town, and the first thing that his principal competitor does now when a prospective customer enters his place of business is to assure him that he sells only approved materials. That contractor is an educator; every salesman of electrical materials ought to be one. Ability to take orders for cheap goods is not salesmanship. When the lamp manufacturers wanted to educate the public to the use of tungsten lamps, three or four years ago, they proceeded by training their salesmen to the task. Having had charge of the training crew of one of the largest companies I know the methods that were employed.

I believe another thing that is very desirable is that the public know more about the work of the Underwriters' Laboratories along electrical lines, and that for such information it must in a measure depend upon the men who are selling electrical supplies. I have met salesmen on the road who were very properly making the fact that their goods were on the approved list a strong argument for consideration with any prospective customer.

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[1] A paper read at the meeting of the Electrical Supply Jobbers' Association, Washington, D. C., February 17-19.

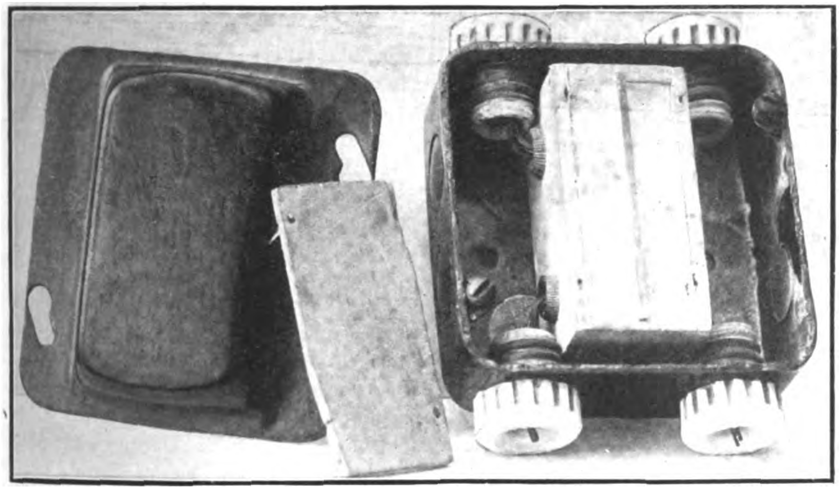
who had very incomplete notions as to what approval really means. For example, I have found salesmen who thought that when any given product of any particular manufacturer had been admitted to the Laboratories' label service, the manufacturer was entitled to apply labels to any unit in this class of products which he might offer for sale. As a matter of fact, however, the label service amounts to continuous supervision of the manufacturers' goods at the factory, and, as far as is practicable, this supervision is reinforced by following up the behavior of the labeled appliance or material in the field.

For example, in the case of rubber-covered wire the Laboratories' inspector at the factory tests enough of the factory output to convince him that the coils to which labels are to be applied are standard, and then there is what we consider a very complete field follow-up system. From time to time our representatives in the various parts of the country purchase coils of wire from the stocks of local dealers and send them to the Laboratories for examination and test. Moreover, there has lately been adopted the practice of sending out to every electrical inspector who will use them, cardboard tags for mailing samples of wire of doubtful quality to the Laboratories. The inspector who finds wire that seems to him to be sub-standard material uses this tag to forward a two-foot sample of it to the Laboratories, and gets a prompt report of the result of the Laboratories' test on the samples submitted without any charge whatsoever. Inspectors have manifested a disposition to co-operate heartily in this sort of follow-up scheme and the tests on the samples of wire submitted for examination have led us to believe that the use of sub-standard wire is not nearly so extensive as one would expect it to be, when there is taken into consideration the ignorance of the public in some quarters as to quality of wire and the always seductive prospect of saving a dollar on a wiring installation.

You gentlemen are doubtless familiar with our demerit system as it is employed in the label service on rubber-coverer wire. This scheme has been extended to rigid conduit and has been found to work well there.

The Underwriters' Laboratories are desirous of having the public know intimately of their work. We are in the field for service and not for profit. Our natural field, so far as the electrical industry is concerned, is the examination of materials to see that they conform to the requirements of the Code, but we miss no opportunity to do what we can toward educating inspection departments and the public to require standard materials. This, by the way, is a large part of my own personal work.

Even in the day when the cruder types of wiring prevailed the hazard of electric service was not great. That it was not was due mainly to the activities of a small group of pioneers in the field of inspection. With them began the campaign of education. Let us have unified effort to continue this campaign until even in the hamlet that is smallest and most remote from the vigilance of the electrical inspector there shall be no thought of using wiring materials that are not up to the standards prescribed by the National Electrical Code.



Device Sold as a Current Saver.

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Unique Current Saver (?).

Of the numerous and well known devices designed to effect economy in the use of electrical energy, whether the economy is real or fancied, the simple and harmless-appearing fitting illustrated herewith must be given a place by itself.

Appearing in use in Chicago in the outlying residential districts during the past summer, its meteoric career ended suddenly, owing incidentally to the fact that meters are read from time to time and inspectors are still in existence.

It will be seen that the appliance consists of a standard stamped-steel outlet box and cover, and that porcelain bushings are provided for the wire leads, which form a part of the equipment. The removal of the cover discloses a small wooden box imbedded in a hard cement which entirely fills the rest of the space in the outlet box and seals the lead wires from view.

Extending across the wooden box is a partition of thick glass forming two compartments, which in turn are filled with a white material, such as plaster of Paris.

This combination was sold at a reduced price of only eight or ten dollars, a real bargain at that, for the installation was made without extra expense. No tools were required, for the operation consisted simply of twisting the ends of the lead wires around the service wires, meter loops, or any convenient place on the circuit, using a little tape to hold the thing in place, after which it was guaranteed to prevent the meter from racing or running too fast, to average the loads so that no maximum peaks would appear, and even to protect the premises from danger or injury during thunder storms.

If any doubt was expressed as to the economy and great utility of the device the installation was made "on trial" and a deposit accepted "on account" for a month's service.

But alas, after using electric lights, flatirons and cookers extravagantly for several weeks and finding the current bills larger than ever, the assistance of the meter man and inspectors was invoked, only to find that the wires that are carefully bushed through the top of the box extend *unbroken* and *well insulated* through the opposite bushings at the bottom of the box! Moral—"Do it electrically!"

◆

Among the Contractors.

The City of Riverside, Cal., is building a new City Building. The order for the supply and installation of the indirect lighting fixtures in this structure has been given to D. Coldren, of Riverside. Mr. Coldren has also recently completed the installation of lighting fixtures in the Riverside Public Library.

The Southwest Electrical Company, of Redlands, Cal., has recently completed the installation of the ornamental street lighting system in that town.

The Harry I. Wood Company, Louisville, Ky., is to install the wiring for 28 three-phase, 440-volt motors for the H. Pilcher's Sons organ factory in Louisville, Ky. This will be a complete conduit installation.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association,
11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

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R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

There are one or two questions which make a more or less frequent appearance in the Secretary's mail and it seems as if it might be worth while to call atention to them here. The first that occurs to me is this: "Would it be permissible to return mains back through a service pipe, the feeds are carried in a conduit on the outside of the building to cutout and switch in the basement and returned through the same conduit thence through a second entrance under the eaves to the distribution center." This question or what is practically the same problem was considered at length in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of July 5, 1913, page 21, and I would refer those interested to that place. That there are those who still meet with it is evident, because the question has appeared in my mail four times in the eight months which have elapsed since it was answered.

In that same issue (Question 231) appeared a related problem, that of the tap circuit run in the same conduit with the main. In order to meet the question raised here it is noted that the new edition of the Rules of the City of Boston contains a modification of the last sentence of Rule 26*p* of the Code, inserting the qualification that the four two-wire or three three-wire circuits allowed must be of not over 660 watts each.

Another question is this: "In frame houses do you consider it a good installation to have the service pipe placed back of the lath and plaster running down to the basement where the main switch is placed, pipe ends and meter is installed?" This question was answered in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of March 1, 1913, on page 451. There were eight replies, and each stated the practice would not be permitted; however, the Secretary's files show seven inquiries during the year that has elapsed.

My third example is this: "Is there anything in the Code to prevent the using of a double pole snap or flush switch to control two different 660 watt circuits of lights, one leg of each circuit being carried through one leg of the switch?"

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

This question was answered on page 472 of *Electrocraft* for July, 1911. We find there 12 replies; of these, 7 considered it to be permissible, 3 stated that it would not be permitted in their jurisdictions as they did not believe it in accordance with the Code, while the remaining two felt that it was not touched upon by the Code but that they should try to discourage the scheme, it being just as easy and practically no more expensive to put two single pole switches under one plate.

Some of the suggestions made were: That it would make a difference whether the two legs of the switch were—

(a) In the two outside wires in case the two circuits were taken from opposite sides of a three-wire main,

(b) Both in the neutral in the above case,

(c) Both in the same wire in case the circuits tapped a two-wire main,

(d) In the wires of opposite polarity in this case.

Again it was suggested that in case the switch were used this way there would be two ruptures of independent circuits, whereas used normally the two breaks were in series and might be considered to divide the potential drop.

A third suggestion was the possibility of crossing the wires in the switch so that if there were two single branch cutouts side by side the left cutout might run through the right side of the switch and vice versa.

In the two years and a half which have passed this question has re-appeared over a dozen times.

Another question which turns up less frequently but still fairly often deals with a three-wire circuit with plug fuses and a small 220-volt motor tapped off same, what type of fuses must be used in the various places, it being understood that they were inside the 30-ampere bounds.

In regard to this the Secretary suggests that our members re-read the clauses covering fuses under Rule 68*f* and believes they will be considerably interested, and possibly somewhat surprised.

The Secretary is now in a position to help members who would like to become enlightened as to practice in different localities regarding specific points, by transmitting inquiries to the secretaries of the several sections when they may be discussed at the section meetings and the resulting ideas sent to the questioner.

There are many points wherein interchange of opinions and mutual discussion are very enlightening and helpful to us all, and the Secretary earnestly wishes that the members make more use of his office. Several times he has appealed to the members to send him any interesting matter, anecdotes, etc., which continually occur, not to speak of the serious matters of our work, but the response is as the Irishman said "a stunning silence."

Please take note of this and give the Secretary just a bit of a lift for he very much desires to be able to supply this column with matter of interest twice a month, and it is really a hard job, whereas just a little help from the members would ease it up a whole lot.

Regarding the two questions herein contained there is little or nothing to be added. As to the spacing of 500-volt switches in cabinets, it may be worth while to note that the street-railway condition referred to in answer 5 is complicated by the possibility of the high-potential discharge of a field magnet when the switch is opened. This also applies to all cases where the switch controls a motor circuit, of course, things should be so arranged that when the switch is opened the field can discharge through the armature or other circuit but once in a while conditions are temporarily such that it does not. The inductive field discharge can be a horribly spiteful affair and under such conditions the very widest spacing is none too much. In the case of a non-inductive circuit on the other hand, there is nothing particularly disturbing about the 500 more than the 250 except that it hurts considerably more, and may be seriously dangerous to persons of abnormal heart conditions.

Switch Spacing in Cabinets.

Question 255. In installing a 500-volt knife switch in a metal cabinet is any greater spacing required between cabinet and live parts than in the case of a 250-volt switch?

Answer 1 (W). No.

Answer 2 (D). Rules are inadequate. At least two inches should be required.

Answer 3 (U). The only rule that would apply is that giving the distance between switch parts of opposite polarity for the voltage stated, by analogy to this case.

Answer 4 (V). All switch boxes we have met with have liberal allowance, but if distance from nearest metal live part and box differed from Rule 65, Table 4 would require a change to conform thereto.

Answer 5 (O). Rule 75*a* does not require any greater spacing for 500 than for 250 volts. It would, however, be very poor practice to install 500-volt apparatus without inserting barriers between current-carrying parts and the grounded metal of the box. In case of grounded street-railway circuits, personal experience has shown that this is needed for satisfactory work.

Answer 6 (Y). No.

Answer 7 (R). Not according to Rule 65, **Table 4.**

Answer 8 (B). The Code does not differentiate as to distance required between walls, back or door of cabinet and any exposed live metal parts of devices contained in same when such devices come under the classification "Low-Potential Systems, 550 *volts or less.*"

Answer 9 (N). There is no distinction in the Code.

Answer 10 (E). We generally expect to see 4 inches being influenced in this position by Table 5, Rule 65.

Answer 11 (Q). No greater spacing required for 500 than for 250 volts.

Answer 12 (H). Rule 65, table 4 should give a pointer. Spacing should be same as for between live metal parts.

Answer 13 (S). No. Rule 70*a*.

Answer 14 (X). Yes, compare Tables 3, 4, 5 in Rule 65.

Answer 15 (P). I should be obliged to decide, in accordance with Rule 65*c*, that the requirement of 0.5-inch space between the head of the supporting screw and the nearest live metal part furnishes a precedent for requiring 0.5-inch space between the metal of the box and the nearest live metal part irrespective of whether the switch were designed for 250 volts or for 500. Rule 65*c* is a general requirement for all voltages of switches.

Show-Window Fixtures.

Question 256. Rule 30c limits the use of fixtures when wired on the outside. Does this restriction apply to fixtures of the chain type?

Answer 1 (W). Certainly.

Answer 2 (D). This type of installation should be governed by Rule 32*e*, I think.

Answer 3 (U). I should say that chain fixtures do come under this rule.

Answer 4 (V). This rule does apply to chain fixtures but in windows where they are hung high and the nature of the business is such as to assure that no goods will be suspended thereto nor pins nor decorations come in contact with them I allow them to be used.

Answer 5 (O). Rule 30*c* is intended to apply to all fixtures wired on outside, in the case of chain fixtures, however, the wire is usually stranded (77d) and by referring to Rule 32*e* it will be noted that inspection departments may authorize by special written permission, the installation of chain fixtures in show windows. It is not expected that inspection departments will exercise this right in cases of show windows liable to contain quantities of readily inflammable material.

Answer 6 (Y). Yes.

Answer 7 (R). Yes. The rule is intended to prevent inflammable material in show windows from coming in contact with the wires.

Answer 8 (B). The restrictions of Rule 30*c* apply to chain fixtures as well as to any other type. Exceptions may, however, be made in chain fixtures as permitted by Rule 32*e* relating to flexible cord.

Answer 9 (N). When the chain fixtures are properly wired I usually apply the option of Rule 32*c*.

Answer 10 (E). I do not so hold when the chain fixture is properly wired and with approved wire.

Answer 11 (Q). Yes; unless special permission be obtained.

Answer 12 (H). I should say it certainly does.

Answer 13 (S). Yes.

Answer 14 (X). Yes.

Answer 15 (P). I am of the opinion that the general prohibition contained in Rule 30*c* against the use of any exposed wiring in show windows is modified by Rule 32*e*, which states specifically that chain fixtures (which, of course, carry exposed wiring) may be used in show windows under special permission.

San Francisco Office for Commerce Bureau.

In the issue of February 21 we announced the establishment of branch offices of the United States Bureau of Foreign and Domestic Commerce at New York City, Chicago and New Orleans.

An additional branch office has just been opened at San Francisco, Cal., its address being Rooms 76 to 78, Appraiser's Stores Building.

Public Service Commissions

GEORGIA.

Macon Railway & Light Company. The Commission has rendered a decision in the Macon electric-rates case in which the Macon Railway & Light Company asked for authority to increase rates. Under the company's former rates commercial lighting and power current was furnished at from 4.05 cents net down to 2.02 cents net per kilowatt-hour and residence lighting current for from 6.75 cents down to 5.85 cents net per kilowatt-hour. The company adopted these low rates anticipating severe competition of the Georgia Public Service Corporation. The rates ordered by the Commission are, for residence lighting, a maximum rate of 9 cents net per kilowatt-hour for the first 50 kilowatt-hours' use per month, and for commercial lighting and power, a maximum rate of 5 cents for the first 100 kilowatt-hours' use per month.

The Commission criticises the action of the city in granting a franchise admitting the competitive company instead of applying to the Commission for reasonable rates and improvement in service of the company first in the fields. Real competition is now gone, and the companies are controlled by the same interests. The result is unnecessary duplication of property upon which the public must pay a reasonable return.

The decision states that "the Commission earnestly believes that it would be wise if the Legislature would prohibit the building of duplicate public utilities, or the grant of franchises to such, prior to application to and issuance by this Commission of certificates of public convenience and necessity."

IDAHO.

Competition Prevented. Upon the petition of the Great Shoshone & Twin Falls, Water Power Company operating in the city of Twin Falls, the Commission ordered the Idaho Power and Light Company to immediately desist and refrain from constructing an electrical transmission system in the city of Twin Falls or furnishing electrical energy within the city. The Commission held that the service of the Great Shoshone and Twin Falls Company is adequate and that public convenience and necessity does not require the service of the Idaho Power Company. The latter company had commenced construction work in Twin Falls but had not applied to the Commission for a certificate of public convenience and necessity. The company contends that it had the right to do this without securing a certificate from the Commission as it is a part of the company's general transmission system which had been under construction prior to the enactment of the Public Utilities Law under the permit issued by the state engineer permitting the use of water power from the Malade River. The Commission points out, however, that the franchise to do business in Twin Falls was not accepted by the company and that construction work was not begun until after the Public Utilities Law was in effect and that the right of the company to enter Twin Falls was, therefore, clearly dependent upon the Commission's approval.

A similar holding was made in the case of the Southern Idaho Water Power Company against the Beaver River Power Company, and the defendant was ordered to desist and refrain from further construction of an electric transmission system within the city of Pocatello. The petitioner is furnishing service in Pocatello and the commission held that public interests would not be conserved by the entrance of a competing company.

The Washington Water Power Company was authorized to put in effect flat rates for electric lighting in the Couer d' Alene mining district of Northern Idaho.

The Northern Idaho & Montana Power Company, of Sandpoint, was authorized to put in effect a combination heating and power rate for laundries of 2.5 cents per kilowatt-hour subject to a 10 per cent discount if paid on or before the tenth day of the month succeeding that during which current was used, with a monthly minimum of $2.00 per kilowatt connected.

The Kootenai Power Company was ordered to put in effect in the City of Couer d' Alene reduced rates as agreed upon between the municipality and the company.

The Idaho-Oregon Light & Power Company was authorized to put in effect a new schedule providing a material reduction in the company's rates.

Uniform Rates. The Commission of this State has issued an order requiring the Great Shoshone and Twin Falls Water Power Company and the Idaho Power and Light Company, formerly the Beaver River Power Company, to furnish electricity at uniform rates in the towns of Wendell, Gooding, Mountain Home and Glenns Ferry. The ruling was made on the complaint of the town of Wendell in which the charge was made that the former company had discriminated against that town in the matter of rates as compared with the rates charged in the towns of Gooding, Glenns Ferry and Mountain Home.

ILLINOIS.

Acting Secretary Resigned. William Kilpatrick, who has been acting secretary for the Public Service Commission, has resigned.

Franchise Approved. The Commission approved the franchise granted by the village of Noble authorizing Henry W. Schilling to conduct a telephone business in the village.

Certificate of Public Necessity Denied to Competing Telephone Company. The Commission has denied a certificate of convenience and necessity to the Bethany Mutual Telephone Company to operate in Macon County. The Macon County Telephone Company is furnishing service in this territory and the Commission held that public interests would be best conserved by regulation of the rates and service of the company furnishing the service rather than by authorizing a competing company to offer duplicate service.

MASSACHUSETTS.

New England Telephone & Telegraph Company. The United Improvement Association of Boston asked that the Commission order the New England Company to restore four and six-party telephone service for suburban residences. The Commission finds that six-party line service is "unsuited to a multi-exchange district like the metropolitan suburban where the service problems at best are most complex," and holds that it would be contrary to the public interest to take any action which would result in increasing this type of service. The Commission recommends that the company restore to its schedule for further trial the four-party line suburban residence service. If it becomes apparent that this class of service is unduly burdensome to the general service, the matter of its retention may be reconsidered.

MISSOURI.

Telephone Engineer. George P. Player, telephone engineer for the Oklahoma Corporation Commission since its organization, has taken a similar position with the Missouri Commission.

NEW JERSEY.

Eastern Pennsylvania Power Company. The Board of Public Utility Commissioners has partially dismissed complaints against the Eastern Pennsylvania Power Company of New Jersey and the Easton Gas Works regarding the exaction of advance deposits for meters. The Board finds that the $5 deposit now asked is not unreasonable except as to prepayment meters, in which case it announces that an abatement of this amount to $2.00 must be made, and requests the Easton Gas Works to notify it within two weeks of the modification of its rule reducing the sum to such an amount.

The State Supreme Court has handed down a decision affirming that the Board of Public Utility Commissioners has a right to refuse to approve franchises granted by municipalities where it is deemed that the utility is not necessary for public convenience, and denies the mandamus writ applied for by the Eastern Telephone & Telegraph Company. In its opinion the Court states that the power of the utility board is not limited by statute to supervising the execution of the permission and consent granted by a municipality, but includes the power to determine whether the privilege or franchise conserves the public interest. The Eastern company was recently granted franchises by the Board of Freeholders of Cape May County and by the Borough of Avalon for telephone and telegraph lines, same being refused by the Board of Public Utility Commissioners on the ground that such territory is now properly served.

NEW YORK.

Importing Power From Canada. The Public Service Commission, Second District, has granted permission for the further importation of electrical power from Canada.

The Commission granted the application of the Canadian-American Power Corporation, a new domestic concern, to engage in business, to issue stock, and to merge with itself the Niagara Falls Electrical Transmission Company. The Canadian-American Corporation seeks to take over a contract with the Electrical Development Company for furnishing 46,000 electrical horsepower produced in Canada, the current to be sold in the United States.

Permission was desired to issue $3,000,000 stock on account of the contract, and $435,000 for the purchase of the Niagara Falls Electrical Transmission Company. The Commission restricted the issue of stock to a total of $1,250,000. Of that amount $435,000 may be 7-per-cent cumulative preferred stock. The permission is granted upon certain conditions, including these: (1) That every contract with purchasers of electric current shall contain a clause that the price and the terms and conditions affecting the price and the duration of the contract shall be subject to revision by the Commission upon complaint or upon the motion of the Commission, if it shall appear to the Commission that the said price, terms, or conditions are unreasonable or unjust or operate to produce unjust discrimination or undue or unreasonable preference or prejudice, advantage or disadvantage as between customers. (2) That the company will so arrange its charges for electric current that they shall not on the average exceed $19 per horsepower, but that this shall not operate to prevent the Commission from requiring a lower price to be accepted for different kinds of service from that which this applicant may establish and have in force. (3) That until the further order of the Commission it will reserve at least 23,000 electric horsepower from its sale capacity for sale to consumers of electric current for light or power.

Discrimination in prices charged by Canadian electrical producing companies, whereby Canadian purchasers are favored to the prejudice of American customers and the existing shortage of electrical power on the Niagara frontier, are discussed in the opinion, with the finding that the various contracts with the producing companies should be revised as to prices charged the American distributing companies, and that there is a large shortage of electrical power in Western New York, with a strong demand for a greater supply which is not being met by existing companies, and also that the contracts mentioned tend to perpetuate high rates to consumers.

The Commission points out that the Hydro-Electric Commission of Canada has contracted for current delivered at a Canadian producing plant for $9 per horsepower in large quantity, while the charge for Canadian electric current to this company for a large amount of power is $12.50 per horsepower. It is stated that for a considerable period such discrimination has been practiced in favor of Canada and against distributing companies in New York.

OHIO.

The Dayton Light & Power Company is authorized to issue six-per-cent cumulative preferred capital stock of the par value of $297,800. The stock is to be sold for the best price obtainable but for not less than 80 per cent of the par value. The proceeds of the stock is to be used to reduce outstanding common capital stock in the amount of $250,000, and to reimburse the company for certain additions and betterments to petitioner's plant. The company's petition for authority to issue stock to obtain money to cover the partial cost of the reconstruction and rehabilitation of the company's property and for extraordinary expenditures, beyond the normal, made necessary to operate its property during and subsequent to the flood of March, 1913, is continued for further investigation.

Union City Electric Companies. The Union City Light Company of Indiana and the Union City Ohio Electric Company applied to the Commission for approval of a contract for the furnishing of electric energy. The Commission held that its approval is not required under the law, but if a contract is entered into a copy is to be filed with the Commission.

The Commission approved the transfer of the property of the Union City Light Company, located in and about the village of Union City, O., to the Union City Ohio Electric Company for $1,500, the sum agreed upon by the companies. The purchasing company was further authorized to issue $1,500 of capital stock to be sold at par value for the payment of the purchase price of the property to be transferred.

OKLAHOMA.

The Pioneer Telephone and Telegraph Company. The Oklahoma Supreme Court has refused a rehearing to the telephone company on its appeal from the order of the Corporation Commission requiring it to refund approximately $62,000 in alleged excess charges to subscribers in Oklahoma City. The court recently affirmed the order of the Commission and upheld the constitutionality of the law passed by the fourth Oklahoma Legislature, authorizing the Commission to take charge of the collection of such refunds from public service corporations and distribute them to the individuals directly affected. That order is now made final, unless appeal is taken to the Supreme Court of the United States.

WISCONSIN.

Annual Report of Utilities. The compilation of the detailed reports of the income account and balance sheet of the public utilities of the state for the year ending June 30, 1913, is practically completed.

The Method of Flicker for Color Photometry.

At the meeting of the Philadelphia Section of the Illuminating Engineering Society on January 6 a paper by C. E. Ferree and G. Rand entitled "A Preliminary Study of the Deficiencies of the Method of Flicker for the Photometry of Lights of Different Color," was presented by Professor Ferree. This paper presented the preliminary work of a study of the method of flicker, which is still in progress.

A satisfactory method of photometry should enable small differences in luminosity to be detected and the results should be reproduceable for a given observer with small variations, and for a number of observers with slightly greater variations. The method should also possess logical sureness of principle, or its results must in the average agree with those of some method which possesses this sureness of principle. Great difficulty has been experienced in obtaining methods of photometry for colored light which have these features. The present methods are of two kinds; one involving direct comparison or equality of brightness, and the other involving the method of flicker.

With regard to sensitivity, the equality-of-brightness method has the following disadvantages: (1) small differences in luminosity cannot be detected because the actual difference is masked by difference in color quality; (2) results for a given observer cannot be reproduced within small enough limits; (3) results cannot be reproduced by different observers because the sensitivity to color varies more than the sensitivity to brightness and because the standard for judgment of equality differs more in different individuals when the factor of color is present.

The method of flicker possesses greater sensitivity than the equality-of-brightness method, because color differences are eliminated when the eye is exposed successively to colored and colorless light. Both impressions are distinct at low rate of speed. At a higher rate there is color flicker, then color fusion, then brightness flicker, and finally complete color and brightness fusion. In color photometry the speed must be such as to obtain color fusion without brightness fusion. Under this condition a very slight change in one of the impressions will produce flicker when there is no flicker. Flicker thus becomes a very sensitive means of detecting difference in brightness. This sensitivity however, is not so great for colored as for colorless light.

The method of flicker, however, does not possess the sureness of principle required of a satisfactory method. At the necessary rate of speed the eye is very much underexposed to the stimulus; and the observation of flicker is subject to variations dependent upon the following factors, the effects of which have not all been adequately studied and sometimes not even recognized: (1) the intensity of illumination and the rate of giving the impressions to the eye; (2) the different rates of speed required for the fusion of different colors; (3) the effect of the saturation of the colors used on the rate of fusion; (4) the effect of the size of field; (5) the effect of the ratio of the times of exposure of the lights to be compared. The authors are studying these factors and believe that greater knowledge of them is of fundamental importance in the method of flicker.

The eye does not respond at once with full intensity of sensation at the beginning of stimulation nor does the sensation cease with the cessation of stimulation. This time lag is different for different colors, and it is longer for any of them than for colorless light. With higher intensities the time is shortened. The time is shortest for green, slightly longer for blue, and still longer for red. Values were given for the times found by various observers, all of which were of an order of magnitude greater than the time of exposure in the method of flicker. The eye is consequently very much underexposed in this method and the intensity of sensation is therefore reduced. If all sensations were reduced in like proportion this would be no objection, but the reduction is different for different colors. There is apparently no point in the intensity scale for which the given reduction in intensity for colored light gives the same change in luminosity and sensation that it does for colorless light. Beginning with the spectrum of fully saturated colors and comparing the effect of reduction of colored and white light by equal amounts, the blues and greens are found to decrease in luminosity more slowly than white light and the reds and yellows decrease faster. There is a relative lightening of the blues and greens and a relative darkening of the reds and yellows. This is not confined to low intensities, although it is more striking for the lower intensities. The situation becomes still more complicated if the rate of flicker is changed, and yet it must be changed to preserve the sensitivity of the method in passing from high to low illuminations.

Results of experiments were given to show that in the method of flicker there is a characteristic underestimation of the brightness of red and yellow and overestimation of the brightness of blue and green. This deviation is due to the method of exposure used in the method of flicker. A variation of results was found depending upon the ratio of the time of exposure. The results do not in the average agree with results obtained by the method of equality of brightness.

A method was described which possesses a degree of sensitivity almost as high as the method of flicker and gives results more closely in agreement with those obtained by the method of equality of brightness. It is similar to the latter method, but does not require the observer to judge impressions differing in color quality. It depends upon the extreme sensitivity of the peripheral retina to brightness contrast. In this part of the retina very small changes of illumination are required to produce a noticeable change in the amount of contrast.

The apparatus needed for the method consists of a vertical screen 60 by 50 centimeters, with an opening at its center 15 millimeters in diameter; a motor to carry the measuring disks; and a photometer bar. The surface of the screen is covered with magnesium oxide. This screen is graduated in the horizontal meridian from the center of the 15-millimeter opening. Directly behind the opening is placed the gray which is to serve as the contrast stimulus. The measuring disks are made up of a sector of gray and a sector of black, the varying proportions of which produce the match which is needed between the stimulus of gray, darkened by contrast, and the measuring disk. The measuring disk is carried by a motor the shank of which extends through the screen. When in position, the inner edge of the disk extends approximately to the 20-degree point of the graduations. Immediately in front of the disk and 25 degrees from the center of the stimulus opening is placed the fixation point. The photometer bar is placed in a plane normal to the screen midway between the stimulus opening and the fixation point. The contrast stimulus and the measuring disk thus receive equal amounts of light from the source to be measured.

The method is applied as follows. The observer's eye is lined up with the stimulus-opening by means of a device attached to the screen which need not be described here. The standard lamp is placed on the photometer bar at a given distance from the screen, the eye is turned out to the fixation point and the sectors on the measuring disk situated just back of the fixation point are adjusted by means of a number of separate judgments to match the gray at the stimulus-opening darkened by contrast. The value of these sectors becomes the index of the illumination of the screen for the standard lamp at the given distance. The standard lamp is then removed, and the comparison lamp is placed on the bar, and its position adjusted until the contrast stimulus again matches the measuring disk. Since the proportion of sectors has not been changed from that which was determined for the standard lamp, it can be assumed that the illumination of the contrast screen is again of the same value it was for the standard lamp at the given distance. The comparison of the two light sources, thus, can be gotten directly from the distance readings on the photometer bar. The advantage of the method for color photometry is that in the judgment both for the standard and comparison lights the surfaces, the brightness values of which are being compared, are both illuminated by the same light. The eye is thus never compelled to make its judgment of two surfaces differing in color quality.

Motor Economy and Standardization in Railway Shops.[1]

It is known that in every machine shop there are two distinct service conditions, calling for different types of motors, different methods of control and different methods of applying the motors to the machine tools. That is, there are certain types of tools requiring motors of the constant-speed type, and others whose cycle of duties demands an adjustable-speed type of motor (wrongly called variable-speed motors), those whose speed can be varied to suit conditions, but when fixed remains constant under varying loads.

Alternating-current motors are essentially constant-speed machines, and because of their comparative simplicity several plants have adopted them almost exclusively for their constant-speed work in woodworking shops, driving pumps and fans, line shafting for groups of small tools and for certain large tools requiring constant speed. On the other hand, no commercial method has as yet been devised for varying the speed of an alternating-current motor so it may be used successfully and satisfactorily for machine tool service.

On the other hand, where direct current is available, motors suitable for both constant speed and for adjustable speed are available by the use of direct or continuous-current motors. And since it is now possible to get motors with speed variations of as great as 30 to 1 these motors should not be overlooked.

While it is true that the lack of a proper understanding of the joint problems of the motor and tool builder has been a great drawback, thus showing the necessity for some standardization of speed-ratios, control and dimensions, there is also a lack of standardization of the method of supplying the power in machine shops. At present there are about fifteen possible systems available, all of which are in use in various shops and several of them at once in some shops. For instance; we have direct current at 110, 220 and 500 volts and alternating current at 110, 220, 440 and 550 volts and in single, two and three phases at frequencies of 25 or 60 cycles.

So long as this is the case it will be hard to do much in the way of standardization of shop equipments, and, therefore something should be done toward the adoption of certain standard power equipments for use in shops.

The present tendency among steam railroads is to install turbine-driven alternating-current generators in their power plants, using this current for lighting, turn-table drive, woodworking machines, etc., and installing motor-generator sets to supply direct current for cranes, variable-speed machine tools, etc. This is good practice, so far as it goes, but it frequently goes too far and we find that motors of nearly every possible kind are used in some shops, and that is demoralizing, to put it mildly. If we would profit by the experience of the central stations, whose conditions are similar to ours, a long step in the direction of standardization could be taken very quickly and easily.

When a machine shop is driven through a line-shaft it is not easy to determine the amount of time each machine is in operation, but when electric motors are used (especially as individual drives) it becomes easy to determine both the load-factor and the load, and thus the motor economy. And one of the first things noticed after the adoption of individual motor drives was the fact that the total horsepower capacity of the motors in a given shop was always in excess of the generator capacity. A small difference must be expected, but frequently the ratio is as great as 6 to 1, showing that the average time load-factor of the majority of machine tools is comparatively low.

Analyzing this from the standpoints of time of loading, cutting, unloading and idle time shows that it is very seldom necessary to use motors of very high continuous ratings. In fact, for use in railway shops, motors with an intermittent rating based on much less than two hours' continuous service have been found entirely satisfactory. This means that motors of much smaller size than formerly used are being installed, with a consequent reduction in costs of equipment. This also has a direct bearing on the cost of doing work, through fixed charges.

The most important point is the relative economy of the individual motor drive as compared with line-shaft drive, and this may be summarized as follows: less power required; more speeds possible; time saved in speed adjustments; time saved in reversing; time saved in setting up; time saved by getting proper speed for cutting; time saved by taking heavier cuts; less liability of accidents; more compact arrangement possible and increased economy of operation.

Massachusetts Power for Rhode Island.

George I. Smith, president of the New England Power Company, Boston, states that under a contract recently entered into with the Narragansett Electric Light Company, Providence, R. I., power will be supplied to large consumers in the Rhode Island territory and also a large amount of energy will be furnished to the Narragansett Company's lighting plant, the steam plant to be held in reserve. The New England Power Company's hydroelectric plants are located on the Deerfield River, in northwestern Massachusetts, where four plants are in operation, with a fifth development soon to be effected. The total output will then approximate 55,000 horsepower. About a year ago the New England Power Company of Maine leased the plants of the Massachusetts Company, and also acquired control of the Connecticut River Power Company.

Rules for Linemen.

Representatives of nearly all the electric lighting and transmission companies of Connecticut met at Hartford on February 19, and voted to accept a set of standard precautions for linemen on transmission work which had been formulated by a committee of electrical men called together by the state Public Utilities Commission. These rules will be scrutinized by the Commission and an acceptance printed for distribution among the employees of the companies. The committee which drafted the rules was made up of representatives of the United Electric Light & Power Company, Waterbury; Hartford Electric Light Company, Hartford; United Illuminating Company, New Haven; Southern Telephone Company; Western Union Telegraph Company; Postal Telegraph & Cable Company; and Connecticut Power Company, New London.

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[1] From a report of the Shop Practice Committee of the Association of Railway Electrical Engineers.

American Institute of Electrical Engineers.

Midwinter Convention at New York City, February 25, 26 and 27.

The second midwinter convention of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, February 25 to 27, under the auspices of the Electric Power Committee. The total registration at the convention was 465, and there was an average attendance at the sessions of about 100.

In connection with the convention there was a publicity meeting on Wednesday evening, February 25, with regard to the International Electrical Congress to be held in San Francisco in 1915 in connection with the Panama-Pacific International Exposition. At this meeting addresses were made by C. P. Steinmetz, William Rader, W. D. Ryan, James A. Cruikshank and P. M. Lincoln. All except the first of these was illustrated with lantern slides, and Mr. Cruikshank's talk included some motion pictures. Dr. Steinmetz spoke with respect to the Electrical Congress; Mr. Ryan described the lighting of the exposition grounds; Dr. Rader described the exposition buildings and grounds; Mr. Cruikshank portrayed scenes on a trip to San Francisco; and Mr. Lincoln described and illustrated some of the electrical developments that may be seen on such a trip.

On Thursday evening the I. E. C. dinner-dance was held at the Hotel Biltmore. H. G. Stott acted as toastmaster and brief responses were made by A. E. Kennelly, chairman of the Committee on Program, and by E. B. Rosa, honorary secretary of the Congress. The affair was attended by nearly 350 and was a great success, due largely to the efforts of George F. Sever, chairman of the Committee on Arrangements.

The first session of the convention was called to order by President Mailloux at 10:30 a. m., on Wednesday, February 25. He referred to last year's convention and the precedent then established of having a midwinter convention under the auspices of one of the Institute committees. This had proved so successful that the midwinter convention will probably be an annual event. He explained the method followed in the appointment of committees during the current year and the importance of the subject delegated to the Electric Power Committee. He then introduced D. B. Rushmore, the chairman of that committee, who presided during the session.

Mr. Rushmore made an introductory address, in which he pointed out the analogy between the growth and development of the Institute and of civilization. He showed a number of lantern slides which included curves and statistics showing the production of electrical apparatus, engines, fuel, copper, aluminum, the cost of living and of electric light, the earnings of utilities and many views of electrical machines and applications of electric power.

P. H. Thomas, chairman of the Subcommittee on Engineering Data, then presented a report giving an outline of the Committee's ideas of what might be done in this field. He divided engineering data into three classes: (*a*) Information of an exact character, such as theoretical formulas, methods of tests, physical constants, systems of units, etc. (*b*) Information as to forms of construction or elements of design, such as is useful to an engineer doing specific work. This includes performance figures for power-plant apparatus, transmission lines, measuring instruments, etc. (*c*) Information of a more specific character applying only to special situations where the conditions are not easily set forth. Such information would be of little use in connection with any different problem. Only data in classes *a* and *b* should be considered, and the collection should be limited by excluding data already available in satisfactory form; data which has principally advertising value; and data about which there is not general agreement among engineers.

Harold Pender then presented the report of the Subcommittee on Handbook, dealing with the feasibility of publishing an Institute handbook. This committee had investigated what had been done by other societies and found that some to the advantage of their members issued a number of special publications dealing with particular narrow fields coming within their province. None of them had considered it advisable to issue a general handbook covering an entire branch of engineering. The members of the subcommittee felt that it was neither desirable nor practicable for the American Institute of Electrical Engineers to compile and issue a complete handbook of the subject.

The discussion was opened by H. F. Thomson, secretary of the Handbook Committee, who had communicated with 22 other societies, nine of which were foreign, and had found that the Society of Automobile Engineers was the only one of them to issue a handbook of engineering data. The publications of all the others were of a very special nature. He had some interesting comment on the subject from secretaries of the various societies.

H. M. Hobart presented printed discussion pointing out that the individual members of Institute committees could probably not produce anything better in the way of a handbook than had already been turned out by commercial publishers. He thought, however, that the influence of the Institute could be exerted in such a way as to secure better results with these commercial handbooks. He suggested cooperation in this matter with other engineering societies. He favored publication by the Institute of volumes on special topics which would include information not only from the Institute *Transactions*, but also from papers submitted before other engineering societies. Data can be divided into two large groups; a small group of up-to-date matter and a large group of out-of-date matter. He suggested that tables of data and Institute papers could be made complete in themselves and collected separately and published.

P. M. Lincoln pointed out that a similar publication by the corresponding German society which contains specifications for many kinds of electrical construction represented an evolution from a small beginning.

Comfort A. Adams pointed out the inefficiency of the present methods and results in compiling handbooks. Present handbooks are very inadequate, but he recognized the great difficulties in the way of the Institute producing a handbook which would be worth while. It would represent a stupendous amount of work and he suggested that it would be preferable for an Institute commitee to oversee the compilation of a handbook by a commerical publishing house.

E. J. Henkle pointed out the advantages which the Institute would have in collecting data and referred to the publication by a German mining society which was the best thing in its field and was being copied in other countries.

W. J. Hammer suggested that a looseleaf form of publication would be preferable, the Institute sending out individual sheets as fast as data were compiled and calling upon each member to supply any that he had compiled by himself.

Calvin W. Rice, secretary of the American Society of Mechanical Engineers, regarded such publication as entirely legitimate if the Institute decided that it was desirable and feasible.

Selby Haar approved co-operation between the Institute and handbook publishers and referred to the "Nautical Almanac" as an example of what can be done.

In closing, Mr. Thomas expressed surprise that there were not more in favor of publishing a handbook, and Professor Pender emphasized the enormous amount of work necessary for good results. Poor methods are usually used in the commercial publications. The detail work should be paid for and done under the direction of a committee acting without pay.

President Mailloux thought that the Institute publication, if one were decided upon. should not be classed as a handbook and should not compete with, but supplement, the production of the commercial publications. It should contain a record of the progress in electrical engineering from year to year.

Power-Station Session.

At the afternoon session, also presided over by Chairman Rushmore, the first paper was by James Lyman, Allen S. Rossman and Leslie L. Perry, entitled "Protective Reactances in Large Power Stations." The paper was presented by Mr. Rossman.

Protective Reactances in Large Power Stations.

The concentration of a large generating capacity on the busbars of a single power station demands protection against an excessive flow of current into an accidental fault. Reactance coils can be used in various ways to limit the instantaneous current flow. Reactance coils in the generator leads, while limiting the flow of current from the different generators, are not efficient for limiting the current flow into a fault. Bus reactances are less bulky and less expensive than generator reactances; are more efficient in controlling the current flow, have the advantage of localizing the effect of a fault to one or more sections of the busbars. They have the disadvantage that, under normal conditions of operation, the current flow across them may cause an undesirable drop in voltage. The ideal system of bus reactances would afford maximum protection to service and equipment in emergencies but, under normal operating conditions, would give minimum voltage difference between various points in the busbars. The straight bus, the ring bus, and the ring-and-transfer bus approach this ideal condition in the order named. Reactance coils in each feeder circuit are extremely effective in limiting the flow of current into a short-circiut on the feeder and in isolating the effects of this short-circuit from the other parts of the system.

The discussion was opened by Philip Torchio, who pointed out that the authors had figured on ten per cent internal reactance in the generators, which as now built may correspond to that figure, but most of the machines already installed have less reactance than this, say five per cent at 25 cycles. This value will greaty modify the curves of the authors. Where feeders run in parallel to a substation they may form a shunt to the reactance between bus sections and thus diminish their effect. This fixes a useful limit to the value of such reactances. Reactances in the busbars should have the same current capacity as the switches. He would make this carrying capacity high and the percentage reactance lower.

W. S. Moody pointed out that since a reactance is inserted for protection it should not itself introduce any danger or weak points. On a constant-potential system an amount of reactance that interferes with the constancy of the voltage, that is, with regulation, is prohibitive; inside of this limit the more reactance the better.

H. G. Stott described the installation of the Interborough Rapid Transit Company. He had found the great need for reactances to be to protect the cables from the generators and gave some figures to show what enormous effects might result without such protection. This company has adopted an arrangement different from any of those mentioned in the paper. The external reactance is inserted between each generator and the busbar and the buses are sectionalized by switches. An additional smaller reactance connects each generator to an auxiliary bus. The maximum short-circuit current which is possible is about 20,000 amperes, instead of 60,000, which would be possible without the reactances. It would be preferable to have a reactance protect each feeder, but this was found impracticable on account of the space which would be necessary. The reactance coil itself should be rugged and indestructible by heat.

P. M. Lincoln pointed out that the transient current at the beginning of a short-circuit may be double the value of the permanent current. Generators cannot be injured by short-circuiting, and the problem is to protect the service.

V. Karapetoff advocated the use of reactances in the field circuit of the generators to limit the first rush of current upon short-circuit. He gave the result of some experiments to show the effectiveness of this method.

H. R. Woodrow stated that field coils were often punctured on account of the high voltage induced in them and it was not advisable to insert reactances in the exciter circuit as they would probably emphasize this danger. He also pointed out that the maximum value of the transient current cannot be more than 1.6 times its permanent value.

C. M. Davis preferred reactances in the generator and feeder circuits rather than between the bus sections.

In closing the discussion, Mr. Rossman stated that some work had been done upon reactances in the feeder circuits which would be described in a future paper. Although the reactances in these circuits were smaller than those required in the generator circuits there were so many more of them that this was no advantage.

Four papers dealing with substations were then presented and discussed together. They were as follows: "Outdoor versus Indoor Substations," by Alexander Macomber, presented by Frank C. Sargent; "Outdoor Substations in New England," by Fred L. Hunt; "Indoor and Outdoor Substations in Pennsylvania," by H. L. Fullerton; "Outdoor Substations in the Middle West," by Leslie L. Perry, presented by D. C. Jackson.

Outdoor Versus Indoor Substations.

The development of the outdoor substations versus the indoor type is an interesting commentary on the adaptability of engineering progress to new fields and the subject is briefly recapitulated in this paper, in line with the developments and application of this branch of transmission work. The causes for development of this apparatus, together with a general description of the classes of apparatus involved with have been changed to meet new conditions, are given. The application of the indoor versus the outdoor substations to services of different character is indicated, and the tendencies for the future briefly touched upon. A comparison of the advantages and disadvantages of the types considered is outlined. The advantages of an outdoor installation are its lower first cost, ease of extension, reduction of fire hazard, and simplicity of layout. Its disadvantages are the difficulty of making repairs, operating risks, danger to public, and appearance. For the small isolated substation up to a few hundred kilowatts the cost will be 25 per cent to 50 per cent less than the corresponding indoor station. In large installations the saving will therefore be much smaller. Up to the present time there are installed or under construction approximately 300,000 kilowatts in high-tension outdoor-type transformers. In general, it appears that the equipment for outdoor installations has been successfully developed to meet the severe conditions imposed, and the numerous installations involving outdoor features indicate the extensive use of this idea in the future, while its development as applied to the central station itself affords a considerable field for attention.

Outdoor Substations in New England.

The present development of outdoor switching apparatus and transformers for systems of 110,000 volts or less is such as to make their use entirely successful, and in most transformer substations, a considerable saving in first cost can be accomplished without increase in operating expenses, by making use of this type of equipment.

This paper gives a brief description of two substations of 10,000 kilowatts, ultimate capacity, just put into operation, in which all the high-tension switching apparatus (66,000 volts) and the transformers are outdoors. The low-tension apparatus (13,200 volts) and the railway apparatus are indoors. This arrangement is based on the three following principles which have in this case proved to be sound: (1) That the greatest saving in building cost can be made by putting all high-tension work outdoors. (2) That the switching apparatus, lightning arresters and transformers of voltages in the neighborhood of 66,000 volts are practical and may be successfully operated outdoors in New England. (3) That distributing switchboard, control switchboard and railway apparatus and switchboard are not suitable for outdoors.

Indoor and Outdoor Substations in Pennsylvania.

This paper covers some points in substation design for installations for the lower voltages, including choice of location, type of building and arrangement of electrical apparatus. The subject is treated in three divisions: customers' substations fed from the distribution system, customers' substations fed from the transmission system and company's substations. In selecting a location for transformers there should be considered: (1) the position of the customer's load; (2) location of company's street mains; (3) accessibility for delivering material; (4) accessibility for the operating company's employees, and (5) possibilities of ventilation and sewer connections. Among the advantages of outdoor substations which the author enumerated were reduced cost of installation, increased accessibility for employees, lessened difficulty in making connections to lines, absence of transformer vaults, and better ventilation. Indoor installations, on the other hand, offer the advantages of (1) having the apparatus more accessible for inspection or repairs, (2) involving less danger of unauthorized persons interfering with apparatus, (3) giving customers control of the installation on the primary side if desired, and (4) protection of apparatus from the weather. Points to be considered in the selection of locations for substations are outlined and several types of buildings, particularly the one of concrete slab construction, are described. Attention is also called to different arrangements of electrical equipments, which may be employed for installations of various sizes. Different schemes for installing high-tension switchboard apparatus are considered, attention being called to the open-wire and the cell-structure installations, with special reference to the concrete cell structure and the method employed in its construction.

Outdoor Substations in the Middle West.

Conditions in the Middle West, particularly in the agricultural districts, have often been such as to necessitate the construction of small 33,000-volt outdoor substations in order to make the supply current commercially practicable. These stations have been constructed with very simple switching and protective equipment and economy of design and protection to the main line have been the dominating feature of design. Mr. Perry described and illustrated a substation which can be built economically to accommodate three 50-kilowatt, 33,000/2,300-volt transformers and the distributing equipment. The station consists of a corrugated-iron or steel transformer compartment six feet square, on top of which are supported electrolytic lightning arresters and a steel angle-iron frame carrying the horn gaps and choke coils. The low-tension equipment should be placed inside the compartment. To allow isolation of the substation equipment from the transmission line when repairs or inspections are being made the author recommended mounting disconnecting switches on a pole near the substation with levers and gear connection which can be operated by any intelligent man. Operation of such stations has been successful and they are of great benefit to the communities served. Improvement in lighting and overload protection is looked for.

In opening the discussion D. C. Jackson pointed out the accord between the four authors as to the importance of the outdoor substation and its suitability for the service involved. Many small communities can be served by such equipment, which otherwise could not be served upon any commercial basis.

A. H. Kreusi said that outdoor installations should be limited to small stations. In large stations the saving is too small to warrant it, since continuity of service is less certain with the outdoor station. He inquired whether there was any object in erecting the transformers on towers for outdoor stations instead of placing them on the ground. He also read a written discussion by A. R. Smith, who pointed out that economy was the principal object of the outdoor station, but that enthusiasts were sometimes deceived into thinking such stations economical when they were not.

R. E. Argersinger pointed out that the saving should be large to make the outdor station worth considering.

H. B. Gear considered the question a matter of balance between the cost of building and the cost of apparatus. In industrial substations, however, the question was often one of space rather than cost. For a small station the building sometimes costs more than the equipment. There is little saving in the case of stations for low voltages and large amounts of power and these often involve some equipment that must be housed anyhow. For higher voltages, where big air spaces are needed, he favored the outdoor station, especially, for small amounts of power.

W. S. Moody stated that the figure given by one of the authors of 600,000 kilowatts is too small for the outstanding capacity of transformer equipment. Outdoor transformers up to 7,500 kilowatts and outdoor stations up to 50,000 kilowatts have been constructed. It is important to have water-tight cases for the transformers, and idle units should have arrangements for heating them above the outside temperature, with provisions for permitting gases and air to escape.

J. C. Smith stated that outdoor stations were little used in Montreal, since they necessitated the use of air-cooled transformers. The operation of oil switches under severe climatic conditions is also an important question.

P. W. Sothman said that similar conditions prevented the adoption of the outdoor substation in Ontario. There is a big field for such stations, but there are also many places for which they are not suited. It is often a mistake to save on cost and sacrifice service.

J. E. Kearns said that in stations up to 5,000 kilowatts there was a saving of 10 to 15 per cent in the outdoor staion. The difference would not be so great if sheet-metal buildings were used. For larger stations there is more in favor of the indoor type. The outdoor type is more suited to the South than to the North or the Rocky Mountain region, but for capacities up to 100 kilowattts it can probably be used anywhere.

H. E. Bussey stated that outdoor stations up to 30,000 kilowatts were in use in Georgia, but he did not consider the climate there good for them, since heavy rains and winds were common. No trouble has developed so far but it is likely to develop if the tanks are not tight.

A. M. Rossman, K. C. Randall and Farley Osgood also spoke.

A. H. Kreusi submitted by title a printed outline for discussion on electrical features of power-station design.

Transmission Session.

The first session on Thursday was called to order by Chairman Rushmore at 10:20 a. m., and the report of the Subcommittee on Transmission was presented by P. W. Sothman. This report was entitled "Problems of High-Tension Transmission Lines," and was accompanied by four appendices, as follows: "Deterioration of Porcelain Insulators in Service," by J. A. Brundige; "Radius of Influence of a Direct Lightning Stroke," by L. C. Nicholson; "Transmission-Line Problems in the West," by P. M. Downing, presented by Julian C. Smith; "Switching," by G. Faccioli.

Problems of High-Tension Transmission.

This report contains suggestions regarding the construction and location of high-tension transmission lines. There is need for an intelligent agreement upon protection methods at crossovers. The selection and design of towers is discussed, and recommendations are made regarding the nature, strength and protection of materials entering into tower construction, as well as allowances for movement of wires, sleet and wind. Aluminum and copper conductors are often not equally suitable. Overhead ground wires are considered beneficial as a protection against lightning. Reports indicate that although suspension insulators of the disk-type with metal caps and pins are satisfactory for a year or two, failures begin to occur after this period. Much of the trouble on telephone and telegraph lines is due to insufficient insulation. By employing special grounding coils, good insulation, and frequent transpositions of power lines satisfactory telephone service over paralleling lines has been found to be possible. Constant improvement has been made in station apparatus, especially in the strengthening and protection of apparatus.

Deterioration of Porcelain Insulators in Service.—Many of the failures of suspension type insulators are traceable to improper design or to an unsuitable porcelain body, and not to molecular deterioration of the porcelain. High dielectric strength and mechanical toughness are the principal requisites for high-voltage insulators. Mixtures having these properties are possible but often not used. The lack of allowances for the coefficients of temperature of the component parts of insulators is responsible for many failures. The high-range megger has proved extremely useful for locating faults undiscoverable by ordinary means of inspection.

Radius of Influence of a Direct Lightning Stroke.—Observation and inquiry lead to the conclusion that it is doubtful if any degree of insulation used at present will withstand the effects of a direct lightning stroke. Experience indicates that a direct stroke envelopes such a large region that ground wires cannot always intercept direct strokes. On medium-voltage lines induced effects of distant strokes may cause flash-over or puncture of insulators. Radial influence of direct strokes is rarely in excess of 2,000 feet.

Transmission Line Problems in the West.—On the Pacific Coast leakage due to the accumulation of dust and salt fog is a constant source of trouble. Cleaning of the insulator improves conditions but most satisfactory results are obtained by tying pins together electrically. In most cases voltage must be kept nearly constant over entire network. This is accomplished by using synchronous condensers at important distributing points.

Switching.—Switching oscillations do not constitute a great danger to the circuit unless switching operation is accomplished by arcs in which case destructive cumulative oscillations may cause damage. The discussion shows that low tension switching is preferable.

The final paper of this session was presented by H. W. Buck and was entitled "Practical Operation of Suspension Insulators."

Practical Operation of Suspension Insulators.

This paper describes some of the mechanical and electrical problems which have been experienced in high-voltage-transmission lines equipped with suspension insulators, and points out some of the principles involved and some practical methods of guarding against troubles. Figures are given showing the deflections which will take place for various sizes of aluminum and copper conductors at the insulators, under the pressure of maximum probable wind velocity. The use of ballast weights at the end of each insulator is recommended for lines employing aluminum wire or the smaller sizes of copper wire. Simplicity in the designs of suspension insulators has been found advantageous. The following additional recommendations are made: more liberal clearance between conductors and between conductors and supports, installation of ground wire high above conductors, design of jumpers and fittings at head-end connection so that they cannot become displaced, and the tightening of conductors throughout the line.

In discussing the Committee report, Mr. Buck stated that the sag fables prepared by engineers are disregarded in the field, the line foremen usually exercising their own judgment. The design of lines and the directions for their construction should be within the scope of comprehension of the construction foreman.

F. W. Peek, Jr., discussed the difficulties of measuring disturbances on lines.

C. E. Waddell favored obtaining easements rather than the right of way for a transmission line. In lines up to 60,000 volts he favored wooden poles with fittings ungrounded rather than steel towers. Line supports should be free to move longitudinally but not laterally. He did not favor Mr. Buck's proposition for ballasting, as he considered it preferable to change the span or other elements of design so as to make this unnecessary. A steel-cored aluminum conductor is to be preferred for many installations. In case of a short-circuit the aluminum will burn off, but the steel remains intact and holds up the cable. He favored the form of insulator described by Mr. Buck.

P. H. Thomas referred to the deterioration of porcelain, many instances of which had come to light recently. He attributed the results to defects in the process of manufacture rather than to electrical causes or any actual change in the porcelain *per se*. A method of test in needed which will disclose the insulators which will later fail. The two-piece insulator is less likely to have both parts defective and has this advantage. He has obtained one with a flash-over tension of 90,000 volts.

W. H. Peberdy presented a written discussion by William McClellan, in which it was stated that towers should be designed on the basis of the elastic limit of the steel, and a specimen then actually tested for failure. He pointed out the distinction between the "factor of safety "applying to unit stresses, and "margin of safety" applying to a complete tower. The latter is of more importance in design. He also discussed tower footings. These when made of concrete should have an earth connection. He favored two suspension insulators mounted at 45 degrees at points where it was necessary to prevent unequal sags.

V. Karapetoff objected to drawing conductors up too tight, as he knew several cases where trouble had resulted from this practice.

Paul M. Lincoln disagreed with Mr. Faccioli regarding switching on the high-tension side, as he did not know of any damage resulting from this practice. The surges due to switching are not as great as others, such as those produced by lightning, and the line should be built to withstand any that may occur. He agreed with Mr. Buck as to drawing lines up tight.

A. O. Austin gave a talk on insulators and their failure, illustrated with lantern slides. He pointed out that the early lines were installed under different conditions than those existing today. Many insulators which had failed showed evidence of crystallization in the cement, calcium sulphate having separated out in many cases. Incipient cracks, air bubbles in the glaze, etc., are often the forerunners of failure. Insulators should be tested at high frequency.

Farley Osgood pointed out the need of co-operation between operating engineers and manufacturers in testing insulators under practical line conditions. He did not see how switching on the high-tension side could be avoided in busy territory. Most line difficulties result from high-frequency surges.

J. A. Sandford, Jr., did not favor covering the materials of manufacture in specifications of insulators, pointing out that ball clays from many different sources were the same chemically but differed in plasticity. Insulators show no fatigue when the porcelain has been completely vitrified. The fatigue occurs only in imperfect porcelain. If complete strings instead of single units were replaced in cases of breakdown there would be less trouble experienced. He favored the establishment of some central testing bureau in order to get comparative results on insulators.

Julian C. Smith stated that suspension-type insulators were no worse than pin insulators in respect to deterioration. He thought the number of insulators in a string should not depend upon the operating voltage but rather upon the climatic conditions, since their limiting strength should meet abnormal conditions.

E. A. Lof pointed out that the height of lines did not depend upon voltage but was fixed so as to avoid all contacts with other structures. He called attention to a book on catenary construction recently published in Swedish by Carl Heuman.

E. M. Hewlett pointed out that a shorter petticoat means less strain and readier flashover, which is the preferable condition. If the line is insulated to resist lightning discharges the apparatus must also be. It has yet to be shown that porcelain shows fatigue when well vitrified. The failures are probably due to defects which are at first protected by glaze. After the glaze cracks, moisture is absorbed and the unbaked porcelain breaks down.

Selby Haar pointed to the rapid increase in high-tension lines in other countries. Voltages up to 115,000 had now been reached in Japan, 110,000 in South America, and 100,000 in India and in Europe.

Power-Generation Session.

The afternoon session was devoted to power generation and economics and was called to order by President Mailloux at 2:30 p. m. H. W. Buck occupied the chair during the discussion of the papers. The first paper presented was by C. T. Hutchinson and was entitled "The Economical Capacity of a Combined Hydroelectric and Steam Power Plant."

Economical Capacity of a Combined Hydroelectric and Steam Plant.

This paper develops a general method for determining the economical capacity of a combined steam and hydroelectric development. The method involves the use of two curves—one, the "per-cent-deficiency," giving the stream regimen, the other, the "per-cent-load" giving the characteristics of the load. The first curve gives the per-cent deficiency of the water for any stream-flow, and hence fixes directly the deficiency in energy which must be made up by the steam plant. The second curve shows directly the proportion of the total energy of the load that is included above any proportional part of the maximum power, and fixes the capacity of the steam plant required to supply that part of the load which cannot be supplied by the stream. The use of these two curves differs for plants with pondage or without pondage. The capacity and output of the steam plant being thus determined, its total annual cost is determinable and with the annual cost of the hydroelectric plant, fixes the total annual cost of the combined plant. A numerical case is worked out applying to the Susquehanna River at McCall Ferry. The drainage area is about 26,000 square miles, and the results are reduced throughout to terms per square mile. Curves are given for stream flow, per-cent deficiency, loads and per-cent loads, and costs are worked out applying to various conditions. Reservoir capacities of different amounts are also considered. The application of the method depends upon the determination of the cost of a development at any given site for a range of capacities. The cost of any hydroelectric development is made up of certain items independent of the capacity of the equipment and others proportionate to the capacity. In most cases the fixed costs are much greater than the variable costs. Cost figures are given for a number of typical cases.

In discussing this paper H. B. Alverson spoke of the importance of the steam reserve in hydroelectric systems.

This was followed by a paper by H. M. Hobart entitled "The Cost of Electricity at the Source."

The Cost of Electricity at the Source.

The Stott-Gursuch method is applied to the determination of the cost of manufacturing electricity in a 60-cycle station of 100,000 kilowatts installed capacity, as follows. Costs are divided into three parts: (1) production costs; (2) investment costs; (3) administration costs. Production costs are divided into two parts, one of which is fuel; for the other portion $700,000 is allowed. The investment costs are based upon $35 per kilowatt of power plant. An efficiency of 13 to 15 per cent is assumed in the conversion of energy from fuel. Interest is estimated at five per cent, taxes and insurance at three per cent, amortization at 4.6 per cent. Administration costs are taken as $100,000. The results correspond to the assumption that such a station is capable of delivering from 350,000,000 to 700,000,000 kilowatt-hours per annum for load-factor ranging from 0.50 to 1.00. For unity load-factor the cost of three-phase electricity at the outgoing cables ranges from 0.65 cent per kilowatt-hour with coal at $5.00 per ton, down to 0.20 cent per kilowatt-hour for fuel of negligible cost. A method is indicated for tracing through the increase in the cost of the electricity at later stages of its journey from the source to the consumer.

This paper was discussed by John W. Lieb, Jr., H. S. Summerhayes, C. T. Hutchinson, H. W. Buck, F. A. Scheffler, H. L. Wallau, O. K. Howland, C. F. Scott, A. H. Kreusi and V. Karapetoff. It was pointed out that the conditions assumed by Mr. Hobart did not correspond with any existing in actual plants, especially under metropolitan conditions. Thirty-five dollars per kilowatt was entirely too low for first cost of installation. Thus one of the plants in New York City had cost $65 per kilowatt for land and buildings and $85 per kilowatt for equipment. A large plant now going up in the West for 125,000 kilowatts is expected to cost over $45 per kilowatt. This plant will have turbogenerators of 25,000 kilowatts each. The hydroelectric plant at Keokuk cost $180 per kilowatt and if the fixed charges were no higher than 12 per cent, this would make power cost more than it could be produced for from coal if Mr. Hobart's figures were applicable. Besides, a steam plant can usually be located near its load, whereas a hydroelectric plant usually requires a transmission line. Fixed charges should be figured at 15 to 20 per cent instead of the 12.6 per cent used by the author. Capital cannot generally be secured for five per cent and depreciation or amortization should be placed higher than 6.4 per cent. Much steam equipment becomes obsolete and useless within ten years and the New York Edison Company had made five changes in type of equipment since 1884. The load-factor assumed was also higher than is obtained in practice, where 30 to 45 per cent would be a fair figure. On these grounds it was objected that Mr. Hobart's paper would be misleading in that outsiders would take his figures as representing actual possibilities.

Professor Scott pointed out that a 15,000-kilowatt unit can now be installed in the space formerly occupied by a 150-kilowatt unit. Considering also the increase in lamp efficiency a capacity for about 300 to 1,000 times the same lighting can now be installed in the space formerly required. It should be remembered also that the cost of generation is a small item in the cost of supplying energy, the distribution cost being usually greater.

Professor Karapetoff commented upon the fact that 30 per cent of the cost was for accessories and thought engineers in this country should be interested in the Thury series system, which uses smaller cables and less auxiliaries for the same size of plant, thus reducing the capital cost.

In closing the discussion, Mr. Hobart admitted that the fixed charges should be figured at a higher percentage. He pointed out that his figures for installation cost were reasonable for a plant outside of the large cities, where land is very expensive. Thus a recent English station had contracted for 6,000-kilowatt units at $8.00 per kilowatt. His estimate was based on $8.50 for steam-raising equipment; $5.00 for condensing equipment; $10.50 for accessories; $8.00 for buildings and $3.00 for contingencies.

Distribution Session.

The session on Friday morning was occupied with a report of the Subcommittee on Distribution, of which Peter Junkersfeld is chairman. The meeting was called to order by President Mailloux at 10:30 a. m., and Chairman Rushmore occupied the chair. In the absence of Mr. Junkersfeld, H. B. Gear presented the report of the Committee. It was accompanied by nine appendices, as follows: "Three-Wire Direct-Current Distribution," by Philip Torchio; "Alternating-Current Distribution," by H. B. Gear; "Effect of Consumers' Apparatus and Wiring on Distribution," by Harold Goodwin, Jr.; "The Relations of Distribution Problems and Switching Equipment," by E. B. Merriam; "Distribution for Street-Lighting Service," by P. M. Lincoln; "Direct-Current Distribution for Surface Railways—Urban Service," by R. H. Rice, presented by Mr. Gear; "Direct-Current Distribution For Underground and Elevated Railways," by E. J. Blair, presented by Mr. Gear; "Direct-Current Distribution For Interurban and Steam Railroads," by W. G. Carlton; "Alternating-Current Distribution For Interurban and Steam Railroads," by W. S. Murray, presented by Mr. Gear.

Distribution of Electrical Energy.

This report discusses the economy of the centralization of electrical power generation and the centralization of distribution. Numerous references are given to articles on the distribution of electrical energy by American and foreign authors.

Three-Wire Direct-Current Distribution.—The modern three-wire direct-current distributing system consists essentially of a three-wire network of distributing mains fed at numerous points by a multiplicity of cable feeders, supplied with current from a system of substations. Marked improvements have been made in synchronous converters, such as the use of commutating poles, graphite brushes with slotted commutators and self-lubricating copper graphite brushes for the collector rings. Other developments have been the split-pole synchronous converter and the synchronous booster converter for obtaining regulation. Manufacturers have produced units as large as 4,000 kilowatts and are prepared to furnish larger units. From recent tests it would appear that diametrically connected six-phase converters will operate satisfactorily under the same conditions as a double-delta-connected machine, and give greater simplicity of connections between transformer and converter. Stand-by batteries giving large current discharges for short periods of time are being adopted for emergency purposes.

Alternating-Current Distribution.—Both bulk supply and general distribution are discussed. Bulk-supply systems in America have been chiefly developed on the principle of radial lines. Such a system employes direct lines from power station to substation. Tie lines between substations furnish a reserve source of power. Several methods of supplying substations are discussed on the basis of reserve investment. Until recently it has not been satisfactory to operate high-tension lines in parallel at the substation end on account of the absence of reliable reverse-power relays. The Merz-Price system of protective relays has had large and successful application in the north of England. The main disadvantage of this system is the expense of the necessary pilot wires. Modified forms of reverse-power relays have been developed within the past two years and are under trial. The introduction of synchronous converters and three-phase transformers of almost any desired capacity permit the use of cables at a point near their full safe carrying capacity. The induction-type regulator has largely superseded the transformer-type in substations. Extensive improvements have been made in the details of control and regulating apparatus. General distribution is usually accomplished in America by 2,200-volt mains, the customers being supplied from secondary mains at 110-220 volts. The advisability of furnishing light and power service from the same feeders is discussed. Modern pressure-regulating apparatus permits this combination in most cases. Three-wire and four-wire distributing systems are discussed. Emergency-switching points are necessary to permit mains of two circuits to be joined and to cut out sections of cable. A cross-connected network of secondary mains is preferable in denser parts of a city. The secondary system may be protected by "network protectors," such as are used in New York City. Motor service cannot usually be served from lighting secondaries. Selection of transformers and systematic checking of their loads is important where economy is desired.

Effect of Consumer's Apparatus and Wiring on Distribution.—It is advisable to have some fixed rule as to size of motor above which no single-phase service will be rendered and below which polyphase service will not be rendered. General practice requires auto starters on motors of any size. Automatic-self-contained starting devices for motors have been marketed. Rectifiers, cooking stoves, medical apparatus, etc., are usually allowed on lighting systems, except where their use makes trouble. Wireless apparatus is generally undesirable. Charges for electric service are not ideal. It would seem well to devise some system basing the minimum charge on the starting current instead of the horsepower rating.

Direct-Current Distribution for Surface Railways—Urban Service.—Various methods of distribution are discussed. Marked developments have been made in generating, converting and control equipment for power houses and substations.

Direct-Current Distribution for Underground and Elevated Railways.—Various methods of distribution are discussed. On account of numerous distribution points it does not seem desirable to increase voltage above 600 volts direct current.

Direct-Current Distribution for Interurban and Steam Railroads.—Extensive direct-current electrification of steam railroads has been made. It is not probable that 600 volts will be used extensively for this service. Numerous roads have adopted 1,200 volts. The Butte and Aanconda Railroad is operating successfully on 2,400 volts.

Alternating-Current Distribution for Interurban and Steam Railroads.—In general, the alternating-current contact wire is not adapted where the equipment must be common to city and interurban operation. High-voltage, alternating current at 25 cycles supplied by single overhead wire is well adapted to steam-railroad electrification.

The Relation of Distribution Problems and Switching Apparatus.—Means are being sought to give complete protection against service interruption due to faults in the distributing and receiving apparatus. Several schemes have been devised for indicating the unbalancing of phases. Numerous improved forms of overload relays and reverse-power relays have been devised. The carbon circuit-breaker is almost universally used for direct-current voltages up to and including 1,200 volts. Up to 5,000 volts direct-current magnetic-blowout circuit-breakers are successful. Oil-immersed circuit-breakers are generally used on alternating-current circuits. Owing to increased generating capacities now concentrated in single units, means are necessary to aid in the dissipation of energy. The most efficient solution of the problem is a scheme introducing resistance into the circuit in shunt with the oil circuit-breaker during its operation.

Distribution for Street Lighting Service.—A separate distributing circuit is best adapted for this service, because it must be switched on and off at certain periods. Where this system is not used lamps are operated in groups. The series system is best adapted. Constant current is secured from constant-current generators or transformers. The use of constant-current transformers in conjunction with rectifiers has largely taken the place of constant-current direct-current arc machines. The series system is well adapted to both arc and incandescent lamps. Series-incandescent lamps are shunted by special reactance coils which carry the full current upon the breaking of a lamp.

The discussion was opened by H. L. Wallau, who emphasized the keynote of the report, which is centralization, eliminating duplication of generating and distribution equipment. This usually means lower cost and increased reliability. This can only be carried out as far as the substation, since beyond that point different kinds of service are required. In Cleveland, cables are being connected in parallel with relays installed for protection. The substation buses are not segregated, but operate in multiple. Rotary condensers are used in the substations to improve the power-factor. The weatherproof insulation on 2,200-volt cables has been found to deteriorate with time, but it remains good enough for these lines to be connected in star.

In answer to a question, D. W. Roper stated that with the system used in Chicago for four-wire, three-phase lines, short-circuits on the neutral present no difficulties. The circuit-breaker opens on the wire which is short-circuited, and compensators maintain the proper pressure on the other two wires. It seldom happens that the neutral wire becomes open near the station. The relays on this system are set for very high currents, so as to avoid interruptions from overloads. The relays are intended to operate only on short-circuits and not on overloads.

In answer to another question, Philip Torchio stated that the size of the neutral wire in a three-wire system is a question of regulation. The New York Edison Company keeps the regulation very low by using a large neutral conductor and the system as a whole has been liberally designed. The neutral might well, however, be made smaller than the other wires.

E. M. Hewlett spoke of the applications of relays and of oil switches, which can now be supplied for almost any purpose for which they are desired.

J. B. Taylor stated that the controlling reason for the use of the series system in street lighting was the characteristic of the arc lamp. Another reason was the fact that direct current was universally used initially and a series circuit represented the use of the lowest amount of copper. With the high-efficiency tungsten lamp and the use of alternating-current circuits there is now little reason for using separate circuits for street lighting.

A. P. Kelly referred to the interruptions caused by circuit-breakers and the fact that induction motors will drop out in such cases. In Baltimore, auxiliary relays have been installed which will automatically close a switch as soon as it has been opened, the time taken being about 0.7 second, or within 40 cycles on a 60-cycle circuit. This prevents interruption of service or even a heavy current flow to accelerate the motors. Switch relays may be set to close once, twice or three times before permanently staying open. Telephone disturbance had been caused in Baltimore from a thirteenth harmonic in the neutral circuit of frequency changers, which suggested the use of this current for testing faulty cables by the use of a detector coil and telephone. This characteristic, however, is being eliminated for operating purposes. His experience on four-wire systems was different from Mr. Roper's, as when one switch goes out all the rest open also. If the neutral wire is opened, the voltages on the different phases may change slightly but operation is not interrupted.

H. B. Gear explained in this connection that in Chicago the neutral wires are not grounded on each power load.

Carl Schwartz gave the details of the New York Central & Hudson River Railroad distribution system. He stated that the appendix by Mr. Murray did not represent present practice. Single-phase current costs more delivered than three-phase current. For insulated negative return feeders to prevent electrolysis, they must provide a uniform voltage over the system. It is often troublesome and expensive to meet this condition.

Others joining in the discussion were S. D. Sprong, H. S. Summerhayes, E. W. Trafford and W. A. Del Mar.

Protective-Apparatus Session.

President Mailloux occupied the chair at the final session, which was called to order at 2:30 p. m. The first paper was by C. P. Steinmetz and was entitled "Recording Devices."

Recording Devices.

The author calls attention to the importance of keeping records in electrical systems and points out that proper records can be secured only by automatic recording devices largely because of the uncertainty of the personal element in times of accident or stress. The three types of recording devices in general use are those having a revolving disk, those using an endless tape or photo-film, and a multirecording device on which no record is made of normal operations and on which the record sheet moves only when a record of abnormal occurrences is being made. The revolving-disk machine produces such condensed records that a sequence of rapidly fluctuating events cannot be distinguished, while the curve-drawing instruments, if the tapes were run rapidly enough to show all the fluctuations, would produce records of such enormous length that they would be impracticable to operate commercially. With the multirecorder the record is made in a very condensed and handy form and its accuracy in respect to time is very high, so that the sequence of events recorded can be checked within a fraction of a second. The latter instrument, therefore, is adapted to produce minute and accurate records of all phases of station operation.

E. E. F. Creighton described the apparatus referred to in the paper, known as the multirecorder. This gives a time record of the opening or closing of switches or any other change in circuit conditions. There are 49 points, each of which must have a pilot wire from the part of the system for which the record is to be kept.

Charles L. Clarke presented a printed discussion, in which he pointed out the great advantages of this recording instrument. Its action is so rapid that the sequence of operation of oil switches can be noted. Time-element relays can be checked to the nearest second. The duration of accidental short-circuits and surges can be recorded. It shows whether a feeder is alive, and if so, the time when it was energized and the end from which it was energized. It may show whether aluminum lightning arresters have been charged at correct intervals, and whether they have been abused by charging them too long. It is very useful to the load dispatcher. Lightning strokes on an overhead ground wire may be recorded. Applications outside of the power station were also noted, as for keeping records of a manufacturing plant.

C. P. Steinmetz pointed out that the apparatus was of great value in giving the sequence of happenings at widely different points, as for example on a long transmission system. One of the 50 points on the recorder can be used for standard time and then the instruments in different stations may have their records compared to show the sequence of events.

E. E. F. Creighton then presented a paper entitled "Present Status of Aluminum Lightning Arresters." He compared the aluminum arresters with other types of arresters and pointed out their various advantages. While the direct-current aluminum type of arrester may be improved, it is not likely to be superseded in principle. Recent investigations of lightning show that there are various kinds of wave fronts involved, not all discharges being of high frequency (500,000 cycles or over). The alternating-current aluminum arrester is not satisfactory unless horn gaps are used in series with it. A large rush of current through the arrester is sometimes found objectionable and this has led to the use of a resistance in series. Abroad some bad experiences have been had in the case of surges, but there has been little trouble of this kind in America. Foreign engineers use water jets and other devices and hold certain objections to the aluminum arrester. He considered the status of the aluminum arrester quite secure, for although it has limitations in current capacity, etc., they are outside of the usual limits of practice.

This paper was discussed by E. B. Rosa, V. Karapetoff, F. W. Peek, Jr. L. C. Nicholson, C. O. Mailloux and C. P. Steinmetz.

Mr. Nicholson stated that the aluminum arrester usually behaved well and the stations equipped with them value them highly, while others seem to get along all right without them. There is no trouble in keeping them in operation. He favored the use of a charging resistance in series. Most trouble from lightning, however, occurs at some point out on the line where the lightning arrester is not involved. Dr. Steinmetz stated that the lightning arrester sometimes gives protection and sometimes does not. If there is a high-frequency surge of too low voltage to jump a spark gap, it may still mass up across reactance and hence do damage, as to the first coil of a transformer. A steep wave front sometimes has a similar effect. Condensers, such as the Mossisky type used in Europe, apparently short-circuit on high frequency, but do not absorb energy. Conditions which are suitable for a condenser of practical size are rather rare. When a high voltage arises in a station where there is inductance and capacity in circuit such a shunted capacity may be useful. The value of a capacity in protective devices is merely to act as a barrier against the normal frequency, when placed in series with a resistance, which is the element really giving protection by absorbing the energy which flows at high frequency. The aluminum arrester is a condenser which at high frequency and high voltage has unity power-factor. Its action is similar to that of a storage battery on a 600-volt direct-current circuit. He drew an analogy between the lightning arrester and the steam safety valve. In either case the shock of discharge may cause a breakdown. A critical resistance in the circuit may hold the voltage on the line long enough to produce damage. The steepness of the wave front depends upon the distance from the point of origin. This is found by experience much different from the ordinary theory, owing to the fact that the theory has been worked out on assumptions which do not hold, since the resistance, for instance, depends upon the frequency.

After a few closing remarks President Mailloux then adjourned the convention.

THE GOVERNMENT AND BUSINESS ADMINISTRATION.

By Guy E. Tripp.

At the meeting of the National Chamber of Commerce at Washington, D. C., on February 12, Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, delivered an address on the pending "anti-trust" legislation. Mr. Tripp said in part:

"Whether it is economically sound or not, the public has the belief that practically all business should be roughly divided into two classes, the one comprising the natural monopolies of public necessities, in other words, public utilities, the other comprising the naturally competitive private business undertakings. Personally, I find no fault with such a division, but manifestly these two distinct classes require different legislative treatments.

"That public utilities should be regulated and not given the free hand that naturally competitive business requires, is sound doctrine, but only when such regulation carried with it an obligation to protect such utilities against the menaces which confront competitive business. If we restrict opportunities, we must reduce the risks.

"Almost nothing has remained unthought of in the way of regulation and restriction, and the cheerfulness with which regulatory burdens have been heaped upon our public utilities is discouraging, when it is remembered that hardly a single voluntary act for protection has been heard of.

"Public utilities should be protected against competition, inadequate rates, demands for excessive service, unreasonable and, unjust damage claims, Federal regulations superimposed upon State regulations, and, most important of all, against oppressive demands of labor. Under present conditions, the mere threat of a labor strike on a railroad is sufficient to almost automatically produce an increase in wages, or cause railway managers to relinquish their right to enforce discipline in the interest of the safety of the public and economy of operation, as instanced by the recent strike on the Delaware & Hudson Railway. The best evidence that our legislators have abandoned their campaign of punishment and have become sincerely desirous of doing the fair thing by our public utilities will be shown when someone has the courage to introduce a bill intended to effectually prohibit strikes and lockouts on railroads.

"The various railroad securities bills which have been proposed almost wholly ignore the investigations of the Hadley Securities Commission which recommended first of all that publicity be required and pointed out objections to any further regulation of securities until publicity had shown what might be needed. However, we already have State supervision of railroad securities quite generally, and I believe that Federal supervision would be found an improvement, provided it supersedes that of the states. I have not heard it suggested, however, that the State's right in this respect could or would be taken from them, therefore superimposed regulation may be imminent and such a condition is justly to be feared by the railroads.

"While, therefore, railroads and other public utilities need special legislation for both regulation and protection, a naturally competitive business (like that in which I am engaged) stands on an entirely different basis, and, if competitive conditions are maintained for it as I believe they should be, neither regulation nor protection of the character just mentioned has any place in its dealings with the government.

"If one cannot manufacture his goods and sell them as cheaply as his competitor can, he must eventually fail; and if his employees force him to the issue, he can shut up his shop and both he and his employees will be out of income for a longer or shorter period, but the general public welfare is not vitally affected.

"A great deal of the proposed legislation at Washington is directed toward creating or maintaining conditions which, in the minds of the legislators, will tend to insure competition among this class of industries which, as I have said, are to be distinguished from public utilities. In so far as these measures will be effective in the direction of securing sane competition, I believe they are wise.

"Monopoly is not in itself objectionable; in fact, it is often the most effective way of dealing with industrial affairs. In Germany it is fostered and protected by the government to a large extent, with the result that the commercial supremacy of that country in the markets of the world has been established within a comparatively few years of the most rapid business growth perhaps that has ever been seen.

"But I believe that our political institutions and the temper of our people are not adapted to monopolistic methods that are in restraint of trade, and that fair competition in business will make a more contented public, a more secure government, and in the end give greater protection to property.

"Therefore, I am in favor of all fair and reasonable legislation sustaining that theory.

"Fair or sane competition is hard to define.

"To my mind free competition is not sane competition.

"The biggest business in the country was founded almost entirely upon the principle of free competition, namely, that of making prices what and when you will and taking all the business from your competitor that you can. If this business was a monopoly, it grew to be so without the aid of interlocking directorates or the alleged money trust; it became a monopoly simply by the practices of free competition.

"Therefore, in considering the various business measures now pending, particular attention should be given to the question: Will they, or will they not, assist in securing sane competition, not free competition?

"The five bills now proposed are, viz.:

"An Interstate Trade Commission bill.

"An Interlocking Directorates bill.

"A Sherman Law Definition bill.

"A Trade Relations bill.

"An Anti-Holding Company bill.

"It is not my purpose to attempt a detailed discussion of these measures, for in the details lie endless differences of opinion, many real and imaginary dangers, and much sincere and insincere befogging of the issues. I believe that the safest viewpoints for the busy citizen are:

"First, Are they based upon the right principles?

"Second, Is it probable that acts can be framed which will sustain these principles without doing more harm than good?

Trade Commissions Bill.

"A trade commission seems to me to be needed in a well rounded plan of business legislation.

"No other agency can so well collect information, conduct investigations, and determine facts for the guidance of the legislature and courts, and that in the last analysis is all the power that the bill gives it.

"No great harm can come from elaborate powers given the commission in the way of getting papers and documents except expense and bother to the corporations.

"It would be a physical impossibility for it to exercise its full powers in this direction, hence it is futile to make statistics as to how many freight trains it would take to convey the papers to Washington.

"I object to the provision that the commission may from time to time make public such information in such form and to such extent as it may deem necessary. There is danger of telling our competitors too much and giving half-truths to the public. It is unnecessarily harsh publicity and I hope the bill will finally be toned down in this respect.

The Interlocking Directorates Bill.

"This bill attempts in four short sections to say who shall not be directors in corporations, to the end that competitive conditions shall be created and preserved.

"In my opinion, as at present drawn, it will wholly fail in its object and will foster the very thing that it aims to prevent.

"It will tend to create dummy boards and enable responsible men to exercise as much control as ever without the restraining influence of personal responsibility.

"It will tend to create one man power corporations and thus render more unstable the investments of the public.

"It is based on a mistaken or exaggerated notion of the Machiavelian activity of the interlocking director.

"I have been in business all my life and I have no hesitation in saying that those terrible charts of control through interlocking directors are worse than worthless.

"As an instance, enough misinformation has been gleaned from them to bring out the statement that the General Electric Company and the Westinghouse Electric & Manufacturing Company are only alleged competitors. I say that is untrue.

"If the whole interlocking directorate bill should be wiped out except the last section, and that should simply provide that the fact of a common director shall be prima facie evidence instead of conclusive that no competition exists between two corporations, it would probably be ample to cover the situation. In its present condition the bill is likely to do much more harm than good.

The Sherman Law Definition Bill.

"This bill defines certain acts as restraints of trade which now are interpreted by the courts one way or the other as they are more or less small and insignificant.

"It is said by the lawyers that under this bill as now drafted no concern could enter into an agreement with any labor union. If this is so, I imagine it will be promptly changed.

"It is also said that the bill imposes upon every concern, no matter how small, weak or insignificant, the same prohibitions which the Sherman Act as now interpreted provides shall be applicable only to concerns so large as to threaten competition.

"This is a bill for a laywer to interpret; but, if it defines with precision what a corporation officer may or may not do to escape criminal prosecution, it will be an improvement upon the present uncertainty.

"However, a careful reading of its very short and concise paragraphs leaves one with a feeling that the definitions are fully as vague as the Sherman Act itself; and, instead of improving, it further complicates a situation which has begun to be clarified.

Trade Relations Bill.

"This bill makes it a violation of the Sherman Act to discriminate in price, for the purpose of injuring a competitor or to fix a price upon the understanding that the purchaser shall not deal in the goods of a competitor, and prohibits mines from refusing to sell to responsible people who apply to purchase.

"The prohibition against discrimination in prices is intended to create sane instead of free competition and I think may prove to be a good provision.

"As to prohibiting the fixing of prices upon the understanding that the purchaser shall not deal in the goods of a competitor I do not view that as revolutionary although it might cause inconvenience to some to adjust themselves to it. On the whole, I think it is fair.

"The provision concerning mining companies is aimed to do away with price fixing, but I am not sufficiently familiar with that business to say how it would work.

"It seems to me that there should be included in this bill a provision such as that recommended in the report of the Committee on Interstate Commerce from which I quote:

"'There ought to be a way in which men in such a venture could submit their plan to the government and inquiry made as to the legality of such a transaction; and, if the government was of the opinion that competitive conditions would not be substantially impaired, there should be an approval, and insofar as the lawfulness of the exact thing proposed is concerned there should be a decision. and if favorable to the proposal there should be an end to that particular controversy for all time.'

"Section 13 of this bill, which permits any person to sue out an injunction against threatened loss or damage, might subject a large company to a multitude of strike suits. It should certainly be amended.

Anti-Holding Company Bill.

"I have never seen a draft of this bill and I believe none has been printed, so a consideration of it is somewhat premature, but it is to my mind fraught with more danger than any other of the business bills recently proposed.

"It will be impossible to prohibit all holding companies without financial disaster, and just how the good can be separated from the bad in an act of Congress I cannot imagine.

"Public utility holding companies, for example, are sound in principle, even though some are not so in practice.

"Practically all large corporations are holding companies to some extent and in many cases they are compelled to be so by the operation of state laws.

"This bill deserves the most careful analysis and its final draft will be looked for with great interest.

"Such a brief summary of these bills is entirely inadequate for any other purpose than to point out the extent to which the federal government proposes to regulate the business affairs of the country, and I have some fear that the impression which will be conveyed by the views which I have expressed will be one of doubt as to whether I am a reactionary or a progressive. I believe no good results can be obtained through wholesale condemnation, and I do not fear the principles which I have outlined, but I do fear the unknown dangers of untried legislation and should have preferred to see such vital changes tried one at a time; but, if that cannot be, I hope the government will finally resolve all doubtfully dangerous provisions on the side of intimidated and apprehensive business interests."

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Utah Society of Engineers Hears Talk on Radium.

L. O. Howard, a Salt Lake mining engineer and associate editor of the *Salt Lake Mining Review,* gave a talk at the regular meeting of the Utah Society of Engineers at its regular meeting at Salt Lake City on February 20, on the development of Utah radium-bearing ores. Mr. Howard said that through discussion in technical and popular magazines, doubtless propagated to a great extent by the publicity furnished by the Bureau of Mines and the recent hearings before a congressional committee on the question of withdrawal of control of the radium-bearing lands as yet unlocated on the public domain, radium has become a matter of much interest to layman as well as scientist. It has been the inevitable result of so much publicity that the public has been grossly misinformed on the subject, both as to the condition of radium therapeutics and with regard to the extent and value of our ores. Concerning Utah deposits little has been published of a reliable nature and the bulk of the people are unaware of the position that Utah has today in the furnishing of ore for radium production.

The impression has been general that we had to look for our radium to Europe; that we did not know how to make it in this country; that the well known ability of foreign chemists has placed America in a humilitating position. It is, however, no longer necessary to depend on a foreign supply. We are today making radium in our own plants in comparatively large quantities.

In connection with the radium in our ores there are two other metals of considerable importance—uranium and vanadium. In Utah the ores of vanadium, uranium and radium are found in several localities in the eastern section. The ore occurs in a sedimentary formation. The beds have suffered considerable erosion, but when this has not been too deep, a thin bed of quartzite lies on the highest portions. Beneath this is a medium coarse to fine conglomerate. Beneath the conglomerate lies a coarse-grained white sandstone, underlaid by a thin seam of green shale.

The ore is found principally as an impregnation of the sandstone and lies in any part of the same near the surface, sometimes immediately underneath the conglomerate, at others on top of the shale. The conglomerate is sometimes the source of valuable ore and occasionally the quartzite shows a slight mineralization. The principal mineral is the canary-yellow carnotite, whose color is often obscured, and a variety of earthy minerals usually accompany it. The various minerals present a startling array of colors—black, all shades of green, yellow, blood red. The black is sometimes glossy, like coal, sometimes talcy, and sometimes dull earthy. These are usually the best grades of ore. It occurs in pockets from a few inches up to five or six feet thick. Utah has an undoubtedly large resource in carnotite ores.

Radium, as put on the market, comes in the form of a radium-barium chloride, and not in the metallic state. A certain amount of radium contained in a relatively large bulk of the salt is just as effective as the same quantity would be in the metallic state and, in addition, some bulk is given by the radium preparation so that it is easily handled, divided or applied, and the useless cost of producing the pure metal is avoided.

The price at which radium sells at present ranges from $120 to $180 a milligram of metallic radium. Price is dependent on several factors, chief of which is the quality of the product. Closely connected with this factor is that of the responsibility of the seller.

Exports of Copper.

During the month of January, 1914, the exports of copper from this country amounted to 36,018 tons, compared to 25,026 tons in January, 1913. During the first half of February the copper exports totaled 18,602 tons; for the week ended February 26, 3,950 tons.

A Severe Storm in Los Angeles and Vicinity.

A storm of unprecedented violence, attended by the heaviest rainfall ever recorded in the history of Southern California, broke over Los Angeles on February 18, and continued without abatement until midnight, February 22. In all, 7.4 inches of rain fell in the City of Los Angeles, and some of the suburban towns registered a fall of 12 inches.

The flooding of rivers and other natural and artificial drains was responsible for serious damage to private property, and to city and county streets and bridges; while the public-utility corporations have reported heavy losses from curtailed revenues due to inability to operate, and to plant destroyed or damaged.

Recent estimates of the damage sustained by various interests are as follows:

Damage to private property	$ 500,000
Cost of repairing city streets and bridges	60,000
Cost of rebuilding county roads and bridges	75,000
Losses sustained by steam roads	1,250,000
Losses by interurban electric railways	125,000
Losses by city electric railways	25,000
Losses by power, telephone and telegraph companies	65,000
Total	$2,100,000

On Saturday morning, February 21, the Pacific Electric Company, which handles the interurban traffic out of Los Angeles, found it impossible to move a car, owing to wrecked bridges or washed-out roadbeds. By noon of that day, its line to Pasadena was in operation and other lines began coming in from time to time as temporary repairs were made. It was necessary for some time to have passengers make walking transfers at points where bridges have been totally destroyed, or where there has been a complete failure of the road bed.

From 6 a. m. to 9 a. m., all cars of the Los Angeles Railway Company, which handles the city traffic, were stalled, due to the washing out of pole lines between the Pacific Light & Power Corporation's substation and the railway company's net work.

The Southern California Edison Company's 60,000-volt steel-tower line running between the Long Beach steam plant and Los Angeles was washed out by the flood waters, and several towers of the Kern River 60,000-volt line, which runs along the bank of the Los Angeles River within the city limits, were destroyed. The Kern River plant is the Edison Company's largest hydroelectric development.

Aside from the destruction of some of its distributing lines, one of which is noted above, the Pacific Light & Power Corporation came through the storm in good shape. Its new 150-000-volt line, 275 miles in length, running from Big Creek to Eagle Rock, just outside the city limits of Los Angeles, recently constructed by the Stone & Webster Corporation, remained in service and was the only source of power for the railway companies for a considerable period of time.

The Pacific Telephone & Telegraph Company's long-distance lines were out of service to San Francisco, Santa Barbara, Bakersfield, San Bernardino and Arizona points. The line to San Diego was the only one intact. Long-distance service was restored to all points except Bakersfield by Sunday night, February 22. The Western Union Telegraph Company and the Postal-Cable Telegraph Company were handling no business, with the exception of one wire to Chicago.

Normal conditions as to service were soon restored, but it will be several months before permanent repairs can be completed.

Census Report on Telephones.

Preliminary figures of the forthcoming quinquennial report on telephones of the United States have been given out by Director W. J. Harris of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of W. M. Steuart, chief statistician for manufacturers.

The statistics relate to the years ending December 31, 1902, 1907, and 1912. They include the total wire mileage and the total number of telephones reported for all systems in the United States that were in operation all or any part of those years. They do not include private telephone lines used exclusively for communication between different departments of the same establishment unless connected with lines elsewhere through a private or branch exchange. The number of telephones includes all installed, including those furnishing service through private branch exchanges, local pay, and outlying toll stations.

During the year 1912 the length fo wire used on the telephone lines of the United States amounted to 20,248,326 miles. This represents a gain of 15,347,875 miles during the decade, or an increase of 313.2 per cent; there were 8,729,592 telephones in use, or 6,358,548 more than the number reported for 1902, an increase of 268.2 per cent.

The number of telephones reported

by the Bell Telephone System increased by 137.8 per cent during the period from 1902 to 1907, and by 62.4 per cent from 1907 to 1912. During the same periods the number of telephones reported by all other companies and systems increased by 183.4 per cent and 22 per cent, respectively. In 1902 the Bell System controlled 69.1 per cent of the wire and 55.6 per cent of the telephones in use. In 1912 this system controlled 74.7 per cent of the wire and 58.3 per cent of the telephones. The proportion of the total wire mileage and total number of telephones owned by the Bell Telephone System has increased during the decade, while that owned by the independent companies has decreased.

The purpose of telephone companies is to afford communication between distant points, and the amount of business is usually expressed by the number of separate messages or talks that pass over the wires. While some companies keep an accurate account of the number of messages, as a rule no record is made from which accurate statistics can be compiled. It is estimated that there were 13,735,658,245 messages or talks sent over the telephone lines of companies which had an income of at least $5,000 during 1912. A message may represent either a few words or a long conversation, and therefore does not indicate the extent to which the equipment is used. It was impossible to obtain even an estimate of the number of conversations over the private branch wires and the party lines which do not require interconnection at the public or central exchanges. No estimates were required concerning the number of messages for the 1,402,844 telephones on the lines of small companies which had an income of less than $5,000 during 1912. Messages for these smaller systems were included to some extent in the census of 1902; therefore the statistics of messages reported for the three years are not strictly comparable, and they should not be considered as representing the total amount of business transacted by telephone systems of the United States during the year 1912.

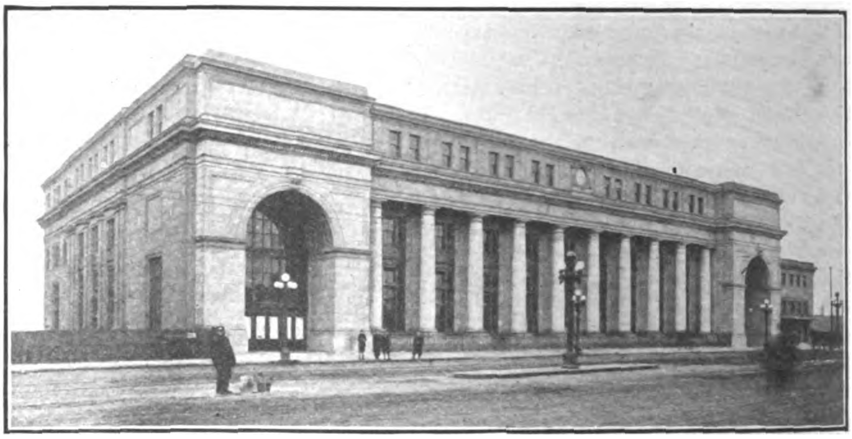
The figures in detail are shown in the following table:

	Year.	Miles of wire.	Number of telephones.	Estimated number of messages or talks.[1]
United States	1912	20,248,326	8,729,592	[2]13,735,658,245
	1907	12,999,364	6,118,578	[2]10,400,433,958
	1902	4,900,451	2,371,044	5,070,554,553
Bell Telephone System	1912	15,133,186	5,087,027	9,133,226,836
	1907	8,947,266	3,132,063	6,401,044,799
	1902	3,387,924	1,317,178	3,074,530,060
All other companies and systems	1912	5,115,140	3,642,565	4,602,431,409
	1907	4,052,098	2,986,515	3,999,389,159
	1902	1,512,527	1,053,866	1,996,024,493

Electrical Features of New Terminal in Minneapolis.

The new $2,000,000 Great Northern Railway Station in Minneapolis, Minn., which was opened for service January 22, is claimed to be the final word in modern terminal construction. It stands on the river-front facing Hennepin Avenue. The main building has its entrance on the street level. The waiting room is 62 by 155 feet, and the concourse 252 by 50 feet, with stairways and elevators leading to train platforms.

The electrical equipment of this new Great Northern station is said to be the finest in the Northwest, as well as the most extensive. More than eleven miles of galvanized iron conduit was used, and more than 25 miles of rubber-covered wire. All of the wire used in this installation is of a quality better than standard adopted by the National Board of Underwriters, the insulation being 30 per cent pure para rubber.



New Railway Terminal in Minneapolis Using Electricity on a Large Scale.

The main waiting room and train concourse are lighted by large ornamental chandeliers with tungsten units. In the new depot, Minneapolis people are given their first sight of recessed lights at the base of all stairway landings, minimizing mis-steps in going down these stairways.

More than 500 switches are used for controlling the various lighting circuits in addition to which there are a number of remote-control switches for controlling groups of lights from various remote locations in the station. All of the remote-control points have small lamps back of a bulls-eye lense to indicate if the lights located at a remote point are burning, or are cut off.

The powerhouse, for furnishing the light, heat and power to the station, is located approximately 1,000 feet north of the building, the wires for supplying light and power and the steam for operating pumps and for heating purposes being carried through an aerial passage-way connecting the two buildings.

The generating plant consists of two simple and one compound engine being directly connected to two 25-kilowatt and one 350-kilowatt direct-current 220-volt generators, making a total of 850-kilowatts. The switchboard for the control of this machinery consists of a six-panel slate board 15 feet long, located along the west wall of the engine room. This is equipped with all the latest instruments for determining the voltage of the generators, the load under which they are operating, and the total amount of current supplied to the building during any given interval.

All of the electrical equipment, including generators, switchboards, panel-boards, conduit and wiring, was installed by the Minneapolis Electric Equipment Company.

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Washington Office for National Independent Telephone Association.

In order to be able to keep in close touch with the Interstate Commerce Commission and with other Federal authorities concerned with interstate telephone business, the National Independent Telephone Association has established an office at Washington, in charge of F. B. MacKinnon, secretary of the Association. Through this office every effort will be made to co-operate with the Federal Government in the investigation and regulation of long-distance telephone business. The address of the office is Rooms 526 and 527, Colorado Building, Washington, D. C.

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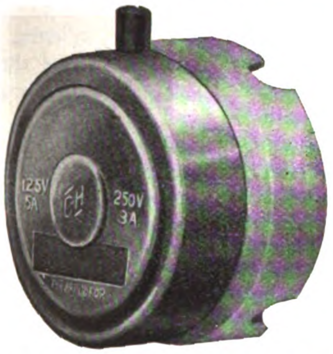
[1] The number of messages reported by the Bell Telephone System includes only completed calls, while the figures for all other companies may include some original calls not necessarily completed; such as calls that the operator reports as "Line busy" or "Does not answer."

[2] Exclusive of companies with an annual income of less than $5,000.

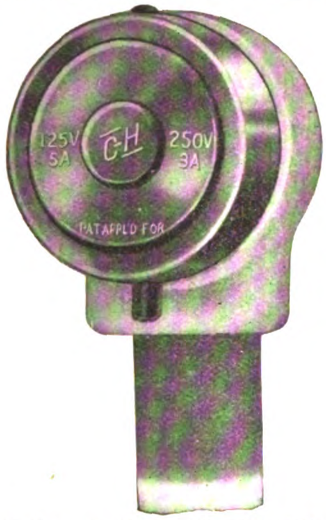
New Electrical and Mechanical Appliances

The Cutler-Hammer Snap-Switch Line Extended.

To the original rectangular and round-base snap switches known as Nos. 7,102, 7,103, 7,107 and 7,108, the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has added a number of new styles making the line complete for use with all wiring systems. The six new styles are designated as catalog numbers 7,109 to 7,114, inclusive. A new and important feature is provided on all the circular-base type switches. This is a snap-locking cap which eliminates the use of screws and saves time in installing. There are two small slots in the side of the cap diametrically opposite each other and near the push-buttons. These slots engage with two nibs secured to the base. To remove the cap, the sides are pressed together and upward which produces a bulge and allows one slot to be released from its nib. The cap is replaced by first engaging one slot, then pressing the sides so that the other slot slips over its nib and locks in place. No screws need be handled and no time is lost.



Push-Button Snap Switch with Slotted Base.



Push-Button Switch with Metal-Molding Base.

The same simple push-button mechanism is used which makes unnecessary the rotating button at the front of the switch. All the switches are indicating, as one button is dark and the other light. The caps are furnished plain or with a label holder for designating the circuit or lamps controlled.

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Electrically Driven Collier "Jupiter" Makes Good Record.

The electrically driven collier *Jupiter* has scored a signal success on her trial trip, just completed off the Lower California coast. Though rated as a 14-knot boat, she maintained an average speed of 15.1 knots for 48 hours, during which time the electrical machinery revolved the propellers at the rate of 115.7 revolutions per minute, developing 6,940 horsepower.

This is the first time the system of electric propulsion has been tried on any naval vessel, and the department officials are greatly pleased at the result. The *Jupiter* was, in competition with the collier *Neptune*, fitted with a reduction gear calculated to bring the speed of her turbines down to the point of economy by gearing, and with a third collier—the *Cyclops*—fitted with reciprocating engines. All three vessels were of the same size and similar lines, and the *Jupiter's* performance, which exceeds that of the two others, may have an important bearing on future naval design.

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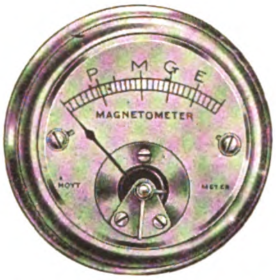
Hoyt Magnetometer for Testing Ford Automobile Magnetos.

Magneto troubles are a frequent source of annoyance to the motor-car user. The advantage of using a magneto on account of the simplicity of the arrangement is appreciated by many motorists and this has created a demand for some means of indicating whether the magneto is in good working condition.

To meet this need the Hoyt Electrical Instrument Works, Penacook, N. H., has developed a form of magnetometer designed particularly for use with model T Ford cars, which have become so popular.

The magneto used in these cars has met with much favor on account of its simple arrangement and reliability of operation if kept in reasonably good condition. By the use of the Hoyt instrument a simple check is kept on the condition of the magneto. The instrument itself is but two inches in diameter and is designed to be fastened to the dashboard of the car. It is permanently connected to the magneto so that at all times it indicates the magneto output.

An exhaustive series of tests with the magnetos used on this type of Ford car show that they usually slowly reach a point at which the magneto, although generating, does not satisfactorily ignite the charge. This point is indicated on the scale of the new instrument by the letter "P", meaning poor. Another point at which the magneto will operate without skipping but ignites the charge rather slowly is indicated by the letter "M", meaning medium. The lowest point at which efficient ignition takes place is indicated by the letter "G" for good. The most perfect condition is indicated by the letter "E" for excellent.



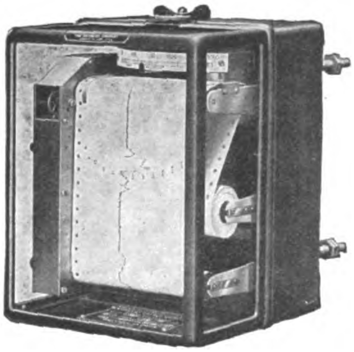
Instrument for Testing Ford Automobile Magnetos.

In installing the Hoyt instrument it is not necessary to disturb any of the regular wiring of the car. It is readily installed and does not require an expert electrician for this purpose. Its use serves to inform the car user when the magneto needs attention and its indication also gives a clue as to the nature of the trouble. The instrument is constructed of high-grade material; its construction is such as to make it little liable to change.

Esterline Graphic Meters.

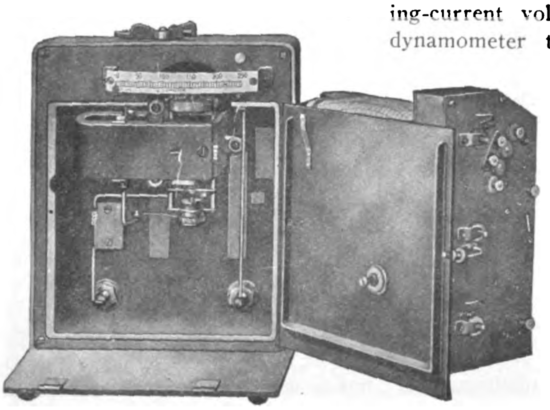
A complete line of continuous curve-drawing instruments has recently been completed and placed on the market by The Esterline Company, Indianapolis, Ind. These instruments are now furnished for the measurement of all electrical quantities, such as volts, amperes, watts, etc. Electric speed recorders, service recorders, pyrometers and graphic counters are also included in this line.

These meters are furnished in switchboard rear-connected type, wall or front-connected type, and in the portable type.

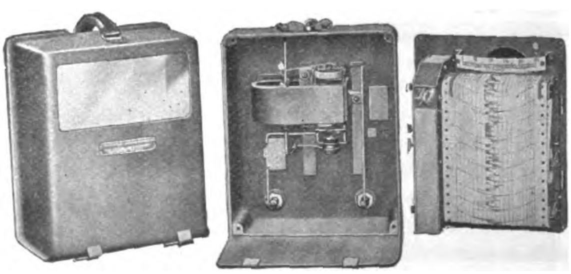


Switchboard Curve-Drawing Instrument.

The general construction of all these types is the same with the exception of the case and the method of making connections. The clocks, meter elements and recording mechanism are the same in all types.



Portable Meter with Clock Door Open.



Portable Meter—Cover and Clock Removed.

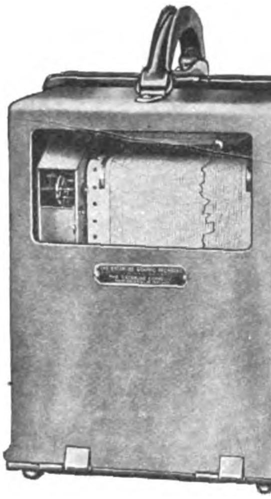
These instruments are of the direct writing type. The pen is in contact with the paper at all times when writing. It is placed in the end of a tubular pointer which is pivoted and provided with a counterweight. The pressure of the pen on the paper is regulated by this counterweight which is adjusted so that there is just sufficient pressure to hold the pen on the paper without creating heavy friction.

The ink supply is retained in a stationary well provided with a cover to prevent spilling of the ink when instruments are moved about. This ink well is located just in front of the armature staff. The tubular pointer is provided with a crook at the back end which dips down into the ink well. The ink, after being started through the pointer and pen, will continue flowing due to capillary action as long as the ink supply lasts. This construction results in a light moving element and constant friction no matter how much ink there is in the instrument.

The clock is of the eight-day jewel-balance-wheel type. It is provided with two driving springs and a third spring which operates the rerolling device provided for winding up the finished chart. On some types the reroll is omitted and the finished record allowed to feed through a slot in the bottom of the case. The clock is fitted with a driving roll equipped with pins at each end which engage perforations along the margin of the record chart. The driving roll is geared through the two idlers to the clock stud which furnishes the driving power. Different combinations of gears are supplied so that five chart feeds, 0.75, 1.5, 3, 6 and 12 inches per hour, may be obtained on any clock by putting on the proper gears. For furnishing rapid chart feeds, a special attachment is provided on the clock, arranged so that shifting a small lever on the front of the clock case instantly changes the chart feed from a given number of inches per hour to the same number of inches per minute. The clock is mounted in a dust-proof case and attached to the door, which in turn is held by four screws.

Meter elements are assembled complete in one unit and may be removed from the instrument without dismantling. For direct-current ammeters and voltmeters a powerful D'Arsonval permanent-magnet type movement is used. For direct and alternating-current wattmeters, alternating-current voltmeters and ammeters a dynamometer type construction is employed. No iron is used in the magnetic fields of the dynamometer movements so that meters of this type are accurate on all frequencies and respond promptly to voltage or load variations. The armature shaft of the meter element is provided with a bracket which carries pivots in which rest the pointer carrying the pen.

Record charts are of continuous web or tape type being 6 inches in width and having a ruled portion 4.5 inches wide. The time divisions are in the nature of arcs across the paper spaced 0.75 inch apart. Range numbers are provided across the chart to facilitate interpretation of curves. Hour numbers corresponding to the gears on the clock are printed along margin opposite the time arcs. Voltmeters are furnished with suppressed-zero scales ranging 90-140 volts or standard scales 0-150 volts. Direct-current ammeters are also furnished with the suppressed-zero scales for special uses or may be furnished with zero-center charts for battery charging or other applications where reverse currents are encountered. Indicating scales are provided above the record charts so that meters may be used either for indicating or curve-drawing purposes. Record charts are of sufficient length to last two weeks at three inches per hour.



Portable Curve-Drawing Instrument.

Alternating-current instruments are provided with adjustable damping devices consisting of a rotating vane immersed in a small cup containing oil or some other viscous liquid. The amount of damping is varied by adjusting the height of the cup, the quantity of oil or the quality of the liquid. Direct-current meters do not require damping as the armature is wound on a metallic frame in which eddy currents are induced when the armature rotates in the magnetic field of the permanent magnet.

The power consumption on these instruments is so low that they may be operated from shunts or transformers already installed. Voltmeters and wattmeters require from 4 to 5 watts for each voltage element on 110 volts. Direct-current ammeters consisting of millivoltmeters and shunts require only about one-third ampere for the instrument. Due to the direct writing construction, no extra control circuits of any sort whatever are made use of.

These instruments are used on switchboards for obtaining voltage and output curves. They are used for getting power consumption of motor-driven tools and for general efficiency engineering. These instruments are especially valuable when it is desired to get an accurate record of power consumption in circuits where the load is fluctuating very rapidly.

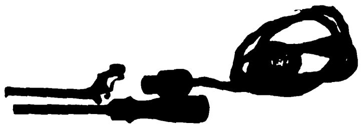
Westinghouse Electric Curling Iron.

A new electric curling iron is being manufactured and sold by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This curling iron can be used with stored heat, as with the flame-heated curling iron. In addition, it can be used with continuous heat, a use which cannot be obtained with the flame-heated iron.

For use with stored heat, the iron is first heated by connecting it to the electric circuit. When it is hot, the swivel plug is pulled out, disconnecting the cord and electric circuit. It is then like the ordinary curling iron and is used in the same manner. When it gets cold, the plug is pushed into place until it is hot again.

Electric Curling Iron Complete.

When it is used with continuous heat, the swivel plug enables the user to grasp the iron in such a way that it can be freely rotated by the thumb and fingers without twisting the cord. It can be used with or without the hair clamp, which is easily removable.



The Three Main Parts of the Electric Curling Iron Disassembled.

This iron is said to be the result of long study and experimentation. It is claimed to be exceptionally simple, reliable and rugged in construction. The heating element is in the form of a rod inserted directly into the barrel. It can be removed by loosening two screws in the handle. In case the heating element burns out from misuse, it can therefore be replaced with less than five minutes' work. The heating-element terminals are positive in action, there being no possibility of loose contacts. The swivel plug, which fits into the end of the handle, is formed of specially prepared molded composition and will not break if dropped. In this plug are carried strong spring contacts which make connection with the terminals of the heater. The cord is attached to these contacts within the swivel plug. There are no exposed terminals and hence no live parts.

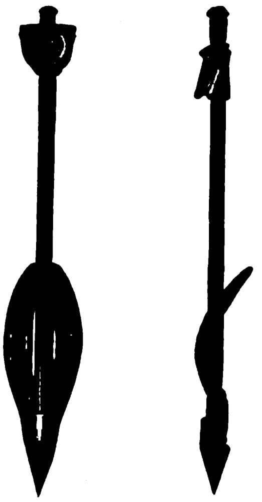
As the input is only 15 watts, it costs only about one-tenth of a cent an hour to use this curling iron with the average price for current.

All metal parts are nickel plated and highly polished. The handle is of wood, black-ebony-finished and highly polished.

The Red-Top Drive Anchor.

With the approach of spring, electrical companies operating overhead circuits are planning their new construction work and also considerable reconstruction necessitated by the violent storms of the last few weeks. In all such work the proper guying of lines calls for the use of many earth anchors.

Of the newer types of anchors suitable for light construction work, one that has been meeting with much favor is the Red-Top drive anchor manufactured by the Universal Cable Grip Company, Syracuse, N. Y. This is an extremely simple anchor, consisting of but three parts; these parts are so joined that they come all ready for use without need for assembling and without danger of loss of any part in shipment.

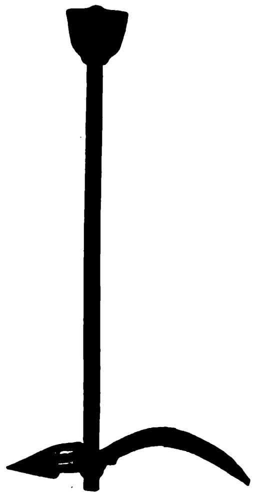


Front and Side Views of Red-Top Anchor in Driving Position.

The rod forming the central part of the anchor is made of special high-carbon steel and has a simple forged shoulder near the lower end and an upset top end. This rod is used both for driving the anchor into the ground and as the guy rod for holding the strains. Driving is very easy in any kind of soil and requires no special tools.

A combination driving point and slug is so shaped as to fit on the rod and offer both a sharp point for driving and at the same time but little resistance to driving in its body. The point is shaped to form a socket for the lower end of the rod so that the driving blows on the rod are transmitted directly to the point. The body of the slug is curved and corrugated to offer great resistance to bending or distortion under strain.

The third part of the anchor is the swivel thimble at the top. This replaces the forged eye in the rod and the galvanized thimble of the ordinary anchor. The thimble forms a serviceable and very convenient means for attaching the guy strand. Its swivel arrangement permits the natural turns in the guy to twist out when the strain is placed on it. The swivel thimble is finished in bright red waterproof enamel; from this the anchor gets its name "Red-Top"; since this red thimble is always above the ground, it serves as a constant warning against stumbling over it.



Red-Top Anchor with Slug Transversely Extended as It Is in Service.

In the first two views herewith are shown front and side views of the anchor in driving position. When the anchor has been driven in place and the guy strand slipped over the swivel top, pulling up on the guy causes the shoulder of the rod to draw up against the hole in the slug. The latter therefore begins to curve out and presently assumes a position at right angles to the rod. Beyond this it cannot turn on account of the shape of the slug.

The latter position is shown by one of the illustrations, which makes clear why the Red-Top anchor has a strong holding power with its maximum surface transverse to the strain.

New Wireless Stations.

Two high-power wireless stations have been opened at the extreme north and extreme south of New Zealand.

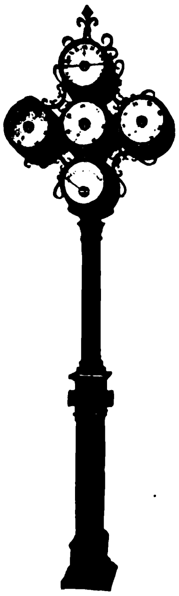
Instrument Posts for Electrically Operated Control Outfits.

Instrument posts are used whenever a device is required upon which to mount meters in a power station in place of using an instrument switchboard. The wiring is concealed in the interior of the posts. The advantages of instrument posts over panel switchboards are that they permit a very convenient and ornamental mounting for meters, besides locating them in such a position that they can readily be observed without obstructing the general view of the operator.

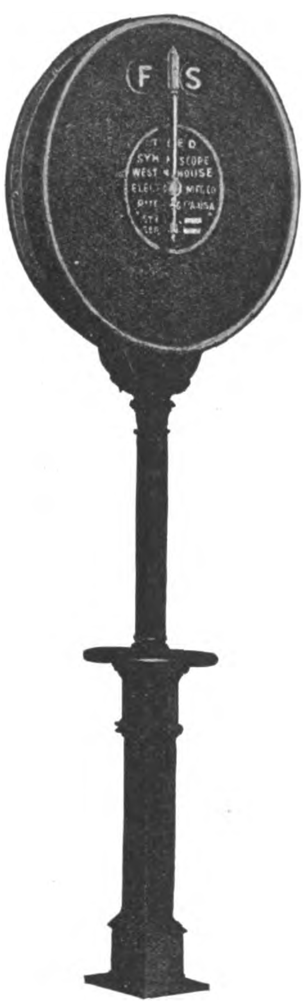
The usual arrangement is to place these posts so as to form a support for the railing of an operating gallery, each post being placed in front of its respective controlling apparatus which is usually located on a suitable controlling pedestal.

The posts may be secured to the floor either by bolting the shank to the side of channel-iron beams located under the floor, or by using a bolted flange collar, secured to the post and provided with holes for holding down bolts. When a concrete floor is provided, a socket can be supplied which may be set into the floor, and which is arranged for bolting to the flange collar. Standard ornamental posts have plates provided at the places where hand railing is usually attached, but when required hand-rail bosses may be substituted. These bosses are drilled to take a standard two-inch pipe. Posts with panel bases are not arranged for hand railing. Standard posts are finished in dead black. The posts having paneled bases are supplied with panels of slate with black marine finish.

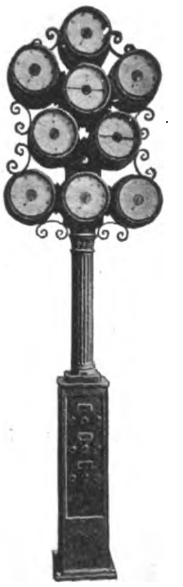
Two styles of pedestals are made, with ornamental bases and with paneled bases suitable for mounting control apparatus. Each of these styles is also made with stationary top and with swivel top which can be turned about by means of a handwheel just above the base. These instrument posts are manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.



Stationary Instrument Post with Ornamental Base for Railing.



Swivel-Type Synchroscope Post with Ornamental Base.



Instrument Post with Paneled-Slate Base.

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Electric Power for Freeport, Tex., from Sulphur Mine Plant.

Freeport, Tex., is soon to have a new electric lighting and power system suitable to meet the needs of this growing seaport. In connection with the new superheated water and power plant now being installed at the Freeport Sulphur Company's mines at Bryan Heights, a new central electric power plant has been recently included in the plans, and will be installed in the next few months. This plant through transmission lines, it is announced by the company, will supply electric light and power to Freeport.

The amount of electricity furnished will be ample for the city, meeting all the requirements of the present and for some time in the future. It will take the place of a much smaller plant now in operation here, and do away with the need for any larger plant being installed in the city for a number of years to come.

The electric current which will be furnished to Freeport and the sulphur mines from this central power station will be generated by a 200-kilowatt Westinghouse steam-turbine generator set. This central power station will be ample to do all the work at the mines at Bryan Heights, in which electric power can be used, such as operating electrically driven pumps to pump water from the canal, and fuel oil from the storage tanks on the Freeport ship channel to the mines, providing power for the machine shop and for commercial and domestic lighting and power at Freeport. The station will be installed by Westinghouse, Church, Kerr & Company, of New York City, in connection with the other new $125,000 developments now being put in at the mines by the Sulphur Company.

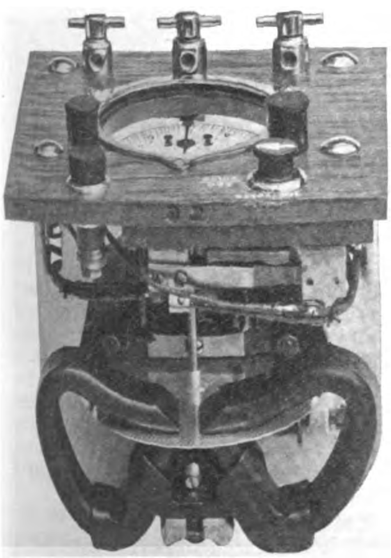
The new sulphur conveyor and loading devices installed by the Sulphur Company at the Seaboard & Gulf Steamship Company's pier on the Freeport ship channel, which has a capacity of 3,600 tons per day for loading vessels with sulphur, is now completed, and ready for operation. It is expected that the first shipload of sulphur to be loaded and shipped from this port will leave here on one of the Seaboard & Gulf Steamship Company's boats within a few weeks. A new loading equipment for handling this product at the mines has also recently been installed and is now in operation. It consists of a Brown hoist, with a loading capacity of 30 carloads of sulphur a day.

Electrically Operated Valves for New York High-Pressure Pumping System.

Three electrically operated valves are now being installed in New York's high-pressure fire system. One of these valves, which is located at Stone and Whitehall Streets, is an accessory to the duplex system and the other two, one at Hudson and North Moore Streets and another in the Bowery just a little south of Houston Street, are for the purpose of separating or uniting the two pumping districts. The last two mentioned are a notable improvement in the system and would demonstrate their enormous value in case of a break in one of the mains. The engineer in either pumping station could, by throwing a switch, instantly separate the two districts until the broken part could be isolated, without interrupting the service in the unaffected district. On the other hand, if either of the pumping stations should be crippled the valves could be opened and the entire high-pressure systems supplied by the working stations.

Each valve is operated by a five-horsepower motor located in the vault beneath the street. The Hudson and North Moore valve is controlled from the pumping station at Gansevoort Street and the North River, while the valve in the Bowery is controlled from the station at Oliver Street and the East River. Special control boards are being installed in both stations to take care of these valves. There is also a control board in each vault at the manhole for rare cases of emergency.

The electrically operated valve at Stone and Whitehall Street is the third valve of the duplex system, the other two being in Houston Street east of the Bowery and at New Chambers Street and New Bowery. The new one will be operated by a three-horsepower motor in the vault controlled as are the other two valves on the duplex system from the Oliver Street station. The duplex system consists in reality of two interlaced but independent systems which connect only at three points, the connections being controlled by the valves electrically operated from the pumping station. A break on either system will immediately show itself on the Venturi chart or pressure gauges on the pumping station outlet to the system and the simultaneous closing of the three valves will isolate the crippled system in about one minute, the other system continuing in operation. Roughly speaking the duplex system covers the territory south of Houston Street all the way to the Battery and east of the Bowery, Park Row and Nassau Street.



Test Meter Removed from Case.

Light-Weight Portable Test Meter.

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A New Light-Weight Test Meter.

A new alternating-current test meter has been placed on the market which will materially lighten the burden of the test man. The meter weighs but 7.75 pounds and has outside dimensions less than 6 inches square by 7.5 inches high when closed. The meter is contained in an antique-finished oak case provided with a leather strap for carrying.

The moving element is an aluminum disk mounted on a shaft of aluminum alloy. Attached to the shaft is a large hand which indicates on a large dial in hundredth parts of a revolution. Two smaller pointers with corresponding dials are located on the large dial. One of these small pointers makes one revolution for every ten of the larger pointer while the other makes one revolution for every 100 of the large one.

The current coils are of one and ten amperes capacity, making this meter suitable for testing meters of capacities up to 15 amperes on both heavy and light loads. In series with the one-ampere winding there is a fuse of small current-carrying capacity protecting this winding from being burned out by accidental overload or short-circuit.

The meter is provided with micrometer for light-load adjustments. By the use of this meter 90 per cent of the alternating-current meters of the average central station, including polyphase meters, may be tested quickly, conveniently, and accurately at the point of installation.

The test meter described above is known as the IB-5 and is manufactured by the General Electric Company, Schenectady, N. Y.

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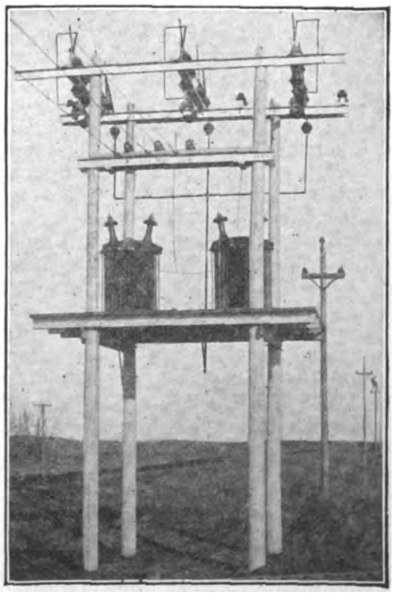
Outdoor High-Tension Substations.—A Correction.

Under the title "Standard Outdoor High-Tension Substations." an article was published in the January 24 issue of the Electrical Review and Western Electrician describing and illustrating the standard 22,000-volt, three-phase substation manufactured by the Delta-Star Electric Company, Chicago, Ill. An incorrect illustration was used, the station described in the article being shown in the accompanying illustration. The illustration shown in the previous article was that of a station which was designed by Sargent & Lundy, of Chicago, and is one of several operating on the lines of the Central Illinois Public Service Company. That substation was described in a paper by H. W. Young, president of the Delta-Star Electric Company, read before the Western Society of Engineers.



Standard 22,000-Volt Outdoor Substation.

Current Electrical News

LIGHTING AND POWER.

(*Special Correspondence.*)

DARTMOUTH, MASS.—This town is considering the installing of electric street lighting. W.

PALM BEACH, FLA.—Charles Kennedy will erect an electric plant and ice factory.

CALLAO, MO.—At a special election the proposition for a municipal lighting plant carried.

CAVE CITY, KY.—S. B. Davis states a company is being organized to install electric light plant.

PALM BEACH, FLA.—Atlantic Fish Company will build an electric light, cold storage and ice plant here.

ELKPOINT, S. D.—Work will be commenced at once on a $25,000 municipal electric light plant. Address the city clerk.

MICANOPY, FLA.—$10,000 will be expended for the construction of an electric light plant. Address the mayor for particulars.

ARCADIA, CAL.—The city clerk has called for bids for a 50-year electric franchise in this town, bids to be opened on April 4.

LANGDON, MINN.—The citizens have subscribed $7,500 for the proposed electric line to be established here. Address the city clerk.

SCOTLAND NECK, N. C.—$10,000 will be expended improving the electric light plant. Address A. L. Purrington for information.

BARTOW, FLA.—$20,500 of municipal bonds for improving the electric light plant were voted. Address Robert C. Halton, mayor, for information.

MASON, OHIO.—The Village Council has retained Seidl and Hausman, of Cleveland, to prepare plans for a municipal electric lighting system here.

ROWLAND, N. C.—The town will construct an electric light plant. $30,000 in bonds will be issued. Address J. McR. Bracy, mayor, for information.

THATCHER, ARIZ.—The Gila Valley Electric, Gas & Water Company has applied for a franchise to operate an electric lighting system in this town.

CEDAR FALLS, IOWA.—March 20 bids will be received by the County Board for an electric plant for the infirmary. Address J. J. Rainbow, architect.

ST. JOHN, KANS.—An agitation is in progress here for the installation of a municipal ice and electric light plant. Address the city clerk for particulars.

LOUISVILLE, KY.—The city is planning an automobile repair shop for which motor equipment may be needed. The Board of Works may be addressed in regard to the matter. G.

MOUNT HOLLY, N. J.—The Asylum Committee of the Board of Freeholders will immediately install an electric lighting plant at the institution named. A.

LOUISVILLE, KY.—The Louisville Pillow Company is to purchase an electric freight elevator, load capacity 3,000 pounds. M. P. Kelley is general manager. G.

RAHWAY, N. J.—The Common Council is considering the installation of a municipal electric lighting plant. Investigations of cost, etc., will be made. A.

MILFORD, N. J.—The Borough officials will install a municipal electric lighting plant, bonds for which were recently approved by a vote of the citizens. A.

SHELBYVILLE, KY. — The Kentucky Utilities Company is planning to build a dam on Clear Creek for the purpose of insuring an additional water supply. G.

CHATTANOOGA, TENN. — The Chattanooga Plow Company will need 300 horsepower in motors, having decided to substitute electric current for steam. G.

EVANSVILLE, IND. — The Board of Public Works is planning a rearrangement of the street lighting system, involving the location of new lamps. G.

MOREHEAD, KY.—The municipal electric light plant was recently burned, with a loss of $10,000. The mayor and other officials are arranging to rebuild at once. G.

WAYNESBORO, MISS.—The Electric Light Company has been incorporated with a capital stock of $30,000 by C. C. Green, O. R. Green and J. A. Leggett.

MORRISTOWN, TENN.—The Mims Goodson Company will purchase electric elevators for installation in a six-story mercantile building which it will erect. G.

HUNTINGTON, ARK.—The Huntington Electric Light & Power Company has been organized here with a capital stock of $8,000. John Degen is president.

BOWLING GREEN, KY. — The Board of Public Works is getting estimates on the cost of installing additional equipment in its city electric light plant. G.

DUCKTOWN, TENN.—The Tennessee Copper Company is reported to be in the market for electrical power equipment for the operation of mining machinery. G.

KNOXVILLE, TENN.—The Knoxville Railway & Light Company is making preparations to begin work on the construction of an underground conduit system. G.

ARKANSAS CITY, KANS.—Burns and McDonald, of Kansas City, have prepared plans for the proposed electric plant. Address the city clerk for information.

ST. CHARLES, VA.—The Electric Transmission Company, plans to triple the capacity of its electric plant and transmission system, increasing to 35,000 horsepower.

LOUISVILLE, KY. — The Merchants' Ice & Cold Storage Company is planning to install two electric freight elevators. Address N. A. Hardin, manager. G.

UPPER SANDUSKY, O.—An ordinance has been passed by the City Council authorizing a bond issue of $25,000 for the erection of a municipal electric light plant. J.

HAZELWOOD, N. C.—The town will construct an electric light and water system. $15,000 in bonds will be issued. Address W. H. Cole, chairman, Finance Committee.

RHEA SPRINGS, TENN. — The Central Tennessee Development Company is reported to be considering the construction of a hydroelectric plant on the Tennessee River. G.

LOUDONVILLE, O.—Extensive repairs to the municipal electric lighting plant, involving the purchase of considerable new machinery, has been authorized by the local council. J.

ARKADELPHIA, ARK.—The Arkansas Power Company will expend $15,000 on improving the electric light plant. Address H. C. Couch, 308 State National Bank, president.

BENSON, S. C.—A charter was granted to the Benson Electric Light Company, capitalized at $50,000. The incorporators include W. S. Murchison, A. B. Hudson and others.

GORDONVILLE, TENN. — The Gordonville Electric Light & Power Company plans to construct a plant with a capacity of 50 kilowatts. Robert Harvey is in charge of plans. G.

RIVERSIDE, CAL.—The City Council is again reviving the proposal of installing an ornamental lighting system on Seventh Street between Rubidoux Mountain and the Santa Fe Depot.

VICTORIA, VA.—The town of Victoria is advertising a franchise for electric lights and also one for telephones. Address H. T. Faison, town clerk, in regard to these projects.

PAYETTE, IDAHO. — Pence & Went are preparing plans for a large electrical pumping station, to be built 2.5 miles southeast of the city, to be used in irrigating orchard lands. O.

LOS ANGELES, CAL.—The Pacific Light & Power Corporation will build a new substation at Vernon to cost about $175,000, and replace its former plant recently destroyed by fire. A.

HECTOR, MINN. — The Renville County Electric Company has been granted a franchise for electric lights and power system here, and a transmission line will be built from Bird Island.

EMERY, S. D.—A movement has been inaugurated to have Emery lighted by electric lights and it is expected arrangements will be made to install a lighting system. Address the city clerk.

BELLINGHAM, WASH.—Mayor J. P. De Mattos, in a special message to the City Council, recommended the bonding of this city for $400,000, to be used in building a municipal lighting plant. O.

RIALTO, CAL.—Bids will be received by the Board of Trustees until April 7 for a 59-year franchise for the transmission of electricity in this town, as applied for by the Rialto Light, Power & Water Co.

COLTON, N. Y.—An order has been issued by the Second District Public Service Commission, approving the construction and operation by Bernard H. Snell and Sara M. Snell of a power plant at Higley Falls in this town by June 1, 1914.

GREENVILLE, O.—Operating seven plants in as many different towns, the Greenville Electric Lighting Company has been authorized by its stockholders to increase its capital stock by $40,000, with which to make extensions to present lines. J.

CLEVELAND, O.—H. Whitford Jones, electrical engineer, has plans nearly ready for the new lighting system for the city of Mansfield. He proposes to specify nitrogen tungsten lamps. Complete plans will be ready early in March. R.

LINN CREEK, MO.—Central Missouri Power Company will organize to construct a hydroelectric plant to develop 3,000 horsepower at this place. There are plans to construct a dam, power house, transmission line, etc., at an expenditure of $250,000.

VANCOUVER, WASH.—The Clarke County Power Company is contemplating entering the electric light and power field in Clarke County, and is trying to interest the Commercial Club here in the proposition. J. H. Cunningham is chief engineer. O.

HEBER SPRINGS, ARK.—Arkansas Hydroelectric Company will expend $2,000,000 for a hydroelectric plant to develop 10,000 horsepower; will construct three dams of reinforced concrete, 100-mile transmission line to cost $75,000, and other facilities.

HELENA, MONT.—Citizens of the West Side recently petitioned the City Council for an ornamental lighting system similar to the one now in use on the East Side. Mayor Purcell is in favor of granting the petition, and the Council will take immediate action. O.

AKRON, O.—O. C. Barber, who hopes to receive from the city of Canton a franchise for an electric power plant at Howenstein, and a franchise in the city of Canton, is considering the extension of his service to cover Alliance, New Philadelphia and Massillon. R.

TACOMA, WASH.—The City Council has adopted the report of Commissioner Nick Lawson in regard to the matter of expending $1,896 in extending a transmission line to the city limits, and to furnish power for use at the county gravel pit near Lakeview. O.

ARMSTRONG SPRINGS, ARK.—D. E. Harrison, manager of the Armstrong Springs Hotel, is planning the installation of an isolated electric plant at once, and would like to receive catalogs and prices on 10-horsepower gas engines and six-kilowatt direct-current dynamos.

NASHVILLE, TENN.—The City Commissioners are reported to have approved plans for doubling the output of the municipal electric light plant so as to furnish electricity for commercial purposes. It is contemplated installing a turbogenerating unit costing $35,000.

COLUMBUS, O.—An improvement which has just been authorized by the City Council carries with it the placing of electric light wires, and all other wires except trolley, under ground. This is the first move in a general campaign for removing overhead wires from all down-town streets. J.

WINFRED, S. D.—The City Council of this city has opened negotiations with an electric light company at Howard to extend its wires to this place so Winfred can be lighted in a modern manner. If suitable arrangements can be made the necessary franchise will be granted the Howard Company.

ST. CHARLES, VA.—The Electric Transmission Company is reported to have plans for increasing the capacity of its plant to 35,000 horsepower, to enable it to supply current to a large number of coal mines. The Insull interests of Chicago, it is said, have purchased control of the company. G.

SPENCER, S. D.—Steps have been taken here to organize a stock company for the purpose of installing an electric light system. In the event that sufficient stock is not subscribed, it is probable a franchise for the lighting system will be granted to an outside company. Address John Krause for further particulars.

DAYTON, TENN. — The Dayton Light & Power Company has been formed with $100,000 capital stock by Chattanooga interests and will get power from the transmission line of the Tennessee Power Company. The Dayton company will build its own transmission line to the main line of the Tennessee Power Company. G.

KALAMA, WASH.—The Washington-Oregon Corporation, which owns and operates a network of power lines in Southwest Washington, extending from Tenino to Kalama, is considering the proposition of erecting a new $250,000 power house on the Kalama River, to replace the one recently destroyed by fire, which, it is said, was valued at $30,000. O.

WHITE SULPHUR SPRINGS, MONT.—Civic improvements to cost approximately $100,000, which include the installation of an ornamental lighting system, will be made in this city during the year. Work is to begin early in the Spring. The light system will be installed under the supervision of Gerharz-Jaqueth Engineering Company, of Billings, Mont. O.

HARTWELL, GA.—Franklin Light & Power Company proposes to construct two steam plants here to develop 5,000 horsepower; hydroelectric developments to follow. Forty miles of transmission lines to cost $50,000 connecting Hartwell, Lavonia, Conan, Bowersville and Royston, Ga., will be constructed. The total cost of the plants is estimated at $100,000.

PORTLAND, ME.—The Cumberland County Power & Light Company has acquired right of way for a pole and tower transmission line to connect its present 38,000-volt line at Dunstan with the steam power plant of the York Light & Heat Company in Biddeford. The latter company has recently been acquired by the Cumberland Company. The cost of the line will be about $45,000. W.

YOUNGSTOWN, O.—The Consolidated Company will place all overhead wires in Federal Street underground. This work will be of course very expensive owing to the tons of costly lead-covered high-voltage cable which it will be necessary to purchase to do the work, which is estimated to cost about $60,000. Address the general manager of the Consolidated Company in regard to this work.

NORTH YAKIMA, WASH. — The Board of County Commissioners, Yakima County, have granted the franchise asked by the Pacific Power & Light Company for light and power lines over and along Valleyview Avenue, County Road No. 5, Hillcrest Way, and Grand View and Orchard Avenues, in the district adjacent to North Yakima on the west. The line will be nearly three miles in length.

TAPPAHANNOCK, VA. — The Tidewater F. P. Lighting Company, incorporated, has been organized in Tappahannock, and capitalized at $5,000. The object of the company is to sell and install all kinds of lighting and heating equipments. H. C. DeShields, A. A. Cralle, J. C. Phillips and George W. Daingerfield are the incorporators. Application has been made for a charter, and the company will begin operations in a very short time.

RUSHVILLE, ILL.—As a result of the heavy tolls levied by the local public service corporation, amounting to $6,000 per annum, members of the City Council and Mayor Glass have been considering for several months the advisability of establishing a municipal electric plant to be used for street lighting and for pumping water from McElho for the city water system, and a committee consisting of Aldermen Keeling, Hodgson and Purcell, has been appointed to investigate the proposition.

FREEPORT, TEX.—Freeport is soon to have a new electric lighting and power system suited to meet the needs of this growing sea-port. In connection with the super-heated water and power plant now being installed at the Freeport Sulphur Company mines, at Bryan Heights, a new central electric power plant has been recently included in the plans, and will be installed in the next few months. This plant, it is announced, will supply electric light and power to Freeport through transmission lines.

SACRAMENTO, CAL.—Through an application to the State Conservation Commission, and by the statement of C. H. McKendree of Lakeview, Ore., a power project is revealed intended to furnish 100,000 horsepower by harnessing the waters of Fall River in Shasta County. Incidentally the Commission will be called upon to decide a novel point involving the disposition of power generated on a California waterway in the neighboring states of Oregon and Nevada. The application calls for permission to divert a flow of 1,500 cubic feet of water per second, capable of generating 48,000 horsepower.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

MUSCATINE, IOWA.—The Iowa Telephone Company will improve its local system at a cost of $25,000. C.

WESTBORO, WIS. — Westboro Telephone Company has been incorporated with a capitalization of $2,500 by J. W. Kaye and others.

THOMASVILLE, GA.—The Consolidated Telephone & Telegraph Company has been incorporated with a capitalization of $250,000.

DEADWOOD, S. D.—Western Union Telegraph Company will rebuild its line in the Black Hills and install new equipment, costing $275,000. C.

MONTESANO, WASH. — The Montesano Telephone Company, William Shore manager, will install a modern telephone system in this city, it is stated. O.

BOSCOBEL, WIS.—Pleasant Valley Farm Telephone Company has been incorporated with a capital of $500 by A. E. Anderson, J. V. Staskal and G. K. Roen.

OUTLOOK, WASH.—Outlook Telephone Company has been incorporated with a capital of $5,710 by H. C. Davis, W. F. Nass, A. C. Turner and William Barnes.

MADISON, S. D.—The Dakota Central Telephone Company plans to install a new system and remove all poles to the alleys. George Pheifer is manager. C.

DUNLAP, TENN.—A company has been organized to construct a telephone system from Dunlap to Whitewell. J. J. Lasater is president and D. M. Harris, secretary.

MEADOWDALE, WASH. — Sound Telephone Company has been incorporated with a capital stock of $5,000 by W. P. Cleveland, Louis Andrew and Joseph R. Cleveland.

EUREKA, MONT. — The directors of the Eureka Mutual Telophone Company are considering building an extension of their lines up St. Clair Creek and to Gateway.

SEQUATCHIE, Tenn. — The Sequatchie Valley Mutual Telephone Company has been incorporated with a capital stock of $3,000 by Landy Phelps, L. J. Lewis and others.

SACRAMENTO, CAL.—Charles A. Loraine has been granted a certificate of public necessity and convenience to exercise a telephone franchise granted by the Supervisors of El Dorado County.

MUSKEGON, MICH. — Providing the State Railway Commission approves of its action, the United Home Telephone Company will issue bonds or stock for $150,000 to build an entire new system in Muskegon.

NORMAN, OKLA.—The Norman Telephone Company will construct a central plant and install a central-energy system and place heavier cables underground. Address Dwight and Bozell, of Norman, for desired information.

CHESTERVILLE, N. Y.—The Chesterville Local Telephone Company, Incorporated, has been granted articles of incorporation with a capitalization of $154. The incorporators are Elmer J. Hunt, Dormansville; Theodore De La Verone and Edward King, of Westerlo.

ATLANTA, GA.—Southern Bell Tel-Telephone & Telegraph Company has issued $5,000,000 bonds for improvements to its system in territory embracing Georgia, Florida, North and South Carolina, Kentucky, Tennessee, Mississippi, Louisiana and portions of Illinois and Indiana.

POCATELLO, IDAHO.—The Mountain States Telephone & Telegraph Company has prepared plans and will immediately begin construction of a new telephone exchange in this city. The plans also entail the installation of new cables and conduit, and in all about $80,000 will be spent in this city. O.

HILLSBORO, ORE.—The Hillsboro Telephone Company, has sold a controlling interest in the local telephone system to Charles E. Wells, of Kingsville, Tex., for $20,000. Mr. Wells took over the management of the system March 1, and announces that he will make several large improvements. O.

OLYMPIA, WASH.—The Chamber Lake Telephone line recently petitioned the County Commissioners for a franchise to construct and maintain a telephone line along certain county roads beginning at the intersection of the Boulevard and Pacific Highway, and extending south along the J. A. Kirby, Herman and other roads. O.

DALLAS, TEX.—The Commissioners' Court of Dallas County has granted a franchise to the Texas Power & Light Company for the construction of a telephone line from Dallas to Eagle Ford and Cement City, to be used in connection with the electric power supply line being installed by the company into Cement City. D.

OLYMPIA, WASH.—The Lacey-Chambers Prairie Mutual Telephone Company, through its president, John W. Mayes, recently filed a petition with the County Commissioners of Thurston County for a franchise to build and operate a telephone system over certain portions of the Pacific Highway and the Yelm and Rainier Roads. O.

GAGE, MONT.—The North Side Telephone Company, composed of ranchers in this vicinity, has recently been organized for the purpose of building 20 miles of telephone lines, which will connect up this section with Gage. Work will commence, according to all reports, as soon as the weather will permit. Address President James Batschelet, here.

OLYMPIA, WASH. — Representatives of the Peninsula, Mud Bay, Snider Prairie and West Side Telephone Companies, recently organized and consolidated into one company, following which an application was made for a franchise authorizing the placing of poles and stringing of wires along certain county roads. Charles E. Starr is Chairman of the Board of Directors. O.

BOZEMAN, MONT.—Articles of incorporation have just been filed for the Farmers' Home Telephone Company, a corporation formed for the purpose of constructing, purchasing, leasing, operating and maintaining telephone and telegraph lines, and conducting telephone exchanges in certain parts of Gallatin, Broadwater and Jefferson Counties. G. C. Watson, Three Forks, is president. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MIDDLEBORO, KY.—The city is advertising the sale of a franchise for the operation of a street railway April 30. Address Mayor Manring for details. G.

PORTSMOUTH, O.—Portsmouth Street Railway Company wishes to issue $500,000 in bonds for a street-car line from Sciotoville to Ironton. It awaits the decision of the State Public Utilities Commission. R.

LONG PRAIRIE, MINN.—R. H. Battey, of Detroit, and F. D. Brandenberg, of Thief River Falls, are endeavoring to interest local business men in a company to build an electric line from Thief River Falls east and south.

CHARDON, O.—Right of way for the proposed Chardon-Jefferson electric line from Chardon to Hambden has been forwarded to the company's officers. The matter of financing has been taken up with the state utilities commission. R.

LOS ANGELES, Cal.—The Los Angeles Railway Company has made application to the State Railroad Commission for the privilege of issuing bonds to the amount of $23,500,000, the proceeds to be used in extending and improving the line of the Los Angeles company. T.

LONG PRAIRIE, MINN.—R. H. Battey, of Detroit, and F. D. Brandenberg, of Thief River Falls, are endeavoring to interest local business men in a company that proposes to build an electric line from Thief River Falls east and south through this part of the state. C.

SAN ANTONIO, TEX.—The Alamo Engineering & Construction Company has been organized here with a capital stock of $20,000. It is stated that the company will build the proposed interurban line between Waco and Austin. W. J. Armstrong, of San Antonio, is named as the principal incorporator. D.

SAN FRANCISCO, Cal.—The Board of Public Works has called for bids to be opened on May 4 for building the Chestnut Street branch of the Municipal Street Railway system from Van Ness Avenue along the Exposition Grounds. This will be the first portion of the extension to be built under the recent bond issue.

AKRON, O.—Out of the $2,000,000 additional preferred stock authorized by the Northern Ohio Traction & Light Company, extensive improvements will be made in Akron during the spring and summer. The sum of $150,000 has been set aside for the purpose of double-track work on the company's Akron, Barberton & Cleveland line. J.

PITTSBURGH, PA.—The Cleveland-Pennsylvania Interurban Railway Company has been incorporated. The company proposes to build and operate a line between Cleveland and Sharon and eventually expects to extend the line to Pittsburgh by way of Newcastle. The incorporators are Harry P. Smith, Elijah Ashley and others, of Pittsburgh.

LOUISVILLE, KY.—W. H. Netherland, of Louisville, is interested in a company being organized to build an electric line running through Muhlenberg County, from Central City to Greenville and Central City to Drakesboro, to be operated in conjunction with a large hydroelectric power station in Green River, a few miles from Mount Olive. The primary object of the power station is to sell current for light and power to numerous coal mining concerns in western Kentucky.

SAN FRANCISCO, CAL.—The Ocean Shore Railroad Company has officially applied to the Railroad Commission for authority to issue $200,000 in bonds for the purpose of electrifying the road from San Francisco to Half Moon Bay. According to present plans the electrification will be by means of a groove trolley, and estimates include substations, telephone lines and other equipment. Provision is made in the application for new motor cars to cost $55,000 and for an electric engine to cost $24,000.

NEW INCORPORATIONS.

DETROIT, MICH.—Victor Electric Supply Company has been incorporated with a capitalization of $15,000.

MANITOWOC, WIS.—E. Stupecky & Company has been incorporated by Edward Stupecky, Leonard Zielsdorf and Edward Warren.

DALLAS, TEX.—Carroll Electric Company has been incorporated with a capital stock of $5,000 by E. A. Corley, William M. Jones and William C. Carroll.

ELDORADO, WIS. — Wisconsin Light, Power & Milling Company has been incorporated with a capital stock of $10,000 by O. A. Huelsman, A. H. Genrich and L. F. Lurvey.

BOSTON, MASS.—The Cole Railway Equipment Company has been incorporated with a capital of $250,000. Charles W. Potter, Harry A. English and Elizabeth F. Uniac are the incorporators. W.

LOS ANGELES, CAL.—The Independent Electrical Supply Company has been incorporated with a capital stock of $25,000. The incorporators are Hyman Schwartz, I. E. Irvine, E. Irvine and James Irvine. T.

AUGUSTA, ME.—The Continental Engineering Company has been incorporated, capitalized at $1,000,000. The incorporators are Ernest L. McLean, Augusta; E. M. Leavitt, Winthrop; R. A. Kittredge, Hallowell. W.

MANHATTAN, N. Y.—Bateman & Miller Electric Company has been incorporated with a capital stock of $5,000 by Charles D. Bateman, John Miller, of New York City, and Charles F. Hulseman, of Brooklyn.

McINTOSH, S. D.—The McIntosh Electric Company has been incorporated with a capital stock of $5,000. The company will build an electrical plant. The incorporators are T. W. Luke, Harry Luke and W. D. Snyder.

BANGOR, ME.—The Eastern Maine Power & Development Company has been incorporated with a capital of $200,000. The incorporators are Nelson H. Hydorn, Oscar A. Fickett and Terence B. Towle, all of Bangor. W.

DULUTH, MINN.—Articles of incorporation have been granted to the Western Mesaba Electric Company to engage in business in this city. The capital stock of the company is $100,000 and the incorporators are Frank McCormack, M. J. McCormack and James A. Hanks.

DOVER, DEL.—Articles of incorporation have been filed for the Dwyer Wireless Telephone Company, New York-San Francisco, the business being to conduct wireless telegraphy, telephony, aerophony and to construct buildings, stations, etc., for that purpose. The capital stock is $10,000,000. The incorporators are Max Oschler, Samuel H. Loveless, Sydney M. Oschler, and Antonio C. Montgomery, all of New York City; Harry P. Dwyer, George Hough Perry, William Henry Schooler and Lloyd Michels, all of San Francisco.

FOREIGN TRADE OPPORTUNITIES.

(Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., and Association of Commerce Building, New Orleans, La. Apply for addresses in letter form, giving file number.)

No. 12,532. ELECTRIC CRANES.—The American consul at Madrid, Spain, reports that proposals are requested for supplying and installing in the port of Gijon Musel four electric cranes with the corresponding electric line, the estimated cost of which is about $53,000; and the construction of the railway line necessary for these cranes, the estimated cost of which is $7,500. Proposals must be submitted through a resident agent to the Secretaria de la Junta del Puerto de Gijon Musel, Gijon Musel, Province of Oviedo, Spain, before March 27. A list of persons in a position to bid on this contract may be obtained from the Bureau of Foreign and Domestic Commerce.

No. 12,533. ELECTRIC HOUSEHOLD APPLIANCES.—An American consul in Canada reports that a city in his district is about to have a daytime electric-current service. There will be a moderate demand for electric household accessories, flatirons, etc. Catalogs should be sent immediately to a number of firms whose names were given in the report, as the new service is to be inaugurated in May.

No. 12,592. ELECTROMAGNET FOR PORT WORK.—A large electromagnet for discharging scrap iron and other metal material from steamships in a certain European port is to be purchased by the authorities. American firms in a position to supply the same should communicate with the Harbor Board, in Italian, stating prices, terms, specifications, etc. American companies wishing to treat with a local firm in the matter and desiring to sell through this firm may address a concern named by an American consular officer.

No. 12,596. TUNGSTEN LAMPS.—A business firm in Canada, which furnishes bank references, informs an American consular officer that it desires to be put in touch with American manufacturers of incandescent lamps, with a view to securing the exclusive agency for British Columbia.

No. 12,606. DYNAMOS AND ELECTRIC SUPPLIES.—A report from an American consular officer in India states that a local firm desires to be placed in communication with American manufacturers of dynamos and electric stores. The firm desires to import direct or to act as agents in India for American manufacturers. Catalogs, price lists, and discounts are desired. Correspondence may be in English.

PROPOSALS.

TRANSFORMERS, ETC.—Sealed bids will be received by J. N. Cowdery, director of public service, Niles, O., until March 9, for furnishing transformers, incandescent lamps, and meters for the electric light plant. R.

CABLE.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 14 for furnishing considerable electrical cable, as per Schedule 6433, for delivery at the Navy Yard, Pearl Harbor.

ELECTRICAL APPLIANCES. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 17 for furnishing miscellaneous galvanometers, etc., as per Schedule 6449, for delivery at the Navy Yard, Annapolis, Md.; four 300-kilowatt turbogenerating sets and spare parts, as per Schedule 6432, for delivery at the Navy Yard, Brooklyn, N. Y.

RUBBER-INSULATED CABLE.—Sealed proposals will be received at the Engineer Depot, U. S. Army, Washington Barracks, D. C., until March 17 for furnishing armored duplex rubber-insulated lead-sheathed cable as follows: Item 1, 19,500 feet 81 mils.; item 2, 4,500 feet 26,300 cir. mils.; item 3, 3,020 feet 106,000 cir. mils.; unarmored duplex rubber-insulated lead-sheathed cable; item 4, 5,200 feet 81 mils. Further information upon application to Joseph E. Kuhn, lt., col., corps engrs., U. S. Army.

ADDITION TO ELECTRIC LIGHTING PLANT.—Sealed proposals will be received by the Borough Council of South River, N. J., on March 9 for an addition to the present borough electric lighting plant, including the installation of a gas producer, gas engine, generator and switchboard, in accordance with drawings and specifications prepared by C. S. Partridge, superintendent of the Board of Public Works, and now on file in his office. All bids must be accompanied by a certified check on a New Jersey national bank, payable to the order of George Allgair, borough collector, without any additional endorsement whatever.

ELECTRICAL SUPPLIES.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 17 for furnishing restranding and reinsulating cables, to be delivered at the Navy Yard, Boston, Mass.; 50,000 feet of incandescent lamp cord, and 1,110 polished-brass key sockets, fiber lined, one-eighth-inch pipe, to be delivered at the Navy Yard, Brooklyn, N. Y., all as per Schedule 6471; 1,000 five-ampere receptacle plugs, 300 double and snap-switch receptacles, and miscellaneous electrical supplies, for delivery at the Navy Yard, Washington, D. C., as per Schedule 6473; two telephone ringing dynamotors, two 50-watt talking motor generators, one telephone switchboard, type C-54, and miscellaneous telephones, for delivery at the Navy Yard, Camden, N. J., as per Schedule 6477. The Bureau will also receive proposals until March 24 for 3,000 feet of rubber-insulated rattail wire for aerials, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6489.

FINANCIAL NOTES.

The Pacific Gas & Electric Company has decided to pay off on March 25 all of its outstanding six-per-cent gold notes dated July 1, 1913. The notes will be redeemed at 100.5 and accrued interest, and after that date interest will cease to accrue.

The recent increase in the authorized capital of the Northern Electric Company to $10,000,000 is explained by the statement that the company is absorbing the Imperial Wire & Cable Company, the other big subsidiary of the Bell Telephone Company of Canada. The president of the merged companies will be E. F. Sise and the vice-president Paul F. Sise.

The Commonwealth Power, Railway & Light Company has sold to Hodenpyl, Hardy & Company, $1,500,000 convertible six-per-cent five-year bonds, dated May 1, 1913. The bonds are part of an authorized issue of $10,000,000, which, with present offering, are now all outstanding. The bonds have been offered at a semi-private sale at 99 and nearly all of them have been sold.

For the week ended February 14, all electric properties operated by H. M. Byllesby & Company showed a net gain in connected load of 230 customers with 293 kilowatts of lighting and 138 horsepower in motors. New business under contract, but not connected, included 713 customers with 466 kilowatts of lighting and 572 horsepower in motors. The output of the properties for the week was 6,910,055 kilowatt hours, an increase of eight per cent over the corresponding week of 1913.

Empire District Electric, which has sold $350,000 out of an authorized issue of $500,000 of one-year six-per-cent coupon notes to New York bankers; is a subsidiary of the Cities Service Company and operates in southwestern Missouri and southeastern Kansas. The notes are secured by the pledge of $600,000 of the first-mortgage bonds of the company, and in case the remaining $150,000 of notes are issued a proportionate amount of bonds will be deposited as collateral.

The Arkansas Hydroelectric Company, of Heber Springs, Ark., is planning to invest $2,000,000 to construct a hydroelectric plant developing 10,000 horsepower, on the Little River, near Heber Springs. There will be three dams, one principal power dam, 600 feet long by 90 feet high; two reservoir dams, 1,400 and 800 feet long, respectively, and each 90 feet high. The electrical transmission system will cost $80,000 to install. The electric equipment is for a four-unit installation totaling 10,000 horsepower and water-wheel equipment for four turbines under a 90-foot head, with 70,000 cubic feet of water per minute.

Lee, Higginson & Company and Drexel & Company have bought $5,800,000 Portland Railway, Light & Power Company first and refunding mortgage five-per-cent bonds due 1942. The bonds were sold by the company to pay for completed improvements. They are part of a total authorized issue of $75,000,000, of which $21,800,000 is now outstanding, and $18,000,000 is reserved for retiring underlying bonds. The remainder can be issued for not exceeding 80 per cent of cash costs of additions and improvements under restrictions of the mortgage. The issue has a cumulative sinking fund of one per cent annually, 1915 to 1926 inclusive, and 1.5 per cent annually thereafter, figured on total amount issued.

Dividends.

Brooklyn Rapid Transit Company; a quarterly dividend of 1.5 per cent, payable April 1 to stock of record March 9.

Chicago Elevated Railway; regular quarterly dividend of $1.50 on participation referred certificates, payable March 2 to stock of record February 26.

Chicago Telephone Company; the regular quarterly dividend of two per cent, payable March 31, to stock of record March 30.

Eastern Power & Light Corporation; the regular quarterly dividend of 1.5 per cent on preferred stock, payable March 15 to stock of record Feb. 28.

Monongahela Valley Traction Company, 1.5 per cent on common, payable March 2 to stock of record February 26.

Montana Power Company; regular quarterly of 1.75 per cent on preferred and 0.5 per cent on common, payable April 1 to stock of record March 16.

New York Edison Company; quarterly of 1.5 per cent, payable March 14.

Northern Ohio Traction & Light Company; quarterly of 1.25 per cent on common, payable March 15 to stock of record February 28.

United Gas & Electric Company; a semi-annual first-preferred dividend of three per cent; payable April 1 to stock of record March 14.

Reports of Earnings.

KEYSTONE TELEPHONE COMPANY.

	1914	1913
January gross	$ 107,479	$ 104,027
Net	53,200	49,615
Surplus	26,467	24,040

MOUNTAIN STATES TELEPHONE.

The Mountain States Telephone Company's report for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$ 7,530,211	$ 6,844,576
Net	2,847,574	2,513,371

CUMBERLAND COUNTY POWER & LIGHT.

	1913	1912
December gross	$ 205,547	$ 175,134
Net after taxes	89,484	73,122
Surplus after charges	25,908	16,612
12 months' gross ...	2,354,797	2,128,388
Net after taxes	1,041,924	927,054
Surplus after charges	327,651	282,280
Balance after preferred dividends ..	*193,651	199,780

*Equivalent to 7.2 per cent on common stock.

BANGOR RAILWAY & ELECTRIC.

	1913	1912
December gross	$ 65,645	$ 60,334
Net after taxes	34,919	31,516
Surplus after charges	17,565	14,175
12 months' gross ...	764,085	710,027
Net after taxes	417,573	389,185
Surplus after charges	209,989	189,528
Balance after preferred dividends ..	*104,989	84,528

*Equivalent to 5.2 per cent on common stock.

CONSUMERS POWER OF MICHIGAN.

	1913	1912
December gross	$ 325,028	$ 284,111
Net after taxes	147,742	112,888
Surplus after charges	77,782	64,284
12 months' gross ...	3,155,214	2,774,551
Net after taxes	1,486,477	1,266,651
Surplus after charges	710,726	651,002
Balance after preferred dividends ..	392,226	381,002

BELL-TELEPHONE OF PENNSYLVANIA.

The Bell Telephone Company of Pennsylvania's report for the year ended December 31, 1913, compares as follows:

	1913	1912
Gross	$18,934,912	$17,803,375
Net	4,859,730	4,715,681
Surplus after interest and dividend	1,238,416	993,075

CITIES SERVICE COMPANY.

	1914	1913
January gross	$ 414,759	$ 169,989
Net after expense......	411,173	164,270
Balance after interest..	382,006	164,270
Balance after preferred dividends	245,174	100,804
Surplus after common dividends	166,646	67,277
12 months gross.........	2,417,180	1,237,464
Net after expense......	2,333,965	1,165,102
Balance after interest..	2,181,737	1,165,102
Balance after preferred dividends	*1,199,593	543,042
Surplus after common dividends	688,165	308,612

*Equivalent to 10.92 per cent on common stock.

COMMONWEALTH EDISON.

The report of the Commonwealth Edison Company for the year ended Dec. 31, 1913, compares as follows:

	1913	1912
Operating revenue ...	$16,838,743	$15,361,649
Operating expense and depreciation	9,504,427	8,855,572
Net operating revenue	7,334,316	6,506,077
Taxes and mun. company	1,353,915	1,127,195
Operating income.....	5,980,400	5,378,882
Other income.........	261,526	203,847
Total income	6,241,927	5,582,229
Interest on bonds....	1,600,000	1,600,000
Depreciation reserve..	544,000	544,000
Balance	*4,097,927	3,438,229
Dividends	2,816,864	2,516,783
Surplus	1,281,063	921,445

*Equal to 8.93 per cent on $45,838,936 capital stock against 10.4 per cent earned on $32,964,800 previous year.

NATIONAL CARBON COMPANY.

The National Carbon Company has issued its annual report for the year ended Dec. 31, 1913. The income account compares as follows:

	1913	1912
Net earnings	$1,476,621	$1,261,203
Preferred dividends ...	315,000	315,000
Balance	*1,161,621	946,203
Common dividends	330,000	330,000
Balance	831,621	616,204
Depreciation, etc.	335,714	366,094
Surplus	495,907	250,110

*Equal to 21.12 per cent on $5,500,000 common stock, as compared with 17.2 per cent earned on same stock previous year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 2	Feb. 23
American Tel. & Tel. (New York)........	120½	121
Commonwealth Edison (Chicago)........	136½	136
Edison Electric Illuminating (Boston)........	260	260
Electric Storage Battery common (Philadelphia)........	53¼	53¾
Electric Storage Battery preferred (Philadelphia)........	53¼	53¾
General Electric (New York)........	147	149¼
Kings County Electric (New York)........	120¼	120¼
Manhattan Transit (New York)........	1	1
Massachusetts Electric common (Boston)........	11¼	11
Massachusetts Electric preferred (Boston)........	61¾	62¼
National Carbon common (Chicago)........	155	158
National Carbon preferred (Chicago)........	115¼	117
New England Telephone (Boston)........	138	139
Philadelphia Electric (Philadelphia)........	26¾	26¾
Postal Telegraph and Cables common (New York)........	86	86½
Postal Telegraph and Cables preferred (New York)........	69¾	70
Western Union (New York)........	53	64½
Westinghouse common (New York)........	70¾	71⅛
Westinghouse preferred (New York)........	115	116

PERSONAL MENTION.

MR. JOSEPH S. MALLORY, fire marshal of the city of Philadelphia, addressed the Jovian Electrical League at its weekly luncheon at the Bingham Hotel on Thursday, March 5, on the subject of fire prevention.

MR. J. B. ANDERSON, who for five years has been superintendent of the Savannah (Ga.) Electric Company, has been transferred to Baton Rouge, La., where he will be superintendent of the lighting department of the Stone & Webster property there.

MR. FRANCIS E. DONOHOE, formerly of the American Electrical Works, New York City, resigned on February 1 to become associated with the National Conduit & Cable Company and the National Brass & Copper Tube Company, with headquarters at 41 Park Row, New York.

MR. W. A. CONVERSE, chemical director of the Dearborn Drug & Chemical Company, Chicago, delivered a lecture on "Ill Effects of Boiler Water and Their Causes" before the Newark, N. J., section of the National Association of Stationary Engineers on February 23.

MR. W. R. PATTON has been appointed manager of the Milwaukee office of the Wagner Electric Manufacturing Company recently opened at 731 Wells Building, Milwaukee, Wis. Mr. Patton has been connected with the Wagner Company for a number of years and has made a host of friends in the Middle West.

MR. L. L. STONE, president of the Pikesville (Ky.) Lighting Company, has been appointed manager of the electrical department of the Consolidation Coal Company. The company has large power plants at Jenkins and in other parts of Eastern Kentucky, and is constructing transmission lines for the purpose of supplying energy to coal mines and other communities.

MR. BERTRAM SMITH has been appointed assistant manager of the Edison Storage Battery Supply Company, of San Francisco. This company handles the Edison battery on the Pacific Coast. Mr. Smith started in the storage battery business in 1899 with the old National Battery Company, Buffalo, N. Y., and was secretary and treasurer for three years. Since the absorption of the National Battery Company by the United States Light & Heating Company, Mr. Smith has been manager of the latter company's battery department in Chicago.

MR. W. I. MIDDLETON, electrical engineer of the Simplex Wire & Cable Company, delivered an interesting lecture, illustrated by lantern slides, on the manufacture and testing of insulated wires and cables, at the Franklin Union, Boston, Mass., on February 26. He spoke also of the desirability of uniform specifications on insulation and the progress recently made along these lines by the Joint Rubber Insulation Committee. He pointed to the marked advance that manufacturers have already made in their testing departments, and spoke of the new voltmeter that his own company has developed for measuring peak voltages.

MR. E. W. CHAPIN, Harvard '13, has been appointed assistant in the department of electrical engineering, and MR. H. L. MANLEY, Massachusetts Tech. '11, and MR. A. I. PASHEK, Massachusetts Tech. '13, have been appointed special research assistants in the department of electrical engineering at the Massachusetts Institute of Technology. The two new research assistants are made necessary by increase in such work as the investigations which are under way for the R. H. Macy store, involving the examination of the entire delivery service, while Mr. Chapin will be engaged in matters related to the Vail library.

MR. W. F. BAUER has become assistant manager of the railway department of the Edison Storage Battery Company, at Orange, N. J. In the early days of electric car lighting Mr. Bauer was connected with the Pullman Company, of Chicago and Jersey City, and with the Wagner Palace Car Company. He was chief electrician of the Missouri-Pacific Railway at St. Louis from 1903 to 1905. Later on he became sales manager for the Electric Storage Battery Company at Chicago, and in 1907 he was appointed to a similar position with the National Battery Company. Later on he became manager of the United States Light & Heating Company's railway department at Chicago. He will make his headquarters at 2025 Michigan Avenue, and will have immediate supervision over the sales of the railway department for the west and southwest for the Edison company.

OBITUARY.

PROF. EDWIN J. HOUSTON, noted scientist, inventor, author and teacher, died at Philadelphia, Pa., on March 1, from heart disease. Mr. Houston was born at Alexandria, Va., on July 9, 1847. He was graduated from the Central High School in 1864 and later received the honorary degree of Ph. D. at Princeton. He was one of the inventors of the Thomson-Houston system of arc lighting. He was Emeritus Professor of Physics at Franklin Institute, Professor of Physics at the Medico-Chirurgical College, and a member of the American Institute of Mining Engineers and the American Philosophical Society. For many years Professor Houston occupied the chair of Natural Philosophy and Physical Geography in the Central High School of Philadelphia. He was an expert in electricity and was twice president of the American Institute of Electrical Engineers and was chief electrician at the World's Fair in Chicago. He was the author of several textbooks and editor of "The Electrical Dictionary."

Prof. E. J. Houston.

MR. WILLIAM E. PHELPS, for many years president of the Phelps Manufacturing Company, of Detroit, Mich., died at the home of his daughter, Mrs. Violet Lewis, in Seattle, Wash., on February 8. Mr. Phelps left Detroit last June in search of health. He was born at Elmwood, Ill., in 1833. During President Lincoln's administration he was Consul-General at St. Petersburg, and later served in the Illinois Legislature. He is survived by his widow, a son, J. Wiley Phelps, president of the Phelps Manufacturing Company, Detroit, and his daughter in Seattle.

DATES AHEAD.

Buffalo Electric Show. Elmwood Music Hall, Buffalo, N. Y., March 9-14. Secretary, Harry S. Hilliker, Electric Building, Buffalo, N. Y.

State Independent Telephone Association. Des Moines, Iowa, March 10-12. Secretary, Charles C. Deering, 309 Life Building, Des Moines, Ia.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11. Secretary, M. J. O'Leary, 195 Broadway, New York, N. Y.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. H. Fritch, 900 South Michigan Avenue, Chicago, Ill.

Minnesota Electrical Association. Annual convention, Minneapolis, Minn., March 18-20. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

Society of Efficiency, New York, N. Y. April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore, Coliseum, Cleveland, O.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

National Metal Molding Company, Pittsburgh, Pa., announces that its office in Atlanta, Ga., has been moved to the new Healey Building. F. S. Montgomery is southern manager of the company in charge of this office.

Apple Electric Company, Dayton, O., maker of automobile specialties, announces that it will not remove its plant from Dayton, as contemplated. The company has been consolidated with the Splitdorf Electrical Company, of Hoboken, N. J., and the Dayton plant will be enlarged.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a sales office in the Wells Building, Milwaukee, Wis. The office will be in charge of W. Russell Patton, who has for some time been identified with the sale of Wagner apparatus in that territory.

Naugle Pole & Tie Company, 5 South Wabash Avenue, Chicago, is sending out folders showing several views in its extensive Chicago yard and calling attention to its excellent shipping facilities and to the prompt shipments that can be made from the large stocks of poles kept on hand.

The Economy Fuse & Manufacturing Company, of Chicago, has obtained the sole license and exclusive sale of S. & C. extra-high-potential fuses for the Dominion of Canada. The fuses will be manufactured under license in Montreal and all sizes will be ready for delivery March 15.

Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa., is sending out to contractors and others interested in convenient wiring specialties a circular showing the special clamps which it has devised for use with its Unisectional steel wall boxes. These are arranged to clamp flexible armored cable and for fastening loom in switch boxes.

Chicago Bridge & Iron Works, Throop and 105th Streets, Chicago, Ill., has issued a well illustrated booklet of its steel water towers, standpipes, oil tanks, etc. These are made in a great variety of forms and sizes for various heights of mounting. Although a structural steel tower is used for the support in most cases the tank can also be placed upon a concrete, stone or masonry wall.

The Bryan-Marsh Division of the National Lamp Works of the General Electric Company announces that its Minneapolis office has been removed from 311 First Avenue North to 722-24 Plymouth Building. This change of location was necessitated by the constantly increasing demand for Bryan-Marsh lamps in the northwest, due, in a large measure, to the company's energetic manager, J. L. Barnard.

McIntosh & Seymour Corporation, Auburn, N. Y., has issued bulletin No. 51 describing the types of Diesel oil engines for which it has recently secured the American rights of manufacture. These engines are briefly described and their advantages over other types of prime movers are clearly set forth. The corporation has also issued bulletin No. 52 devoted to its type F horizontal steam engines. These are made either as single cylinder or as tandem-compound or cross-compound machines.

The Nungesser Carbon & Battery Company, Cleveland, O., has ready for distribution catalog No. 5, entitled "Brush Grades." This catalog is supplemental to the previous price list and gives data and information respecting the various grades of carbon, graphite and composition metal brushes upon which the Nungesser company is specializing. Copies of this valuable catalog will be sent to those making proper request and establishing their identity with companies interested in this material.

The Lagonda Manufacturing Company, Springfield, O., has issued a new bulletin on automatic cutoff valves. This publication is an excellent example of the present popular type of engineering catalog, since it is a text of valuable but concise information. It discusses the causes and effects of water hammer in boilers, the effect of cutting in boilers below or above the pressure of the steam header, the specifications of boiler-insurance companies and the methods of government tests. A copy of this bulletin may be had by writing to the company.

Duncan Electric Manufacturing Company, LaFayette, Ind., has issued bulletin No. 28, which deals with its switchboard watt-hour meters. Both direct-current and alternating-current meters are made; the former are either of the series or shunted type and the latter are either of the series type or provided with current transformers and in some cases also with potential transformers. The bulletin describes and illustrates these instruments quite fully, pointing out unique features of the construction and advantages secured thereby.

The Simplex Electric Heating Company, Cambridge, Mass., has been elected a member of "The Rice Leaders of the World Association." A recent announcement states that this association is an affiliation of leading business concerns in America, each representing a different line of industry. It is also stated that an indispensable condition for any concern to qualify for membership is to have builded its business upon the principles of "honor, quality, strength and service." A heraldic emblem has been selected as the combined symbol of these several qualifications.

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued a very attractive publication describing the P. & H. excavator. The booklet is printed upon a fine grade of paper and has exceptionally good half-tone illustrations showing some of the machines in operation for digging various trenches. The construction of the machine is described and its approximate cost of operation given. These machines are equipped with either wheel or caterpillar tractions. They are built in several sizes to meet the various requirements of different classes of work in different localities.

The Lord Manufacturing Company, Bush Terminal No. 7, Brooklyn, N. Y., has ready for distribution bulletin "R" describing and illustrating the "Hydroground" permanent earth contact. This grounding device is made in two types of design—the disk hydroground and the tubular hydroground. The bulletin gives complete information respecting the electrical and mechanical characteristics of both types, and also gives some valuable information relating to the installation of the hydroground and a discussion of grounds in general. Copies of this bulletin will be furnished to those interested upon request.

The Electric Storage Battery Company, Philadelphia, Pa., has issued Handbook IX, devoted to Hyray-Exide battery and switchboard units for small electric plants. These sets comprise a 16-cell storage battery and a switchboard panel complete with switches, ampere-hour meter, and ammeter and rheostat. The whole outfit is shipped in one box and installed with a minimum of trouble so as to be readily connected to the generator and the lighting circuits. Three sizes of battery are supplied, ranging in capacity from 44 to 117 ampere-hours. These sets are particularly suitable in rural districts and other remote places where central-station current is not available.

Safety Insulated Wire & Cable Company, 114 Liberty Street, New York City, has ready for distribution a well illustrated pamphlet entitled "Making One Dollar Do the Work of Two." It describes how the town of Forest Park, Ill., installed an ornamental cluster street-lighting system on one of its main streets at exceptionally low cost by the use of "Safety" steel-taped cable laid directly into the parkway or underneath the brick paving adjoining the curb. This cable is made with one or more conductors of any desired size. Its steel and jute armor eliminates the expense and labor of providing a separate conduit. This type of cable can be laid rapidly in any kind of weather. The cable for the Forest Park installation was supplied through M. B. Austin & Company, 700 West Jackson Boulevard, Chicago, managers of the western department of the Safety Insulated Wire & Cable Company.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has had reprinted in attractive form the report on the high-pressure pumping and fire-main system recently installed in Cleveland, O., this report having been prepared originally by the Cleveland Inspection Bureau for the use of fire-insurance companies interested in Cleveland risks. The pumping station contains four electrically driven pump units with a capacity of 2,500 gallons per minute each. The pumps and motors were supplied by the Allis-Chalmers Manufacturing Company. Many illustrations of the pumping station and of test streams are given, also a map showing the district protected.

Record of Electrical Patents.

Issued by the United States Patent Office, February 24, 1914.

1,087,917. Block-Signal System. E. F. Bliss, assignor to Union Switch & Signal Co., Swissvale, Pa. A normal danger block system with special relay control.

1,087,930. Meter for Elastic Fluids. A. R. Dodge, assignor to General Electric Co. Includes an electric motor and controller.

1,087,931. Meter for Measuring the Flow of Fluids. A. R. Dodge, assignor to General Electric Co. The movements of the float are magnetically transmitted to the needle.

1,087,937. Electrolytic Generator. C. Ellis, Montclair, N. J. For generating hydrogen and oxygen.

1,087,950. Electric Generator and Vehicle-Starter. E. L. Jones and C. H. Roth, assignors to Jones Electric Starter Co., Chicago, Ill. A gear and clutch arrangement for connecting the engine and motor-generator when the torque of one machine predominates.

1,087,966. Automatic Control of Signals by Light. W. A. Moffet and R. P. Perkins, San Francisco, Cal. The light rays are projected on a selenium cell which controls an electric circuit to the signal.

1,087,971. Fuse Switch. T. E. Murray and G. W. Christians, New York, N. Y.; said Christians assignor to said Murray. A fuse case with terminal contacts and handle at the end fits into a socket with diverging walls.

1,087,972. Motor-Control System. R. C. Newhouse, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. For an electrically operated dredge or power shovel.

1,087,985. Incandescent-Lamp Suspension. H. R. Sargent, assignor to General Electric Co. A combination porcelain suspension cleat and lamp receptacle.

1,087,997. Electropneumatic Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Has an electrically controlled valve for supplying air from the signal line to the brake cylinder.

1,087,998. Diagnostic Lamp. R. H. Wappler, assignor to American Cystoscope Makers, New York, N. Y. Comprises an electric lamp and dry cells carried in the handle.

1,088,002. Electrohydraulic Power Appliance. M. C. White and O. C. Duryea, Los Angeles, Cal. An electric motor-driven pump is mounted on a hydraulic riveter.

1,088,003. Resistance Grid. N. Wilkinson, assignor Allis-Chalmers Mfg. Co. Is made of a single resistance conductor bent back and forth, the bends being connected by insulated bolts.

1,088,018. Means for Working Microphones in Parallel. R. Goldschmidt, Berlin, Germany. Mutually inductive current-equalizing choke coils are connected in series with the microphone.

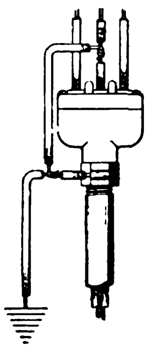
1,088,024. Alarm Device for Automatic Sprinkler Systems. A. C. Johnson, assignor of one-half each to A. A. Carpenter and R. H. Burdick, Chicago, Ill. An electrical alarm.

1,088,092. Portable Machine Saw. M. Reichlinger, Orscholz, Germany. Motor-driven.

1,088,094. Electric Headlight. J. M. Richardson, Highland Park, Mich. The lamp has two filaments, one at the focal center and the other adjacent thereto.

1,088,101. Grounding Device. H. E. Schimmel, Providence, R. I. The neutral wire coming out of the cable end bell and the conduit are grounded. (See cut.)

1,088,114. Unit or Grid. E. C. Van Glahn, assignor to National Electric Utilities Corporation, New York, N. Y. The coils of the heating element are supported in insulators held by T bars above and below.



1,088,101.—Grounding Device.

1,088,120. Portable Self-Contained Electric Lamp. F. T. Baird, Blue Island, Ill. Turning the bail causes the lamp to protrude and closes its circuit.

1,088,126 and 1,088,127. Winding-Reel for Dynamo-Electric-Machine Coils. M. J. Clark, assignor to Northwestern Electric Co., Chicago, Ill. Comprises a rotatable supporting frame, plates slidably mounted on opposite sides of the frame, and gear mechanism for shifting the plates to bring holding members into and out of alined position with other holding members.

1,088,129. Electrical Recorder. W. H. Cone, assignor to C. E. Bentley, Chicago, Ill. Includes a solenoid-operated rotary type element and an electromagnetically operated printing device co-operating therewith.

1,088,157. Manufacture of Electrical Resistances. A. W. Maley, West Bromwich, England. A rheostat comprising a continuous iron conductor having a carbon content concentrated near the exterior.

1,088,165. Electric Lamp Fixture. T. Nelsen, Chicago, Ill. A bracket with lamp socket set in a recess about which is a globe holder.

1,088,180. Printing Apparatus. H. Querier, Wellington, New Zealand. Has a pair of solenoids beneath the table for positioning any particular die into the line of engagement with the table.

1,088,197. Device on Transformers for Preventing the Decomposition of Oil by the Oxygen Contained in Air. A. Aichele, assignor to Aktiengesellschaft Brown Boveri & Cie, Baden, Switzerland. A horizontally disposed diaphragm of heat-insulating material is supported slightly below the upper surface of the oil.

1,088,210. Storage-Battery Insulation. J. N. Davis, Denver, Colo. A channel-shaped insulation fitting about the lower edges of the grids.

1,088,232. Purification of Water. F. M. Leavitt, assignor to Leavitt-Jackson Engineering Co., Brooklyn, N. Y. Provides electric control for the flow of the purifying gas.

1,088,246. Railway Signaling System. J. B. Struble, assignor to Union Switch & Signal Co. Has special relay control.

1,088,268. Electric Circuit-Breaker and the Like. E. A. Fagerlund, Stockholm, Sweden. Includes a tube containing a liquid, a solenoid surrounding it and a permanent, movable magnet arranged close to the lower part of the tube.

1,088,270. Telephone System. W. A. Fricke, assignor to Monarch Telephone Mfg. Co., Fort Dodge, Iowa. An operator's special test key.

1,088,276. Arc Lamp. J. Harden, assignor to General Electric Co. Has a special clutch arrangement.

1,088,278. Rainguard for Insulators. M. K. Holmes, assignor to Hemingray Glass Co., Muncie, Ind. A centrally perforated plate with a number of inwardly projecting spring fingers to externally embrace the body of the insulator. (See cut, next page.)

1,088,283. Telephone. P. L. Jensen and E. S. Pridham, assignors to Commercial Wireless & Development Co., San Francisco, Cal. Comprises a magnet having an air gap forming a dense magnetic field, a diaphragm, and oscillatory coil forming part of the line circuit and located in the air gap in such a way that it is held rigidly against bodily movement transverse to its axis but is free to oscillate by torsional flexure of the supports.

1,088,296. Electrode. J. W. Richards, South Bethlehem, Pa. Has encircling heat-retarding peripheral recesses.

1,088,311. Electrical Conduit. J. S. Wheeler, Guelph, Ont., Canada. Fibrous ribbon is formed into a tube about which a strip is helically coiled, then both are covered with fabric and saturated with a binding compound.

1,088,327. Accounting System. W. J.

Crumpton, assignor to W. R. Heath, Buffalo, N. Y. Includes electrically driven registers.

1,088,337. Trolley. J. E. Geiger, Kittanning, Pa. A special harp construction.

1,088,343. Process for Making Filaments and Filamentous Plates for Storage-Battery Electrodes. H. C. Hubbell, Newark, N. J. Consists in aggregating a book of alternate layers of different metals, subjecting this to pressure to reduce the materials to thinner layers and applying an eliminating process affecting one set of layers but not the other.

1,088,346. Apparatus for the Production of Gaseous Ozonids. W. J. Knox, New York, N. Y., assignor to Knox Terpezone Co. of America. Includes an ozone generator, a vapor generator and a mixing chamber.

1,088,363. Electric Railway-Signal System. A. Pillich, Lackawanna, N. Y. A block-signal system with circuit-closing devices adapted to be actuated by a passing train.

1,088,366. Unloader for Fluid Compressors. W. Prellwitz, assignor to Ingersoll-Rand Co., New York, N. Y. To insure starting the driving motor with little or no load.

1,088,374. Electric Battery and Accumulator. F. Sablon, assignor to Société Anonyme Electrique de Chumesnil, Chumesnil-Lez-Lille, France. A packing consisting of small fragments of ceramic material to prevent movement of the electrolyte.

1,088,402. Electric Insulating-Fitting. J. F. Burns, Philadelphia, Pa. An insulating bushing including a tube with a number of transverse grooves arranged in staggered relation.

1,088,433. Automatic Time Cutoff. J. Lyle, Longbeach, Cal. An alarm clock releases a trip to open a knife switch.

1,088,451. Mounting for Motors. F. W. Rilance, Thornton Township, Ont., Can. A motor is mounted on a turntable which is prevented from rotating by thumb screws.

1,088,454. Switch-Indicator. C. M. Roe, Jersey City, N. J. An electric signal system so arranged that when any of the tracks is opened by its track switch it operates its signal, cutting out the signals of the successive tracks.

1,088,472. Ignition System for Explosive Engines. C. T. Spicklemire, Wabaningo, Mich. Includes a special reversing switch in the primary circuit.

1,088,489. Self-Regulating Dynamo-Electric Machine. C. A. Vanderwell and A. H. Midgley, Acton Vale, England. Has main and supplementary poles on the field and main and supplementary brushes on the commutator.

1,088,496. Electrical Heating Device for Metallurgical Furnaces. U. Wedge, Ardmore, Pa. Has a series of superposed working chambers with resistance elements in the upper portion thereof to radiate heat downwardly on the material on the hearths.

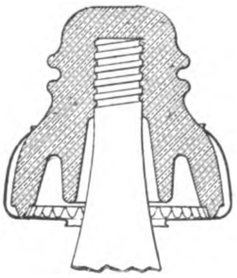
1,088,499. Electromechanical Player for Musical Instruments. J. F. White, Pittsburgh, Pa. An electrically controlled piano player.

1,088,502. Searchlight for Pistols. J. B. Williams, Oakdale, Tenn. An electric lamp and cell are arranged beneath the end of the gun barrel.

1,088,503. Electrical Steering-Gear. J. D. Williamson, Jr., assignor to Williamson Bros. Co., Philadelphia, Pa. Includes an electric motor and special control therefor.

1,088,511. Levitating Apparatus for Starting and Stopping Aeroplanes and the Like. E. Bachelet, Mount Vernon, N. Y., assignor of one-half to M. R. Bracewell. Comprises an aeroplane support, a guideway therefor, and means for producing a periodic magnetic field to levitate the support and aeroplane.

1,088,517. Means for Regulating the Speed of Asynchronous or Induction Motors. J. Bethenod, assignor to Société Alsacienne de Constructions Mecaniques, Belfort, France. Includes a polyphase commutator machine acting as a frequency converter, and an auxiliary machine mechanically coupled therewith, the rotor of the commutator machine having rings connected with the rings of the motor to be regulated.

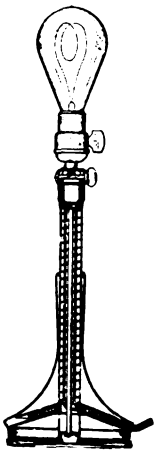


1,088,278.—Rainguard for Insulators.

1,088,527. Combined Electric-Light System. J. H. Bucham, Danville, Ill. For operating incandescent and arc lamps from the same generator.

1,088,531. Portable Storage-Battery Case. J. A. Callier, Roslyn, Wash. For carrying by a miner in connection with his headlamp.

1,088,541. Automatic Exchange System for the Transmission of Intelligence. F. S. Coulter, Livonia, Ind., assignor of three-tenths to W. F. Guthrie. The exchange mechanism includes a drum with jacks on its interior surface and a rotatable axial shaft carrying cooperating plugs.



1,088,607.—Lamp Stand.

1,088,563. Shoe-Polishing Machine. G. B. Grafton, assignor to Westmoreland Automatic Machine Co., Irwin, Pa. Motor-driven.

1,088,607. Electric-Lamp Stand. W. A. McKay and M. Claussen, assignors to Wizard Electric Lamp Co., San Francisco, Cal. A telescopic stand for an incandescent lamp. (See cut.)

1,088,611. Device for Signalizing the Presence of Explosive Gas Mixtures in Fire-Damp Mines. H. Neubauer, Siebleben, Germany. Includes an explosion chamber, an ignition device and an electric alarm.

1,088,620. Spark Plug. J. J. Platt, Milford, Conn. Has an observation opening in the side.

1,088,648. Circuit-Controlling Lock. T. N. Birch, Kansas City, Mo. The switch is moved longitudinally and laterally by the key of a multitumbler lock.

1,088,657. Reversing and Controlling Gear. J. P. Hall, Oldham, England. Includes a main electric motor, a controller therefor, a motor for driving the controller, a selecting gear for stopping the controller in predetermined position and a slip coupling between the second motor and the controller.

1,088,669. Telephone Support. R. M. Allen, assignor to Western Electric Co. For adjustably holding a desk set on a table or desk.

Patents Expired.

The following United States electrical patents expired March 2, 1914.

577,864. Alternating-Current Arc Lamp. E. R. Knowles, Brooklyn, N. Y.

577,872. Electrical Car-Lighting. M. Moskowitz, Newark, N. J.

577,885. Electric Railway. C. Skinner, Chicago, Ill.

577,911. Automatic Telephone-Call Device. E. P. Boland, New York, N. Y.

577,912. Electric Railway. S. G. Brosius, Baltimore, Md.

577,920. Telephone-Call Register. W. A. Heckard and D. Ogden, Columbus, Ind.

577,950. Double-Pole Reversing Snap Switch. H. A. Gorn, New York, N. Y.

578,001. Current Motor. C. A. Barron, Seattle, Wash.

578,006. Table Telephone Apparatus. L. M. Ericsson, Stockholm, Sweden.

578,016. Commutator Brush. J. F. Kester and F. C. Atherton, Buffalo, N. Y.

578,069. Electric Motor. H. A. Stock, Millersburg, Pa.

578,070. Electrode. A. E. Woolf, New York, N. Y.

578,077. Testing Apparatus for Electric Automatic Systems. C. Burgher, Newton, Mass.

578,107. Electric Lamp. M. M. Kohn, Chicago, Ill.

578,113. Message-Recording Instrument. B. J. Noyes, Boston, Mass.

578,114 and 578,115. Electric Signaling Apparatus. B. J. Noyes.

578,122. Combined Telephone and Annunciator System. J. R. Strong, New York, N. Y.

578,126. Telegraphy. R. H. Weiny, Arlington, N. J.

578,131. Combination Battery Cell. H. A. C. Anderson, New York, N. Y.

578,139. Electric Switch. W. W. Doty, New York, and J. A. MacKnight, Mount Vernon, N. Y.

578,171. Electrolytical Apparatus. C. F. Turner, New York, N. Y.

578,182. Apparatus for Regulating and Modifying Electric Circuits. G. F. C. Adam, Hanover, Germany.

578,233. Electric Arc Lamp. A. Guendel, New York, N. Y.

578,266. Oil, Gas or Like Engine. W. Rowbotham, Birmingham, England.

578,275. Electric Circuit. J. S. Stone, Boston, Mass.

578,280. Dynamo-Electric Machine and Electric Motor. C. P. Turner, New York, N. Y.

578,298. Train-Controlling Device. C. A. Shea, Milton, Mass.

578,304. Electric Rail-Bond. B. J. Jones, Chicago, Ill.

Electric Vehicle Section

TIRES FOR ELECTRIC VEHICLES.

Monthly Meeting of Electric Vehicle Association.

The February meeting of the Electric Vehicle Association of America was held on the evening of February 24, at the Engineering Societies Building, New York City. President Frank W. Smith called the meeting to order at 8:30 p. m., and referred briefly to the action of the Board of Directors in securing permanent headquarters in the building and appointing A. J. Marshall as executive secretary. He then introduced Mr. Marshall, who made a short address referring to the work which had been planned. The Association now has 575 members.

Chairman Becker, of the Committee on Membership, was then called upon, and told of an active campaign being organized, and requested the co-operation of all members.

A paper entitled "The Tire Question as Applied to Electric Vehicles," by F. E. Whitney, was then presented, in the absence of the author, by E. R. Whitney. It was illustrated with lantern slides.

The Tire Question as Applied to Electric Vehicles.

The items affecting the cost of operation of electric vehicles have within the last 10 years undergone changes approximately as follows:

Battery.	
Weight reduced	30 per cent
Capacity increased	25 per cent
Life increased	50 per cent-150 per cent
Tires.	
Life increased	100 per cent
Cost reduced	50 per cent
Mechanical Parts: Transmission, gearing, bearings, etc.	
Life increased	100 per cent-500 per cent
Weight reduced	30 per cent-50 per cent
Efficiency increased	50 per cent
Current Rates.	
Reduced	50 per cent-75 per cent

The purpose of this paper is to briefly outline several interesting features noted in studying the tire question and the consequent effect on the performance of the vehicle.

As the data obtained has been confined to tires as applied to trucks and delivery wagons, solid tires only have been considered.

The prevailing types now on the market can be divided into two distinct types, viz.—Endless and Block; and further sub-divided into five classes, viz.:

Class A—Endless, cross wire.

Uniform compound throughout. The rubber at the base reinforced by embedded cross wires and secured to wheel by side flanges or side wire.

Class B—Endless, concentric wire.

Uniform compound throughout, having several wires embedded in the rubber at the base and running around the wheel, secured to wheel by press fit on band and side flanges.

Class C—Endless, hard rubber base.

Soft rubber tread, vulcanized to hard rubber base, which in turn is vulcanized to steel bands which are roughened and dovetailed to secure more permanent attachment. Tire secured to wheel by press fit and side flanges or T-bolts or, as with the case of a number of manufacturers, secured by rings, embodying a demountable feature.

Class D—Block, separate blocks.

Separate blocks secured by cross or side wire and metal cages over blocks bolted through felloes.

Class E—Block, notched tread.

The block effect is secured by V-shaped notches cutting the tread of the tire but the base is left continuous and the method of attachment varies with the manufacturer.

There are reasonable arguments as to the advantages of each class, and as all classes are in general use, there must be merit in each, the general drift at the present time, however, seems to favor the hard rubber base tire.

In selecting tires best suited for any particular case, there are five points to be considered from the point of view of the electric vehicle user, and I place then in the following order:

(1) Efficiency.
(2) Durability.
(3) Resiliency.
(4) Weight.
(5) Cost.

Efficiency is described in mechanics as being the ratio of effect produced to energy expended and with tires the most efficient tire is the one that will roll along the road and offer the least resistance to rolling, the effect of the efficient tires being to reduce the power required to propel the vehicle over the road.

A well designed truck with good tires will show a current consumption of say 35 watts per 1,000 pound mile, and of this total of 35 watts, from 20 to 25 are absorbed in the tires alone, leaving the remaining 15 to 20 distributed between bearings, gearing, motor loss, windage, etc. A change in tires on this same truck could easily increase the current consumption to 50 watts per 1,000-pound mile or in comparison in miles on one charge of the battery the truck in the first case would cover say 50 miles on one charge of the battery, as against 35 in the second case.

From the above it can readily be seen that careful design can easily be offset by an inefficient set of tires; so that if a saving in tire cost per mile is made it is made at the expense of increased current consumption, battery maintenance and reduced efficiency of the vehicle as a whole.

A number of methods have been adopted to test tires for efficiency and there is demand at the present time for a standard method of test, and the establishment of reasonable limits of efficiency. In fact, a number of electric vehicle manufacturers have set standards of their own and are specifying a certain test from the tire manufacturers.

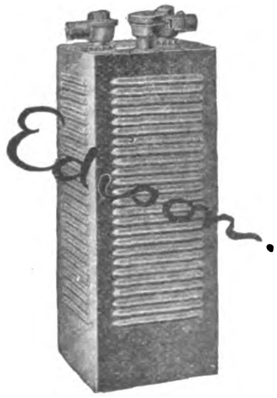
The several methods of test which we have found most satisfactory are as follows:

Bounce Test, which consists in dropping a piece of hard material on the tire from a definite height and measuring the height it will rebound. The proportion of the rebound to the total height will represent the efficiency of the tire, and although this is simply a comparative test, the results secured have been reasonably accurate and the test is quickly taken with tires either on or off the wheel.

Coasting Test.—Allowing the vehicle to coast down a known grade and determining the distance it will run; this being repeated with different makes of tires. The more efficient tire will coast further. This test involves changing wheels and to be accurate should be repeated under identical conditions and one test should follow the other as closely as possible

Running Test, which is made by running the vehicle over a measured course and with proper instruments and stop watch determine the power consumed in terms of watt-hours per ton or 1000-pound mile.

Towing Test, with traction dynamometer. This consists of towing the ve-



In the Blizzards

The Performance of the Edison Storage Battery is its Best Advertisement

DURING the Recent Severe Storms you could see the superiority of the Electric Trucks. Every third one of these Trucks was run by an Edison Battery and every Edison Battery did its duty. A few of the users in the Storm Centers are given below—ask them if they were glad to have Edison Equipment when the Blizzard struck.

NEW YORK

Abraham & Straus.
Adams Express Co.
American Express Co.
Bellevue Hospital.
Bonwit-Teller Co.
Burns Bros.
Charity Organization Society.
H. B. Claflin Co.
Columbia Storage Warehouse.
Dept. of Health.
Geo. Ehret Brewing Co.
General Baking Co.
Gimbel Bros.
Hammacher, Schlemmer & Co.
James A. Hearn & Son.
S. Lichmann's Sons Brewing Co.
Frederick Loeser & Co.
Lord & Taylor.
R. H. Macy & Co.
Mills & Gibb.
N. Y. Edison Co.
Public Library.
Jacob Ruppert.
F. & M. Schaeffer.
Franklin Simon & Co.
David Stevenson Brewing Co.
Tiffany & Co.
Ward Bread Co.

CHICAGO

American Posting Service.
Armour & Co.
Blue Valley Creamery.
Boston Store.
Carson, Pirie, Scott & Co.
Case & Martin Co.
Cluett, Peabody & Son.
Commonwealth Edison Co.
A. Dickinson Co.
The Fair.
H. J. Heinz Co.
Manhattan Brewing Co.
Mandel Brothers.
Marshall Field & Co.
Pilsen Brewing Co.
Jos. T. Ryerson & Sons.
Schoenhofen Brewing Co.
John R. Thompson.
Western Electric Co.
Western News Co.

BOSTON

American Express Co.
Boston Terminal Co.
Brown & Wales.
Burkhart Brewing Co.
Edison Electric Illuminating Co.
Haffenreffer & Co.
Houghton & Dutton.
N. Y., N. H. & H. Railroad.
North Provision & Packing Co.
Old Colony Trust Co.
Thompson & Norris Co.
J. C. Thornton & Co.
Turner Center Creamery Co.
Central Ice Mfg. Co.
N. E. Telephone & Telegraph Co.

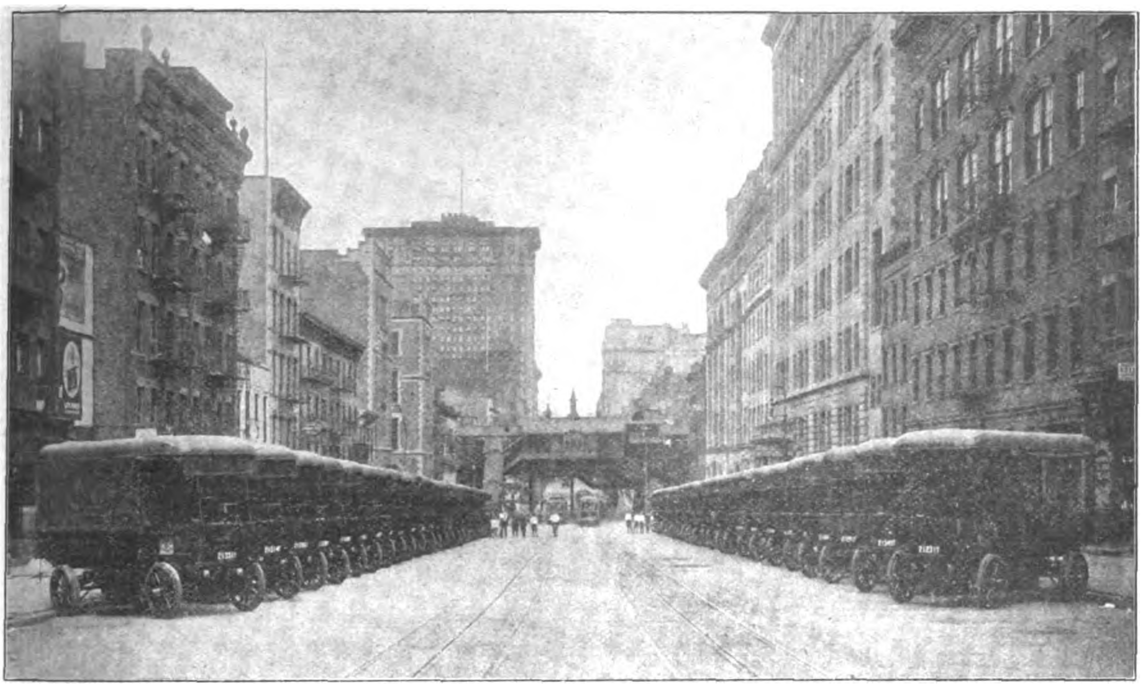
THE EDISON BATTERY did not buckle its plates when the extra load came on because you can even short circuit an Edison without injuring it. The Edison Battery had no broken jars because its steel container is practically unbreakable. The Edison Battery was not injured by too rapid charging to take care of the increased current demand because the Edison may be "boosted" at 5 times its normal charging rate for short periods without harm. In fact there were no battery troubles to put an Edison out of commission immediately or so distintegrate its elements as to materially shorten its life. If you will learn how it is made you will see why this was so. We have an interesting booklet on the subject that is yours for the asking.

Edison Storage Battery Co.

105 Lakeside Avenue, ORANGE, NEW JERSEY

CHICAGO ADDRESS: 2025 Michigan Avenue

Take New York for Instance



A Fleet of "Electrics" owned and operated by The American Express Co.

This is a photograph of a fleet of electric delivery wagons in the service of The American Express Co. in New York City. This company operates in New York 84 Electric Vehicles equipped with "Ironclad-Exide" Batteries. The National Express Co. has 11 "Electrics," and the Westcott Express Co. has 15 "Electrics" in New York City equipped with "Ironclad-Exide" Batteries.

The Jacob Ruppert Brewing Co., of New York City, one of the largest users of electric trucks in New York, has 23 trucks equipped with "Ironclad-Exide" Batteries and 12 trucks equipped with "Exide" Batteries.

George Ehret, another of the largest brewers in New York City, and one of the first brewing companies to adopt "Electrics", has 19 trucks equipped with "Ironclad-Exide" Batteries.

The Central Brewing Co.; Lower's V. Gambrinus Brewing Co.; Bernheimer & Schwartz; Otto Huber—these are other brewers in New York City using various types of "Exide" Batteries.

The New York Edison Company has 110 electric vehicles equipped with various types of the "Exide" Batteries.

The United Electric Light & Power Co., of New York City, operates 7 "Electrics" of varying capacities, equipped with the "Ironclad-Exide" Battery.

New York City has hundreds of other electric vehicle users—both commercial and pleasure—who are receiving excellent service from either "Exide" "Hycap-Exide" "Thin-Exide" or "Ironclad-Exide" Batteries.

Central Stations interested in increasing the use of Electric Vehicles will find that it pays to endorse the "Exide" Batteries.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator" The "Tudor Accumulator"

The "Exide" "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago **PHILADELPHIA, PA.** Denver San Francisco Seattle
St. Louis Cleveland Atlanta Detroit **1888-1914** Los Angeles Portland, Ore. Toronto
886 "Exide" Distributors 9 "Exide" Depots "Exide" Inspection Corps

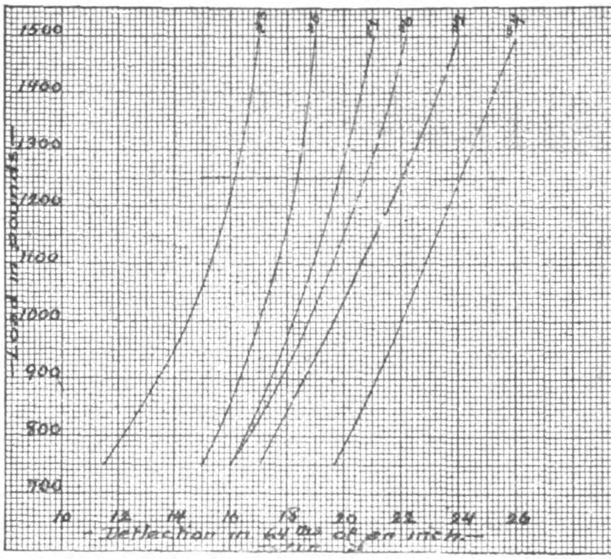


Fig. 1.—Deflection in Tire.

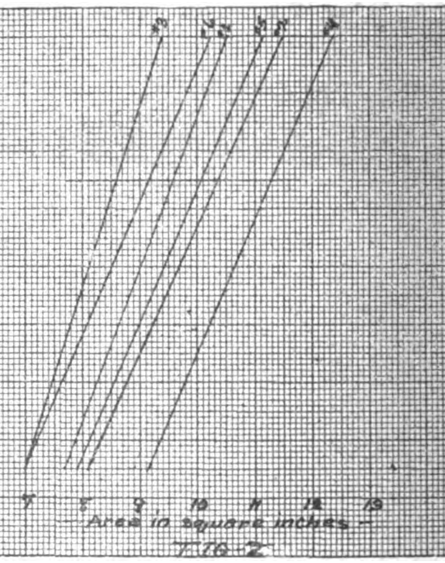


Fig. 2.—Area of Contact.

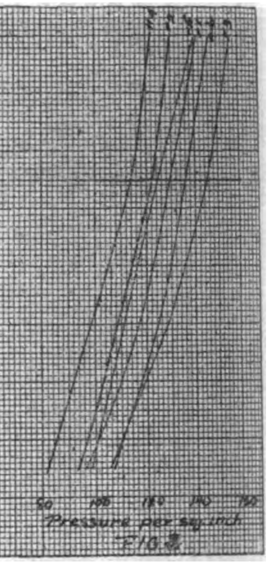


Fig. 3.—Cushioning Effect.

hicle over a definite course in both directions and observing the draw bar pull required This is an accurate test and is easily taken, but has the disadvantage of requiring the second vehicle and more men.

Dynamometer Test, which consists in mounting the tire to be tested and rolling it against a steel tired wheel, the resistance to rolling being determined in pounds at various speeds and pressures.

The question of durability is important as the cost of laying up a truck to have tire changes made involves considerable expense as well as inconveniences. For this reason a high-priced tire that will run 10,000 miles is a decidedly better proposition than a tire costing 20 per cent less which will only give 8,000 miles of service.

Resiliency is elasticity and although frequently used as referring to tire efficiency, indicates the amount the tire will depress under a given load and its value is in the cushioning effect.

The amount of cushion which the tire interposes between the wheel and the road is an important factor in the value of the tire as measuring the amount of injurious vibration and shocks which are absorbed. In order to determine this effect tires were given various loads and observations taken of the compression of the tire; also of the area in contact with the road.

From these observations curves have been plotted showing the load characteristics of various makes of tires and also the contact with the road, and the load per square inch of the surface in contact.

Fig. 1 shows a series of curves in which the deflection of the tire in sixty-fourths of an inch is plotted agains load in pounds. This test is made by pressing the tire between two parallel surfaces and simply measuring the compression in inches. It will be noted that on curve 3 with a load of 1,250 pounds a compression of 16-64ths is shown, as against 24-64ths on curve 4. In other words, on a bump, tire 4 will compress 50 per cent more than tire 3, and, consequently, absorb proportionately more vibration.

In Fig. 2 area in square inches is plotted against load in pounds.

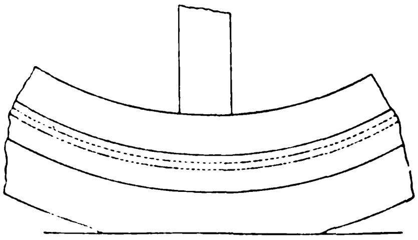


Fig. 4.—Shape of Tire Under Load.

In Fig. 3 pressure per square inch is plotted against load in pounds.

It will be noted that the area in contact with the road varies with the different makes of tires from 8 six-tenths to 11 three-tenths square inches. This, however, does not indicate much unless the pressure per square inch is taken into consideration.

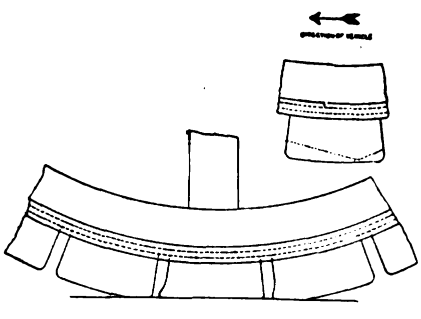


Fig. 5.—Effect Obtained with Block Tires.

Pneumatic tires are usually worked at about 75 to 90 pounds per square inch. It will be noted by Fig. 3 that at 1,250 pounds, solid tires are working at pressures of from 115 to 145 pounds per square inch. The wear on the solid rubber and the service it has to perform are considerably more severe than in the case of pneumatic tires.

Referring to Fig. 1, it will be noted by curve 4 from the direction of the curve that at even 1,500 pounds the tire has not reached its full capacity, whereas on curve 3 the deflection is not increasing in proportion to the added weight and consequently this tire is close to its carrying capacity. This shows that although the tires all have the same rating there is a decided difference in the actual carrying capacity.

Fig. 3 shows an interesting comparison. The first two curves are taken from Fig. 1 as showing tires of about the usual grade of rubber. The lower curve, however, shows test taken on a very soft tire which showed a deflection under load of from two to three times the usual amount. The cushioning of these tires was splendid and the vehicle rode as nicely as if on pneumatic tires, but the shape of the curve indicates that this tire is badly overloaded which actually proved out in this particular case.

Fig. 4 is made to show the shape of tires under load. It will be noted that there is a slight wave in the rubber at both the front and the back of the area of contact with the ground. When the vehice is moving this wave is in front and of increased height.

Fig. 5 shows the effect which is obtained with block tires. It is interesting to note that usually the first idea is that the heel of the blocks is worn out first but as a mater of fact, the toe is worn more on account of its creeping out from under the load as the wheel revolves. The dotted line indicates the

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shape the blocks assume after having been in service for some time.

It is frequently contended that block tires eliminate the wave in front and consequently are more efficient than endless tires. This is a fallacy, however, as the wave instead of being continuous, is broken by each block and very careful tests for efficiency have shown conclusively that with rubber of the same compound the efficiency test is the same.

The question of weight is usually given consideration by the vehicle manufacturer, but the tire manufacturer and the user do not seem to appreciate the importance of reduction in weight, as is evidenced by the fact that practically all of the tire manufacturers in producing their hard base designs have applied an intermediate band to the wheel, simply for the purpose of securing the tire, although the added weight from this band on a set of wheels for a five-ton truck amounts to approximately 400 pounds, and the cost of hauling this 400 pounds—which is approximately 2.5 per cent of the weight of the truck carrying average load—around for one year amounts to $40.00.

As President Smith had to leave early Day Baker was called to the chair to preside during the discussion. He called first upon representatives of the tire manufacturers, Messrs. Swander, Westlake, Phillips and Ashwell, who readily admitted that Mr. Whitney has pursued tests of tires further than the manufacturers. Mr. Ashwell stated that the factories were now alive, however, to the importance of efficiency and were developing along that line. He asked a number of questions which brought out the following information from Mr. Whitney. It is easy to segregate the losses of energy due to the tires and to the other elements of a truck. The results with worn tires are not uniform; some retain their initial qualities and some do not. There is not much variation in a batch of new tires made from the same compound, but tires of the same make do show differences. Little is known regarding the changes which the tire compound undergoes with age; some change but little, while others change a great deal, especially if unused.

Mr. Phillips explained the reason for the steel band on the wheel with some tires, and told of a test on two tires which differed greatly when new, but approached equality when half worn out.

W. P. Kennedy explained the work of the Society of Automobile Engineers in endeavoring to standardize wheel sizes. In a few years there will probably be only two sizes of wheels used on trucks, 36 inches and 40 inches.

Others joining in the discussion were Messrs. Sweeny, Stevens, Duck, Smith, Curtis, Lloyd and Howland.

Mr. Duck and Mr. Baker told of the proposal in Massachusetts to make the license fee for motor trucks proportional to the tonnage, and of the hearing on the bill, which was opposed by nearly everybody except the highway commissioners. The Committee on Roads and Bridges, which has charge of the measure, has not yet reported. The same question will soon come up in New York and all should co-operate to oppose it as class legislation.

Mr. Pardee said that a law was passed in Ohio making the fee dependent upon the horsepower of the motor. It was $5 up to 12 horsepower, with a surtax running up to $30. The automobile clubs secured an injunction against its enforcement. In Michigan a similar law was passed, and in order to make it valid, the personal tax on automobiles was repealed. This has aroused opposition in Detroit, as the state now gets the fee instead of the city getting the tax.

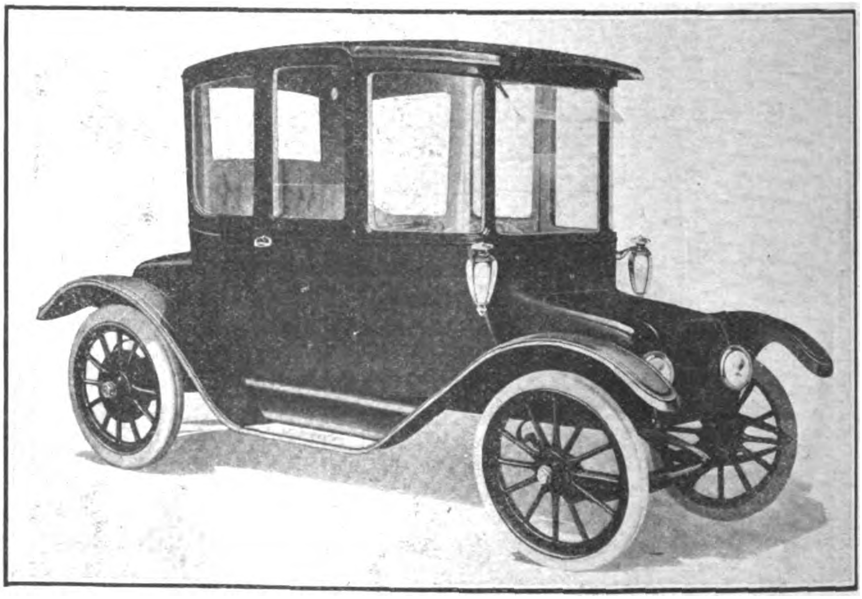
In closing the meeting, Mr. Baker announced that the Electric Motor Car Club of Boston was to celebrate its third anniversary on March 3 and invited all to be present.

◆

New Model Woods Electric Car.

Among the electric vehicles that aroused great attention at the recent Chicago Automobile Show was a new model developed by the Woods Motor Vehicle Company, of Chicago. The manufacturer of this car claims it to be fully a year ahead of present practice in electric car design and construction. The illustration herewith gives a general idea of the exceptionally graceful lines of the exterior. The outlines of the car are of pleasing, swinging curves; even the corners of the windows are rounded. The front and rear battery hoods have been merged with the body design in a stream-like effect. The fenders are made with long sweeping curves and crowned tops. The body of the car is hung low and the doors are wide and high with a neatly arched top.

In the running gear and chassis construction of this car a number of new ideas have been incorporated. The drive is through worm gear of the Hindley type which is extensively used by one of the best known English car builders. The worm is so mounted beneath the axle as to insure thorough lubrication by means of a forced circulation of oil through the worm and between the bearings. A feature of the chassis construction is the use of a subframe which carries the batteries and motor. Radius rods attached to the rear axle and extending to the chassis frame support the rear springs, thus giving them a leverage, which it is claimed makes the car an exceptionally easy-riding vehicle. Full elliptic springs are used.



New Model Woods Electric Car.

The interior of the car comprises everything that may be desired by the most fastidious taste. The seats are very roomy, the upholstery is soft and deep and the revolving chairs used in the front of the car are unusually large and comfortable.

The company states that it has prepared four types of the car described above; one has dual control from either front or rear seat, another is controlled from the front seat only, a third is driven from the rear seat only and has large revolving chairs in front, and the fourth is controlled from the rear seat and has a single long seat in front.

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CENSUS REPORT ON CENTRAL STATIONS.

The report of the United States Bureau of the Census on electric light and power stations for the year 1912, with comparisons for the years 1907 and 1902, the preliminary figures of which are given in this issue, presents much of interest. The most notable thing about this report is the general increase in electrical development which has taken place during the decade in question, illustrating to what an enormous extent the application of electric power and the use of electrical energy for lighting have increased.

The annual energy output of all the central stations of the country, including both municipal plants and those operated by private companies, doubled between 1907 and 1912, and in the latter year was 4.6 times the output in 1902. The income of the stations did not increase so rapidly, showing that the average price for electrical energy decreased. The income in 1912 was 1.7 times the income for 1907 and 3.5 times the income for 1902. Expenses increased less rapidly than income, indicating that the lower prices to consumers were accompanied by greater returns to investors; but the rate of return on the investment is not indicated.

The average size of the power plants has increased at the same time that the number has increased. While the number of stations was increasing 44 per cent, the capacity increased 308 per cent, and the employees, 162 per cent. In 1902 the average kilowatts of generator capacity per plant was 335; in 1907 it was 575 and in 1912 it was 980. These figures confirm the tendency, of which every engineer is very well aware, that stations are growing in size and that there are frequent consolidations of smaller plants into one large one.

One notable feature of these statistics is the fact that the number of steam plants has decreased since 1907, although the capacity of such plants has nearly doubled. At the same time there has been an increase in the number of plants driven by water wheels and by gas and oil engines, especially the latter. The most notable increase given in the table, however, is the capacity of motors which are served from the central stations. The horsepower represented by this service has increased 843 per cent since 1902 and was 2.5 times as great in 1912 as in 1907. This is a striking and convincing evidence of the growth of the industry.

As regards electric lighting, it is to be noted that the number of arc lamps in service has decreased since 1907, while at the same time the increase in incandescent and other varieties amounted to 82 per cent. With the advent of the half-watt tungsten lamp, which will be a more serious competitor of the arc lamp than anything hitherto available, we may expect this tendency in electric lighting to be emphasized in the next few years.

It is notable that municipal plants have increased more rapidly in number than those privately owned, but the tendency in this direction is less marked during the second five years of the decade than during the first five. However, during the second five years municipal plants increased nearly 25 per cent, while privately owned plants increased only 6 per cent. The municipal plants now number 30 per cent of the total. If compared in capacity or output, however, the percentage would probably be less than this, but the necessary figures for such a comparison are not given in the report. The diminishing rate of increase in municipal plants (the increase from 1902 to 1907 was over 53 per cent) can probably be attributed to the more enlightened attitude of the utility managers in dealing with the public. The strenuous efforts which are made nowadays to give the best possible service, the readiness to adjust complaints, the policy of managing a utility as a quasi-public institution in which the citizens of any community should take an interest and have this interest met by a co-operative spirit, together with a rapid advance in the regulation of public utilities by state commissions, should have a marked tendency in limiting the extension of municipal ownership in the future.

REPRODUCTION VERSUS DEPRECIATED VALUE.

In rate cases before public utility boards one element of importance in arriving at what is a fair charge for service is obviously the return which it will yield, and all authorities are agreed that no rate can be fair unless it at least yields a return on the value of the property or on the investment, or some such figures. But when one comes to the determination of what is the fair value of the property, one gets at once into the difficult part of the case. An illuminating discussion of this question forms a part of the proceedings of the Haverhill (Mass.) Gas Light Company vs. Barker, et al, before a master in defense of the existing rate schedule against an order of the Massachusetts Gas and Electric Light Commission, reducing the company's price. The company maintains that reproduction rather than depreciated value is the proper basis upon which to adjudicate rates and its reasons are set forth so clearly that they deserve mention.

If one undertakes to ascertain, as many courts have done, in such cases, just what is the present value of the property, regarded as so many pieces of land, so many machines, or so many miles of pipes or lines, and what it would cost to put in new equipment, and then tries to figure out how much ought to be deducted from that cost new, because of the varying age of the different parts of the property, one soon gets into the realm of speculation. Of course, efforts are made to figure out the amount of depreciation fair to accept, but after all, such efforts are never very satisfactory. On the other hand, it is an unquestioned fact that although, of course, during every day the life of particular parts of the property is shortened, yet the plant often improves in utility and efficiency with use. The parts of the plant become co-ordinate. Again, if one undertakes to fix the rate on the basis of a depreciated value, which fluctuates up and down more or less, it is obvious that if the rates are flexible they will be varying every year and almost every day, unless one adopts an average allowance for depreciation. In some way or other the actual depreciation from year to year must be ascertained and the company allowed to earn an amount representing the actual depreciation plus a fair return on the depreciated values of the property in addition to operating expenses.

The task of trying to determine the exact amount of depreciation occurring from year to year is difficult, and is not a matter of mathematical certainty. It does not depend alone on the life of parts. No part of a plant has any really fixed life. Averages are estimated, which are all right for average funds, but in reality the plant is renewed mainly because of obsolescence or inadequacy, equipment being discarded even though fit for operation. On the other hand it is fairly easy to ascertain the cost of reproduction. The prices of materials are well known to experts, and the cost of reproduction new is not a difficult matter to determine. It is also possible for an expert to estimate with reasonable accuracy the amount of money which a company would have to set aside from the beginning to provide an average fund sufficient to maintain the property and renew it as necessary.

THE COST OF ELECTRICAL ENERGY AT THE SOURCE.

The paper presented by Mr. H. M. Hobart at the midwinter convention of the American Institute of Electrical Engineers on "The Cost of Electricity at the Source" aroused a storm of protest on account of the figures which were used in computing the cost of a kilowatt-hour at the power house when energy is generated in bulk at a steam plant. Mr. Hobart admitted that his fixed charges were taken too low to represent possible practice at the present time. He defended his figures for cost of installation against the onslaught of his many critics. Certain it is that the figures used would not serve for the construction of a plant at any point where land is very valuable, as in a large city, and could at best only correspond to a plant erected at some remote point. Since the largest demands of power are, however, in thickly populated districts, this would represent a possible case only if the plant were intended to supply some large industry in an isolated location. This industry must be one which carries on a continuous operation in order to attain such high load-factor as Mr. Hobart assumed. It is not likely, therefore, that the specific figures used in the computation would apply to any actual power development, and unit costs of the values obtained are not likely to be reached in practice.

The two important lessons which might be drawn from Mr. Hobart's paper, however, were almost entirely ignored in the discussion. One of these is the fact that the cost of the actual generation of power is but a small fraction of the cost of delivering it to the consumer at the point of utilization. Even in densely populated districts where the energy is generated within a short distance of the load, distribution costs are found to exceed the cost of generation and to these are generally to be added other costs of an incidental nature, as well as the cost of the commercial department of the supply company, which is a necessary factor in securing a load. When, in addition to this, low load-factor, low power-factor and other disadvantageous elements must be reckoned with, it is not surprising that the consumer usually has to pay for his energy several times the cost of mere generation.

The other point to be mentioned is the bearing upon the relative cost of electrical energy generated by steam and by water power.. Under certain conditions the cost of electric power at the source is less when generated by one means and under other conditions it may be less for the other. Since investment costs are higher for a hydroelectric plant, the unit cost of energy appears more favorable for this case when the load-factor is high. Since, however, a steam plant can usually be located near the point of consumption, whereas a transmission line may be a necessary feature of the hydroelectric plant, and since the cost of generation is such a small part of the total cost of supply, it is evident that the advantage of a water-power plant over a steam plant can be great only where the conditions are especially favorable. The popular view that a water-power plant inherently connotes a supply of cheap energy to the consumer, a supply which is necessarily cheaper than where a steam generating plant is used, is shown to be a delusion which does not correspond with the actual facts.

HETEROCHROMATIC PHOTOMETRY.

Heterochromatic photometry, or the comparison of intensities of light sources of different colors, is a problem for the standardizing laboratory. For if it can be successfully worked out here, secondary standards may be easily established for any color and commercial measurements carried out through the comparison of light of approximately the same color. The common methods of photometry are based upon equality of brightness, and when applied to lights of different colors meet the obstacle that in judging equality of brightness which is intermingled with differences in color, different observers use different criteria and the same observer may do so at different times. Hence the results show unsatisfactory variations.

This difficulty has led to a search for other methods of photometry where different colors are involved, and up to the present time the method of flicker has seemed to be the most promising. It also, however, has certain inherent defects arising from the physiological properties of the eye, so that it cannot be said that as yet we have any wholly satisfactory method. It is found that the rate of flicker necessary is such that the eye is not exposed to the stimulus long enough to give a sensation corresponding to the full intensity of the stimulus; the decrease in apparent intensity due to the short exposure of the retina is not in the same proportion in all cases, since it depends not only upon the intensity of the light but upon its color; moreover, different rates of flicker are necessary for different colors and different intensities. For these reasons there is in the method of flicker a characteristic underestimation of the intensities of red and yellow light and an overestimation in the case of green and blue. While the uniformity of results is greater than with the method of equality of brightness, the results do not agree with that method, which it must be admitted is based upon a better principle and is limited in its application only by the uncertainty of personal judgment.

The defects of the method of flicker are emphasized in a paper read before the Philadelphia Section of the Illuminating Engineering Society and abstracted in our last issue. At the same time the authors, Dr. C. E. Ferree and Miss G. Rand, proposed a method of color photometry which avoids the difficulties of both the method of flicker and the method of equality of brightness. It has, moreover, a sensitivity about as high as the method of flicker. This method depends upon the phenomenon that the apparent difference in luminosity between a white and a gray surface depends upon the intensity of illumination of the surface, and this effect is found to be accentuated in the peripheral portions of the retina, which are consequently made use of in the observations. A match in luminosity is obtained between a test object, in which the apparent luminosity is dependent upon contrast with a white surface, and an adjustable comparison object under a known intensity of illumination. This equality disappears when the illumination is altered; consequently a test of equal illumination under a second and unknown source is the retention of the match between the test object and the comparison object, and this is independent of the color of the second source. Fuller details of this method, with a description of the apparatus, are given in the abstract referred to above.

This proposal seems a valuable one and one which should be thoroughly tested out under the conditions which obtain with the exact comparison of standard sources, as it furnishes great promise of solving this difficult question. Since it obviates the difficulties of the other methods, it only remains to be seen whether its accuracy is sufficient and whether it introduces any new difficulties in the situation. If these questions are satisfactorily answered the method may well become a standard one.

United States Government Exhibits at the Panama-Pacific Exposition.

The United States Government is preparing a series of elaborate exhibits for the Panama-Pacific International Exposition next year. It is said that these exhibits will be more comprehensive than any similar display ever made before. Exhibits will be made by various Government departments and will be distributed among the various exposition buildings in accordance with the class to which they belong.

Among the Government departments which will make exhibits are the United States Treasury, the War and Navy Departments, Post-office Department, Life Saving Service, the Fish Commission, Bureau of Standards, Bureau of Mines and the Geological Survey. An exceptionally interesting exhibit will be the very complete model, 500 feet long, of the Panama Canal.

Jovian Meeting at Columbus, Ohio.

The Jovians of Columbus, O., had one of the best meetings of the year on March 6, at the Kaiserhoff, with an attendance of 52 members. The star feature was an address by W. D. McKinney, superintendent of the Telephone Despatch Company, Boston, Mass., back in 1881-3, and later of the New England Telephone & Telegraph Company. As this period was the very beginning of commercial telephony, he was able to tell of many things not dreamed of in the experience of present-day electrical men, but which were a nightmare to those who were trying to establish public service with imperfect knowledge and crude appliances. Mr. McKinney introduced to the telephone world John J. Carty, now chief engineer of the American Telephone & Telegraph Company. He was picked out from a telegraph-operator job paying $20 a month, and made Mr. McKinney's assistant. Mr. McKinney is a personal friend of Alexander Graham Bell, Thomas Edison and other telephone men, and is himself the inventor of several telephone devices.

March Meeting of Philadelphia Section, Illuminating Engineering Society.

The next meeting of the Philadelphia Section of the Illuminating Engineering Society will be held on March 20, at the Engineers' Club, 1317 Spruce Street, Philadelphia, at 8 p. m. F. D. Bartlett will present a paper on "Lighting and Signaling Systems of Subways," and Prof. James Barnes will present "The Sun—The Master Lamp."

Buffalo Electric Show.

An electric show has been in progress in the Elmwood Music Hall, Buffalo, N. Y., during the present week, and closes at 10:30 p. m. this evening. The show is under the management of George H. Dreybus, and was organized by the Jovian League of Buffalo, which caused the Buffalo Electric Show Company to be incorporated. The chairman of the Executive Committee is E. D. McCarthy, and the secretary is Harry S. Hilliker. The decorations and illumination were in charge of W. D'A. Ryan.

The local electrical interests took an active part in the show and prominent among the exhibits were those of the Robertson Cataract Electric Company, H. I. Sackett Electric Company, the Federal Telephone & Telegraph Company, the Buffalo General Electric Company, the New York Telephone Company, and the local branch of the Jovian Order.

The Naval Reserves of New York State operated a wireless station in the building.

Among other exhibitors were the following: Buffalo Forge Company, Ericsson Manufacturing Company, Federal Sign System, McCarthy Brothers & Ford, Cataract Power & Conduit Company, Western Electric Company, W. C. Jaynes Electrical Company, J. C. Sterns Electrical Company, Holtzer-Cabot Company, Johnson-Wahle Electric Company, Frantz-Premier Suction Cleaning Company, Tower Electric Sales Company, Buffalo Electric Contracting Company, Burroughs Adding Machine Company, Thordarson Electric Manufacturing Company, National Carbon Company, Sterns Electric Equipment Company, American Steel & Wire Company, H. J. Wood & Company, J. N. Adam & Company, William Hengerer Company, Buffalo Electric Company, Flexlume Sign Company, Thomas Cusack Company, Monarch Refillable Fuse Company, Economy Fuse & Manufacturing Company, J. G. Clemens & Company, The Electric Shop.

Safety First Movement Take up by Utah Light and Railway Company.

The Utah Light and Railway Company has gotten out a neat button bearing on its face the company's monogram and the words, "Safety First." These buttons are presented by the company to the members of the "Safety First" committee, consisting of 25 employees of the company. This committee is changed at regular intervals. The retiring members retain their buttons, thus becoming ex-officio members of the Safety Committee.

Large Steam Power Plants to be Discussed at Chicago Dinner of Mechanical Engineers.

The Chicago Section of the American Society of Mechanical Engineers will hold its third dinner meeting at the Hotel Sherman, Chicago, on the evening of March 18. This meeting is expected to be an exceptionally important one on account of the subject to be discussed and the prominence of the speakers.

The subject will be "Large Steam Power Plants." The committee in charge of arrangements announces that it is expected there will be present at the meeting the following men in responsible charge of some of the largest steam power plants in this country. The speakers will be: John F. Sparrow, New York Edison Company; I. E. Moultrop and James B. Andrew, Edison Electric Illuminating Company of Boston; J. W. Parker, Detroit Edison Company; John Hunter, Union Electric Light & Power Company, St. Louis; and W. L. Abbott, Commonwealth Edison Company, Chicago.

Preceding the meeting members of the Section will be the guests of the Commonwealth Edison Company in inspections of the Fisk Street and Northwest stations of the company. All those desirous of attending the dinner should notify the committee in charge, or the chairman of the Section, Paul P. Bird, 120 West Adams Street, Chicago.

Big Rejuvenation to Be Held at Louisville.

Over 100 candidates for initiation into the Jovian Order have been listed for the rejuvenation which will be held at Louisville, Ky., March 17. The rejuvenation will be a joint affair, Louisville and Lexington, Ky., and Evansville, Ind., having part. The Seelbach Hotel has been selected as the place, a banquet following the rejuvenation, which will be participated in by a number of high officers of the order, including Reigning Jupiter W. N. Matthews, of St. Louis. James Clark, Jr., of Louisville, statesman for that district, and C. J. Eaton, of Lexington, statesman for the Bluegrass section of Kentucky, are in charge of arrangements. The interest in the event is increased on account of the fact that the rejuvenation is the first ever held in Kentucky.

Predicts Success of Trans-Oceanic Radio-Telephony.

William Marconi, while delivering a lecture in Rome, before all the nobilities of Rome and a great throng of the public generally, predicted the early success of radiotelephony, declaring that the human voice could be projected across the ocean by this method more quickly than a message could be sent by cable.

Electricity in Brass and Iron Bed Manufacturing.

In the manufacture of brass and iron bed steads, springs, couches, etc., the conditions encountered in applying electric motor drive are almost identical with those to be met in electrifying ordinary machine shops. In the weaving departments, however, special problems must be solved as the practice varies in every establishment.

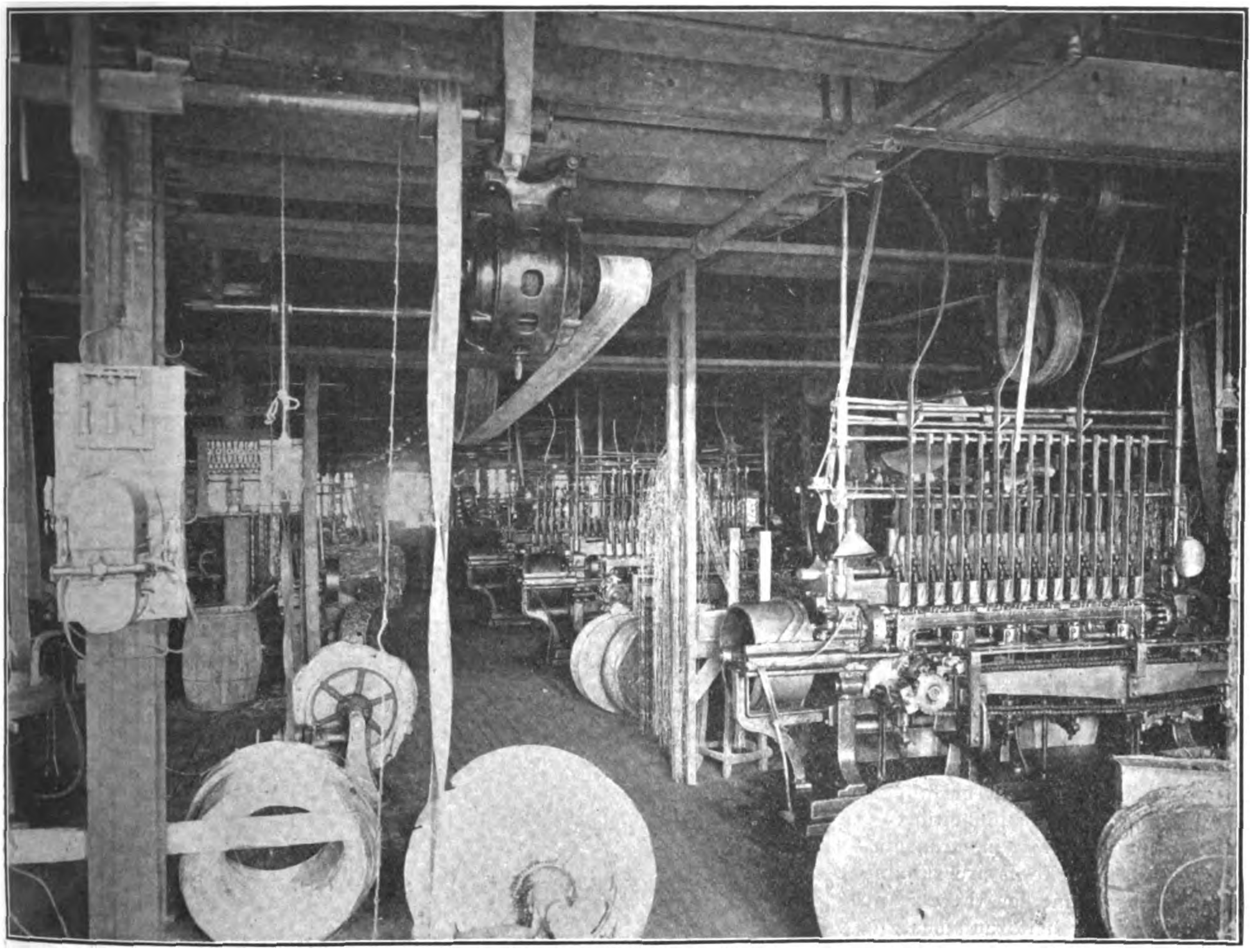
In the manufacture of brass and iron bed steads there are comparatively few operations that are of a special nature. Tube drawing and cutting and some of the special bending machines are perhaps common only to this industry but aside from these the conditions encountered in applying electric motor drive are similar in every respect to the ordinary machine shop.

In the manufacture of springs and sanitary couches the conditions are, of course, entirely different as the operations involved are different in practically every plant. In fact, most all of the larger establishments in this industry have designed and manufactured their own looms and auxiliary machines. It is obvious, therefore, that only general practice can be commented upon, the details as to sizes and types of motors, methods of applying, etc., having to be worked out by the power engineer for each case.

Briefly the operations in making bed springs, etc., are as follows: Wire in loose coils, as received from the mills, is usually first conveyed to the spooling room, either by means of conveyors, or manually. These loose coils are then rewound on special spools, to insure a continuous, easy feed for the looms. From the spools the wire is fed to link-making machines and then to the looms, where the springs are woven.

Aside from these departments of a bed-manufacturing plant the conditions are the same as in machine shops. A review of some of the salient features to be considered in soliciting the adoption of electric drive for plants in this industry may therefore be pertinent.

The application of motors for driving machine tools in a manufacturing establishment may be divided into four classes: (1) Group drive at a constant speed. (2) Individual drive at a constant speed. (3) Individual drive at an adjustable speed. (4) Cranes, hoists, elevators, etc. The selection of the type of motor and the question of groups of individual drive depends upon the number of factors, viz., nature of the work, size or location of machine tool, percentage of time that machine is in operation.



20-Horsepower Motor Driving Group of Bed-Spring Weaving Machines.

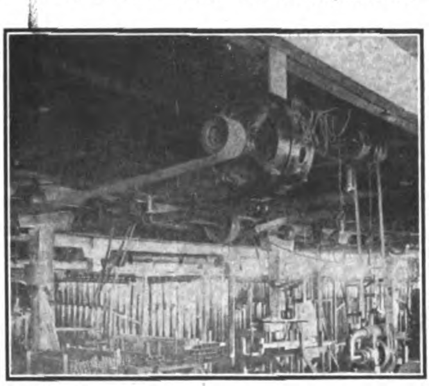
In determining on the motor outfit for operating machine tools, one of the most difficult questions to decide is that of group or individual driving, and the most general solution is a combination of these two methods. The ideal method, and the one coming more and more into general use is to have the motor form an integral part of the machine. This method entirely eliminates belting and shafting, both main line and jack shafts. The saving in cost of these mechanical transmission parts partially compensates for the installation of motor and controller.

The slip of belts introduces an uncertain factor in power supply which is entirely absent with individual motor drive. Furthermore, with individual motor drive the power delivered to the driven machine is automatically controlled and, in case of heavy demands, may greatly exceed the rated power of the motor, even for considerable periods of time. Thus a motor-driven machine is always capable of maximum production, while with belt drive and poorly adjusted belts the machine frequently balks before the full capacity of the machine is reached.

The even and easily manipulated speed control of machines individually driven increases their productive capacity to a very material extent.

The advantages of individual motor drive may be summed up as follows:

(1) Better control and greater range in speed and closer speed regulation. The average increment of speed increases in a belt driven machine tool is about 50 per cent. In an adjustable-speed motor it is 10 per cent to 20 per cent.



15-Horsepower Motor Driving Drills.

(2) Increased output and decreased cost of production, due in part to increase in amount of power available in motor over that transmitted by belts.

(3) Increased light and cleanliness by elimination of dust and belting.

(4) Greater ecenomy in transmission, especialy when tools are running only part of the time, as there is no loss due to driving belts and shafting when tool is idle.

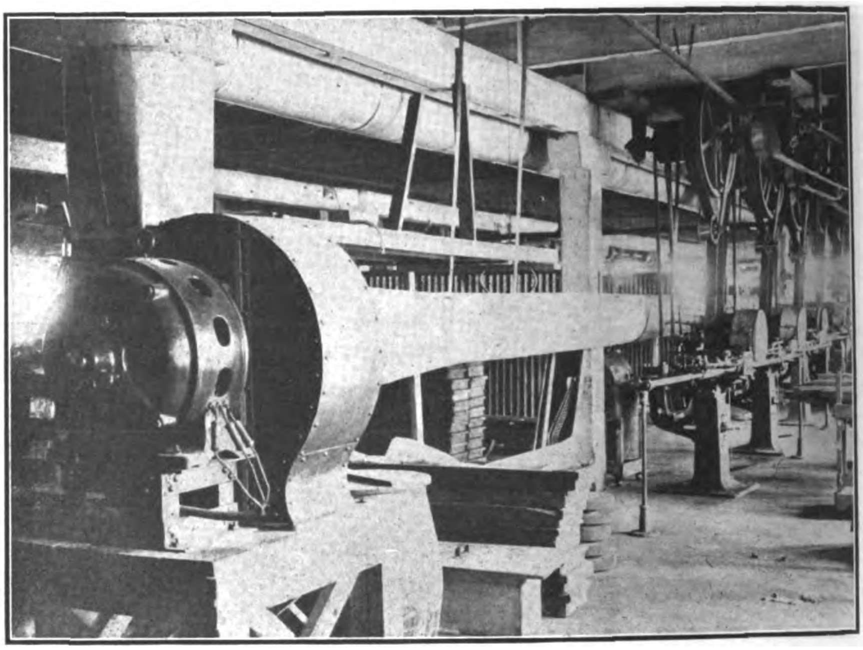
(5) Reduced cost of repair and maintenance, owing to absence of shafts, hangers, pulleys and belts.

(6) Head foom for cranes.

(7) More economical disposition of floor area and more convenient location of tools. Machines can be placed to best possible advantage with regard to light and sequence of operation. Additional tools can be readily added to equipment or location changed without any changes which are necessary in shafting when belt-driven tools are used.

(8) Use of portable tools which permits of bringing one or more tools to the work and thus performing several operations at the same time on a large casing.

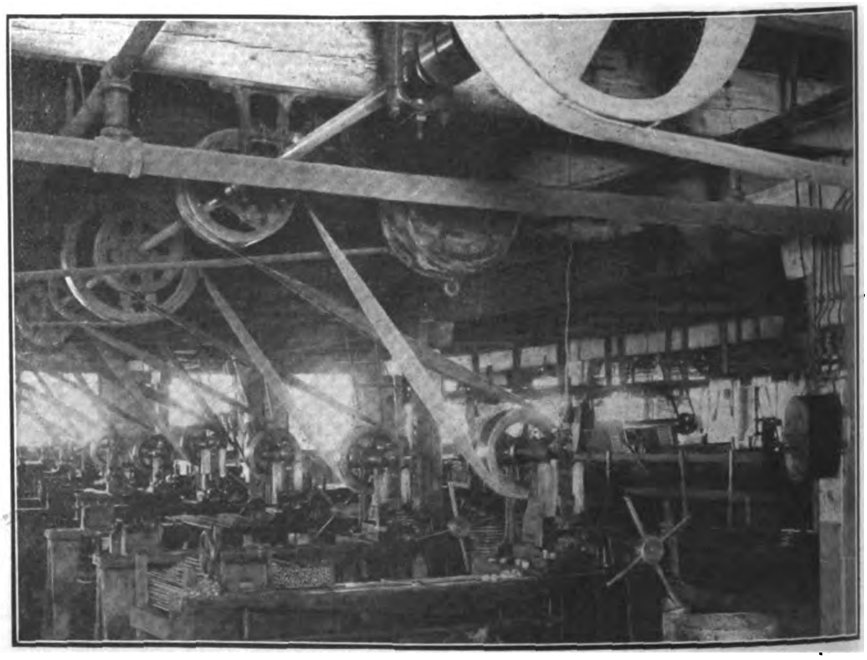
(9) Reduced cost of buildings, as absence of shafting simplifies construction.



15-Horsepower Motor Driving Exhaust Fan.

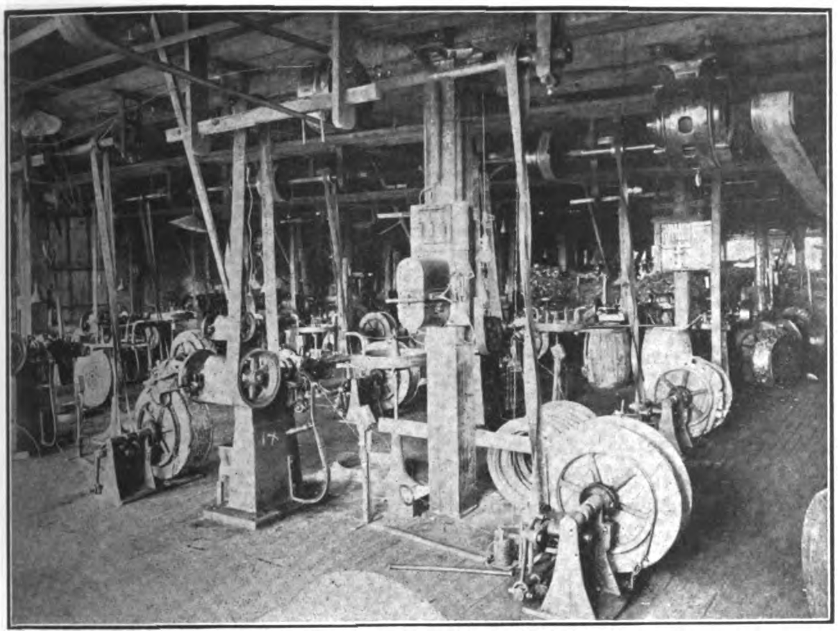
(10) Reduced cost in installation in many cases, especially for tools in isolated positions where expensive shafting and hangers would exceed cost of applying individual motors.

(11) Greater reliability and steadiness of power and freedom from stoppage of a number of tools, as in the case of a hot bearing or broken belt.



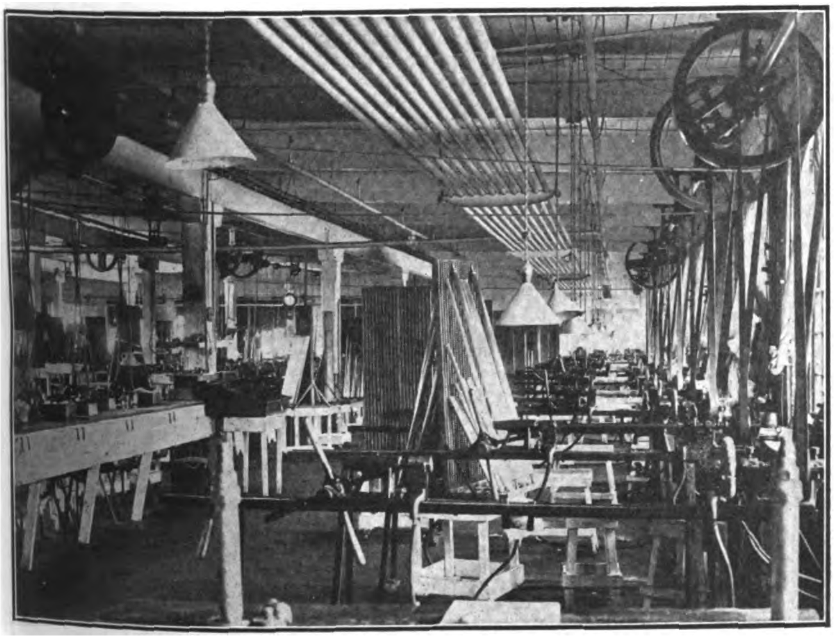
30-Horsepower Motor Driving Tube-Cutting Machines.

The most important advantage to be gained is a speed regulation adapted to the work. The convenience of securing the desired speed for maximum cutting, when electric drive is used, will result in a material increase in output. On most of the belt-driven machine tools the average increase of speed per step is about 50 per cent. For instance, the spindle speeds might run as follows: 10, 15, 23, 53, 70, etc. It was found by closely watching the work on these machines that while in many cases the speed was evidently too low for a given piece of work, yet the increase of speed to the next step was so great that the tool steel could not stand it. The controller used is such that the average increase of speed per step is about 10 per cent, i. e., 10, 11, 12.1, 13.3, 14.6, 16.1, etc. It will therefore be seen that the output per machine and therefore per man, will be considerably increased, since it is possible to more nearly approach the working limit of the tool steel. In every shop the labor item is the largest single item of expense, and the saving of a small per cent of a man's time will amount to quite an item at the end of a year.



20-Horsepower Motor Driving Link-Making Machines.

Electric drive provides a steady power and permits of great ease of speed regulation. The controller can be placed at the most convenient point, or, if advisable, two or more handles can be provided at different points, one being arranged to travel with the tool carriage. With the belt-driven machine more or less time is always lost in throwing a belt, and a negligent operator will not always take advantage of a change of speed on account of the exertion required to make the change.



Five-Horsepower Motor Driving Lacquer Machines.

It allows head room for cranes. A traveling crane can be used to great advantage in a machine shop, particularly for serving the larger machines. The effect of the electric crane on the economy of the shop cannot well be over estimated; though it is difficult to express in figures this economy.

With plenty of light and the absence of dust and dirt caused by shafting and belts, a workman surely ought to be, and usually is, inspired to do better and more efficient work.

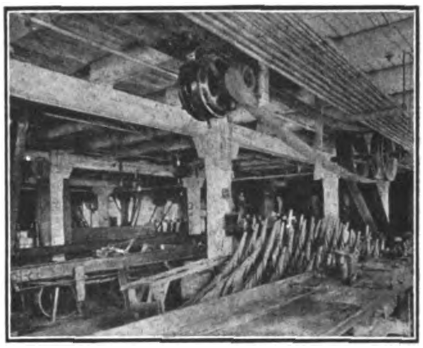
The machines can be placed to the best possible advantage and, if it should be necessary to rearrange them, it can be readily done.

If it is necessary to work a few machines overtime, a lot of power will not be wasted in running a shop full of shafting.

When a machine is not running it is not using power, whereas, in a belt-driven shop, the shafting is always running. Experiments have demonstrated that in an ordinary machine shop the shafting requires as much or more power than the power required to run the machines.

The absence of shafting simplifies the construction of the building.

· When changing over from lineshaft drive to individual motor drive in bed manufacturing plants as in others, the question arises whether to equip the old line-shaft driven machines with motors or to install new motor-driven machine tools. The old machines are not as strong in construction as new tools designed for motor drive, nor are they equipped with the latest devices by means of which the time required to make adjustments can be greatly reduced. Owing to weaker construction old machines cannot be made to remove metal as rapidly as machines built with this point in view. The old machines are also more or less worn and not as accurate as new machines. A concrete example will show a method of arriving at a decision between attaching a motor to an old machine and purchasing a complete new motor-driven equipment.



15-Horsepower Motor Driving Tube-Drawing Machines.

The case taken for consideration involves the modification or exchange of a 72-inch vertical belt-driven boring mill, so as to obtain a greater output at lower cost per unit of product. This mill, the original cost of which was $3,200, has been in use five years. The hourly overhead operating charge has been determined at 91 cents. The machinist receives 35 cents an hour for 54 hours per week (2,808 hours per year). The total earnings for the year from this machine amount to $4,200. The operating expenses for the year are as follows:

Overhead	0.91 × 2808 =	$2,555.28
Wages	0.35 × 2808 =	982.80
Total		$3,538.08
Net profit $4,200 — $3,538 =		662.10

The depreciated value of this tool on a basis of 10 per cent reduced balance is 66

Brass-Bed Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Company manufacturing a complete line of high grade brass and iron beds and sanitary couches. There is a total of 125 men employed working 10 hours per day.

Total connected horsepower, 153. Total number of motors installed, 11. Average kilowatt-hours per month, 10,112.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	11,100	May	8,920	September	8,200
February	8,680	June	7,480	October	10,610
March	9,670	July	7,880	November	11,080
April	16,740	August	9,380	December	11,610

Load-factor, 12 per cent; operating-time load-factor, 26 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	30	850	Belted to a line shaft driving a battery of nine tube-cutting machines.
1	20	1,120	Belted to a line shaft driving five bed-spring weaving machines; and four link making machines.
1	5	1,120	Belted direct to one tube-drawing machine.
1	7.5	1,700	Belted to a six-foot shaft (two hangers) and two countershafts (four hangers) driving one Beach Manufacturing Company jig saw; one Bentel & Margedant 24-inch pattern lathe.
1	15	1,120	Belted to 120 feet of shafting (22 hangers) and 12 two-hanger countershafts driving one Bradford 14-inch engine lathe; one Jones & Lamson three-inch turret lathe; one Columbia 30-inch boring mill; one Lodge & Shipley 18-inch lathe; one Binssee horizontal boring mill; one Lodge & Shipley 20-inch combination turret and engine lathe; one Laponite No. 2 broaching machine; one Jones & Lamson 2.25-inch turret lathe; one Prentice Tool & Supply Company 16-inch lathe; one Dresses 18-inch turret lathe; one six-inch forming lathe; one Jones & Lamson 2.25-inch chucking lathe; one Baker Brothers 24-inch double-machine drill; one polishing lathe (two 12-inch by three-inch wheels); one 24-inch exhaust fan; three eight-feet by 12-inch tumbling barrels; one automatic punch press (32-inch flywheel, six-inch by 2.5-inch rim); one Woodward & Rogers tapping machine; one G. W. Heartley punch press (19-inch flywheel, four-inch by two-inch rim); one C. S. Shuster wire straightener (18-inch flywheel, 4.25-inch by 2-inch rim); one double emery wheel (9-inch by .5-inch wheels); one No. 1-C punch press (12-inch flywheel, 2-inch by 2-inch rim); two two-spindle special horizontal drills; one thread rolling machine; one Fox rim-drilling machine; one Rockford 18-inch drill; one five-ton screw press; one Fairbank 12-inch sensitive drill.
1	5	1,700	Belted to a 14-inch shaft (four hangers) and three two-hanger countershafts driving one 16-inch cut-off saw; one Witherby, Rugg & Richardson 12-inch jointer; one Hermance 12-inch combination rip saw and horizontal drill; and one 20-inch pony planer.
1	7.5	1,700	Belted to a 30-foot shaft and a two-hanger countershaft driving one J. F. Coffman miller; one eight-inch sensitive drill; one E. W. Bliss No. 2.5 punch press (24-inch flywheel, five-inch by three-inch rim); one Standard Machinery Company No. 2-C punch press (18-inch flywheel, 3.5 by 2.5-inch rim); one 18-inch drill press; one Mossberg No. 2-C punch press (18-inch flywheel, 3.5-inch by 2.5-inch rim); one Rockford 18-inch drill.
1	15	1,120	Belted to a nine-kilowatt 12-volt 750-revolutions-per-minute generator.
1	40	850	Belted to 180 feet of line shafting and five two-hanger countershafts driving one 150-light 110-volt direct-current generator; one 2,000-pound freight elevator; four Rockford 18-inch drills; two Cincinnati two-inch plain millers; two 12-inch sensitive drills; one Bradford 16-inch lathe; one Michigan Machinery Company size 21 punch press (24-inch flywheel, four-inch by two-inch rim); and three Laquer machines.
1	0.5		Belted to a 16-inch exhaust fan.
1	7.5	1,700	Belted to line shafting driving one Porter 24-inch lathe; one Bradford 22-inch lathe; one Steptoe 16-inch shaper; one 10-inch tool grinder; one V and O No. 3 punch press; two special rolling machines; one E. W. Bliss No. 2½ press.

per cent of its first cost. If a motor is installed the investment appears as follows:

Value of tool $0.66 × 3200	= $2,112.00
Cost of motor, gears, controller, wiring, etc.	= 550.00
Total investment	$2,662.00

The hourly overhead charge of 91 cents includes interest and depreciation at 16 cents an hour; the overhead charge exclusive of interest and depreciation will therefore be 75 cents an hour. The depreciation on the new investment for the remaining five years' life of the tool will be 20 per cent per year, making the charge for interest and depreciation 26 per cent. The operating cost of the old tool with motor drive is, therefore,

Overhead (exclusive of interest and depreciation) $0.75 × 2808	= $2,106.00
Interest and depreciation, 26% of $2,662	= 692.12
Wages, 0.35 × 2808	= 982.80
	$3,780.92

Assuming 10 per cent increased earnings, due to adoption of individual motor drive, makes the total earnings:

$4,200 + $420 = $4,620.00

The net profit is then

$4,620 — $3,780.92 = 839.08

or 31.5 per cent interest on the investment of $2,662.

The corresponding figures, based on the installation of a new machine tool with individual motor drive, are approximately as follows:

Cost of new tool	= $3,400.00
Cost of motor, etc.	= 270.00
	$3,670.00
Scrap value of old tool at 5%	160.00
Investment	$3,510.00
Overhead operating charge:	
$0.75 × 2808 =	$2,106.00
Wages as above	982.80
Interest and depreciation for 10 years (depreciation 10 per cent, interest 6 per cent) 16% × $3,510 =	561.60
Total	$3,650.40

Assuming 25 per cent increased output for the year, the total earnings become:

125 per cent × $4,200 =	$5,250.00
Net profit is then $5,250 — $3,650.40 =	$1,599.60

or 45.3 per cent on the investment.

The above figures show that for the conditions given, approximately 14 per cent greater return on the investment is gained by installation of a complete new tool. It is evident, therefore, that although a somewhat greater capital is required for the new installation, it is by far the better investment. It is also probable that the old machine tools would not last more than five years after the changes were made, whereas the new tool will give good service for at least double that period. Furthermore, the new machine has the added advantage of being in first class condition, thus insuring greater accuracy of workmanship and less liability to accidental delays.

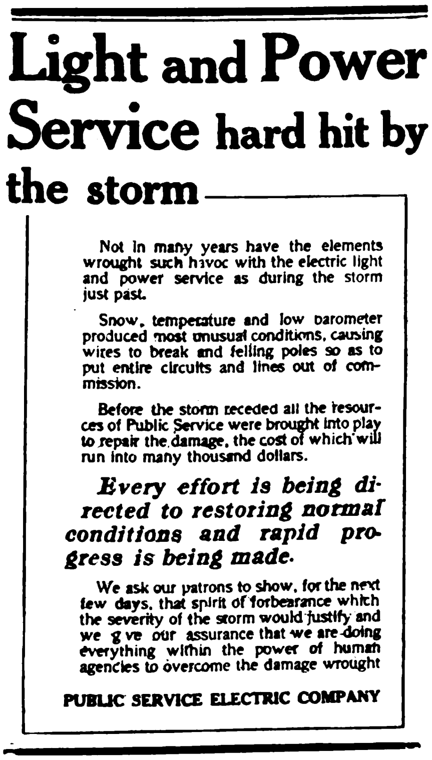
Information relative to the motor installation in a plant purchasing power is given in the accompanying data sheet.

Commercial Practice Management, Rates, New Business

New Jersey Utility Companies Advertise Service Conditions in Storm Period.

The recent severe snowstorm along the Atlantic Coast, centering in New York, New Jersey and vicinity, brought multiplied hardships to the public-utility companies serving this territory, with a total loss of many thousands of dollars. Throughout the state of New Jersey, practically every city and town, including Newark, Trenton, Camden, Jersey City, and surrounding districts, electric-lighting and power service was discontinued from March 1 to 3, due to damage to overhead distributing systems and the shutting off of energy as a precaution against further damage. Telephone lines were likewise effected, making attendant frequent interruptions in connections and service.

The forethought and consideration accorded consumers by the Public Service Company, which serves this territory, is shown by the accompanying reproduction of an advertisement which was run by this company in all important newspapers in the State during the storm period. These notices were opportune; informing consumers of the reason for interruptions in service and requesting their indulgence. They served to eliminate unnecessary inquiries, and at the same time earned for the company increased good will and respect of the various communities.



Light and Power Service hard hit by the storm

Not in many years have the elements wrought such havoc with the electric light and power service as during the storm just past.

Snow, temperature and low barometer produced most unusual conditions, causing wires to break and felling poles so as to put entire circuits and lines out of commission.

Before the storm receded all the resources of Public Service were brought into play to repair the damage, the cost of which will run into many thousand dollars.

Every effort is being directed to restoring normal conditions and rapid progress is being made.

We ask our patrons to show, for the next few days, that spirit of forbearance which the severity of the storm would justify and we give our assurance that we are doing everything within the power of human agencies to overcome the damage wrought

PUBLIC SERVICE ELECTRIC COMPANY

Newspaper Advertisement of Public Service Company After Recent Eastern Storm.

The New York Telephone Company also published similar advertisements in all papers reaching its subscribers. Under date of March 5 the New Jersey newspapers contained the following pertinent announcement:

"To the Public: The storm of Sunday and Sunday night, consisting of a very heavy fall of wet snow and sleet, accompanied by excessive high winds, was the most severe experienced by the wire-using companies in the State of New Jersey during the last fifteen years.

"Repairs are now under way, and will be completed as promptly as conditions will permit.

"In the meantime, we ask the indulgence of those subscribers whose service has been affected."

◆

Reduced Rates in Massachusetts.

The Central Massachusetts Electric Company, which supplies electricity to the towns of Monson, Palmer, Warren, West Brookfield and Wilbraham, has notified its customers in Brookfield that beginning April 1, the maximum price of current will be 16 cents in place of 17 cents per kilowatt-hour, with a reduction of one cent per kilowatt-hour if bills are paid before the tenth of the month. The company entered this territory about a year and a half ago and has secured a constantly increasing number of customers.

◆

Central-Station Power for Woolen Mills.

A 20-year contract has been signed between the Central Maine Power Company, Augusta, Me., and the American Woolen Company, for the supply of 385 horsepower to the mills of the latter company at Skowhegan.

Electric Rates in South Pasadena Reclassified and Reduced.

An ordinance has just been passed regulating the price of electricity in South Pasadena, Cal., this to go into effect May 1, 1914. The reduction is made on electric service for domestic use and will save the residents of the city about $20,000 annually. For rate-regulating purposes the electric service has been divided into five classes for lighting and into seven classes for power, dependent entirely upon the amount of current used. The classes and reduced rates are as follows: For lighting—class A, 7 cents per kilowatt-hour; class B, 6 cents; class C, 5 cents; class D, 4 cents; class E, 3 cents. For power—class A, 5 cents; class B, 4.5 cents; class C, 3 cents; class D, 2.5 cents; class E, 2 cents; class F, 1.8; class G, 1.2. These rates average a 20-per-cent reduction. The Pacific Light & Power Company serves the territory in and around the city.

◆

Growth of the Western States Gas and Electric Company.

The Stockton Division of the Western States Gas & Electric Company was formed by the combination of the Stockton Gas & Electric Corporation and the American River Electric Company in December, 1910, by H. M. Byllesby & Company. During the period between April 1, 1911, and January 1, 1914, there was an increase of 4,417 electric customers or 120 per cent and an increase of 2,433 gas customers or 59 per cent, whereas Stockton's population increased only 29 per cent in the same period. At the time Byllesby & Company assumed management there was one electric meter in service to each 9.4 of population, today there is one electric meter for every 5.48 of population. These figures of meter ratio include the fifteen other communities served.

During the period of Byllesby management the property has been entirely rehabilitated, part has been reconstructed and a great deal has been accomplished in the way of extension, addition and improvement. Great strides have been made promoting the use of electric power for irrigation. At the present time the total load of this nature served by the company amounts to approximately 5,000 horsepower. Following is a comparison of the electric connected load as of December 31, 1913, with that of April 1, 1911, covering a period of two years and nine months:

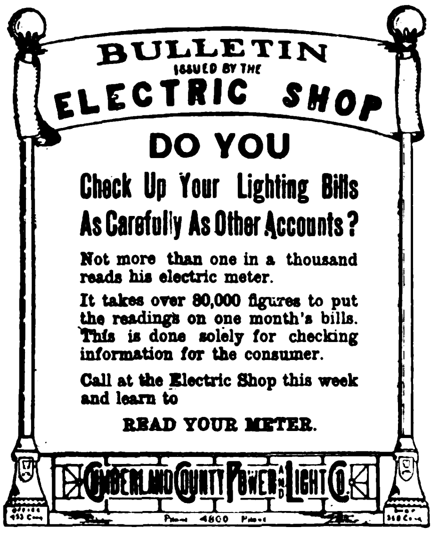
	Dec. 31, 1913	Apr. 1, 1911	Increase	Per cent Increase
Total number of customers	8,091	3,674	4,417	120
Kilowatts lighting load	7,355.4	3,487.6	3,867.8	111
Kilowatts city lighting load	253.2	201.2	52	25.9
Horsepower motors connected	14,699.2	3,386.5	11,312.7	330
Total kilowatts all purposes	18,574.1	5,974.8	12,599.3	211

(Note: These figures are exclusive of railway load, which averages 700 kilowatts.)

Customers Urged to Read Their Meters.

The Cumberland County Power & Light Company, Portland, Maine, has adopted the policy of urging the customers to form the habit of reading their electric meters, and is inserting advertisements in the local newspapers, which are printed in the form of daily bulletins, in which this subject is discussed. The company asserts that not more than one customer in a thousand reads his meter, and offers to explain how to read the measuring devices to all who will call at the company's office.

The accompanying illustration shows one of a series of newspaper advertisements used in this campaign to educate the company's customers. It is believed that if patrons get into the habit of reading their own meters there will be fewer unnecessary complaints made.



BULLETIN ISSUED BY THE ELECTRIC SHOP

DO YOU

Check Up Your Lighting Bills As Carefully As Other Accounts?

Not more than one in a thousand reads his electric meter.

It takes over 80,000 figures to put the readings on one month's bills. This is done solely for checking information for the consumer.

Call at the Electric Shop this week and learn to

READ YOUR METER.

CUMBERLAND COUNTY POWER AND LIGHT CO.

Cumberland Company Advertisement.

◆

Union Gas & Electric Accepts Temporary Rate Ordinance.

The Cincinnati council has passed and the Union Gas & Electric Company has accepted a temporary rate ordinance for electric current to be effective for six months. The rates are substantially the same as those now in effect, a maximum rate of 10 cents a kilowatt-hour and a $1.00 minimum charge. The temporary ordinance was passed to give time for a valuation of the property of the company to be made by the state commission and upon this valuation will be based a ten-year rate contract. The Union Gas & Electric is the principal operating subsidiary of the Columbia Gas & Electric Company.

Electrical Development in the Bronx.

On January 31, 1914, the Bronx District of New York passed the 1,000,000 mark in 50-watt equivalents, making for this Borough a greater connected load than that of many of the big cities in the United States.

From 620 customers, and 38,771 50-watt equivalents in 1901, to 37,637 customers and 1,045,000 50-watt equivalents, seems like a long trail, but it has actually been covered by Edison service in the Bronx in 14 years. Startling changes are the custom in the Bronx, but the remarkable increase in the use of electricity is a story in itself. All this has come to pass since the year 1900, when The New York Edison Company succeeded the North River Light & Power Company in this district. In 1900 there were about 25 miles of street mains and at the present time there are 250 miles. In 1900 there were approximately 450 customers, using about 28,000 16-candlepower equivalents. The City lighting, which is included in this total, amounted to 800 street arc lamps. There were at that time 71 employees. The substation equipment consisted of a generating capacity of approximately 1,200 kilowatts and the output for the first year amounted to 3,000,000 kilowatt-hours.

In the year 1905 the population of the district amounted to about 271,500 with a connected load on the Edison lines of 1,290 customers, aggregating 110,087 50-watt equivalents. This was an increase of about 35 per cent for the population growth and of more than 290 per cent of electric consumers.

At the end of the next five year period, 1910, the population was estimated at 439,575, or a growth of 62 per cent, with 11,986 customers and 424,184 50-watt equivalents, or a net increase of 285 per cent.

On January 31, 1913, the estimated population of the Bronx district was 575,000, out of which there were 38,590 Edison customers, and a connected load of 1,045,000 50-watt equivalents. As remarkable as the increase in population in the Bronx has been it will be seen that the increase in the use of electricity has out-distanced the growth of population by 115 per cent for the period extending from 1910 to 1914.

The accompanying table will give an idea of the rise in the volume of the company's business in the Bronx borough from the year 1900 to the present date, as well as the per cent and horsepower gained. The latter is given merely to illustrate the increasing use of electric service for manufacturing purposes.

The records of the company show an average gain of one electric consumer to every 15 persons, an average installation of 27 50-watt equivalents per consumer, and nearly two 50-watt equivalents to each inhabitant. This record would be hard to duplicate by any city of the size and population of the Bronx borough. These figures include the street lighting equipment maintained for the City of New York, the total of which is 3,859 lamps, comprising 1,994 street arcs, four flaming arcs and 1,895 tungsten incandescents. Additional city street-lighting installations are being placed on the Edison circuit every day and streets being lighted which were heretofore not lighted or where only gas was used.

Illumination of Portion of Southern Boulevard.

The present facilities for generating electric current are very extensive and it may be interesting to know that the total output for the year 1913 amounted to 49,500,000 kilowatt-hours. This work is handled by one central office located at 362 East 149th Street and three substations located at 140th Street and Rider Avenue, Park Avenue and East 188th Street, and Whitlock and Garrison Avenues. These substations are so located as to simplify the question of operation and distribution. Underground zones have been established and pole lines removed wherever business has warranted. Such changes have already been made on Third, Westchester, Longwood, Prospect and Tremont Avenues. The main offices at 362 East 149th Street, house 158 employees, while the various substations throughout the district, including the superintendent's office at 140th Street and Rider Avenue, have a total of 498 employees, making for the district a grand total of 656 employees as compared with 71 in the year 1900. Attractive showrooms where all kinds of electrical and commercial household devices are demonstrated to the public are located at the main offices of the company in 149th Street.

Third Avenue Looking East from Melrose Avenue.

The exceptional growth of manufacturing in the Bronx is shown by the increased use of electric power. In the year 1902, the first which shows any use of electric power in the Bronx, there were 741 horsepower used, while in 1913 there were motors connected to the extent of 14,482 horsepower. Almost all of the new buildings in the Bronx are on Edison service and practically all of the apartment houses now in course of construction have contracted for electric light. A large part of the lighting load is made up of store-window lighting and street signs, many of the main thoroughfares in the Bronx resembling Broadway in brilliancy of illumination.

Year	Customers	Per Cent Gain	50-Watt Equivalents	Per Cent Gain	Power
1901	620	..	38,771	..	.....
1902	726	17	55,205	42	741
1903	824	12	65,787	19	941
1904	996	17	83,072	26	1,190
1905	1,290	29	110,087	32	1,680
1906	2,101	63	156,829	42	2,229
1907	3,240	54	212,534	35	3,106
1908	4,361	34	258,434	21	3,641
1909	6,782	55	309,120	19	4,549
1910	11,986	76	424,127	37	6,169
1911	20,146	68	579,175	36	7,651
1912	28,582	41	754,901	30	9,350
1913	37,637	31	998,389	32	14,482

Only approximately one-half of the Borough of the Bronx is supplied by the New York Edison Company, the remainder being the territory of the Westchester Lighting Company and the Bronx Gas & Electric Company. The possibilities of the industrial growth of the Bronx have only been fairly opened at the present time, the real future being still ahead. The Bronx is made up of more than 26,000 acres, the principal part of which is comparatively new territory, the developments so far having been confined almost exclusively to the lower half.

Electric Sign Data

Electric Sign Advertising in Boston.

An interesting commentary on the electric-sign situation in Boston, Mass., by G. H. Young, of the Edison Electric Illuminating Company, gives some of the reasons why greater progress has not been made in spectacular electric signs in that city. The chief reason is on account of the existing ordinance which unduly restricts the hanging of signs. Speaking of this, Mr. Young says that the question is repeatedly asked by Boston merchants, "Why are there so few spectacular signs in Boston, the kind of signs that have made Broadway and extended its blazing trail of commercial prosperity so many miles?"

A sign man in Boston, should he admit that there are fewer of these signs (per capita), would refer to his marked limitations. Among the restrictions on electrical advertising on a large scale, there is none more potent than the "two-foot rule" prohibiting the projecting of signs more than two feet from a building line, and setting a maximum of fifteen feet on the perpendicular length.

New York City permits electric signs to project eight feet beyond and over the building line, and in other cities, also, electrical advertisers of modern merchandise have had greater opportunities to produce results.

In Boston there has been an apparent dislike of the big spectacular sign—the sign that makes one buy. The flashing of names written electrically stamps them indelibly in the minds of the buying public.

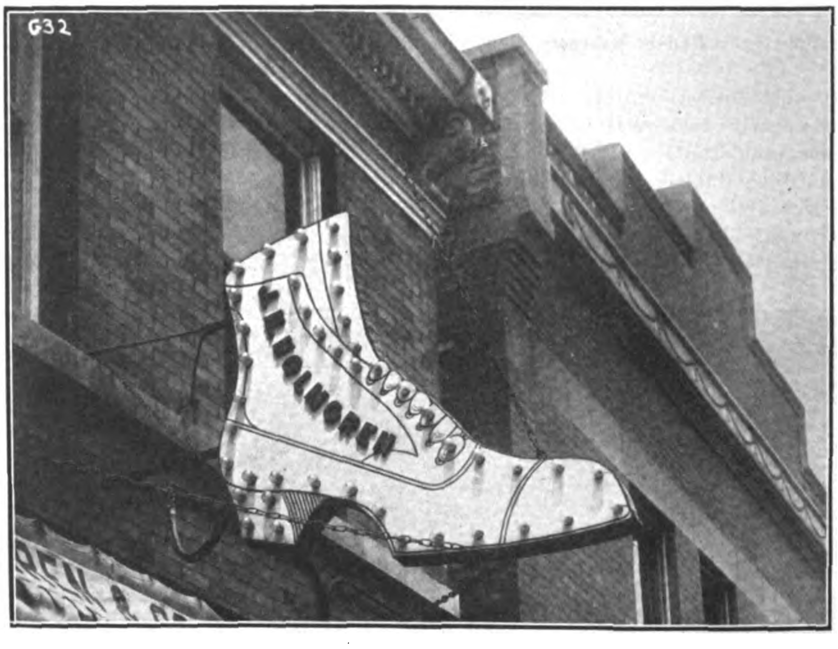
But although Boston has been reluctant to step aside, for reasons mentioned and no doubt also on account of geographic conditions in reference to arrangement of streets, the future success of the electric sign here is inevitable. The great Edison clock on Boylston Street, a leader of its kind, set the pace, and in the past two years electrical advertising has been assuming greater proportions; and new inquiries are coming in even from the conservative banks and churches. Only recently a prominent Boston banker expressed the opinion that the banks would soon wake up to the advantages of electrical advertising and follow the lead of western institutions of the same class.

The great value of electrical advertising as a business getter is unquestioned and the possibilities of the designer and manufacturer of electric signs is unlimited.

In connection with the Boston situation, L. D. Gibbs, advertising manager of the Edison Electric Illuminating Company, who has been co-operating with the contractors in Boston and showing them how to boom their own business as well as to help the central station, said that his department would try to furnish halftones for them for their illustrations, to a limited extent, until further notice.

"You can put up any sign," said Mr. Gibbs, "that with some definiteness calls attention to your business or to the electrical business, and wire back to a proper location, and we will install the meter and furnish the current for advertising purposes, you to take the responsibility of furnishing a time switch or seeing that the sign is turned off at proper hours. We advise and urge that you make it a point to burn these signs, for which we furnish the current, as many hours as it is at all profitable to do, from early evening until as late as there are people passing.

"We are also going to try to get around to each one of you with miniature house signs, in regular rotation, but expect you to furnish the lighting for them. You may wait for two months for one of these signs, but don't get worried, because you want to remember that we hope you will have a live proposition always with this house wiring plan. It has not been put out in a spectacular way, but as I understand it, it is one of the fundamental things that is going to make business for all of us."



Electric sign manufactured by the Federal Sign System (Electric), Chicago, Ill.

This sign is inexpensive yet is very effective for shoe stores. As will be noted, the shoe is outlined with lamps; the background is a blue enamel with the name of the merchant in black, raised letters.

There are 43 10-watt tungsten sign lamps used, burning continuously. A sign exactly the same as the one illustrated is arranged with a flasher that lights each lamp separately and the effect is very pleasing. The name can also be flashed if it is desired to do so.

No color effects are used except for the lamps.

Electrical Construction

WIRING AND EQUIPMENT FOR FORMING EDISON BATTERIES.

G. E. Ellis, Jr.

Recently in making an extensive addition to its factory, at West Orange, N. J., the Edison Storage Battery Company has provided a space for forming and testing cells about four times that previously occupied. One floor, nearly the entire length of the west wing of the new extension, is devoted exclusively to the forming of the smaller capacity types of cells for lighting, ignition, etc., while a portion of the south wing of the building on the same floor adjoining, about 225 feet in length, is devoted to the larger capacity types, such as are used for electric vehicles, street cars, train lighting, etc. The total floor space devoted entirely to testing is about 25,000 square feet.

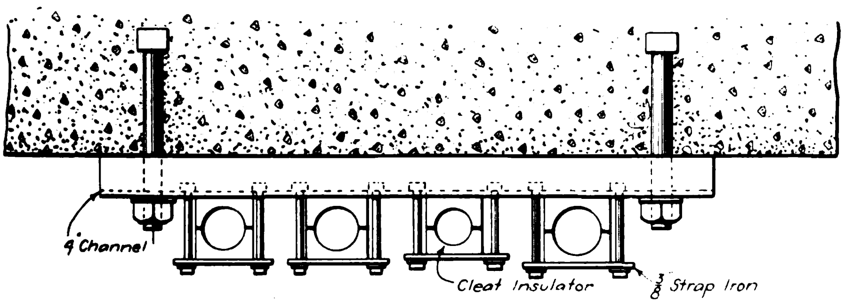


Fig. 1.—Method of Hanging Feeders.

The supply of direct current for the large number of battery circuits in this room is taken from two-phase, 60-cycle rotary converters which also supply power for the constant-speed, 115 and 230-volt direct-current motors throughout the main factory. The three-wire distribution system is employed, the neutral being brought out from the middle points of the secondary coils of a bank of single-phase transformers and run with the other two legs of the line taken from the direct-current side of the rotary, to the direct-current rotary panel and thence through automatic 3,000-ampere 250-volt overload circuit-breakers equipped with low-voltage release and reverse-current relays to the direct-current bus which supplies the current for the testing and power feeder circuits. Two 1,500-ampere, 120-240-volt feeder circuits supply the current for the testing and forming room. The three-wire feeder cables, the outside legs of which are 2,000,000 circular mils, and the neutral 1,000,000 circular mils, are taken from the switchboard trench in the substation on the first floor to the ceiling of the second floor (where the testing room is located) in rigid iron conduit bushed on the ends. Upon emerging from the conduit the cables are run under the concrete floor beams on a rack specially constructed of four-inch channel iron which is fastened up by means of seven-eighth-inch anchor bolts. To this are clamped the procelain cleat insulators by means of pieces of strap iron bolted to the channel iron. Two bolts pass through each strap, the insulator being held in between. When the nuts are tightened up on the strap iron the cable is gripped and held securely. See Fig. 1.

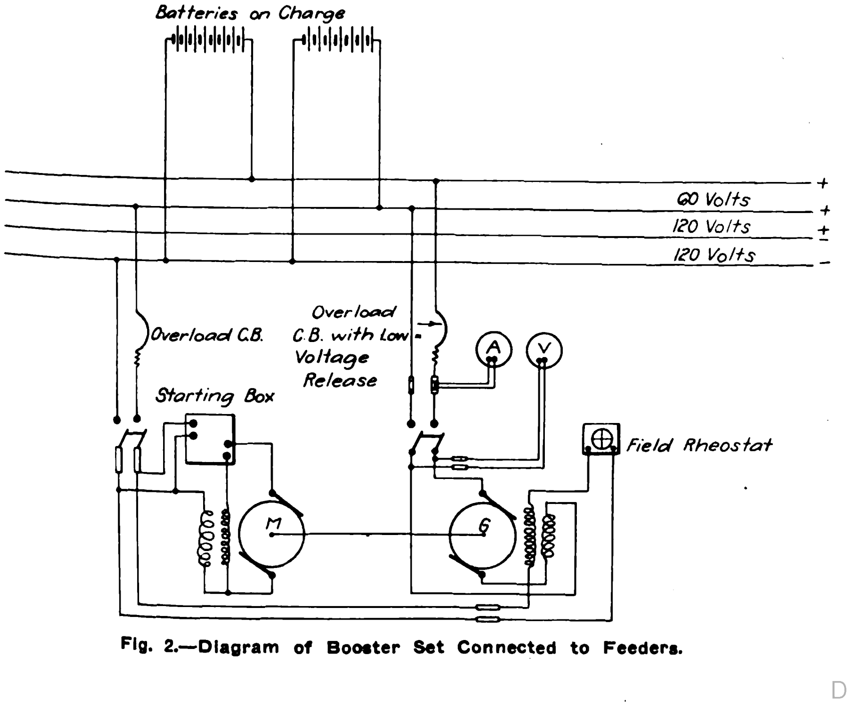


Fig. 2.—Diagram of Booster Set Connected to Feeders.

The three-wire feeder cables having the longest run are tapered toward the end, the busses of the testing circuits being supplied at intervals directly from these mains. On the positive side of the three-wire feeders another or fourth leg is tied in, when the testing switchboards are reached, in order to add the voltage of a 60-volt shunt booster. The addition of this leg provides for charging as many as 140 to 150 cells (which are the standard numbers usually connected in circuit) the booster voltage being added toward the end of charge as the battery counter-electromotive-force rises. Also this enables trays containing a small number of cells to be charged very economically on the "booster" side of the line. The negative leg of this four-wire line is made about one and one-half times larger than the positive booster legs on account of the added current it has to carry. That is to say a great deal more current is carried to the negative by the addition of the booster leg, as a great deal of charging is done on 300 volts as well as on 240 volts. Separate panels are provided for the motor and the generator of this booster set, the motor circuit being taken directly off the 240-volt three-wire testing feeders. Fig. 2 shows the way this set is connected up to the feeder mains, showing protective devices, etc.

The testing switchboards in the west

wing, all of which have been added recently, are arranged on structural-steel galleries which run the full length of the room on either side. On these galleries groups of 10 panels are arranged in each bay, back to back, transversely in reference to the gallery. See Fig. 3. This permits the most economical spacing of the circuits and the operator in the gallery can more easily watch the batteries on the floor. This also allows of good ventilation as there is a natural draft across the room from the windows, the switchboard offering no obstruction in this position. The principal features of the switchboard arrangement are as follows:

(1) Individual panel for each circuit.

(2) Ammeter on each panel always in circuit so that the rate can be constantly watched.

(3) Close regulation of current secured by using a coarse and a fine interpolated adjustment of the variable rheostat (also a fixed resistance is used which can be added or subtracted by a short-circuiting switch).

(4) Voltages obtainable by means of two single-pole, double-throw switches and a triple-throw swivel switch.

(5) Balanced discharge into either side of 120-240-volt line or through resistance.

Fig. 4 gives a good idea of the general layout of the circuits, showing arrangement of switchboard on the gallery and the wiring to testing trucks below. Note the very compact arrangement of the rheostats, the fixed resistances being below. Fig. 5 shows the wiring connections for a single circuit. The usual method of operation on the first forming run for a standard circuit of 140 or 150 cells is to throw in on 120 volts for a few minutes, then step up to 240 volts by the swivel switch, remaining on this point for several hours, then finish the last three or four hours of charge on 300 volts by stepping up to the third position of the swivel switch. Subsequent charges are usually started directly on 240 volts, owing to the somewhat higher counter-electromotive-force of the cells to start. The discharge is first started by throwing in on the 120-volt position and discharging directly into either side of line; when the operator is unable to maintain the required constant discharge rate by discharging into line with all the resistance cut out, he throws open the lower single-pole, double-throw switch connecting with the positive side of the line, and cuts in some resistance; then throws the switch over to the reverse position and regulates the current to the correct rate. By this means the battery is discharged entirely through the resistances. The fixed resistance is used and made just half the value in ohms of the variable as it effects a saving in cost and the steps obtained; using one-half as variable gives as close a regulation as could be desired.

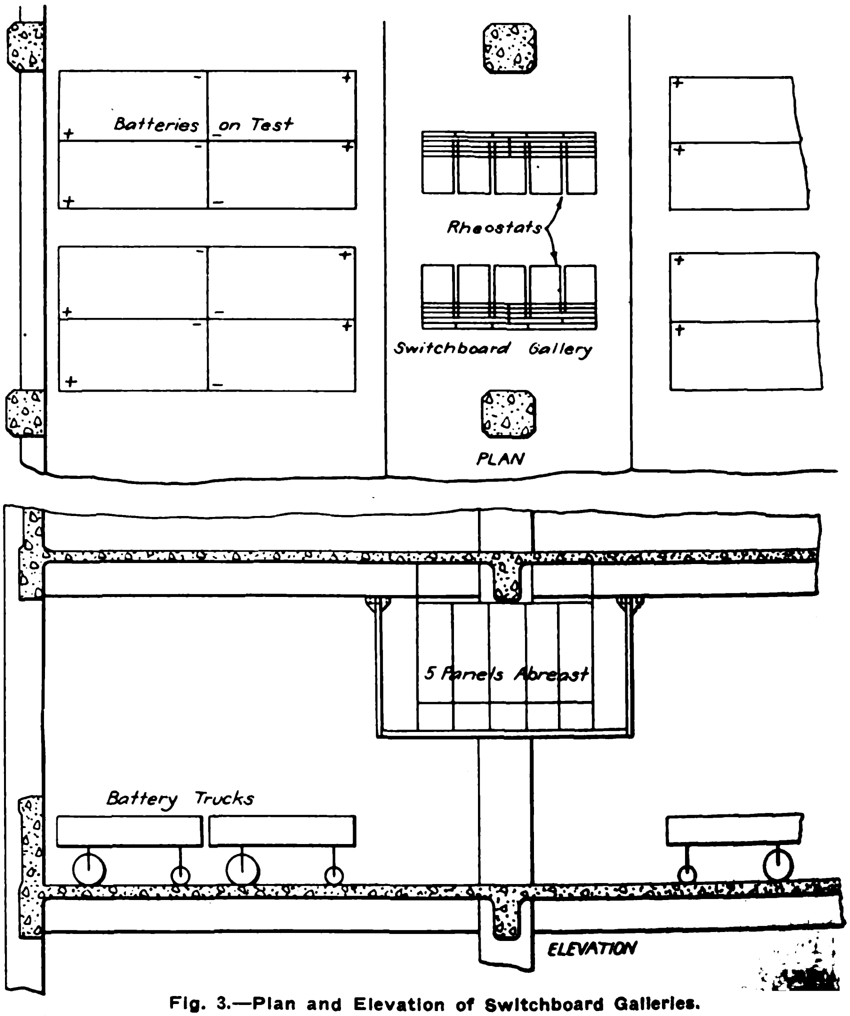


Fig. 3.—Plan and Elevation of Switchboard Galleries.

The single-conductor battery leads of No. 10 rubber-covered wire run from the back of the panels to the ceiling (only a question of two to three feet); thence they are run together in a rigid iron conduit along the ceiling to points above the respective circuits, where pipe taplet fittings with openings for two and four-wire porcelain covers are provided for the drops to the battery terminals, the positive and the negative leads being kept separate so that there is no danger of leads of opposite polarity becoming mixed. The positive leads for the battery nearest the gallery, however, are run down through the flooring and along underneath, as this saves considerable wiring. See Fig. 4. The ends of the leads are provided with lugs which fit over the taper poles of the cells at the terminals of the battery and are clamped down with the terminal nuts, all contact parts being nicely reamed and finished to secure the best possible surface contact.

The circuits, as has heretofore been stated, consist usually of 140 to 150 cells, which are carried in wooden frames mounted on steel trucks, which greatly expedite the moving of the cells between departments. For the smallest size a complete circuit of 150 cells can be carried on one truck, 10 trucks being placed opposite the 10 panels in each bay. The bodies of these trucks have angle-irons running lengthwise on each side into which fits the wooden frame which is insulated from the steel work by flat pieces of porcelain. This frame supports the wooden blocks, which are placed crosswise, being long and narrow and raised at intervals and shaped to fit the bottoms of the steel cell containers. (See Fig. 4.) Across the top of the frame strips are nailed to keep the cells spaced equally and to prevent the cans from touching. As an additional precaution to guard against grounds, all wooden frames and blocks are dipped in the insulating paint manufactured by the company especially for the cell containers, trays, battery boxes, etc.

Voltage readings of each circuit are taken at intervals during each discharge, a regular form, giving a record of each run, being kept and showing actual capacity of each cell, which owing to the "watch-like" precision of manufacture show a remarkable uniformity. To obtain these voltage readings rapidly a low-reading, finely-divided-scale voltmeter is employed having a period that will allow 30 or more full-scale deflections per minute. This meter is read by the operator in the gallery, one being fastened to a table in each bay.

The instrument leads run down to a forked wooden stick provided with soft copper strips on each tip to which the leads are clamped by a sort of binding screw and copper washer. With this stick the boy on the floor bridges the cell terminals, bringing down the stick with sufficient force to insure a good contact and obtains the voltage of each cell. In this way the readings for an entire circuit can be taken in about five minutes. After each discharge the cells are watered by means of a special electric filling device, which closes a circuit through a relay ringing a bell when the solution has reached the proper height above the plates.

The chief distinction in the larger capacity circuits in the south wing is that of course heavier wiring and copper is employed; also more space per circuit has to be allowed on the floor, making the arrangement of the panels different; otherwise the general layout of the circuits is the same as in the west wing. In addition, however, to the regular type of panels for charging and discharging, there are in the shipping room a few panels of different capacities for commercial charging only, the voltages obtained being 60, 120, 180, 240 and 300, whereby various numbers and sizes of cells can be accommodated. These panels either employ five receptacles for obtaining the different voltages or a combination of a single-pole, double-throw switch and a triple-pole swivel switch. Combined overload and underload circuit-breakers are placed in each of these circuits, most of this charging being done at night; consequently the rate is not apt to be so carefully watched as on the regular forming circuits.

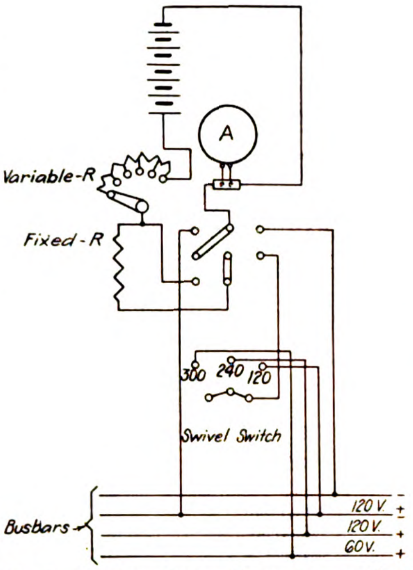


Fig. 5.—Wiring Connections for a Single Circuit.

As a whole, probably the most striking feature of this forming room, is the entire absence of all corrosive and suffocating fumes. All copper, polished nickel and other exposed metal parts are perfectly clean and bright. No special lacquers or protective coatings of any kind are employed as the gases given off from the alkaline solution of the Edison battery are odorless, colorless, and non-corrosive, the potash solution of itself being a preservative of steel.

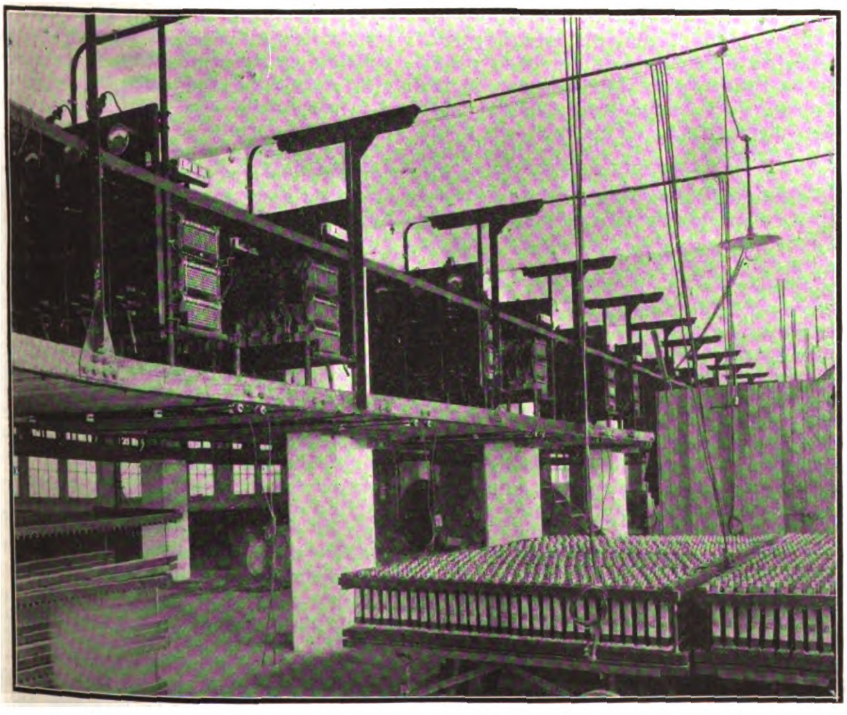


Fig. 4.—General Layout of Circuits, Showing Arrangement of Switchboard.

Tests on Weatherproof Insulation for 2,300-Volt Distribution Systems.

At the recent Cincinnati convention of the Western Association of Electrical Inspectors, as reported quite fully in our issue of February 7, there came up a report by the Committee on Outside Wiring. The main topic considered in this report was whether 2,300-volt distributing circuits should have bare or insulated wire. The report strongly recommended insulated wire. Supplementing the report was a very interesting paper by Edward J. McGann, of the division of electrical inspection, City of Chicago. Mr. McGann's paper gave the striking results of some original tests of weatherproof insulation for 2,300-volt lines and is therefore reproduced below in slightly condensed form.

From the standpoint of present practice the suggestion that 2,300-volt secondaries be run without insulation on the conductor itself, could be considered as a radical departure in this branch of electrical construction, if the suggestion were expressed as a reaity. Again the suggestion was evidently made at a time when the ineffectiveness of weatherproof insulation at this voltage was taken into consideration, the assumption being that 2,300 volts on a weatherproof insulated wire was as dangerous a factor to life and property as the bare conductor itself.

The results of the tests herein contained are not to be taken as authoritative. They were made only to show the possible degree of safety weatherproof insulation affords under different weather conditions and also for a basis of a discussion of a much mooted question.

Extending our thoughts to the hazardous sphere of the line repairman, one need not stretch his imagination very far to consider his position on a wet day working on bare conductors carrying 2,300-volt current, or linemen stretching a new line of bare wire on a pole already having 2,300-volt bare lines strung thereon under any condition of weather.

Weatherproof insulation, although not guaranteed to withstand undue strains, at least offers a certain protection to linemen when elevated on tower wagons or on poles with spurs. As a comparison common lamp cord with only one-thirty-second inch wall of rubber insulation must withstand 6,000 volts on a breakdown test. The thickness of the wall of new weatherproof line wire No. 8 to No. 2 is from three sixty-fourths inch to one-sixteenth inch, which is double that of the rubber wall of the cord and I dare say this insulation might stand 2,300 volts to ground without rupture, providing the line has not deteriorated too much from age.

Insulation Tests.

A number of test pieces of weatherproof insulated wire, which had been in the service of the Commonwealth Edison Company, of Chicago, show the following wet and dry insulation breakdown tests.

Size of Wire	Test	Length of Service (approx.)	Volts between Insulated Conductors ("cross")	Volts to Ground
No. 6	Dry	New	15,000	9,700 (a) 9,800 (b)
No. 8	Dry	New	10,000	6,950 (a) 8,200 (b)
No. 6	Dry	3 years	9,400 (a) 9,500 (b)	4,450 (a) 5,250 (b)
No. 8	Dry	5 years	7,200 (a) 7,700 (b)	4,150 (a) 5,750 (b)
No. 6	Dry	10 years	3,250 (a) 4,050 (b)	2,750 (a) 2,400 (b)
No. 6	Wet	New	4,375	2,500 (a) 2,500 (b)
No. 8	Wet	New	5,350	2,975 (a) 3,250 (b)
No. 6	Wet	3 years	3,500 3,350	1,775 (a) 2,225 (b)
No. 8	Wet	5 years	3,000 3,750	1,450 (a) 1,900 (b)
No. 6	Wet	10 years	2,250 2,000	500 (a) 750 (b)

Each sample was cut in half, for the tests under column "Volts between Insulated Conductors" designated (a) and (b), the test noted (b) being a check on the (a) test, on the 3, 5 and 10-year samples. Each test was made by hanging one insulated wire over the other and testing between conductors until breakdown resulted. Column, "Volts to Ground," also has an (a) and (b) test for each specimen, both of which were used for the "cross" test, the "ground" test being made at a different point on the insulation.

Each sample for the wet test was paraffined at the ends to prevent surface leakage and was immersed 24 hours in water. The idea of this length of immersion was to let the insulation absorb the same degree of moisture it might obtain by being exposed to a 24-hour rain beating down on the line. The tests show mathematical inconsistency due probably to ununiformity in manufacture or impurities in the impregnating solution.

The following table shows the relative thickness of insulation of the different specimens under test.

Size.	Age.	Diam. over Insulation.	Diam. of Conductor.	Thickness of Insulation.
No. 6	**new**	0.331 inch	0.160 inch	0.085 inch
No. 8	new	0.290 inch	0.128 inch	0.081 inch
No. 8	3 yrs.	0.292 inch	0.128 inch	0.082 inch
No. 6	5 yrs.	0.326 inch	0.160 inch	0.083 inch
No. 6	10 yrs.	0.224 inch	0.160 inch	0.032 inch

Test Comment.

I noted that the 10-year specimen was covered with only a single braid instead of a triple braid, as is now manufactured on this wire; the braid was badly worn and parts of the line from which it was cut were bare. The thickness of the insulation on this wire was only 0.032 inch while that of our present new wire averages 0.086 inch. This old insulation only stood a breakdown test of from 500 to 750 volts after 24 hours immersion in water. A lineman working on such a line surely needs all the protection afforded by rubber gloves tested at 10,000 volts.

Consider now the 5-year sample, the insulation was triple braid and measured 0.083 inch in thickness. After 24-hour immersion the insulation broke down at from 1,450 to 1,900 volts, showing that during this period of service weatherproof lines have had a great deal of the impregnated moisture-repellant washed out, and the line from a protective standpoint shows need of renewal.

The three-year sample also shows washout to an appreciable degree, the insulation breaking down at 2,300 volts for a thickness of 0.082 inch.

New wire under the same conditions of test broke down at from 2,500 to 3,250 volts. This insulation seems to be the only one to stand over 2,300 volts to ground without rupture.

Under dry conditions, the 10-year sample with the 0.032 inch thickness of insulation stood a breakdown-to-ground test of from 2,400 to 2,750 volts. This line with even this poor insulation might almost be handled with bare hands in dry weather, were it not for the attendant danger of standing on pole steps or spurs, which may penetrate into the pole sap. From the five-year piece to the new one the dry insulation test increases from 4,150 to 9,800 volts breakdown to ground.

Line Crosses.

To the initiated, no explanation of the amount of trouble that might be caused by a swinging cross on a line of bare conductors is necessary. To enumerate a few of these, I may mention: line flashes due to momentary contact between wires of opposite phases; transformer-secondary burnouts due to a possible welding of this swinging cross across wires of a phase; the frequent blowing out of fuses or circuit-breakers, if a generator is directly supplying these lines; heavy line surges due to these short-circuits.

After the above consideration of bare conductor lines permit me to again refer to the table showing the results of "Cross" tests between insulated conductors. The 10-year specimen previously considered shows a breakdown of from 2,000 to 2,250 volts between insulated conductors. With this low grade of insulation, 2,300-volt lines may experience trouble from swinging crosses in wet weather; a complete breakdown, however, might be stayed on account of surface leakage causing heating at the point of contact of the crossed lines, this heating resulting in a drying out of the insulation thus materially increasing the breakdown voltage above 2,300. Lines five years and less in service under wet-weather conditions would invariably stand 2,300-volt weatherproof insulated wires crossed on each other, as the range from the five-year to the new specimen varies from 3,000 to 5,350 volts breakdown. This test, if given any credence at all, shows that lines up to at least five years of age could be depended upon not to cause trouble between 2,300-volt conductors from line crosses as the breakdown test is necessarily too high.

Consider for a moment the effect of 10-year-old line carrying 2,300 volts, breaking and falling across a low-potential building service of the same age and insulation in wet weather. The effect is a short-circuited low-potential secondary and also the entrance of 2,300 volts into the building over its service wires, the latter probably causing disastrous results to apparatus connected to this service and to the lives of those having to come in contact with such apparatus. This same effect would exist if the 2,300-volt lines were run bare, and "crossed" on a building service 10 years of age, but in this case only a single wall of insulation would have to be broken down. Since this defective insulation broke down on a ground test at from 500 to 750 volts which is similar to the above conditions, it is clearly seen that by having both high and low-tension wires insulated the ratio of safety is 4 to 1 in favor of insulating both, to guard against high-voltage entrance into buildings. The "cross" test between insulated wires of this age varied from 2,000 to 2,250 volts breakdown.

Insulated building services of new wire would not be safe from high-voltage entrance with 2,300-volt transmission lines running uninsulated, the ground test showing only 2,500 volts on a "wet" test.

A piece of new telephone wire (new Code) tested, when dry, 10,000 volts to ground. A "cross" test between dry telephone wire and the 10-year, 24-hour immersed sample of weatherproof wire previously mentioned showed a breakdown test of 17,000 volts. If both pieces had been immersed for the same length of time, breakdown might have resulted at about 10,000 volts. Telephone systems would thus be removed from danger whether 2,300-volt lines were run either bare or insulated until both became deteriorated from age.

One advantage of weatherproof insulated lines, regardless of its insulation qualifications, is the protection it offers to copper wires in smoky sections of cities, particularly railroad yards. Bare lines in these locations, where wires are subject to sulphur fumes from smoke, would readily sulphate and after a year or two of service break down through this destructive agent. Public-service companies are not prone to spending money unnecessarily every few years for new copper lines when the insulation may be employed to this advantage.

Summary.

In consideration of the life and fire hazard from 2,300-volt entrance into buildings in conjunction with the results of the wet "cross" and "ground" tests it is apparent that bare conductors would most certainly increase these hazards when crossed on an old building service. The insulation breakdown on the wet "cross" test shows up so high even with 10-year old single-braid insulation that the possibility of high-voltage entrance into buildings causing destruction to life and property would be reduced to a minimum if triple braid were used and aged for the same period.

New weatherproof wires under wet conditions of weather are the only ones standing a strain over 2,300 volts. Since lines must necessarily age after being put into service, it is a fact that after a year or two on the pole the insulative quality of the insulation becomes almost useless from the standpoint of a protection to linemen. In general, linemen and repairmen who have no ready access to data concerning the age of pole lines can only judge their age from long experience, and the policy of safety of using rubber gloves on *all* lines of this voltage offsets the deficiencies of insulation. As previously cited elsewhere in this report, weatherproof insulation is also a protection against the elements. This protection is a decided advantage over bare conductors.

Although the advantages of insulating the wires over the use of bare conductors are decidedly in favor of insulation, we cannot help but consider weatherproof insulation as a poor one. It seems that some years ago when

2,300 volts became an almost universal distributing voltage to transformers a cheap insulation was put on these wires, first because they were out of reach on poles away from any danger of being handled except by the operating company's repairmen and secondly because the wires gave an appearance of safety to the unsophisticated public by being insulated.

The only reason that this old insulation is used is because of its cheapness. No improvement in this particular branch of electrical construction has been achieved.

I say improve the insulation on these wires to give the protection desired against this voltage. You may argue that an improved insulation means dearer line construction; lives also are dear, so is electrical apparatus. Let us have a better insulation so that the destruction of these two vitals of the electrical industry may be practically eliminated.

A Singular Electrical Fire.

There have been reports of all kinds of "freak" fires caused or supposed to have been caused by electric wiring, but the following account is worthy of mention as it is the first one of its kind brought to the writer's attention.

A call came recently from one of our customers that the dining-room floor push in one of the residences, had caused a fire and wondering all the time I was on the way what this mysterious message meant, found on reaching the premises that the dining-room floor push was an old-style arrangement with the plate split through the center. The customer was having his floor refinished and the painter had the floor covered with wood alcohol to remove the old varnish, using steel wool for rubbing. There were four dry cells on the dining-room bell, which happened to be connected to an annunciator. It did not take much of a spark to ignite the wood alcohol and the entire room was filled with flame. The contact was made by rubbing the steel wool over the plate of the floor push and this made the spark.

E. M. Raetz.

Signaling From Meter Station.

The peak load on our system is in excess of the capacity of the power house, which is 5,000 kilowatts. We are, consequently, compelled to purchase power from another company at certain times. This is accomplished by tapping the high-tension transmission line running from our power house to the substation, 90 miles away. At this tap, which is 30 miles from the power house, connection is made to the generating station, which is connected in parallel through meters which are provided with reverse cutouts so that the meters will not run backwards in case current flows from the line into the auxiliary power house. It was known that at times power was being transferred in this direction, however, and it was desired to control this without keeping an operator on duty at the auxiliary station. It was accomplished as follows:

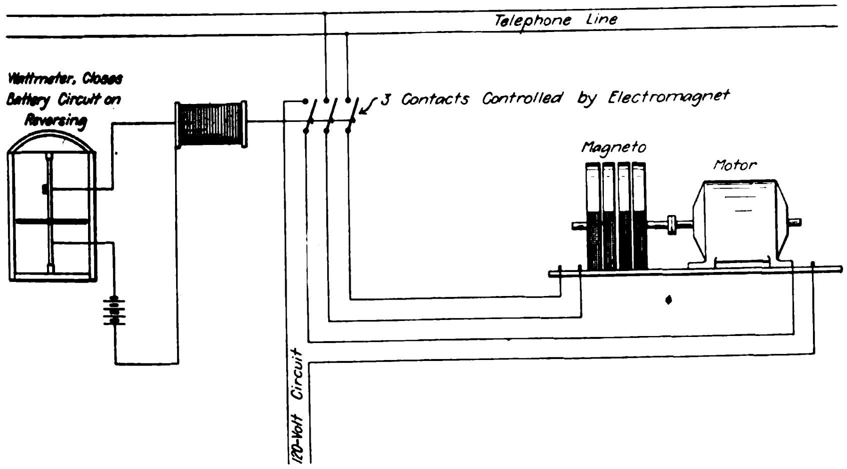

Telephone Line
Wattmeter, Closes Battery Circuit on Reversing
3 Contacts Controlled by Electromagnet
Magneto
Motor
120-Volt Circuit

Diagram of Signaling System.

A telephone line was utilized, as shown in the accompanying illustration. When current flows into the station so as to actuate the meter cutout it also closes a local battery circuit and causes an electromagnet to close three contacts simultaneously. One of these is connected in the 120-volt driving circuit of a motor which brings a magneto up to speed. The other contacts connect the magneto to the telephone line, thus ringing a bell at the main power house. The operator here then reduces his voltage until the bell stops ringing. The device does not interfere with the use of the telephone line in any way.

By occasionally bringing the voltage up until the bell rings and then reducing it again until the bell stops ringing, the operator can at all times be sure that power is not supplied in the wrong direction and yet keep his voltage up to near equality.

An adjustable spring on the shaft of the meter allows a small amount of power to flow back before the mechanism operates. This avoids too delicate a balance. James McMahon.

Meeting of Oregon Contractors.

The annual meeting of the Oregon Electrical Contractors' Association will be held at Portland, Ore., on June 8 and 9. This will be during the week of the annual Rose Festival, and it is expected that a large attendance will be a feature of the meeting. Particular attention is to be paid to manufacturers' exhibits, for which special facilities, with free space, will be provided.

Among the Contractors.

The Wagner-Woodruff Company, of Los Angeles, Cal., was awarded the contract for placing electric fixtures in the Board of Education's warehouse on San Pedro Street.

The contract for the electrical wiring of the Lehr Memorial Building, Elyria, Ohio, has been let to Avery-Loeb Electric Company, of Columbus, O.

The Marine Electric Company, of Louisville, Ky., has the contract for wiring the courthouse at Shelbyville, Ky.

The Santa Monica Supply Company, which is now under the management of William Atwell, Jr., and J. S. Lockwood, has recently moved into new and larger quarters at 1446 Third Street, Santa Monica, Cal. The company manufactures fixtures and deals in supplies, besides doing a general electrical contracting business.

The General Electric Inspection Company, Newark, N. J., has been awarded the contract for electrical work and wiring in the new temple and school building for the Congregation B'nai Jeshurun. About 800 lamps and small motors totaling about 50 horsepower, will be installed.

The contract for the electrical installation for the new Broadway Theater in Portland, Ore., has been awarded to the West Coast Engineering Company. The electrical equipment of this theater will be very complete, especially for the stage and special lighting effects. The lighting of the exterior of the building and the main entrance will be among the interesting features, and will consist of approximately 600 decorative lamps. The company also has orders to overhaul the electric wiring system in the Portland Academy.

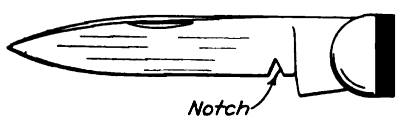
The Swan-Bower Company has been incorporated to engage in the business of electric wiring and handling fixtures and supplies at Steubenville, O.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Skinning Wires.

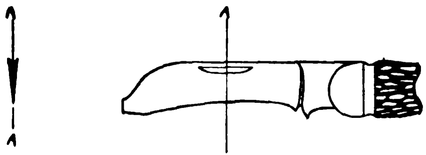
Anyone who has a number of fixtures to make up will find that by making a notch in his knife blade, as shown in the illustration, he can strip the ends of the fixture wire in about one-quarter the time otherwise required and not run the risk of breaking the wire off, as is often the case when a sharp blade is used. Simply insert the wire in the notch and pull the knife along it. John Shortt.



Notched Knife Blade.

Another Way.

When using a pocket knife to strip insulation from wires it is impossible to keep the blade sharp for any length of time. I have found it desirable to grind the back of the blade hollow, as shown in the accompanying illustration. This is done on an emery wheel, leaving two sharp edges at the section through *AA*. These edges are used for skinning the wire after they have been stripped with the cutting edge.



Knife Blade with Ground Back and Screwdriver Point.

Another handy attachment on a knife blade is a screwdriver for light work, such as connecting sockets. It is formed by grinding down the point of the blade to the desired shape, as is also shown in the illustration.

Robert Oster.

Dimming the Light.

A novel arrangement for turning down an electric light in places where the lamp is within reach is the following: In a dome over the dining-room table I use a single pendent tungsten lamp with a glass reflector. I took the strings off of a "dimalite" socket rheostat which I used for the purpose and by using a weatherproof-socket shade-holder was able to attach the reflector directly to the dimalite. An ordinary shade-holder was too small. Mounted in this way the light can be dimmed or raised to full brightness at will by turning the reflector. H. Piccard.

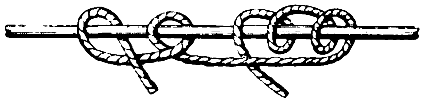
Threading Tube Without Scratching.

In threading one-eighth-inch brass tubing, such as is used in fixture work for arms, stems, etc., take a 12-inch round file and turn it into the opposite end of the nipple to be threaded. By placing the stocks in a vice, the tubing can be turned by applying a pipe wrench to the file, thus leaving the finished surface of the tubing unharmed.

W. C. Dee.

Rolling Hitch.

There are many times when it is desired to pull up a line of wire without the aid of a come-along, Buffalo or other form of wire grip. In such a case the rolling hitch which is illustrated in the accompanying figure is very useful. The rope or cord should be arranged to form the hitch as shown, and care must be taken that all of the turns are pulled up tight before the strain is applied, for in this lies the holding power of the hitch. To increase the gripping capacity of the knot, half hitches can be made at the strain end of the object, but these are not really needed unless the strain that is to be applied is terrific or the object is very small in diameter, such as a No. 9 iron wire. It may be noted that this hitch will hold fast on a length of two-inch steel shafting, even though smeared with grease, provided all turns are made close and pulled tight and several half hitches taken in addition. W. E. Rhodes.



The Rolling Hitch.

Fishing in Partitions.

In the issue of February 14 there is a wiring kink by William E. Rhodes on "Fishing in Partitions." He uses a string with pieces of lead attached. I have found a much better scheme is to use a piece of chain such as plumbers supply for bath-tub drains. The chain is flexible and strong, so that it is not likely to break, and will not hang up on the plastering or nails. It can be used to pull wires through flexduct, as well as partitions. I carry a piece of the chain in my kit at all times.

A. H. Jackson.

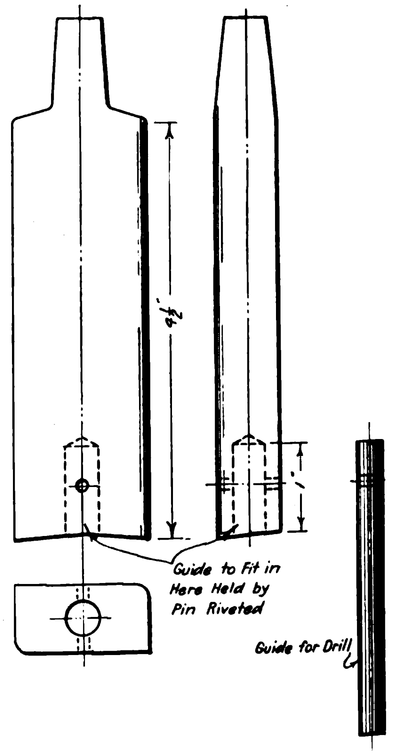
Tight Socket Bushings.

I have found that some socket bushings are very hard to screw into the socket and are often broken in the attempt to do so. I find that this can be prevented by heating them a little, after which the bushing can be easily inserted and breakage avoided.

A. J. Smith.

Tool for Drilling Marble.

A tool for drilling large holes, say 1.5 inches in diameter, in slate and marble is shown in the accompanying illustration. It is made of tool steel 1.5 by 0.75 inches. Larger or smaller drills can be made by choosing stock of the proper dimensions. The drill should have a hole in the bottom about one inch deep, exactly in the center. This is to be used for a guide, the guide rod being made of a three-eighths-inch steel rod, which is held in position by a pin riveted through the drill. The length of the guide rod depends upon the thickness of the panels to be drilled and will generally be about two inches.



Drilling Tool.

This drill will be found very useful where both speed and accuracy are desired. A three-eighths-inch pilot hole is first drilled through and the guide of the large drill is inserted in this. The guide holds the drill in definite position and prevents creeping and side play. It will be found of great benefit for drilling holes in old panels where the new holes are directly alongside of or cut partly through the old ones. The guide thus prevents the drill from shifting over into the old holes. H. W. Parsons.

Public Service Commissions

CALIFORNIA.

Pacific Gas & Electric Company. The Commission, in its own motion, has instituted an investigation of the rates, service and extensions of the Pacific Company in its San Jose district.

Southwestern Home Telephone Company. The Commission rendered a decision upon this Company's application for authority to issue $101,300 in short term notes and to pledge $197,000 in bonds as collateral security therefor. The Commission does not make a final ruling in the case, but states that it will hold the matter in abeyance until July 1, 1914. It directs the company to take steps to reduce its floating and bonded indebtedness. The Commission also calls upon the company to arrange to cancel $300,000 in stock which was issued originally on a contract by which the company had the right to retire it upon the payment of $3,750.00.

The Oceanside Electric & Gas Company has been granted authority by the Railroad Commission to renew notes in the sum of $12,442, and to issue its six-per-cent twenty-year bonds in the sum of $25,000, a sufficient number of which will be sold by the Company at ninety per cent of the par value so as to net the applicant $14,100, which sum will be applied to the payments of the notes and to reimburse the treasury for additions and betterment.

The City of Claremont, Los Angeles County, has transferred the jurisdiction over its public utilities to the Railroad Commission.

CONNECTICUT.

Rules for Protection of Linemen. The Commission called a conference on the matter of the adoption of rules for the protection of linemen employed by trolley, telegraph, telephone and electric companies. The committee appointed by the interested companies, at the suggestion of the Commission, submitted a set of rules to be observed by the employees when at work. The rules were approved by the Commission.

GEORGIA.

The Georgia Railway & Electric Company was authorized to issue $334,000 in refunding bonds to be used to refund to the company a portion of the money expended for improvements and extensions during the last six months of 1913.

INDIANA.

The Indianapolis Telephone Company has been authorized to install an improved four-party line service at a reduced rate of $15 per year. The Central Union Telephone Company has applied for authority to increase its rates in Indianapolis and for the establishment of the measured service system of rates.

Electric Rates in Richmond. The city of Richmond which operates a municipal electric light plant, and the Richmond Light, Heat and Power Company have filed a joint petition asking for authority to reduce and equalize rates for electric light and power.

Natural Gas Case. The Commission has reduced the rate for natural gas in Union City and Winchester, Indiana. In determining rates the Commission made an allowance for depreciation, taking into consideration the average life of the well in each particular field. This is the first rate case handed down by this commission.

MARYLAND.

Municipal Utilities. The question of extending the jurisdiction of the Public Service Commission is being discussed by the Commission and a bill will undoubtedly be prepared by the general counsel to be submitted to the present legislature. Charles E. Phelps, chief engineer of the Commission, submitted a report to the Commission recommending that municipally owned utilities should be subject to the same regulation as privately owned utilities. The greatest evil of municipal ownership, says Mr. Phelps, is unfair and unprofitable discrimination in rates. The temptation to absorb the expenses of operation in the tax rate is also great. It is said that the conduct of some of the municipally owned gas and electric companies of the state is such as to convince the Commission that prompt and drastic action is necessary. Poor service, grossly discriminatory rates, often for political reasons; loose methods of bookkeeping and inefficient and careless operation are said to characterize the conduct of certain of the companies. If these companies are required to maintain the same standard of service, both as to quality and rates, that is required of privately owned gas and electric companies, it is contended, the public will be greatly benefited.

The Chesapeake and Potomac Telephone Company was ordered to reduce its telephone toll rates for Frederick County upon the complaint of the Frederick County Farmers' Association. The reduced rates are to be in effect April 1.

MASSACHUSETTS.

Proposed Legislation. The Supreme Court annulled the decision of the Board of Gas and Electric Light Commissioners in which the Board dismissed the application of the Fall River Gas Works Company for authority to issue stock. The annulling of this decision has called in question the authority of the Board over security issues. The Board has submitted a bill to the legislature which aims to more clearly define its authority over such issues. The bill provides that "the Board may refuse to approve of the issue of stock or bonds if in its opinion such issue would be inconsistent with the public interests." Forrest E. Barker, chairman of the Board, stated that the bill proposes no new principle. The policy that the Board must determine that stock issues by companies under its jurisdiction are reasonably necessary has been unchallenged for more than twenty years.

Public Service Commission. A bill to reduce the membership of the Public Service Commission and to provide for the election of the Commissioners is being considered in the legislature.

MISSOURI.

Springfield Gas and Electric Company. The final arguments before the Public Service Commission were heard in the Springfield lighting rates case. This is the first important valuation and rate case before this commission and a decision in this case will establish precedents for subsequent rate investigation. The franchise granted the company provided that not more than

15 cents per kilowatt-hour shall be charged for electric service. The general maximum rate for residence lighting charged by the company is 13.5 cents per kilowatt-hour. The city council passed a rate of 6 cents per kilowatt-hour and the company did not accept this rate, but appealed to the Commission to fix just and reasonable rates.

NEW YORK.

New York Telephone Company. The Assembly adopted a resolution asking the Public Service Commission, Second District, to explain lack of progress in the examination into the affairs of the New York Telephone Company.

The Commission of the First District Fails to Agree in regard to authorizing security issues of the Consolidated Gas Company, and the New York Edison Company. Commissioner Maltbie has filed an opinion opposing the applications in their present form. Commissioner Cram is also opposed to the issue while Commissioners Williams and McCall are in favor of granting all that the companies ask. It is alleged by the commissioners opposing the application that the expense vouchers have not been carefully examined to determine whether the expenditures are proper capital charges, and Commissioner Maltbie considers the 5.5 per cent rate of interest both excessive and unnecessary.

Assistant Secretary. Matthew J. Harrington of Manhattan has been appointed assistant secretary at a salary of $3,600 per annum to fill the vacancy caused by the resignation of William L. Ransom, now judge of the City Court. Mr. Harrington was formerly secretary of the Department of Docks and Ferries.

OHIO.

Bucyrus Light & Power Company. Milo R. Maltbie, member of the New York Public Service Commission, First District, was called as principal witness in the Bucyrus rate case before the Ohio Public Service Commission. This is the first instance in which a commissioner of one state has testified in a hearing before the commission of another state.

PENNSYLVANIA.

George P. Wilson was appointed chief of the bureau of tariffs by the Public Service Commission.

Utility Rates. An order is to be issued by the Commission requiring utilities to file all rates and schedules with the Commission.

WISCONSIN.

Appeal to Circuit Court. Test cases have been brought by the Milwaukee Northern Railway Company and the Chicago and Milwaukee Electric Railway Company appealing from the orders of the Railroad Commission requiring the joint use of certain portions of their respective systems by the Milwaukee Electric Railway and Light Company. It is alleged that public convenience does not require the joint use of tracks and that the Commission's order will have the effect of depriving the complainants of their properties without due process of law and without adequate compensation. The Circuit Court has been asked to set aside the Commission's orders.

The Chippewa Valley Railway Light and Power Company has been authorized to purchase the Ellsworth Heat, Light and Power Company and to issue $42,000 in preferred stock and negotiable funds to be applied on the purchase.

The Strum Telephone Company was authorized to issue $880 worth of capital stock, to be divided in shares of $40 each. Application was also made by the Company to issue $200 of additional capital stock to be used in payment for certain property heretofore acquired by it. The application was granted.

The Readfield and Fremont Telephone Companies were ordered to make a physical connection of their lines between Fremont and Readfield, the compensation to be fixed for each message was 10 cents, with a monthly charge of 25 cents for unlimited service over the lines of the above companies.

Oakfield Telephone Company. The company's application to increase its toll message rate to subscribers from Oakfield to Fond du Lac was denied. The company wished to charge 10 cents per message for messages of five minutes or less, whereas a charge of 5 cents per message had been in effect previously.

Philadelphia Section Activities.

The Philadelphia Electric Company Section of the National Electric Light Association is maintaining a high standard in the personnel of the speakers at its monthly meetings. On Monday, February 16, the speaker was John Price Jackson, dean of the Engineering School of Pennsylvania State College. His topic was "Co-Operation and Effectiveness in Industrial Organizations." Professor Jackson's discourse was greatly appreciated, not only because of its high intellectual character, but also because of the note of sympathy which was produced by the fact that the speaker was many years ago attached to The Philadelphia Electric Company. Professor Jackson is commissioner of the Department of Labor and Industry of the State of Pennsylvania, and has had charge of a recent conference under whose auspices labor organizations and employers were brought to a better understanding. The speaker stated that effectiveness in industrial corporations was dependent upon two things. The first was the right attitude on the part of the employees towards the company, and the other was a due appreciation on the part of the company of the services of its employees. Employees should not indulge in criticism of the company among themselves, much less to outsiders, who would undoutedly take a very wrong meaning from caustic adverse remarks. Employers should remember that their workmen are human and that appreciation of their services, and improvements which tend toward their safety and sanitary and pleasant working conditions, would do more towards bringing about an effective organization than caustic criticism or arrogant methods. The speaker related many instances illustrative of these points which both amused and interested his audience. Professor Jackson's discourse should go far toward promoting the co-operation and effectiveness which was the subject of his paper.

The meeting of the Engineering Department Branch on February 2, was a "Beacon Night." The speakers of the evening were Albert R. Granger, manager of the Beacon Light Company, Chester, Pa., and John E. Melloy, electrical superintendent of the same company. Mr. Granger's remarks were of a historical character and brought out many incidents in connection with the history of the earlier days of the company, which brought memories of the olden days to the minds of many of his hearers. Mr. Melloy ably supplemented Manager Granger in his remarks concerning the mechanical operation of the Beacon Company.

The February meeting of the Meter Department Branch was held on February 6. The paper of the evening was entitled "Economic Factors in Central Station Development" and was prepared and read by A. R. Cordner, of the Philadelphia Electric Company's Meter Department. This paper is one of those submitted in the Joseph B. McCall prize competition. Mr. Cordner's paper showed that he had given his subject much study and thought and that it will stand well among the papers which will receive foremost consideration.

Philadelphia is mindful of the fact that it is to be honored with the 1914 convention. Wide-awake committees have been appointed to look after many of the things which will need to be cared for in such a large gathering, and all those who attend the convention will be assured of plenty of good old Quaker hospitality.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 200. — Electrically Operated Phonograph.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 204. Highest Voltage.—What is the highest known voltage ever developed in any electrical apparatus?—M. L., Oak Park, Ill.

No. 205.—Lamps for Blue-Printing Machines.—What kind of lamps are best to use for blue-printing machines, carbon arc lamps or mercury-vapor lamps?—H. I. N., St. Louis, Mo.

No. 206.—Short-Circuit Current.—If a short-circuit, consisting of a No. 4 copper wire, should occur across a 600-volt railway feeder of approximately 871,000 circular units at a distance of 70,000 feet from a power plant which is the source of the current, what current would flow through the feeder and what would be the voltage at the source of supply, and how is it calculated? The power plant has a full-load capacity of 600 kilowatts with an overload capacity of 50 per cent of the full-load capacity.—J. G. M., La Marque, Tex.

No. 207.—Connection of Current Transformers.—On an alternating-current, three-phase 2,200-volt switchboard with indicating wattmeter that has two potential and two current transformers, (A) does it make any difference in the reading of the wattmeter, if both the secondaries of the current transformers are reversed on their own transformers? If so, why? (B) Does reversing the secondaries of one current transformer change the wattmeter reading? If so, why?—T. J. O. K., Atlanta, Ga.

No. 208.—Motor Trouble.—I have a 40-kilowatt machine which was formerly run without trouble as a generator; now it is used as a motor, and on starting or stopping a heavy flushing occurs around the commutator, although the motor runs fine on full speed. What is the cause of this?—J. M., Kearney, N. J.

No. 209.—Series-Parallel Lamp Control.—How can I arrange a circuit to throw three lamps from a parallel to series connection and vice versa? Can this be done with only one switch?—B. T. O., Chicago, Ill.

Answers.

No. 196.—Speeding Up Street Cars.—If an electric street car designed for a maximum speed of 25 to 30 miles per hour is to be run part way in a rapid-transit subway at a speed of 40 to 45 miles per hour, can the motor and control equipment be readily adapted to the higher speed desired or must a motor equipment designed for the higher speed be substituted? Could this be accomplished satisfactorily by changing the ratio of the reduction gear?—B. F., Chicago, Ill.

The best suggestion that can be made on this is to use the old method of shunting a portion of the motor fields in order to obtain the higher speed, provided that the design of the motors will allow of this without sparking and also provided that the higher speed does not require greater power than the motors are capable of. The changing of pinions, etc., as suggested by others, has the disadvantage of giving the higher speed at all times and I would assume from the question that the old conditions of the outside running were to be maintained in addition to the subway work and it is likely that conditions would not warrant the higher speed outside.—W. M. P., Seattle, Wash.

No. 201.—Fixture Wire.—Is heavier wire than standard fixture wire required in fixture work in any city? I have been told that this would soon be required in all large cities because of the tendency to connect flatirons and other appliances to the nearest fixture outlet. Is there any basis for this belief?—S. W., Chicago, Ill.

While electric irons are not supposed to be connected to electric fixtures or cord drops, this is the most common method of using them. The general use of electric irons and other electric devices has developed much faster than the wiring of buildings. The large majority of buildings are being wired under specifications that were in use ten years ago. The architects and owners have not been educated to the present-day requirements, consequently no provisions are made for the many electrical devices which are in common use. Base, wall and floor receptacles should be provided, when the building is being wired, for the use of electric irons, coffee percolators, hot plates, radiators, vacuum cleaners, washing machines, etc. The National Electrical Code would hardly sanction connecting irons, etc., to fixtures due to the fact that the connected load would then exceed 660 watts. The six-pound iron which is the size mostly commonly used is rated at 550 watts and with the addition of the lights the wattage may be well over the Code limit.

The writer has in a number of instances designed the fixture with a Hubbell chandelier plug No. 5325 or similar fitting at the bottom of the fixture and wired this with a separate circuit of No. 12 wire. This plug had no switch and the circuit was fused separately and could be used for devices using as high as ten amperes.—C. T. P., San Francisco, Cal.

The writer knows of no proposed increase in size of fixture wire more than the requirement of the new Code concerning all rubber-covered wires. I think such an increase would create a greater abuse of fixture wiring, for if people will now connect a 500-watt iron to a lamp socket that is only intended for, say, 200 watts, what would they do if they knew that the wires were larger? Perhaps they would connect an electric range or some other current-consuming device to the socket. To avoid this evil the contractors should talk of the advantages of installing more baseboard and wall outlets, so that the customer could have ample means of connecting vacuum cleaners, flatirons, fans and anything he might wish to use, of 500 watts or less. The customer should also be taught that electric fixtures as a rule are only wired for a very slight increase in current more than originally supplied, and should be used for nothing but the purpose of lighting.—E. D. D., Del Rio, Tex.

No. 202.—Rewinding Motor.—What size wire should be used to rewind a one-half-horsepower, 220-volt, direct-current, bipolar, shunt-wound motor to be used as a generator to deliver 15 amperes at 30 volts? How many turns should there be in each armature coil? How many feet of wire in the field coils?—G. R. L., Sioux Falls, S. D.

Answering this question in the only way possible without knowing the size of cores, slots, etc., would suggest that G. R. L. decrease the number of turns in both armature and field in the ratio that he wishes to change his voltage from 220 to 30 and increase the copper wire area per turn in the same ratio. Further, it is likely that he will be able to parallel his armature windings and commutator bars so that by merely reconnecting these he can get his results. He will have to rewind his field entirely, either using new wire of the larger area or paralleling the old so that the result is the same. This latter is hard to do, unless the various strands are wound on at one time, as different locations in the coils may mean very much greater resistance with the same number of turns.—W. M. P., Seattle, Wash.

No. 10 B & S wire would be a safe size to use in the case. As to the second part of the question, I would suggest that as nearly as possible, one-seventh the number of turns be put in each armature coil as at present and that the field coils be left as at present. Any slight variation in voltage due to the impossibility of evenly dividing the turns by seven or to the fact that 30 is not exactly one-seventh of 220 can be taken care of by the field rheostat, or by varying the speed, or both.—J. H. M., San Francisco, Cal.

No. 203.—Service-Entrance Conduit.—When the wires of service companies are run aerial, would the Code require sealing the ends of the conduit that runs down the side of the pole and from the base of the pole underground into the basement?—G. R. L., Sioux Falls, S. D.

I would suggest that the best plan would be not to seal the end at the bottom, because if this is done and any moisture accumulates within the conduit it could not drain out, and if the upper end be turned drip-loop style, I should say the best plan would be to leave both ends open as to get the benefit of any circulation of air that might occur through the conduit.—W. A. M., Cold Spring, N. Y.

The rule is for underground systems alone. In your case you are only required to keep the conduit waterproof, equipped with a standard service head and the inner end must extend to and properly enter the cutout cabinet.—H. E. W., Chicago, Ill.

The question is not very plain; it may mean sealing only the two ends of the run of conduit, or at every coupling or joint. In the first case of sealing only the two ends, the Code requires an approved fitting at each end as stated in rule 28*d*, with separately bushed holes for each conductor. The type F Condulet as put out by the Crouse-Hinds Company makes a good fitting for outside use, because it protects the interior of the conduit from rain and other injurious effects that might otherwise get in and cause trouble. For the inside end there are numerous fittings for one to choose from. In the second case of sealing at every joint, I find nothing in the Code that requires it. Of course, it is understood that the taper in the thread of the conduit makes a snug fit; providing the work is done right this should help to keep the moisture out. A great many good, practical electricians, however, cement their joints when on a job of that kind. In my opinion it makes a safer job when installed underground outside.—W. T. E., Seymour, Conn.

Philadelphia Electrical Conference.

The regular meeting of the Philadelphia Electrical Conference was held February 26 at the meter department headquarters of the Philadelphia Electric Company, Eleventh Street, Chairman Devereux presiding. This was one of the best meetings held by the Conference, there being about 250 members present, and as the subject "The National Electrical Code" was of vital interest to all present, the discussion was very spirited.

Louis J. Grossman, chairman of the Committee on Organization, submitted his first report. M. E. Arnold made a short address on "Co-operation" which was well received, and W. K. Kerford, vice-chairman of the Conference, spoke of the willingness of the Philadelphia Electric Company to assist the contractor in every way, especially in the way of two-phase motors and similar devices. There was further discussion on switchboards and also on motor control. Among those taking part in the discussion were Messrs. Barry, Buchanan, Eckstein, Schwartz, Dunn, Grossman, Kerford, Loveland, Marley, Saeta and Smith.

The good resulting from these meetings is becoming more apparent and an invitation is extended to all persons interested to attend these meetings held the fourth Thursday of each month at 226 South Eleventh Street. The following officers will serve during the ensuing year: Washington Devereux, chairman; William Kerford, vice-chairman; Herman Eckstein, treasurer; Richard H. Silbert, secretary.

Annual Westinghouse Dinner.

On the evening of March 7, at the Fort Pitt Hotel, Pittsburgh, Pa., the Westinghouse interests of the Pittsburgh district held their fourth annual banquet under the auspices of the Westinghouse Club. The interests represented were the Westinghouse Air Brake Company, the Westinghouse Electric & Manufacturing Company, the Westinghouse Machine Company, the Union Switch & Signal Company, the R. D. Nuttall Company and the Pittsburgh Meter Company. There were approximately 500 Westinghouse men present. Following the banquet the evening was devoted to speeches, songs and moving pictures.

One of the most striking features of the arrangements made by the committee was the installation by the Union Switch & Signal Company of a standard semaphore. This semaphore was electrically operated and controlled from the speaker's table, and the object being to furnish a warning to the speakers should they exceed the time limit. A small card was distributed giving the explanation of the signals as follows: green—proceed; yellow—proceed under forced draft in order to finish before the next signal; red—stop! danger! Considerable humor was interjected by the operation of these signals during the evening. The toastmaster was W. A. Bole, assistant general manager of the Westinghouse Machine Company and director of the Trafford City Foundry.

A. L. Humphrey, vice president and general manager of the Westinghouse Air Brake Company, spoke on the product and the possibilities of that company. In the course of his remarks he called attention to the fact that the company since its organization had never failed to meet a payroll on time, nor passed a dividend, executed a note or issued a bond. It has manufactured during 45 years of existence a sufficient number of brakes to equip a train of cars, which, if placed on one track end to end, would encircle the earth. The speaker unhesitatingly placed the air brake as one of the greatest inventions of the nineteenth century.

Col. H. G. Prout, vice-president of the Union Switch & Signal Company called attention to the value of the automatic signal system as an aid to travel. He called attention particularly to the recent accident at the interlocking tower of the Boston & Maine Station at Boston, which caused the company to annul 239 trains a day; the loss of passenger revenue to the company was very serious but by no means to be compared with loss to the public using this station.

C. A. Terry, vice-president of the Westinghouse Electric & Manufacturing Company, spoke on the recent achievements of that company. In the course of his remarks he said that "deeds are men," and therefore a story of the accomplishments of the company would necessarily be a story of the men responsible for the same.

The main address of the evening was that of Guy E. Tripp, chairman of the board of directors of the Electric Company, who discussed the administration bills now before Congress looking to the regulation of trade. Mr. Tripp said he fully endorsed the principle laid down by President Wilson that "private monopoly is indefensible and intolerable" and believed that its prohibition would do the things that President Wilson says it will do. The speaker stated that he yielded to no one in his respect for the institutions of the United States, and particularly for the high office of its president, and he furthermore regretted to see growing up in this country, particularly among the young people, the lack of respect for our laws and executive authority. Mr. Tripp discussed in some detail the various proposed bills. He summarized his suggestions as follows:

"The suggestion is that the Trade Commission Bill be modified along the lines I have outlined, and that the Sherman Law Definitions Bill and Trade Relations Bill be abandoned altogether because all the acts prohibited or defined in these bills can be prohibited or defined by the trade commission itself. That the Interlocking Directorates Bill be greatly modified and that the Anti Holding Bill confine itself practically to prohibiting a holding company from owning securities of competing corporations."

The Electrification of the Butte, Anaconda & Pacific Railway.

The Butte, Anaconda & Pacific Railway is in many ways one of the most remarkable examples of steam-railroad electrification in this country. Besides being the first 2,400-volt direct-current railway, it is also credited with being the first steam road operating both freight and passenger schedules to electrify its lines purely for reasons of economy. A number of steam railway electrifications have been made because of peremptory factors, such as terminal and tunnel operation or for rapid suburban service. This Montana road, however, cannot be classed as an "enforced electrification," since no such special limitations were the determining factors.

Electric locomotives were first put in service on this line on May 28, 1913. During the first seven months of service, they made approximately 201,000 miles and hauled about 2,365,000 tons of ore. The electric locomotives were described at length in the Electrical Review and Western Electrician of June 14, 1913, pages 1292 to 1294.

The steam-locomotive crews, consisting of engineman and fireman, easily acquired proficiency in handling the electric locomotives; in fact, two or three days' instructions from a competent electrical man were ordinarily sufficient. The change from steam to electric haulage was made without any change in the personnel of the train crews and without any delays or alterations in the schedule. The enginemen, without exception, have expressed themselves as being greatly pleased with the easy operation of the locomotives.

The electrified lines of this system extend from the Butte Hill yard to the smelter at Anaconda, a distance of 32 miles. There are numerous sidings, yards, and smelter tracks that have been equipped with overhead trolley, making a total of about 95 miles on a single-track basis.

The Butte, Anaconda & Pacific Railway is essentially an ore-hauling road, the freight traffic from this source originating at the copper mines located near the top of Butte Hill. From the mines, the ore trains are lowered down the mountain a distance of 4.5 miles to the Rocker yards located a few miles west of the city of Butte. At this point, new main-line trains are made up for transportation to the smelters at Anaconda. The main-line division extends through a rough mountainous country, a distance of about 20 miles, with grades as high as 0.3 per cent.

At East Anaconda, the main-line trains are broken up and hauled up Smelter Hill to the stock bins, where each car is run over the scales and weighed. The shifting of cars in connection with weighing and subsequent delivery to the concentrators is done by single locomotives.

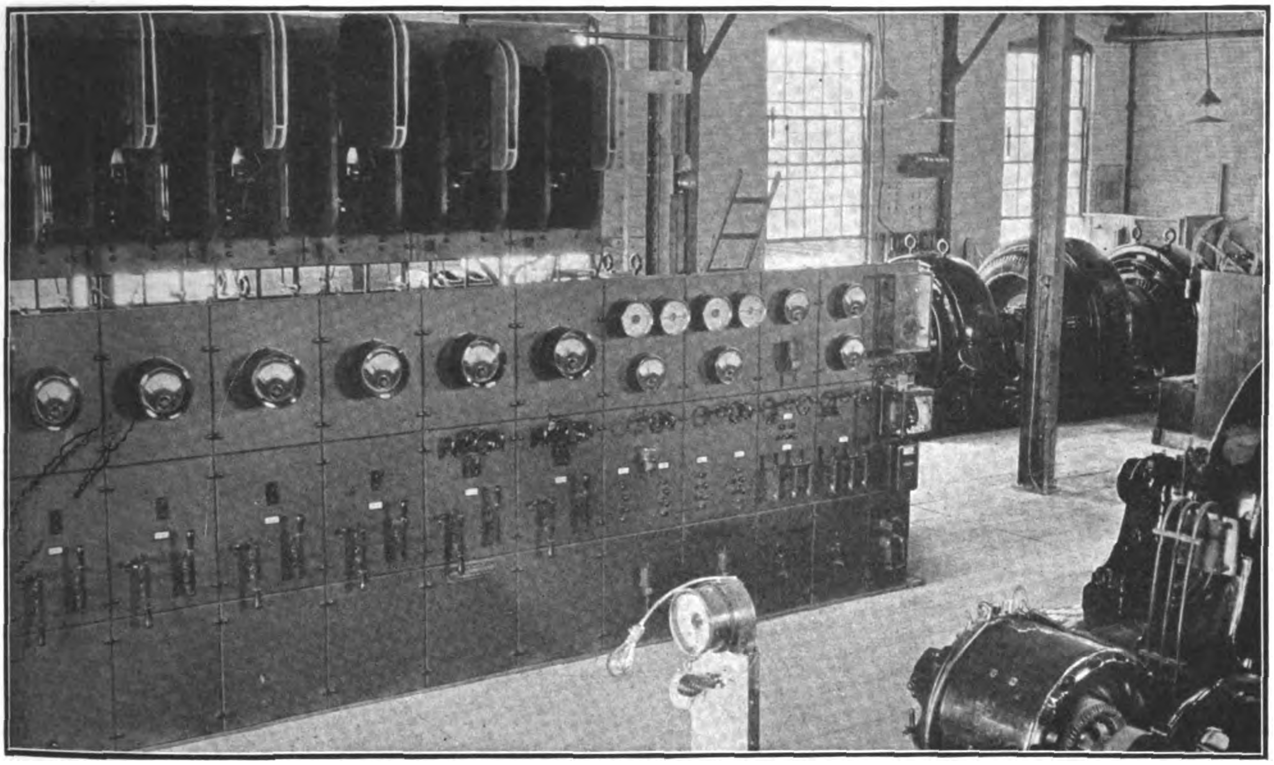
The east-bound traffic consists in returning empty cars to the mines and the transportation of copper ingot to the Butte yards, where it is shipped over other roads to refineries.

Between the cities of Butte and Anaconda, at the ends of the electrified portion of the system, there is considerable local traffic, both passenger and freight. The city of Butte and vicinity has a population of about 65,000, and Anaconda about 10,000. At Butte this railway connects with three transcontinental railways and for a distance of 16 miles it is paralleled by two of these lines, the Northern Pacific and the Chicago, Milwaukee & St. Paul. The last-named railway company has already contracted for power for the operation of electric trains from Harlowton, Mont., to Avery, Idaho, a distance of 440 miles.

The maximum curvature on the system (20 degrees, 285-foot radius) occurs on the Butte Hill line. On this part of the road there is an average curvature of 6 to 10 degrees. The locomotives are designed with sufficient flexibility to take a curve of 31 degrees (180-foot radius) at slow speed.

The freight traffic consists largely of copper ore and amounts to more than 5,000,000 tons per year. This material is handled in steel ore cars weighing about 18 tons and having a capacity of 50 tons each. Trains of 30 loaded cars weighing 2,000 tons are made up at the Butte Hill yards and hauled by two-unit locomotives to the Rocker yards, where 4,000-ton trains are made up for the main line. At the East Anaconda yards, the trains are again broken up and 1,400-ton trains are sent up Smelter Hill to the ore bins. All of the shifting and spotting of cars, at the smelters and in the sorting yards is done by single locomotive units.

Eight passenger trains per day are operated between Butte and Anaconda, four in each direction. The main-line trains

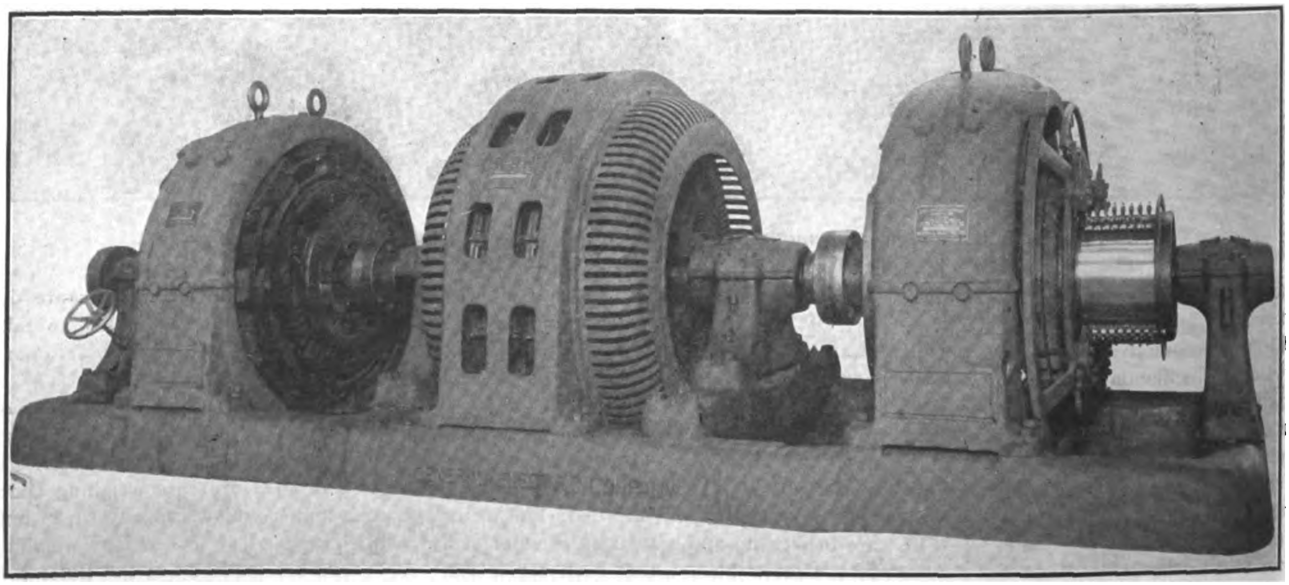


View in Anaconda Substation, Showing 2,400-Volt Direct-Current Switchboard and Motor-Generator Set.

were first hauled by electric locomotives on October 1, 1913, and promptly demonstrated their ability to make better time than was possible with steam engines. Single locomotives are used, hauling trains of from three to five passenger and baggage cars.

Energy for the operation of electric trains is purchased from the Great Falls Power Company. The generating plant is located at Great Falls, Mont., on the Missouri River, and has for some time been supplying electric power for the operation of the mines and smelters at Butte and Anaconda. Six hydroelectric units are installed, having a nominal rated capacity of 21,000 kilowatts. The machines are of the horizontal type, generating 6,600 volts, three phase, at a frequency of 60 cycles. The power is stepped up to 102,000 volts for transmission to the transformer substation at Butte, a distance of 130 miles, over two separate parallel lines constructed on the same right of way. An extension of the system transmits power at 60,000 volts to a second transformer station at Anaconda, 26 miles farther on.

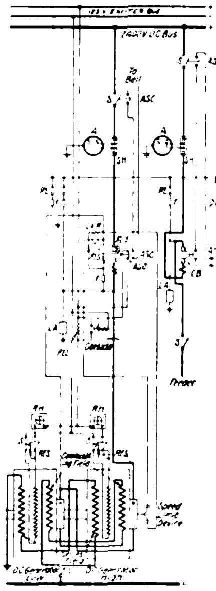
The Butte substation forms the center of the extensive power system operated by the Montana Power Company. Besides the Great Falls 102,000-volt transmission lines, there are several 60,-000-volt transmissions terminating at this point, which form a part of the Montana Power Company's system. These lines bring in power from the Hauser Lake, Canyon Ferry, Madison and Big Hole plants. At the Butte substation this power is stepped down to 2,400 volts, three-phase, and all of these lines are tied in on the 2,400-volt bus. Ample protection is therefore afforded from interruption of service.



One of the Substation Motor-Generator Sets—2,300-Volt Synchronous Motor and Two Series-Connected 1,200-Volt Direct-Current Generators.

It is an interesting fact that the railway load was taken on without any increase in the high-tension transmission facilities. It is estimated that the additional load from this source is approximately 20 per cent of the railway, industrial and lighting load furnished by the street railways, mines, and smelters at Butte and Anaconda.

The two existing substations at Butte and Anaconda were used to house the 2,400-volt equipment required for operating the electric trains, so that no additional buildings were constructed for this purpose. Power is furnished by two 1,000-kilowatt, 3-unit motor-generator sets in each substation, taking power from the 2,400-volt alternating-current buses. These units operate continuously 24 hours per day, seven days of the week, to supply the necessary current for train operation. Each set consists of a three-phase, 60-cycle, synchronous motor running at 720 revolutions per minute and direct-connected to two 500-kilowatt, 1,200-volt direct-current generators, insulated and connected to operate in series for 2,400 volts. The generators are compound-wound and have both commutating poles and compensating pole-face windings. These fields are connected on the grounded side of the armature, and the main fields are separately excited. The 1,200-volt generators are provided with heatproof insulation and, owing to their unusually good commutating characteristics, will carry three times normal load for periods of five minutes, as well as the usual 50 per cent overload for two hours.



Direct-Current Wiring of Substation.

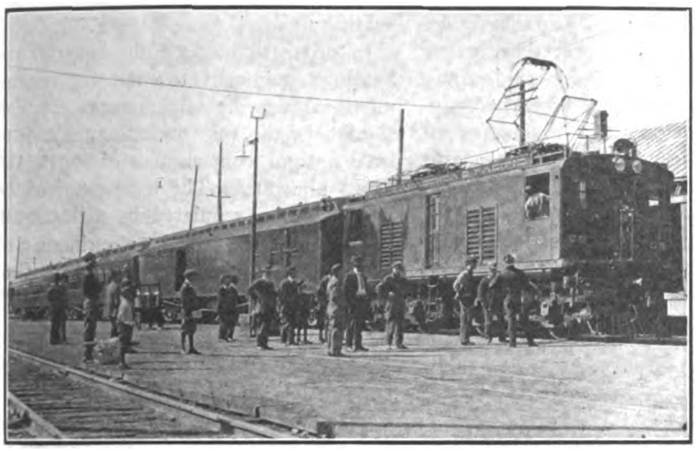
An automatic voltage regulator is used to maintain an approximately constant voltage at the terminals of the motor by power-factor regulation. The motors are protected against overload by inverse-time-limit relays, which are set to open at four times normal load. These relays have been adjusted to open under sustained overload in about two seconds and upon short-circuit their action is practically instantaneous.

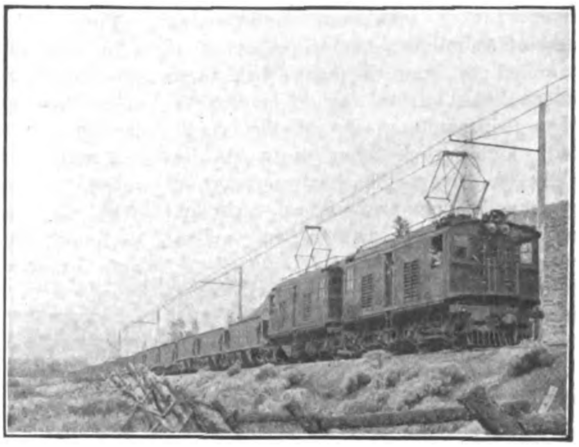
Excitation for the two generating units in each substation is obtained from two induction-motor-driven sets, rated 50 kilowatts each at 125 volts. One set is used for supplying current to the synchronous-motor fields and is controlled by the automatic voltage regulator. The second unit supplies current to the separately excited fields of the direct-current generators.

The 2,400-volt switchboards for controlling these sets are said to be the first direct-current boards to be constructed for this voltage. In general, they are similar to the standard 600-volt types with increased insulation and special provision for interrupting the 2,400-volt current. The circuit-breakers and switches are also arranged for remote control, and all apparatus on the panels is provided with ample insulation to insure safety to operators.

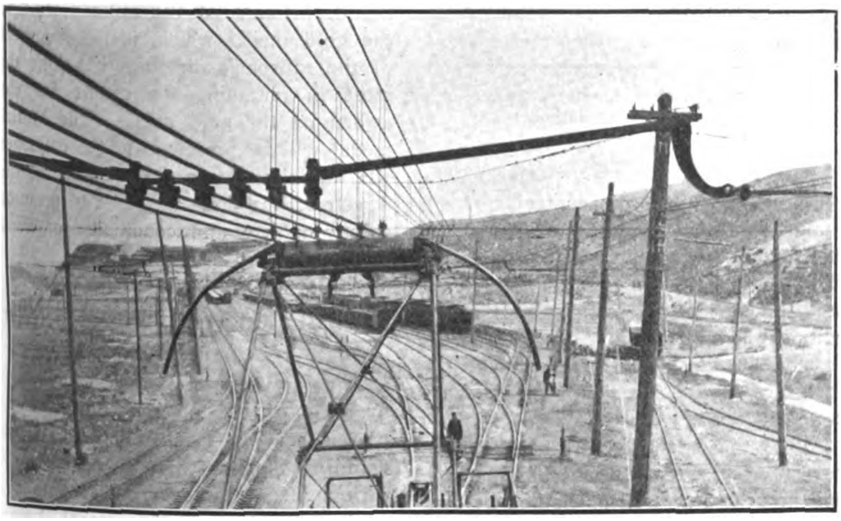
The 2,400-volt circuit-breakers and

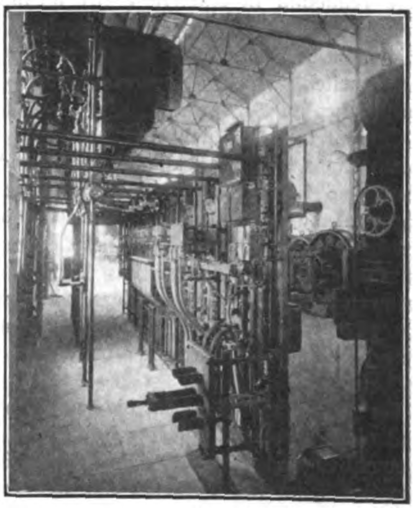
switches are installed on separate panels above and back of the main panels, and are operated by connecting rods from handles mounted on the front of the main switchboard. These handles are similar in appearance, and to avoid confusion the circuit-breaker handles are inverted. The breakers are equipped with special magnetic blowouts and arc chutes, and provision is also made for automatically inserting a high resistance in the generator field at the same instant the main circuit-breakers open, thus reducing the generator voltage.


Single-Unit Locomotive with Passenger Train.


Two-Unit Locomotive Hauling Ore Cars.

The alternating-current switchboard contains two panels for controlling the synchronous motors by means of remote-control, solenoid-operated oil switches; there are also two panels for the motor fields, and a panel for the automatic voltage regulator. These panels also contain other necessary instruments, including frequency and synchronism indicators, ammeters, wattmeters and relays.


A Section where the Pantograph Trolley Engages Six Trolley Wires.


Rear View of Direct-Current Switchboard, Butte Substation.

The overhead construction for this system was especially designed to give the flexibility necessary for satisfactory operation of the pantograph trolleys used on the locomotives. The No. 0000 grooved copper trolley used over all tracks is supported by an eleven-point catenary suspension from a stranded-steel messenger cable. Both side-bracket and cross-span construction are used as required by the local conditions. There is a large amount of special work on account of the many yards and sidings, and in one case 12 tracks are spanned. The cross-span construction used at this point is supported by a third pole between the eighth and ninth tracks. The hanger used on the straight-line construction is a rolled-steel strap looped over the messenger wire. This loop is closed at the ear and the wire is clamped in place by a single bolt. Special pull-offs are used to increase the flexibility of the suspension.

The section breakers were designed for the 2,400-volt service, and at six points insulated crossings are necessary at the intersection of the 2,400-volt trolley with the 600-volt trolley of the city street-railway system. On the main line a very simple section insulator is used. This consists of paralleling the two trolley wires from the ends of each section at a suitable distance for insulation so that the pantograph bridges the two circuits for a short distance, thus avoiding interruption of the power supply to the locomotive. The construction in the yards and sidings is simplified by paralleling the trolley from the side tracks for a short distance along the main line. This avoids the use of switch plates or similar devices. At some of these junction points the pantograph engages as many as six trolley wires.

The overhead lines are protected from lightning by 2,400-volt direct-current arresters installed on poles at intervals of one-third of a mile the entire length of the system.

As feeders, the No. 0000 trolley is reinforced between the substations with two 500,000-circular-mil bare copper cables tapped to the trolley at intervals of 1,000 feet. A No. 0000 negative return wire is also installed between Rocker and East Anaconda. This wire is carried on the trolley poles and is connected to the cross bonds at intervals of 1,000 feet. The rails are connected by No. 0000 bonds at every joint. The substations are normally connected together by these feeders, allowing an interchange of current. In emergency either station can supply current to the entire system.

The locomotive equipment consists of

17 80-ton units, 15 for freight and 2 for passenger service. The freight locomotives are geared for slow speed and are operated in pairs for the main-line service. The maximum free-running speed is 35 miles per hour. The two passenger locomotives are of the same construction as the freight units, but are geared for a maximum free-running speed of 55 miles per hour. A speed of 45 miles per hour is made with three passenger coaches on straight level track.

These locomotives are of the articulated double-truck type with all the weight on drivers. The cab contains an engineman's compartment at each end and a central compartment for control apparatus.

The four motors are of the GE-229-A commutating-pole type, wound for 1,200 volts and insulated for 2,400 volts. This motor was designed for locomotive service and is provided with forced ventilation. The double-unit, 160-ton locomotive is capable of giving a continuous sustained output of 2,100 horsepower. The motors are connected to the driving wheels by twin gears similar to those used on the Detroit River Tunnel, Baltimore & Ohio, and the Great Northern locomotives.

The control equipment is Sprague-General Electric Type M, multiple unit, operating the four motors in series and in series-parallel. The 1,200-volt motors are permanently connected in series. The controller provides ten steps in series and nine in series-parallel. The transition between series and series-parallel is affected without opening the motor circuit, and there is no appreciable reduction in tractive effort during the change. The transfer of circuits at this point is made by a special change-over switch, which is operated electro-pneumatically.

Current is collected by overhead roller pantographs, pneumatically operated and controlled from either engineman's compartment by an air valve. A 2,400-volt insulated bus line runs along the center of the cab roof. These bus lines are connected together by couplers between the two freight units, so that current may be obtained from either one or two collectors.

For operating the control equipment and air compressor and for lighting the locomotive and cars, 600-volt current is supplied from the 2,400/600-volt dynamotor installed on each locomotive. This machine is similar in construction to the 1,200/600-volt dynamotor, having two distinct sets of armature coils wound on the same core and brought out to a commutator at each end. One of these windings is designed for 1,800 volts and the other for 600 volts, the two commutators being connected in series across the 2,400-volt circuit. The load current is taken from the 600-volt commutator.

The mechanical load furnished by the direct-connected blower supplies sufficient curent in the series-field windings to provide for the necessary excitation, so that no shunt windings are required. The blower which supplies ventilating air to the motors consists of a multivane fan mounted on an extension of the dynamoter shaft.

Further details of the locomotive design were given in the preceding article already referred to. All of the locomotives have been maintained by the regular shop force with the assistance of one man experienced in electrical apparatus.

Standard 600-volt lighting fixtures are used on the cars, and each passenger and baggage coach is wired for five groups of five lamps in series. The lights in each car are controlled by a suitable master switch and fuse with snap switches in the individual circuits. 36-watt railway type Mazda lamps are used, giving about 26-candlepower at 110 volts per lamp. Lighting current is taken from a 600-volt train-line bus, which is connected to the dynamotor on the locomotives

Trestle at Washol Smelter, Showing Typical Bridge Construction

All of the passenger and baggage cars now used between Butte and Anaconda will be heated as well as lighted by electricity as soon as the equipment can be installed. The cars will be heated from a single heating unit installed underneath the car floor and supplied from a 2,400-volt bus connected directly to the 2,400 volt bus on the locomotive This unit will have a maximum capacity of 25 kilowatts and will be used to heat the air which is distributed to different parts of the car by means of a small motor-driven blower. Cool air will be drawn into the insulated case inclosing the heating units from some point on the roof of the car. After passing over the heating coils the air will be carried through ducts under the floor of the car to radiators placed between alternate seats. The blower has a capacity of from 500 to 1,000 cubic feet of air per minute, and the motor is connected in series with the heating units.

In order to increase the range of the heating equipment to meet the requirements of varying temperatures, provision is to be made for connecting the coils to give a total consumption of 10, 15, 17.5 or 25 kilowatts. The temperature of the car is to be regulated by a thermostat.

All apparatus for the electrification of this railroad was furnished by the General Electric Company, Schenectady, N. Y.

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Brady Medals for Safety Work on Electric Railways.

Three medals, of gold, silver, and bronze, to be known as the Anthony N. Brady Memorial Medals, will be awarder for the first time this year by the American Museum of Safety for the best work done during the year by an electric street railway in America in accident prevention and industrial hygiene. The medals have been donated by Nicholas F. Brady, son of Anthony N. Brady, who succeeded his father as president of the New York Edison Company. They will be awarded at the next annual meeting of the Museum of Safety, and thereafter each year.

The gold medal is to be awarded to the railroad which makes the best record. The silver medal will be given to the department of the railroad winning the gold medal which, in the judgment of the railroad's directors, has done the most in obtaining the results for the award of the gold medal. The bronze medal will be presented to the employee who individually, in the judgment of the directors, has done the most to promote safety of life and conditions for good health.

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Normal Conditions Restored After Los Angeles Storm.

The transmission and distribution systems of the electric power companies serving Los Angeles, Cal., are rapidly being restored to normal condition after the severe washouts experienced during the recent heavy rainfall. The Southern California Edison Company, which was the most seriously affected, has built a temporary line to take care of its 60,000-volt power line between the Long Beach steam plant and Los Angeles. The 60,000-volt Kern River line has been permanently rerouted so as to do away for all time with the towers which were formerly located on the banks of the Los Angeles River.

Direct-Current Turbogenerators for Combined Electric and Heating Plant in Cleveland.

A meeting of the Cleveland Section, American Institute of Electrical Engineers, was held February 23 in the Electric Building. The speaker of the evening was H. L. Wallau, electrical engineer of the Cleveland Electric Illuminating Company, who presented a paper entitled "Notes on Large Direct-Current Turbine-Driven Generators."

All of the power and lighting circuits of the downtown district of Cleveland are of the Edison three-wire direct-current type. The Cleveland Electric Illuminating Company has also installed steam-heating lines for the downtown office buildings, and the demand for this steam became so great that it was necessary to either supply live steam into the lines or install some machines which were non-condensing and would exhaust the steam into the lines. About a year ago it was therefore decided to install two 3,750-kilowatt, 275-volt direct-current turbogenerators with a 10 to 1 McAlpin reduction gear. Owing to the enormous quantity of steam used in this heating system there is a back pressure of about 15 pounds, so that electricity becomes the by-product instead of the steam as in most heating systems. The Cleveland Electric Illuminating Company now has 900,000 square feet of radiating surface used for heating purposes. The peripherial speed of the armature of these turbogenerators is 8,500 feet per minute and of the commutator 4,250 feet per minute. The turbine weighs 153,000 pounds, the gear 40,000 and the generator 163,000 pounds.

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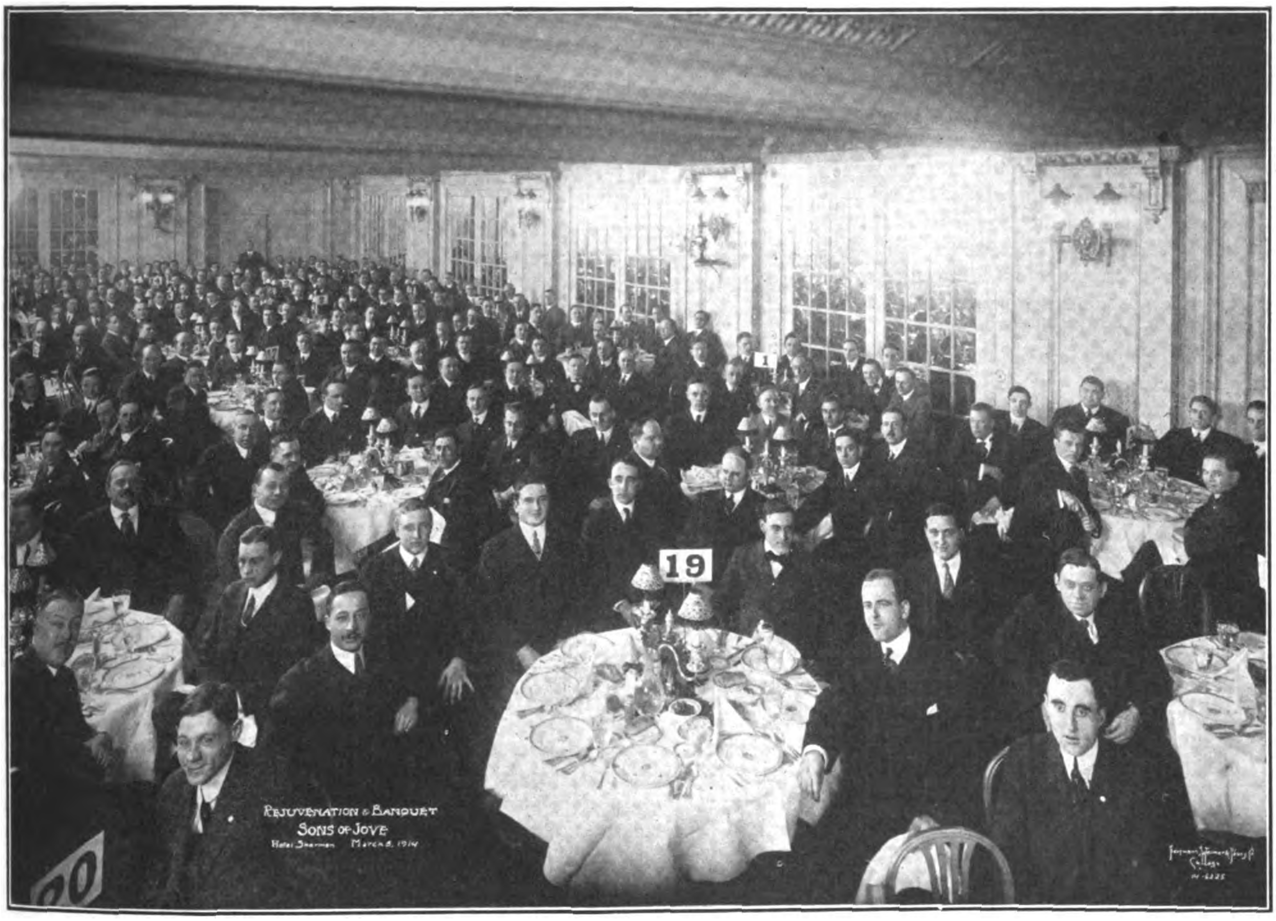
Chicago Jovians Active—Homer E. Niesz Endorsed For Next Jupiter.

An enthusiastic rejuvenation was conducted under the auspices of the Chicago Jovian League at the Hotel Sherman on the evening of Thursday, March 5. A class of 69 candidates were initiated into the Order. Prior to the rejuvenation ceremonies dinner was served in the Crystal room and brief talks were made by Sam A. Hobson, A. A. Gray, Martin J. Wolf, Perry A. Boole and George C. Richards. A feature of the evening was a novel plan introduced by Fred W. Harvey, treasurer of the Chicago Jovian League, for the securing of funds for the local order. By the sales of printed badges numbered from one to 350 in the neighborhood of $300 cash was secured. Those drawing numbers between 336 and 340 were given a pair of sterling silver Jovian cuff buttons; those drawing numbers between 341 and 345 were given gold-filled cuff buttons, and those drawing numbers between 346 and 350 were given solid-gold cuff buttons.



Group at Banquet of Jovian Rejuvenation in Chicago, March 5.

Amid wild enthusiasm the nomination of Homer E. Niesz for the next Reigning Jupiter of the Jovian Order was endorsed by the Chicago Jovian League. Mr. Niesz is a statesman for Chicago and president of the League.

On Monday, March 9, the League listened to an address by Taliaferro Milton, engineer of the Electric Storage Battery Company, on electric storage batteries. Mr. Milton described particularly the function of the central-station battery and included in his remarks also a description of the use of the storage battery in electric vehicle propulsion, for supplying current for exciters in large central stations, and for operating motor-controlled switches, etc.

At this meeting announcemet was made of the appoitment of W. J. Norton, of the engineering firm of Norton & Bird, as statesman-at-large.

A plan was also announced for strengthening the organization of the Chicago Jovian League and the establishment of yearly dues, the organization to include an associate membership of Jovian apprentices who would be given the opportunities of the meetings for a probationary period of one year upon the payment of the dues.

Annual Dinner and Joint Meeting of Boston Engineers.

The fifth annual dinner and joint meeting of the American Institute of Electrical Engineers, the Boston Society of Civil Engineers and the American Society of Mechanical Engineers was held March 4 at the Boston City Club. N. J. Neall presided and introduced H. E. Clifford, of the electrical engineering department, Harvard University, as the toastmaster. Professor Clifford presented the speakers with witty remarks and original poetic characterizations.

Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, was the principal speaker, his subject being "The National Government and Business." Mr. Tripp outlined the measures now before Congress, known as the "Five Brothers Bills": (1) the Interstate Trade Commission Bill which aims to establish a body with authority to inquire into businesses and report to the Attorney General any violations of the Sherman Act; (2) the Interlocking Directorate Bill, which prohibits directors of corporations engaged in manufacturing transportation commodities from acting as directors of railroads or public service corporations doing an interstate business; (3) the Sherman Law Definitions Bill; (4) the Trade Relations Bill, which prohibits discrimination in prices for the purpose of injuring or destroying a competitor, and (5) the Anti-Holding Bill, not yet drafted.

The attitude of most business men toward this legislation is one of taking chances upon it as an added "business risk." The legislators advocate such measures because of popular demand, rather than from any thorough knowledge of the requirements of business. No class of men are better equipped to judge the amount of injury which may result from various plans of government regulation than the business men themselves. Therefore business men should give careful consideration to all these regulatory measures, to the end that a more intelligent public opinion be created.

"Personally, I believe some regulation is necessary," said Mr. Tripp, "not, however, from the standpoint of business efficiency or economical development of the wealth of this country, but because under our political institutions I prefer to see the menacing qualities of monopoly held in check by the establishment of conditions of sane competition rather than by strong direct governmental influence such as Germany exercises." The speaker outlined the German policy of encouraging monopoly but holding it from encroaching on the public welfare; at the same time the German Government owns the railroads and coal mines and engages in other business for the purpose of holding monopoly in check. "I prefer to see in this country conditions for fair competition established by proper legislation, if it can be done, rather than to see government ownership of railroads and other businesses for the purpose of securing the needed balancing influence," said Mr. Tripp. The drawing of a line of capitalization above which certain prohibitions are effective would be regrettable, however, and repugnant to the principles of this government.

The framing of specific business legislation is found to be so difficult that the task of determining whether acts are in violation of the Sherman Anti-Trust Act should be left with the Trade Commission, the speaker held. This Commission should collect information, conduct investigations and determine facts; but for its agents to search the books and records of a company, as if armed with a search-warrant, is obnoxious. The information obtained should be accessible to the public only upon approval of the Commission, and not available to competitors and others with purely selfish motives.

The speaker suggested that the Commission might assume the responsibility of bringing about the results sought in the Trade Relations Bill which aims to do away with some very objectionable practices, but to forbid them specifically it may be necessary to use language which will make the statute apply to such an extent that business would be greatly hampered, providing the law could be enforced. A properly framed Trade Commission bill would be better than specific legislation which might give rise to confusion. The Commission might also have the right to approve the legality of mergers.

Mr. Tripp held that the Interlocking Directorates Bill as now drawn is too drastic. It really almost prohibits a man from holding a directorship in any two companies, and tends to create dummy boards and one-man-power corporations. The bill in its present condition would perhaps do more harm than good.

Standpatters should not condemn indiscriminately all the proposed measures, said the speaker. What is needed is constructive criticism, to encourage safe and sound legislation. "One of the great principles supported by public opinion is that competitive conditions should be maintained, but the public does not discriminate between free competition and fair competition." "There is no better basis upon which to found monopoly than free competition. A great monopoly was built up on these principles, by the underselling of a competitor in his locality until he was stamped out." This kind of competition is to be prevented by the Trade Relations Bill which forbids "any person in interstate or foreign commerce to discriminate in price between different purchasers of commodities in the same or different sections or communities, with the purpose or intent to thereby destroy or injure a competitor." The bill also prohibits anyone from making sales or fixing prices on the condition that the purchaser shall not deal in a competitor's goods.

"Instead of framing statutes to meet these conditions which are almost sure to ramify further and forbid quite harmless and proper business transactions, the duty of deciding whether a specific act is in violation of the principles of fair competition might well be performed by a commission," said Mr. Tripp.

Prof. A. E. Kennelly was the next speaker, taking as his subject: "Results for the Engineering Fraternity Accomplished by the I. E. C." He said facetiously, that most of the troubles of modern civilization—the steamships that bring hordes of immigrants, the railroads, the high buildings—are the result of engineers' activities, and therefore engineers should help solve these problems. The International Electrotechnical Commission, he said, has accomplished a great benefit in formulating uniform international definitions for engineering terms and symbols. He spoke of the language difficulties of the conferences and complimented Mr. Mailloux, president of the American Institute of Electrical Engineers, on his activities in the I. E. C. It was due to the latter that the language of reference in the Commission is French. Prof. Kennelly voiced the hope that universal I. E. C. ratings of machines in all countries would be brought about.

President C. O. Mailloux discussed the importance of the engineer in modern civilization, commented favorably on the Harvard-Technology alliance, and referred to the Stone & Webster organization as an excellent training school for young engineers.

President James Hartness of the American Society of Mechanical Engineers pointed to the progress Germany has made in business, saying: "If we are to look to the welfare of our country we must let people know that they are not to break up big organizations and disintegrate the things that are best ordered for the good of our people."

Dr. M. W. Franklin, of the Sprague Electric Works, Bloomfield, N. J., spoke wittily on the evolution of the engineer.

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University of Wisconsin to Organize Mechanic's Institute.

The demand for professionally trained mechanics to teach in industrial schools has led the regents of the University of Wisconsin to create 15 industrial scholarships, the holders of which will be organized into a mechanics' institute. Intensive practice in special lines of shop work and drawing, and detailed consideration of organization and teaching problems that confront industrial schools will be given at the institute which will be held from March 9 to April 9.

Boston Electric Vehicle Meeting.

Signalizing the third anniversary of the initiation of electric vehicle work through the Electric Motor Car Club of Boston, the members of that organization, together with other interested men, and also public officials of the state and city, were the guests of the Edison Electric Illuminating Company of Boston at the American House on the evening of March 3. About 160 were present.

President Frank W. Smith of the Electric Vehicle Association of America was toastmaster, being introduced by Day Baker, president of the Boston Electric Motor Car Club. Mr. Smith complimented the Boston organization on its work in the electric-vehicle field. The Boston Edison Company, he said, had led in central-station support of vehicle interests. Lieut. W. J. Keville, of the governor's staff, brought the greetings of Governor Walsh.

Edward S. Mansfield, vice-president of the Motor Car Club, told of the formation of the Electric Vehicle Club in March, 1911. He stated that the Boston Edison Company maintains a bureau of education for electric-vehicle users and provides electric signs for garages furnishing charging facilities. In the Boston Edison Company's territory there are now 255 passenger electrics and 208 electric trucks, as against 119 passenger and 50 commercial cars in 1910, a gain of 114 per cent in the former and 316 per cent in the latter, in three years' time. Figures for the state of Massachusetts show an increase of 146 per cent in vehicles of both types. Mr. Mansfield pointed out that if all New England were covered by electrics to the degree that the Edison territory is covered, the advantages to central stations would be very great.

Mayor James M. Curley of Boston voiced his interest in improved transportation facilities in the city, praised the Boston Edison Company for its enterprise, and advocated bringing about of more uniform labor laws throughout the country, to the end the Massachusetts, with its close restriction of labor hours and conditions, should not be at so great a disadvantage in competing with the manufacturers of other states. The mayor pointed out that the city is soon to make a new contract for street lighting.

Charles H. Miles, head of the vehicle work for the Edison Company, spoke on "Plans for the Future." He said that the severe snowstorms of the present winter have demonstrated the ability of the electric to cope with the heavy conditions of the streets. Few disabled cars have been towed in. He announced that large users of this type of transportation in Boston are adding to their fleets; one company is about to add eight trucks. Pleasure-car sales are encouraging, despite the curtailed incomes of many people of means. Mr. Miles believed the proposed low-priced Ford electrics would not hurt the sale of the higher-priced cars but would help the whole industry through the popularizing of the electric.

Mr. Mansfield announced that to meet the need of parking facilities the Head Place archway at the Edison Company building will be available for electrics during theater hours.

P. D. Wagoner, president of the General Vehicle Company, Long Island City, New York, spoke on the subject, "Financing the Electric." A sum of about $13,000,000 is invested in the 60,000 motor vehicles now in use, and the prospects are that a quarter of a billion dollars will be the ultimate yearly investment. The present vehicles replace only two per cent of the horses of the country. Increase this replacement to 25 per cent and the result is 1,000,000 trucks, which, at the low estimated value of $1,000 each, means a total investment of a billion dollars. With 500,000 trucks the investment, coupled with that of garaging facilities, will easily reach a billion and a quarter of dollars, or some $125,000,000 per year for ten years. This investment would be balanced by $130,000,000 worth of dead horses, whose average useful life is about six years. Trucks have twice the life and three times the efficiency of horses.

Mr. Wagoner held that the gradual substitution of the electric truck for the horse is the most satisfactory method, rather than vehicle manufacturers becoming bankers and carrying the burden of financing too large an output. Co-operative delivery systems are objectionable, as merchants on the whole prefer to retain their individuality. Banks should finance the motorization of mercantile houses. A company that can show a saving in delivery costs of 2.5 cents per package, representing about 27.5 per cent on the investment, is readily accorded banking accommodation. "The motor truck is the product of economic law and its use is becoming imperative," said the speaker. "Highway transportation is the one great opportunity for reducing costs."

H. H. Rice, vice-president of the Waverley Company, Indianapolis, urged a mastery of facts and figures as the best equipment for an electric-vehicle salesman.

Prof. D. C. Jackson said that the industry is still in its infancy. The doom of the horse was sounded when quick unloading facilities were devised.

Col. W. D. Sohier, chairman of the Massachusetts Highway Commission, and J. H. MacAlman, president of the Boston Automobile Dealers' Association, also spoke. L. D. Gibbs, superintendent of advertising for the Boston Edison Company, provided the entertainment and musical features.

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Public Hearings by Commission on Industrial Relations.

Public hearings in important industrial centers from New York to San Francisco will be held during the spring and early summer by the United States Commission on Industrial Relations. This announcement has been made by Frank P. Walsh, chairman of the Commission. The hearings will embrace in their scope all the main divisions of the inquiry directed by Congress.

Among the cities that probably will be visited are New York, Philadelphia, Boston, Patterson, Scranton, Pittsburgh, Buffalo, Wheeling, Charlotte, Greenville, Atlanta, Birmingham, Nashville, Louisville, New Orleans, Detroit, Indianapolis, Cleveland, Chicago, Houghton, Milwaukee, Madison, St. Louis, Kansas City, St. Paul, Denver, Trinidad, Dallas, Houston or Galveston, Los Angeles, San Francisco, Seattle, Butte and Lead.

Through examination of witnesses competent to speak for employers, trades unions, other labor organizations, unorganized employees and the general public, the Commission hopes to obtain information concerning the industrial situation that will lead to constructive recommendations.

Some of the subjects to be inquired into in each city are irregularity of employment; possibilities of ending irregularity and increasing production through scientific management; the activities of trades unions and employers' associations; and the extent and operation of governmental machinery for regulating the conditions of industry, including the relations between employers and employees. Successful methods of maintaining harmonious relations beneficial to both employers and employees will be inquired into particularly, with a view to their adoption in other centers where no such methods have been tried.

Eminent authorities on subjects to be included within the scope of the inquiry have joined the staff of the Commission and are now aiding in planning the hearings. Witnesses desired by the Commission will be summoned under the authority granted it by Congress, and volunteer testimony will be welcomed.

Announcing the plan for hearings, Chairman Walsh said: "The Commission will carefully avoid acting as a board of mediation and conciliation, and will not allow itself to be drawn into local controversies or recognize such controversies unless in doing so it can obtain information that has more than local and temporary significance. Every interest will be given a hearing. The Commission will strive to put aside all bias and prejudice. It will urge others to do the same, in the hope that the industrial problem may be studied in the light of reason. The open mind will be our watchword, and we shall endeavor to provide a forum where men representing all factions can meet in the common purpose of finding a way out from bitterness and strife. To accomplish this we shall need the co-operation and help of all concerned. We shall ask those who meet with us at the hearings to come not as employers or employees, but as men belonging to the same human family. The hearings are to be undertaken as one means of carrying out the instructions of Congress to inquire into the industrial situation and to report our conclusions and recommendations. The Commission wishes in particular to invite the help of every person who has a constructive suggestion. Such suggestions will be especially welcome when they are supplemented by testimony as to the successful carrying out of the ideas they embody."

According to present plans the hearings will begin in the latter part of March.

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German Radiotelegraphic Stations in the Pacific.

The first German radiotelegraph station in the Pacific was opened in November, 1909, on Yap (or Uap) Island, in the Carolines, situated about 10 degrees north and to the north of New Guinea. The station was built by the Telefunken Gesellschaft on behalf of the Deutsche Südsee Phosphat Gesellschaft. Yap is connected with the cable system of the Deutsch-Niederländische Telegraphen-Gesellschaft (of Cologne) by three cables to Shanghai, in China, to Guam, and to Menado (on Celebes, Dutch East India). For this reason Yap was selected as a radiotelegraphic center, and further stations have now been erected at Rabaul (seat of the Governor of German New Guinea), at Nauru (in the Marshall Archipelago), and at Apia, in Samoa (14 degrees south); a station on Angaur Island had been built at the same time as that on Yap. The distances worked are considerable. Yap-Rabaul is 2,200 kilometers, Yap-Nauru 3,400 kilometers, Nauru-Samoa 2,700 kilometers, and New Guinea-Samoa 4,000 kilometers. The distance Yap-Tsingtau (in Shantung) is 3,650 kilometers, almost exactly as far as from Clifden, in the West of Ireland, to Glace Bay, in Newfoundland. The station at Apia is to be opened this spring, the other stations are already working. The stations are equipped with 60-horsepower oil-engines, and with umbrella antennae 120 meters in height, to work with an energy of 25 or 30 kilowatts, and with waves ranging from 300 up to 2,000 meters; the ordinary wave-length for ship-signaling is 600 meters.—*Engineering.*

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Census Report on Central Electric Light and Power Stations.

Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of continental United States (exclusive of Alaska, Hawaii, Philippine Islands, and Porto Rico) have been given out by the Bureau of the Census.

The statistics relate to the years ending December 31 for 1912 and 1907, and June 30 for 1902, and cover both commercial and municipal electric plants. They do not include electric plants operated by factories, hotels, etc., which consume the current generated, those operated by the Federal Government and state institutions, or plants that were idle or in course of construction.

The figures as presented for continental United States show general gains for the decade 1902-1912. The number of commercial stations or plants increased from 2,805 in 1902 to 3,659 in 1912, or 30 per cent. The number of municipal plants increased from 815 in 1902 to 1,562 in 1912, or 92 per cent. The total income for 1912 amounted to $302,115,599 as compared with $85,700,605 in 1902, or an increase of 252 per cent. The total expenses, including salaries and wages, in 1912, amounted to $234,419,478, as compared with $68,081,375 in 1902, or an increase of 244 per cent. The total number of persons employed in 1912 was 79,335 as compared with 30,326 in 1902, or an increase of 162 per cent. The total horsepower of the steam engines and steam turbines was 4,946,532 in 1912, as compared with 1,394,395 in 1902, or an increase of 255 per cent. The horsepower of the water wheels was 2,471,081 in 1912, as compared with 438,472 in 1902, or an increase of 464 per cent. The output of stations amounted to 11,502,963,006 kilowatt-hours in 1912, as compared with 2,507,051,115 in 1902, or an increase of 359 per cent. The estimated number of arc lamps wired for service in 1912 was 505,395, as compared with 385,698 in 1902, or an increase of 31 per cent. Incandescent and other varieties of lamps wired for service, however, numbered 76,507,142 in 1912, as compared with 18,194,044 in 1902, or an increase of 320 per cent. The horsepower capacity of the stationary motors served with electric current amounted to 4,130,619 in 1912, as compared with 438,005 in 1902, or an increase of 843 per cent.

The figures are shown in detail in the accompanying table:

CENTRAL ELECTRIC LIGHT AND POWER STATIONS.

	1912	1907	1902	Per cent of increase: 1902-1912
Number of stations[1]	5,221	4,714	3,620	44.2
Commercial	3,659	3,462	2,805	30.4
Municipal	1,562	1,252	815	91.7
Total income[2]	$302,115,599	$175,642,338	$85,700,605	252.5
Light, heat, and power, including free service	$286,980,858	$169,614,691	$84,186,605	240.9
All other sources	$15,134,741	$6,027,647	$1,514,000	899.7
Total expenses, including salaries and wages	$234,419,478	$134,196,911	$68,081,375	244.3
Total number of persons employed	79,335	47,632	30,326	161.6
Total horsepower	7,528,648	4,098,188	1,845,048	308.0
Steam engines and steam turbines:[4]				
Number	7,844	8,054	6,295	24.6
Horsepower	4,946,532	2,693,273	1,394,395	254.6
Water wheels:				
Number	2,933	2,481	1,390	111.0
Horsepower	2,471,081	1,349,087	438,472	463.6
Gas and oil engines:				
Number	1,116	463	165	576.4
Horsepower	111,035	55,828	12,181	811.5
Kilowatt capacity of dynamos	5,134,689	2,709,225	1,212,235	323.6
Output of stations, kilowatt-hours	11,502,963,006	5,862,276,737	2,507,051,115	358.8
Estimated number of lamps wired for service:				
Arc	505,395	[5]562,795	385,698	31.0
Incandescent and other varieties	76,507,142	[5]41,876,332	18,194,044	320.5
Stationary motors served:				
Number	435,473	167,184	101,064	330.9
Horsepower capacity	4,130,619	1,649,026	438,005	843.1

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[1] The term "station" as here used may represent a single electric station or a number of stations operated under the same ownership.

[2] Exclusive of $36,500,030 in 1912; $20,093,302 in 1907, and $7,703,574 in 1902, reported by street and electric railway companies as income from sale of electric current for light or power or from sale of current to other public service corporations.

[3] In addition to salaries and wages, includes the cost of supplies and materials used for ordinary repairs and replacement, advertising, fuel, mechanical power, electrical energy purchased, taxes, charges for depreciation, and all other expenses incident to operation and maintenance.

[4] Includes auxiliary engines.

[5] Includes, for purposes of comparison, 7,082 arc and 267,997 incandescent lamps reported by the electric companies to light their own properties. Lamps used for such service were included in the total number reported in 1912.

California's Joint Committee on Inductive Interference.

California is a state of great distances, and widely scattered centers of population. In general, these centers are at some distance from sources of water power, and at the same time, water is a valuable commodity, owing to the entire lack of rain during the major portion of the year.

Accordingly, hydroelectric plants are located at considerable distances from cities, and steam plants are located near the ocean in order to secure water at reasonable rates. These facts alone make it evident that there should be, and continue to be in the future, a large number of high-tension power lines throughout the state, both to bring power from the hydroelectric stations in the mountains, and from the steam plants at the ocean and to distribute power between communities. The rapid extension of these power lines, operating at potentials varying from 10 to 150 kilowatts, has had a serious effect upon telephone, telegraph and other signal lines, due to inductive interferences where the signal and power lines closely parallel each other.

For a number of years, a more or less acrimonious discussion has been going on, particularly between the power and telephone interests, without any definite results being obtained. principally due to the fact that the power engineer has not understood the telephone engineer's point of view and vice versa. This entire dispute was brought to an issue before the Railroad Commission of the State of California late in the year 1912, by a complaint before that Commission by one of the telephone companies against the operation of a new 57,000-volt line, which closely paralleled the telephone company's lines for several miles.

The Commission was asked to prevent the operation of the power line, as it was feared that inductive disturbances would be introduced on the long-distance telephone lines so as to make the circuits inoperative. The Railroad Commission, in the absence of any definite data on which to base a ruling, wisely proposed the formation of a committee under the authority of the Commission, its membership to be composed of engineers of the telephone companies, engineers of the power companies, and also of the Railroad Commission.

In the meantime, the power company was permitted to energize its line under certain rules of operating, which it was generally believed would minimize the possibility of trouble on the telephone circuits.

The purpose of this committee was to be the collection of data to form the basis for a later order of the Commission regulating the construction of power and signal lines in proximity to each other. This plan instantly met with the approval of the interests involved, and during the early meetings of the engineers, a general plan of experimentation was laid out, and it was at the same time agreed that all power and signal companies within the state, who would signify their willingness to co-operate, should be assessed certain sums of money to meet the expenses of the committee. The assessment was apportioned as nearly as possible in accordance with the relative importance to the individual company of the data to be obtained.

The committee proposed to conduct experiments to determine under various conditions of potential connection and load under what methods of operation power lines could parallel signal lines without introducing unreasonable disturbances. This committee has been conducting its experiments during the past year and has issued its second progress report, which is of interest to others having similar problems.

Experiments have been carried on, principally at two parallels between the 57,000-volt three-phase line of the Sierra & San Francisco Power Company, and the main Coast line toll lead of the Pacific Telephone & Telegraph Company. These two exposures are respectively 20 miles and 8 miles in length.

From the progress report, the following are some of the general results and conclusions indicated as the outcome of the experiments conducted at the above points.

The fundamental (60-cycle) wave of voltage or current is relatively of little importance in the production of noise in telephone circuits. It becomes of importance, however, if it gives rise to longitudinal voltages of sufficient magnitude to constitute a physical hazard, to interfere with the operation of grounded signaling devices or superimposed telegraph service, or to operate protective apparatus on the circuits.

The harmonics of the voltage and current waves are of chief interest as the cause of noise in telephone circuits, particularly the higher harmonics or those within the range of the voice frequencies.

The fundamental and lower harmonics are important as disturbing factors in telegraph circuits.

The above facts show clearly the great desirability, from the standpoint of inductive interference, of having wave forms of voltage and current in power circuits free from all harmonics. That such does not obtain in the present state of the art is a basic cause of the disturbances to communication circuits paralleled by power circuits. Further than this, these facts emphasize the desirability that designers and manufacturers eliminate, as far as is practicable, those features of design favorable to distorted wave forms.

In order to facilitate the anaylsis of the inductive effects of a power circuit on parallel communication circuits, the voltage and currents of a three-phase power system can be conveniently regarded as made up of components which exhibit distinct characteristics and treated separately. In any three-phase system in which the three voltages between pairs of wires are equal in magnitude, the voltage between any wire and ground can be considered to be the vector sum of two voltages which are called the balanced and the residual components respectively. The balanced components consist of three equal voltages between the three wires and ground, the vector sum of which is zero. The residual components consist of three equal voltages between wires and ground which are in phase with each other. The residual voltage of the system is defined as the vector sum of the voltages of the three conductors to ground. It is, therefore, three times the residual voltage of the individual conductors or three times the equivalent single-phase voltage of the three conductors in parallel with respect to the earth. The currents flowing in the three wires of a three-phase circuit may be considered to be composed of three sets of currents, namely: (1) balanced components consisting of equal currents in each of the three line wires whose vector sum is zero; (2) a single-phase current flowing in a loop composed of two of the wires; (3) a residual current divided equally between the three wires and returning through the earth. Residual current is defined as the vector sum of the three line currents. It is, therefore, the equivalent single-phase current flowing through the three line conductors in parallel, with the earth completing the circuit. Connections of current and potential transformers are arranged for measuring the residual current and residual voltage of power circuits under investigation.

For the purpose of clearness, it is convenient to classify induction phenomena as longitudinal or transverse, referring to their manifestation on a metallic circuit. Longitudinal induced voltage refers to the voltage induced between the circuit and ground in the case of electrostatic induction and along the circuit between the two ends of the exposure in the case of electromagnetic induction. The transverse induced voltage of a circuit is the difference between the longitudinal induced voltages of the sides of the circuit. In the case of electrostatic induction this voltage acts between the two sides of the circuit and in the case of electromagnetic induction it acts around the metallic circuit.

It has been found in the case of the power lines investigated that the fundamental, fifth, seventh and eleventh harmonics are prominent in the balanced currents and voltages while the fundamental, third and ninth harmonics are prominent in the residual currents and voltages of the power system.

By a comparison of the prominent harmonics in the currents and voltages of the power system with those of the induction in the telephone circuits it is evident that the longitudinal induction arises principally from the residual voltages and currents while the transverse induction shows principally the characteristics of the balanced voltages and currents, together with some effect from the residual voltage and current.

The effect of the condition of the neutral of the autotransformers at Salinas, grounded or non-grounded, in so far as the induction from these exposures is concerned, is through the residual currents and voltages of the several high-tension lines connected to these transformers. A representative value of the neutral current at Salinas during the tests conducted at that point is 0.3 ampere. It is composed almost entirely of ninth harmonic together with the fundamental and third harmonics, decreasing in magnitude in the order named. The length of the power circuit between Guadalupe and Salinas is approximately a quarter wave-length for the ninth harmonic. This fact may have some bearing upon its large magnitude and is to be further investigated by the committee. Under existing conditions with the power system in normal operation, grounding the neutral of the autotransformers at Salinas does not greatly affect the induction in the exposures concerned. Two reasons may be given for this result: (1) the load balance on the power system is such that a relatively small amount of load current flows through the neutral; (2) as three high-tension lines are connected together by the autotransformers at Salinas, opening the neutral connection to ground of these transformers does not completely eliminate the path for the residual current of any one of the three lines, since it may then flow to earth through the admittance to ground of the other two lines. It is quite evident from these considerations that this case presents special conditions which make it impossible to draw general conclusions applicable to any other case. Further consideration of the effect of grounding this neutral will probably be undertaken by the committee with the idea of determining its effect under abnormal conditions.

The banks of star-connected autotransformers at Guadalupe and Salinas substations are provided with closed-delta secondary windings which supply power for local consumption. For test purposes the secondary delta of the transformers at Salinas was opened. A large increase in the residual voltage and residual current with a consequent large increase in the induction in parallel telephone and telegraph circuits resulted. In all cases this increase applied particularly to the third harmonic. If star-connected autotransformers are used this test indicates, therefore, that from an induction standpoint it is beneficial to provide such autotransformers with secondary windings connected delta.

On the eight-mile exposure it was possible to measure separately under different conditions of the telephone circuits, the electromagnetic and electrostatic induction. For this exposure, also, computations of the magnitude of the induction, both electromagnetic and electrostatic, were carried out. In computations of electromagnetic induction, experience has indicated that the distances between wires and their images cannot be assumed to be twice the height of the wires above the ground. Special tests were carried out in order to determine the equivalent depth of the image conductors. The tests indicated this depth to be approximately 300 meters below the earth's surface. Due to the electrostatic shielding effect of neighboring objects it was found, also, that the computed electrostatic induction was greater than that actually observed, indicating that in effect the ground surface was brought nearer to the conductors. Electrostatic shielding of the circuits under test, by grounding other circuits on the telephone lead at one point, reduced the electrostatic induction, particularly the longitudinal induction.

The effect of typical terminal apparatus of a telephone circuit in reducing the amount of extraneous current reaching the telephone receiver was the subject of some investigation. These effects vary with the length of the line and character of the induction.

As a means of minimizing inductive interference, some study has been given to the proper relative transposition of power and telephone circuits. Some of the considerations involved in this study are given in the portion of this report dealing with the future work of the committee.

The report states that the next step will be the investigation of the parallel between the 22,000-volt three-phase line of the Coast Counties Gas & Electric Company, and a toll line of the Pacific Telephone & Telegraph Company between Santa Cruz and Watsonville, a distance of 17 miles. Particular attention will be given at this point to the study of the effectiveness of several different systems of transpositions of power and telephone circuits, and it is hoped by the committee to be able to determine as follows:

(a) The effect of power transpositions in reducing the longitudinal induction arising from balanced currents and voltages.

(b) The effect of telephone transpositions in reducing the transverse induction arising from: (1) residual currents and voltages; (2) balanced currents and voltages.

(c) The effect of power and telephone transpositions properly located with respect to each other in reducing both the logitudinal and transverse induction arising from balanced currents and voltages.

(d) The relative effectiveness of different transposition systems in reducing electrostatic and electromagnetic induction.

Outside of the purely technical and other valuable information which will be obtained by means of this committee, there is before the electrical world today, a valuable lesson in the effectiveness of co-operation where such co-operation is made possible by the intervention of a third party. Whereas, before the formation of this committee, there was a very decided tendency on the part of both interests to best the opposing interest in the location of its lines, there is at the present time a tendency towards co-operation and an endeavor to assist the power engineer or the telephone engineer, as the case may be, in the solution of his individual problem.

Keeping in Touch With Neighborhood Wants at Minneapolis.

Manager R. F. Pack of the Minneapolis General Electric Company has established a policy of encouraging employees of the company to join local improvement clubs and other civic organizations. Usually a man from the sales department is chosen for this purpose but in a number of cases the representatives are from other departments. It is Mr. Pack's idea that his company should participate in all non-partisan community and inter-community movements and he finds the method described effective. Not only is the company enabled thereby to participate in civic advancement but in this way keeps in close touch with the various neighborhood demands and ambitions. Minneapolis is well known as one of the most beautiful of American cities and this fact is due in considerable measure to the activity of its local improvement clubs and associations.

WHERE AND WHY ELECTRIC TRUCKS ARE ECONOMICAL.

By E. J. Bartlett.

The fact that electric trucks are being extensively used in many of the larger cities of the country, and are at least being introduced in most of the smaller cities, is known to most people who are at all interested in the very serious problem of economical and efficient city merchandise transportation. In fact, many men closely in touch with the motor-truck industry predict that within a very few years fully two-thirds of all city trucking will be handled by the electric. It is also becoming very well understood that the electric has a distinct field for its operation in which it is supreme, while the gasoline and horse trucks fill other service requirements to the best advantage. The suitability of the different types is not alone determined by the particular line of trade in question, but rather by the particular work to be done and the local conditions for doing it. You cannot justly say, because a certain company engaged in your line of work and located in another city, or even in your own city, found gasoline trucks unsuitable and returned to horses, or found electric trucks unsuitable and turned to gasoline trucks, that either type of truck is best for you. Your particular conditions should govern your choice, and those alone.

What are the conditions that demand the use of electric trucks to realize their maximum efficiency and economy? There are many combinations of little things, but some of the more important features are set forth in the following arguments and tables.

Mileage Requirements.

The standard electric truck of the best known makes of any load capacity have a mileage range per charge of approximately 40 miles, with a possible 50 miles if needed. It is entirely possible by the use of batteries of larger capacity than standard to obtain 25-per-cent increase in mileage. These figures are based on the much abused phrase, "under normal operating conditions." By this is meant paved streets or good roads and few hills. Electrics will haul their loads over almost any roads which can be used for gasoline or horse trucks, but the consumption of current for bad roads is increased rapidly and out of proportion to the work done, and if such roads are to be traveled a great deal of the time, the performance of the electric will suffer in comparison with the other types of truck service. It is not that the electric will not pull through a soft, muddy road, or climb a 10 per cent grade, for it will; but perhaps three times the current will be consumed than if running on a hard level road, and if the truck has a mileage capacity of 40 miles under the latter conditions, it would have only some 13 miles capacity if constanly climbing a steep hill or plowing through a muddy road, and will travel at a lower speed. Such severe conditions are hard on any type of truck, but the decrease in mileage would make the electric impractical.

On the other hand, suppose it is necessary to climb a steep hill three times a day and go through a short piece of muddy road twice a day. The hard traveling may not be over three miles in all, but the current used may be sufficient to propel the truck 10 miles on hard level streets. You are then sacrificing seven miles on account of the hills and mud, and should you need the full 40 miles a little larger battery would care for the extra work to be done. Many successful electric truck installations are working in hilly cities. The expense is a little more owing to the larger batteries used, but for that matter it costs fully as much more to haul goods uphill with any kind of truck. The essential difference is the limit to the extra battery capacity which can be added to the electric, while the gasoline tank may be filled several times a day if necessary with the gasoline truck.

The electric is not limited by a steep hill or a piece of bad road, but rather by too many of them. Most companies in most cities can use electric trucks so far as mileage requirements are concerned. Level cities or those with few hills and with good hard streets, have natural advantage in favor of the electric, but do not necessarily establish its field of operation.

Speed or Time Requirements.

The normal speed in miles per hour of the electric truck in its usual sizes is: One-half-ton, 13; one-ton, 10½; two-ton, 9; three and one-half-ton, 8; five-ton, 7. These may seem slow compared to the possible speed of the gasoline truck on a straightaway piece of road, but low speed is one of the strongest points in favor of the electric for much trucking work.

It costs money to drive a heavy motor truck with solid tires under all conditions, and when we remember that the force of a blow struck by a moving object varies directly with the weight of the object and with the square of its velocity, we can realize that a little increase in speed affects the wear and tear on a truck considerably. Furthermore, the electric truck speeds are very nearly the maximum which can be safely used in congested city conditions, and as the electric is more flexible to handle in stopping, starting, threading through traffic, and getting in position to load and unload, it will travel about the same number of miles per day in ordinary city trucking as the gasoline truck when the latter is safely handled. There is also the advantage that the speed of the electric truck is predetermined and cannot be increased to 30 miles per hour or so at the will of an irresponsible driver when he is beyond your immediate jurisdiction. High speed, with its attendant danger, depreciation and repairs, as it exists in the gasoline truck, is not warranted in most trucking conditions where goods are to be hauled cheaply and not on express schedules. Unless your particular problem demands speed regardless of expense, the electric has all the speed consistent with economy.

Garaging Care.

There is nothing mysterious about the power mechanism of an electric truck, any more than there is about the electric battery that rings your door bell and the electric motor and controller that propels your street cars under the guidance of a motorman who knows little about the theory of electricity and with little experience in its application.

There are certain attentions necessary to keep an electric truck in the pink of condition, but they are not more difficult to learn than the theory and practice of feeding and watering a horse, keeping him shod and groomed —in fact, any intelligent driver interested in his work can keep his electric truck in better shape with less effort than he can a span of horses, wagon, harness, blankets, etc.

Every manufacturer from whom an electric truck is purchased will gladly advise fully as to its care, and furnish a factory expert to assist in its installation. So long as electric current for lights or power is available, the electric truck may be readily charged.

The Cost of Operation.

It is comparatively simple to compute the cost of operation when the local conditions are known, such as the cost of electricity, the size and type of battery required, etc. In general terms a comparison of operating cost between an electric and gasoline truck of the same load capacity traveling the same number of miles per day is given below:

Driver:—$156 per year, as a mechanic is not required to operate and care for an electric, or a difference in wages between $15 and $18 per week.

Tire wear:—About evens up with the gasoline. Electric tires wear longer owing to the slower speed, but cost a little more owing to the more resilient qualities necessary to propel the truck with the least power.

Battery wear and charging current:— These items should be considered as fuel cost and will vary with the cost of current and size and type of battery. If current cost is assumed at three cents per kilowatt-hour and figures computed for the "Exide Ironclad" battery as an average equipment, the daily costs will be approximately as follows: 1,000-pound truck, $1.03; 2,000-pound truck, $1.25; 4,000-pound truck, $1.47; 7,000-pound truck, $1.93. With gasoline at 17 cents per gallon, the daily cost of fuel and engine lubricating oil will be approximately: 1,000-pound truck, $0.65; 2,000-pound truck, $0.85; 4,000-pound truck, $1.00; 7,000-pound truck, $1.40. These figures show that the gasoline truck fuel and oil cost over one-half as much as the combined cost of battery wear and charging current for the electric.

Repair Parts, Labor and Depreciation.—As we have already provided for battery wear we have left in the case of the electric a very simple mechanism which is sturdy and naturally requires very little in the way of repair parts and labor to keep it in excellent operating condition.

In addition to these simple parts, such as axles, springs, frame, etc., which are similar in construction in both electric and gasoline trucks, we have in the gas truck a complicated reciprocating gas engine with all the attendant troubles, a train of clash gears or transmission, clutch, gear shifting devices, etc. The repairs, of course, are very much higher for the gasoline truck, and its efficient life is about one-half that of the electric or five years against ten. Assuming the initial cost the same for the two types, we have the following comparison for the different sizes:

REPAIR AND DEPRECIATION PER YEAR.

Size	Electric	Gasoline	Difference in Favor of Electric
1000 pound	$1349	$1731	$382
2000 pound	1455	1891	436
4000 pound	1611	2136	525
7000 pound	1854	2486	632

Assuming interest on the investment, insurance, storage, painting, etc., the same for either type, a summary of the above figures on a yearly basis of 300 working days per year shows the following results:

Size	Electric	Gasoline
1000 pound	$260	$ 600
2000 pound	300	700
4000 pound	390	900
7000 pound	495	1130

In addition to this saving in operating cost you obtain more continuous service with the electric. There are no valves to grind, carbon to remove, ignition and carburetor to repair, and similar attentions which keep the truck out of commission several days a year. The electric is simple in construction, simple to operate and always on the job with a minimum expense. It is adapted to the trucking requirements of at least 85 per cent of all lines of business and in these cases will operate at an economy to the owner.

Comparison of the Silver and Iodine Voltameters.

A form of iodine voltameter was devised by Washburn and Bates and was found to be of about the same order of reproducibility as the silver voltameter. Because of the reversibility of the reactions taking place at the anode and the cathode and the character of the deposit, which precluded the possibility of inclusions of foreign material, it seemed a desirable instrument to use in the determination of the electrochemical equivalents, especially since the values for these constants had heretofore been based on the silver measurements alone.

Accordingly arrangements were made for a comparison of the silver and iodine voltameters at the Bureau of Standards during the summer of 1913, by G. W. Vinal and S. J. Bates, and the results will shortly appear in the *Bulletin* of the Bureau. The operation of the iodine voltameters was in general the same as previously described by Washburn and Bates. The silver voltameters were of the porous-cup and Smith form, following the usual procedure of the Bureau of Standards. Since the same current passed through the silver and iodine voltameters, the ratio of silver to iodine may be immediately calculated. As a result of ten experiments, in each of which several voltameters of both types were employed, the ratio Silver/Iodine = 0.85017 was found.

This is slightly higher than the ratio (0.84998) ascribed to atomic weights. All sources of error have been carefully examined and are critically discussed in the full paper. None, however, are believed to be sufficient to account for the difference between this value and the ratio of the accepted atomic weights.

Using the results of the silver voltameter to measure the coulombs passing through the circuit according to the decision of the London Electrical Conference (1.11800 milligrams of silver = 1 coulomb) the electrochemical equivalent of iodine is 1.31502 milligrams per coulomb.

The value of the faraday on the basis of the present international atomic weight of iodine (126.92) and the foregoing value of the electrochemical equivalent of iodine is:

$$\frac{126.92}{0.00131502} = 96{,}515 \text{ coulombs.}$$

The value of the faraday derived from atomic weight of silver and the defined electrochemical equivalent of silver is:

$$\frac{107.88}{0.00111800} = 96{,}494.$$

The mean value of the two is 96,504, but the authors recommend for general use that the round number 96,500 be used.

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BOOK REVIEW.

"Resuscitation." By Charles A. Lauffer. New York: John Wiley & Sons. Cloth, 47 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company for 50 cents.

The author of this volume is medical director of the Westinghouse Electric & Manufacturing Company and has given much consideration to resuscitation from electric shock. This volume describes the mechanism of respiration and explains the application of the Schaefer prone-pressure method of resuscitation, which is applicable not only in cases of electric shock, but in drowning, asphyxiation and, in fact, in every case of suspended respiration. The material is placed in small compass and should be read by every electrical worker who is not already familiar with this subject. As the author points out, life can be saved in nearly every instance of suspended respiration if the proper means are instituted without delay. The following is a quotation from the foreword: "Complete details of how to rescue a comrade from a dangerous situation must be thought out in advance; the location of switches, and modes of short-circuiting lines, and of separating a body from an electrical contact without danger to the rescuer, must be studied out in advance by the individuals of each department of electrical service. With adequate circumspection and forethought, fatalities can be much reduced. And when these apparent calamities do occur, consternation seizes especially those not adequately trained to cope with the responsibilities of the situation. Artificial respiration should be practiced by everybody, in anticipation of any such emergency."

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Steam Regenerator Patents Sustained.

Judge Hand, of the United States District Court, Southern District of New York, in his decision of January 14, 1914, in the suit brought by the Rateau Steam Regenerator Company against the American Regenerator Company, held Rateau patents Nos. 679,242 and 12,295 valid and infringed.

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Radium Illuminates Sign in Colorado.

According to newspaper reports radium spelled in its own fire furnishes an illuminated sign which is to be used to exploit Colorado's mineral resources. The sign contains the single word "Radium" and is said to be made self-illuminating by the use of an infinitesimal fraction of specially treated radium.

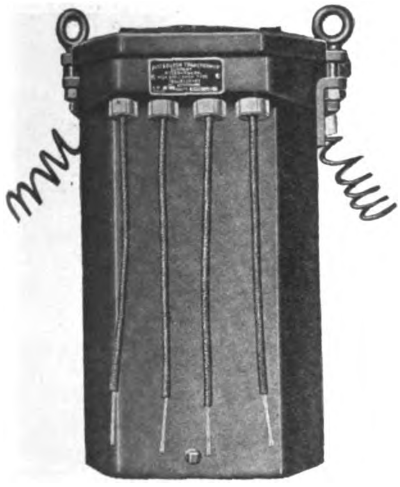
New Electrical and Mechanical Appliances

Pressed-Steel Case for Distributing Transformers.

A new and radically different type of transformer case for distributing transformers has been developed, illustrations of which are shown herewith. This new case is of pressed steel, replacing the ordinary cast-iron cases which have been in general use for the past 25 years. The material used is blue-annealed planished steel plates.

The principal advantages claimed for the new pressed-steel case are that it is much lighter and stronger than the ordinary cast-iron cases.

The reduction in weight of transformers is important to the central-station, because the cost of handling transformers is a definite appreciable item of expense to which little attention has been paid heretofore, probably because there was no escape from the bulk and weight of distributing transformers, since all manufacturers were confined to the use of heavy cast-iron cases.



Distributing Transformer with Pressed-Steel Case.

Another View of Pressed-Steel Transformer Case.

When considering the handling expense, transformers are really a tonnage material, the lightest and smallest size weighing at least 100 pounds, and the medium and larger sizes weighing up to 3,000 pounds each, for the pole-type sizes. The handling of distributing transformers is necessarily done by the line crew with hand power and man power, which is much higher in cost than mechanical horsepower; consequently installation cost is reduced by the lighter transformers.

Saving in the cost of freight is easily seen because it can be definitely shown by figures. An average saving in the total transformer weight of 30 per cent claimed by the manufacturers of the new pressed-steel case transformer, means practically an average saving of 30 per cent in freight, and since transformers run into considerable weight, the cost for freight is a considerable item of expense, which the buyer of distributing transformers must pay directly or indirectly.

While it is difficult to get accurate central-station costs for the handling of such heavy material as transformers, fairly close estimates are made and such estimates show that on 10,000 pounds of transformers shipped 500 miles, the freight, cartage, loading, unloading, warehousing, installing, etc., costs about $110. Thus, a 30 per cent decrease in weight saves $33.

This percentage of weight reduction is substantial enough to result in other practical benefits to the central station in permitting larger transformers to be mounted on poles with the same pole-strain safety factor, or it permits the use of smaller poles for given transformer sizes.

Reduction in weight with the additional advantage of strength is, of course, very desirable. It is claimed that the new pressed-steel case has been developed not only lighter in weight, but much stronger than cast iron, so that the new case will stand up even better to the everyday wear and tear, rough handling in transit, accidental bumps and jars, such as sometimes happen when a transformer is dropped from a pole or wagon.

Tests were made by a prominent laboratory, it is stated, where 13 blows with a sledge failed to show any injury, except slight indentation of the pressed steel, whereas two blows of the sledge applied to an ordinary cast-iron case cracked the case with the first blow and completely shattered it with the second blow.

It is known that the common cast-iron case will leak oil, due to seepage through the porous cast iron unless it is carefully japanned, and where the cast iron is imperfect or thin, hot transformer oil will seep through the metal and drip. Pressed steel, due to its density and non-porous structure, eliminates the possibility of oil seepage.

The new pressed-steel case has been under development for several years and it is stated actual tests in service have been thoroughly carried out by its originators, the Pittsburgh Transformer Company, Pittsburgh, Pa.

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Electric Radiator for Warming Automobiles.

Much trouble is usually experienced in winter by automobilists in trying to start the engine of a gasoline car that has been allowed to become chilled. Another difficulty is the liability of the water in the radiator freezing; this has necessitated draining the radiator at night and refilling in the morning.

Electric Heater for Gasoline Automobiles.

In order to overcome these objectionable features, there has been developed a compact electric radiator or heater that can be placed into the hood of the car at night to keep the entire engine warm. This radiator measures only 6 by 7 by 0.5 inch and weighs but two pounds; thus it is easily handled and used in the hood. The energy consumption of the radiator is small, so that it can readily be connected through flexible cord and attachment plug to any standard lighting outlet in the garage. The radiator furnishes enough heat to keep the engine sufficiently warm to enable it to be started readily.

The radiator has a Dubilier electric heating unit mounted between Electrobestos strips. This is protected by perforated metal sheeting. The construction is such that the element cannot burn out if used on circuits of proper voltage. The radiating surface is so disposed as to make a very efficient heater.

It has been found that by using this radiator the engine can be started almost invariably at the first turn of the crank or first push of the starting button, whether the car has stood idle for a few hours, all night or for several days. It keeps the carbureter and other engine parts in prime condition.

These electric heaters are made by the Dubilier Electric Company, 63 Fifth Avenue, New York City.

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Universal Safety Manhole Guard.

The increasing amount of underground conduit installed in streets with congested traffic has called for some simple and reliable manhole guard to prevent accidents when manholes are opened for cable splicing or other work. Such a guard should be easily transported, readily set up and be of such construction that it will not collapse on slight pretext.

To meet these requirements there has been placed on the market a durable and reliable manhole guard that is made of steel and iron, readily folded for shipment and opened for use, and when opened remains so because of interlock features. The outfit is entirely self-contained and has no loose parts to become misplaced or lost.

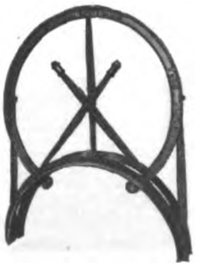

Fig. 1.—Manhole Guard Folded.

Fig. 1 shows the outfit folded up for convenient shipment or storage. In this condition it occupies a floor space of 38 by 8 inches. Its weight is 50 pounds, sufficient to hold it in place in service and yet permitting it to be easily picked up and carried by a workman. Fig. 2 shows the guard viewed from the side when partly opened. The guard in service is shown in Fig. 3.

The guard consists of a one-piece channel-steel top circle, a two-part angle-steel bottom circle and five connecting legs. The latter and the connecting hinge parts and sleeves are made of malleable iron. All joints are securely riveted; the entire construction is therefore exceptionally strong. The two side legs and the rear leg are hinged to both top and bottom rings; the two front legs are hinged to the top ring only near the ends that constitute the opening to give access to the manhole.

To open the guard, the front part of the lower ring is first swung down and then the rear part thereof, together with the upper ring which is connected thereto by the rear leg, is swung into place. This is shown by Fig. 2. When both rings are in place, the front legs are swung down and sleeves on their lower ends are slipped over corresponding lugs on the bottom ring. The guard is thus locked in the service position, Fig. 3. To close up the guard, the sleeves at the bottom of the front legs are first lifted and the folding follows the reverse order of opening.

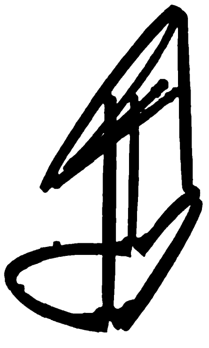

Fig. 2.—Guard Partly Opened.

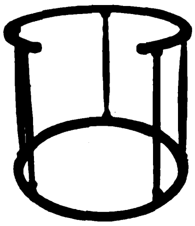

Fig. 3.—Guard Fully Opened.

The guard is of ample size for any type of underground manhole. When in service position, its inside diameter is 36 inches and its full height is 33 inches.

These guards are manufactured by the Universal Cable Grip Company, Syracuse, N. Y.

Underground Cable Proves Valuable.

During the recent severe storms in the East, especially in New Jersey, when nearly all overhead telephone and telegraph lines were down, the underground cables of the American Telephone & Telegraph Company, between Boston and New York and between New York and Washington proved of incalculable service in providing the only reliable means of communication through the affected district.

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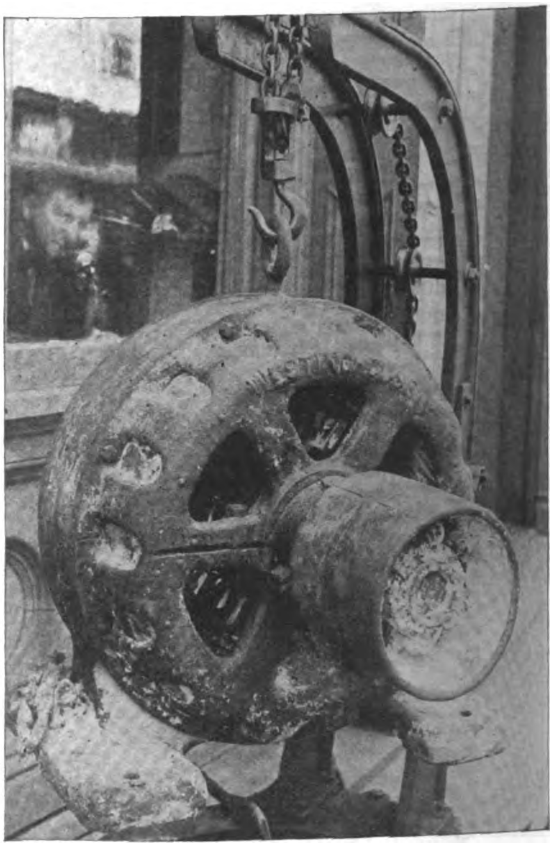
Induction Motor Withstands Severe, Continuous Service in Salt Mine.

The accompanying view shows a Westinghouse induction motor which was recently removed from the mine of the Myles Salt Company on Avery Island, La., and sent in to be rewound, the motor having burned out after six years' continuous service.



Induction Motor Removed from Salt Mine After Six Years' Use.

The very heavy incrustations of salt should be noticed in the pulley, around the terminals, and especially on the rotor fans and stator windings. Needless to say, a good deal of this salt was shaken off during transit, but in view of the water-absorbing quality of rock salt, there is sufficient remaining to make a very striking demonstration of the severe conditions that the motor withstood successfully so long.

New Starting Switch for Induction Motors.

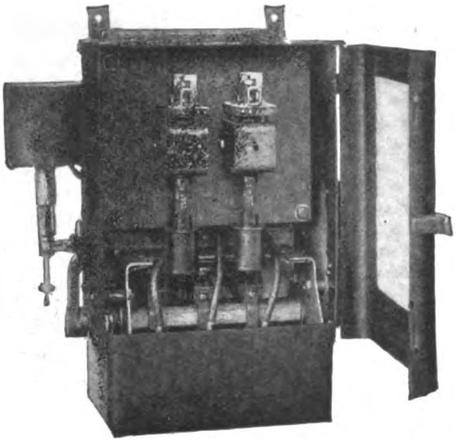
A new switch has been designed for throwing small squirrel-cage induction motors directly on the line. The shaft carrying the switch contacts extends through both sides of the inclosing case, the lever for its operation being attached to the right end, while a locking arm is attached to the left end.

The operating lever is held in the "off" position by strong springs and the design of the switch mechanism is such that the lever cannot be thrown to the running position until it has been thrown to the starting position, thus rendering it foolproof.

The switch contacts are oil-immersed, thus utilizing the oil break to minimize sparking and insure long life. The oil tank is so designed that it takes but a moment to remove it, if one desires to inspect or repair the switch.

This type of switch is provided with a low-voltage-release coil which shuts the motor down in case of failure of voltage. The magnet coil being de-energized, its core drops, striking the lever which engages with the locking arm so as to hold the switch closed in the running position, thus tripping the switch and permitting the starting lever to return instantly to the "off" position. The low-voltage-release coil is totally inclosed so that it cannot be injured in handling or affected by foreign substances.

Starting Switch for Induction Motor.



Switch Opened for Inspection.

Overload relays, so designed as to permit of a wide range of adjustment, protect the motor from overloads and prevent it running single phase. The relays are mounted within the inclosing case.

If it is desired to stop the motor from remote points, push-button stations may be wired into the low-voltage-release circuit so that when the button is pressed this circuit is opened and the switch tripped in the same manner as when the voltage fails.

This starting switch is totally inclosed and is arranged for conduit wiring, the conduit entering the top of the case so that the leads may be brought down inside the case and all connections be concealed. The front of the case is closed by a hinged cover provided with a snap catch to permit of easy inspection of coils and connections.

To start, the operator moves the starting lever away from him to the limit of its travel, throwing the motor directly on the line. After the motor has come up to speed, he pulls the lever towards himself to the running position, cutting the overload relays into the circuit. Thus these relays are not in circuit while starting, which permits their being set for operation just above the full-load current of the motor, if desired.

This switch is designed for use with squirrel-cage induction motors of capacities up to and including 7.5 horsepower, for potentials of 110, 220, 440, and 550 volts, and frequencies of 60, 40, and 25 cycles, two and three phase.

This motor-starting switch is manufactured by the General Electric Company, Schenectady, N. Y.

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Electric Vehicles at Boston Automobile Show.

Seven makes of electric automobiles were exhibited at the Boston 1914 Automobile Show, whose pleasure-car exhibition opened in the Mechanics Building March 7 and continued through the past week. The attendance on the opening night numbered about 50,000. A bulletin of exhibitors, illuminated by means of an electric lighted reflector, occupied a position near the main entrance. The decorations of the halls were elaborated and included Venetian scenes and floral embellishments. The names of the exhibitors were announced at each exhibit by round glass globes suitably inscribed with gilt lettering and enclosing ruby electric lamps.

The Anderson Electric Car Company, makers of the Detroit Electric, showed a five-passenger brougham with duplex drive, and a four-passenger brougham. There was also a two-passenger roadster. Forty-two-cell lead or 54-cell Edison batteries are employed in this company's cars. The five-passenger car is lighted inside by two 20-watt lamps, inclosed in ground glass globes, located in the upper back corners of the body. An automatically operated switch in the door frame lights the lamp as the door is opened to admit passengers.

S. R. Bailey & Company, Amesbury, Mass., showed a four-passenger roadster, a new cabriolet or convertible roadster accommodating two persons, and a two-passenger standard roadster. The cabriolet is equipped with a detachable top with wood-framed side window and folding wind shields which enable the car to be used as an open car in summer and an enclosed car in winter. The four-passenger Bailey is equipped with 60 cells A-6 Edison battery. These cars are designed for a 25 miles per hour running speed, and run 70 to 100 miles on a charge.

The Waverley electrics exhibited by the J. W. Bowman Company included a special "gold car," a four-passenger brougham with elaborate upholstery in cloth of gold, and an exterior specially gilded for the exhibition. There was also a four-passenger dual-drive brougham, operated from either front or rear seat, and a five-passenger forward-drive brougham. The batteries used are optional with the purchaser.

The Peerless Motor Car Company exhibited a four-passenger Rauch & Lang brougham having two separate drives for operation from the forward or rear seats.

The Ohio Electric Car shown by the D. C. Tiffany Company was a four-passenger rear-drive car, and there was also a chassis showing motor equipment and running gear.

The Century Electric Car Company exhibited a four-passenger brougham and a five-passenger car of the same type with especially spacious interior. Willard batteries, especially manufactured for the company, are used.

The following manufacturers of accessories exhibited their specialties: American Storage Battery Company, Burn-Boston Battery & Manufacturing Company, Forest City Electric Company, Holtzer-Cabot Electric Company, Philadelphia Storage Battery Company, Van Dorn Electric Tool Company.

The electrical equipment of the gasoline cars was notable. Electric lights and starting apparatus were all but universal and in several cars electric gear-changing apparatus is employed and the electric brake is also demonstrated as a practical feature. Electrically operated horns, headlights and interior lights were in increasing evidence.

The commercial division of the show will occupy the coming week.

A Typical Up-To-Date Central-Station Standby Storage Battery.

The Indianapolis Light & Heat Company, of Indianapolis, Ind., has recently completed the installation of an emergency storage battery consisting of 156 type H-61 Exide cells. This battery has a capacity of 4,500 amperes for one hour, or 9,300 amperes for 20 minutes. It is installed with 78 cells on each side of the neutral of the three-wire system, of which 22 cells on each side are connected as end cells. Fig. 1 shows a view of the interior of the battery room.

This battery installation is up-to-date in every respect. The cells are mounted on the latest type of oil insulation. There are four remote-control motor-driven end-cell switches, two on each side of the system, each having a continuous capacity of 5,000 amperes with an overload capacity sufficient to carry any output which the battery can give. The two switches on each side may be operated in parallel, if desired, by interlocking their driving mechanism, in which case the two operating motors are connected in parallel. Each motor has, however, sufficient capacity to operate both switches, if necessary.

The 22 end cells on each side of the system are connected to the points on the end-cell switch by heavy lead-coated copper conductors. Each cell switch has 12 points and the 22 cells on each side of the system are connected to the two corresponding end-cell switches in four three-cell groups, three two-cell groups and four single cells. The single end cells are located next to the main battery, permitting adjustment of the floating point within the ordinary range of bus voltage variation. During an emergency discharge the extreme end cells are thus cut in two and three cells at a time as the voltage of the battery drops. The switches travel from point to point at high speed, and it is possible to move the traveling brush from one end to the other, thus cutting in all of the cells of the battery, in fifteen seconds.

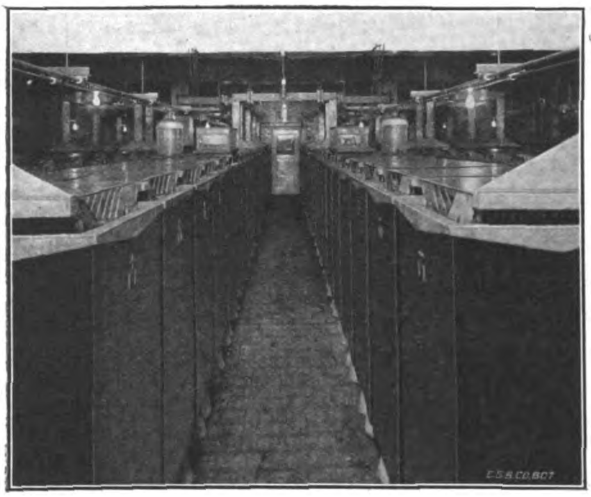

Fig. 1.—New Standby Battery for Indianapolis Plant.

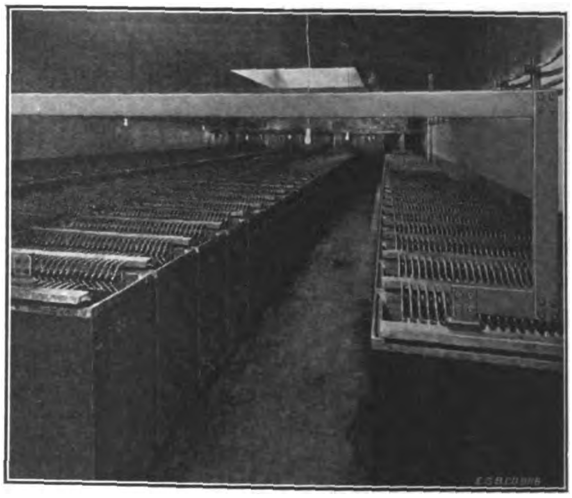

Fig. 2.—Old Battery Installation for Same System.

The battery is equipped with the latest type of automatic pilot-cell-filling devices and recording and signaling hydrometers, one outfit on each side of the system. The hydrometers give a graphic record of the specific gravity of the two pilot cells corrected for variations of temperature, while the cell-filling devices maintain the level of the electrolyte in these pilot cells at a constant point, thus eliminating errors in the specific-gravity record due to evaporation. The hydrometers may also be set to give a signal when the specific gravity of the pilot cell reaches any predetermined value, either at the upper or the lower end of its range, thus warning the operator when the battery is sufficiently charged, or when it reaches a certain state of discharge.

The switchboard equipment for the control of the battery consists of eight panels of black oiled slate, occupying a total length of 10 feet 8 inches with a height of 7 feet 6 inches. On this switchboard in addition to the knife switches for connecting the end-cell switches to the bus and the usual indicating instruments there is installed for each end-cell switch the Electric Storage Battery Company's recently developed indicating control switch. This switch is designed to control the operation of the end-cell switches, and at the same time indicate this operation. It is possible by a single turn to set this control switch to indicate the point to which it is desired to adjust the corresponding end-cell switch, and the latter will then travel to the desired point without further attention on the part of the operator. The setting of this control switch is accomplished by turning a small hand wheel which brings to view behind an opening in the dial the number of the end cell to which it is desired that the end-cell switch shall travel. While the end-cell switch brush is in motion, as a result of this setting, the exposed number is illuminated by an intermittent colored light, the color being red if cells are being cut in and green if cells are being cut out. As soon as the cell switch arrives at the desired point, it will stop automatically and the illumination becomes a steady white light.

This battery installation is installed at Substation C, which is equipped with one motor-generator set for receiving alternating current and delivering direct current to the 240-volt bus. This motor-generator set has a capacity of 1000 kilowatts. The motor is of the three-phase induction type. The neutral point of the battery is connected to the neutral of the system, but no other neutral is provided at this substation, the motor-generator set being connected directly across the outside wires at 240 volts.

For charging the battery there is installed a three-unit booster set consisting of a synchronous motor driving two direct-current generators.

In addition to this battery the Indianapolis Light & Heat Company has in service another battery consisting of 156 cells type H-59 Chloride Accumulator, which has been in service since January, 1901, or approximately 13 years. Its capacity is 9,000 amperes on each side of the neutral for 18 minutes. The combined capacity of these two batteries is sufficient to carry the total peak load for approximately 18 minutes. Fig. 2 shows a picture of the old battery room.

Both of these batteries and appurtenances were manufactured and installed by the Electric Storage Battery Company, Philadelphia, Pa.

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Franklin Electric Manufacturing Company Completes New Middletown Factory.

The Franklin Electric Manufacturing Company has completed factory "B" at Middletown, Conn. The company's factory floor space now totals approximately 133,500 square feet, all of which is devoted to the manufacture of incandescent lamps. The three

Three Factory Plants of Franklin Electric Manufacturing Company.

illustrations herewith show, respectively, the Middletown factory "B," the Hartford factory, and the Middletown factory "A." The latter or new plant contains 66,500 square feet; factory "B" at Middletown, contains 22,000 feet; the Hartford plant contains 45,000 feet.

An item in a recent issue of this publication stated that the company was about to increase the capacity of its "Woodbine Street factory by the addition of another story, making the building of three stories, 62 by 34 feet." This statement should be corrected, as it would lead one to believe that the incandescent lamp factory at Hartford was meant. The building referred to is utilized entirely for office purposes and is separate and distinct from the factory buildings, and the floor space involved is not included in the figures mentioned above.

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An Electrically Driven Southern Brick Plant.

The brick plant of L. I. Stevenson, located about 12 miles from Birmingham, Ala., on the Central of Georgia and Southern railroads, represents everything modern and efficient in equipment and layout. All the machinery is motor-driven, the power is purchased from the Alabama Power Company, and the kilns are operated on the waste-heat system. These several features represent the latest practice in brick-plant operation and have proved in many installations their economy over other methods.

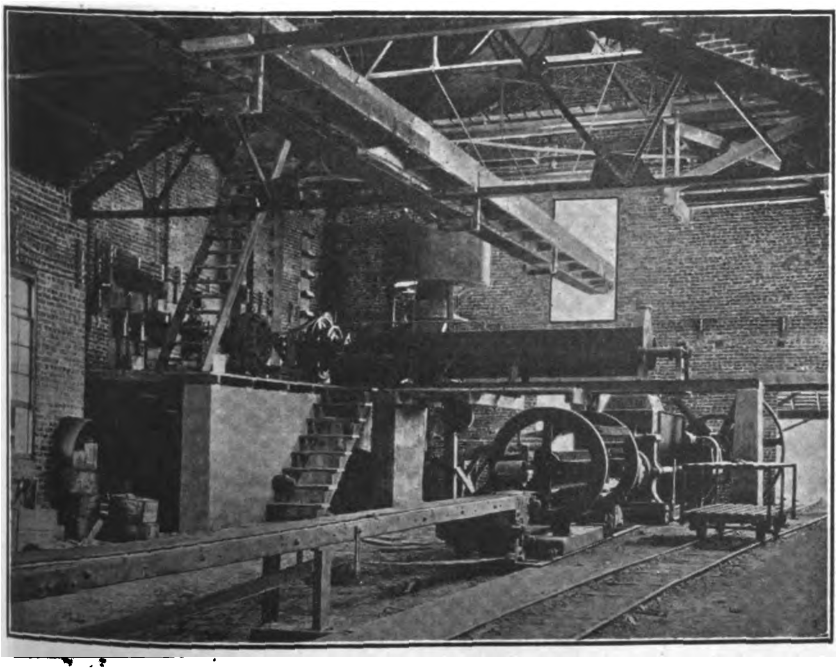
This plant has a capacity of 10,000 brick per hour, the product being red-shale common and Oriental brick, the latter resembling a tapestry brick with a rough wire-cut surface. The brick may be burned any shade from light red to almost black.

Shale is mined at a point several hundred feet from the plant and hauled by cars which are pulled up the slope by a 50-horsepower motor. The shale is first sent to a crusher, driven by a 30-horsepower motor and is then passed through either pulverizers or dry pans, depending on its condition. A tripper conveyor then distributes the material over a 100-foot storage space.

The pug mill is driven by a 50-horsepower motor and the combination brick machine by a 125-horsepower motor. The illustration herewith shows these two machines and illustrates the simplicity of motor-driven machinery and the flexibility with which it can be located to suit the sequence of operations.

An electrically driven transfer car conveys the brick from the dryer to the kilns, of which there are 16, each of 70,000 brick capacity. Three motor-driven fans are used to provide draft, circulation, and exhaust for the kilns.

Power is received at 22,000 volts and is stepped down to 550 volts for the use of the motors, and to 110 volts for the incandescent and arc lamps. A two-panel switchboard equipped with oil circuit-breakers protects and controls the various circuits. The electrical equipment, except the hoist motor and transfer car, was supplied by the Westinghouse Electric & Manufacturing Company, East Pittsburgh. Pa.



View in Electrically Driven Brick Plant.

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Low-Voltage Sparks Not Responsible for Mine Explosion..

During the British government inquiry as to the cause of the explosion at Senghenydd, South Wales, on Octover 14, 1913, in which over 400 lives were lost, it had been suggested that the explosion of gas was caused by an electric spark from the bell or signaling wires. To test this theory careful experiments were made, under official supervision, and the results of these experiments are held to prove that the intensity of sparks at nine volts (the voltage employed in the mine where the explosion occurred) could not ignite an explosive atmosphere. Mine gas, containing over 95 per cent methane, was used in the experiments.

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International Electrical Exhibition in Spain.

The definite announcement has been made that an International Exhibition of Electrical Industries will be held in Barcelona, Spain, in the year 1915. It is considered that the undertaking will not only be of importance for Spain but for all other participating countries as well. A strong managing committee has been named and an initial credit of 10,000,000 pesetas ($1,800,000) has already been voted in order to defray the expenses of the exhibition, which is intended to be really international in its scope. Correspondence in reference to the matter should be addressed in Spanish to the Alcalde of Barcelona, who is at the same time president of the committee in charge of the arrangements.

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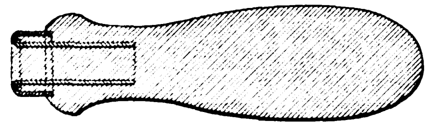
The use of the telephone is slowly increasing in China, particularly where foreigners reside.

An Improved File Handle.

In order to make a more durable tool and also one less liable to cause injury to the workman, there has been devised an improved form of file handle which is manufactured by the W. T. Nicholson & Clipper Company, King Street, Salford, Manchester, England. The accompanying illustration shows the construction. Pressed into the handle is a flanged steel tube which is driven into the end of the wood into which the file is to be inserted. The flange of the tube overlaps the ferrule. It is tapered in order to fit snugly over the ferrule.

By using the tube splitting of the wood is prevented when the file is driven in and the ferrule is also prevented from coming off. By compressing the wood, the file is held much tighter than in an ordinary handle. Danger of the tang running into the workman's hand is also eliminated.



File Handle with Internal Steel Tube for Durability and Safety.

Annual Salesmen's Convention of the National Carbon Company.

The eighth annual salesmen's convention of the National Carbon Company was held in Cleveland, O. during the week of February 23. About 120 employees were present at the banquet on Thursday night at the Hollenden Hotel.

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High-speed wireless tests recently held at the Clifden, Ireland, station, are said to have resulted in the transmission of 145 words per minute, a new record in wireless telegraphy.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CIRCUIT BREAKERS.—**Roller-Smith Company,** 203 Broadway, New York, N. Y..

"Standard" and "Industrial" styles, 600 volts and less.

Approved January 23, 1914.

FIXTURES.—**Mercantile Advertising Company,** Marbridge Building, New York, N. Y.

"Midas" interchangeable electric letters. Special receptacles with plug contacts for 10-watt incandescent lamps and with small glass and metal lanterns inclosing each lamp, together with a special frame for mounting these receptacles and provided with armored cord and an attachment plug.

Approved February 16, 1914.

FLEXIBLE CORD.—Simplex Wire & Cable Company, 201 Devonshire Street, Boston, Mass.

Marking: one red cotton thread or two red cotton threads under braid and parallel to the wire.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved February 11, 1914.

RECEPTACLES, Standard.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

"Hubbell" brass-shell wall sockets.

Key, "Lock Shell," catalog Nos. 3,545, 3,546, 3,719, 3,721, 3,723.

"Quick Catch," catalog Nos. 3,732, 3,735, 3,747, 3,751, 3,752.

Pull, "Lock Shell," catalog Nos. 3,832-34 inclusive, 35,021; also 3,835 for use on metal ceilings.

"Quick Catch," catalog Nos. 3,838-40 inclusive; also 3,841 for use on metal ceilings.

Approved February 10, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell, closed or slotted bases.

Pull, 250 watts, 250 volts.

Conduit box, 428.

Also the above types with shade-holders attached; key type with composition or insulated metal key, or with "Shurlok" attachment.

Approved February 10, 1914.

RECEPTACLES, **Standard.—The Perkins Electric Switch Manufacturing Company,** Bridgeport, Conn.

"Perkins" brass-shell wall sockets (slotted or closed bases).

Key, 250 watts, 250 volts; catalog Nos. "New Wrinkle" 4,554 and 7,554 for use on metal ceilings.

Keyless, catalog No. "New Wrinkle" 7,555 for use on metal ceilings.

Also all the above types with shade-holders attached; key types with composition or insulated metal key.

Approved February 6, 1914.

RHEOSTATS.—**The Cutler-Hammer Manufacturing Company,** Milwaukee, Wis.

"C-H" all capacities, 115, 230 and 500 volts.

Resistance plates, iron-clad; bulletin No. 1,250.

Approved February 10, 1914.

RHEOSTATS.—**The Cutler-Hammer Manufacturing Company,** Milwaukee, Wis.

Direct-current self starters; bulletin Nos. 3,500, 4,400, 4,410 with speed regulators, 0.25 to 20 horsepower; 6,090, with knife switch and fuses; 6,250, 20 to 200 horsepower.

Approved February 10, 1914.

RHEOSTATS.—**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa.

125 to 650 volts. All capacities.

Motor starter; Type DM.

Resistance unit; Type DE.

The rheostats known as Type DM are approved only when circuit-breakers or fuses are installed in connection with them as required by Rule 78*g* of the National Electrical Code.

Approved February 6, 1914.

SOCKETS, **Standard. — C. S. Knowles,** 138 Suffolk Street, Chelsea, Mass.

"Zee" sockets, 660 watts, 250 volts.

Key; catalog Nos. 650 and 750.

Keyless; catalog Nos. 601, 651, 701 and 751.

Approved February 10, 1914.

SOCKETS, Weatherproof. — The Brayant Electric Company, Bridgeport, Conn.

"Bryant" 1,500 watts, 600 volts, mogul base.

Porcelain shell; catalog Nos. 4,069-4,071 inclusive.

Standard for use with incandescent lamps in series on 600-volt circuits.

Approved February 10, 1914.

SWITCHES, Automatic.—Victor G. Jensen, 657 East Sixty-third Street, Chicago, Ill.

"Commonsense" time switch, 30 amperes, 125 volts.

A time switch consisting of an alarm clock and a standard double-pole knife switch mounted in an approved metal cabinet.

Approved February 16, 1914.

SWITCHES, Surface Snap.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Lock attachment, catalog No. 398 and key.

Approved February 17, 1914.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

HARTLAND, MINN.—An electric light plant will be erected here to cost $3.000. C.

PLYMOUTH, IOWA.—The council is planning ways and means to secure electric lighting.

MILTON, ORE.—The Council plans to improve the electric plant. Address the city clerk.

JANESVILLE, MINN.—A movement is on foot to install ornamental lighting on Main street. C.

BEVIER, MO.—At a special election the proposition of a municipal lighting plant carried by a big majority. M.

WINONA, MINN.—George Hirsh is chairman of a committee that will install ornamental electric street lighting in this place. C.

ANAMOSA, IOWA.—Business men will install an ornamental lighting system on the principal business streets of Anamosa. C.

HUNTINGTON, IND.—The Council plans to enlarge the present electric light plant. Address City Attorney F. H. Bower.

HELENA, MONT.—A $30,000 lighting system will be established in the west side. Address Mayor Purchell for particulars.

OMAHA, NEB.—A municipal electric lighting plant will be established. Address R. B. Howell of the Metropolitan Water district.

OLD BRIDGE, N. J.—The Trustees of South Old Bridge are considering the installation of new arc lamps along the main thoroughfare. A.

SUMNER, MO.—A franchise has been granted to a syndicate to build an electric light and power plant. Address the city clerk for particulars.

PRINCETON, N. J.—The Lighting Committee of the City Council is arranging for the installation of additional street lights; incandescent lamps are now used. A.

HOLDINGFORD, MINN.—The Holdingford Milling Company made a proposition to install a lighting and power plant. Address Alex Lemmer for further information.

DEERFIELD, WIS.—A company has been organized with a capital stock of $50,000 to furnish electricity to this place. O. A. Oestrich and I. A. Avery are the incorporators.

ABBEVILLE, LA.—It has been decided to improve the city power plant. Harold Raymond, of New Orleans, is preparing specifications. The contemplated cost is $25,000.

GOOD THUNDER, MINN.—The Commercial Club is planning to install an electric light plant here. Address A. W. Seaquist, president of the Commercial Club, in regard thereto.

WAUCOMA, IOWA.—The water power owned by Robert Twamley will be purchased by the city, and $12,000 will be expended installing a lighting plant. Address the city clerk for particulars.

EDMONTON, KY.—The Edmonton Light & Power Company has been incorporated with a capital stock of $1,250 by George Greenup, S. W. Free, A. B. Thompson, J. L. Dillon and W. E. Vansant.

ALAMOGORDO, N. M.—The Alamogordo Water Works Company is preparing to erect a new power plant which will supply current to operate all the irrigation pumping plants of the Alamogordo Valley. D.

MARYVILLE, TENN.—The Aluminum Company of America, with general offices in Pittsburgh, will built its own power plant, it is reported, erecting a hydroelectric plant on the Little Tennessee River in Blount county. G.

CITY OF MEXICO, MEX.—The Federal Government has granted a concession to Jacinto Barrera and Salvador Luque for the use of the waters of the Tonantongo River, state of Hidalgo, for the generation of electrical energy. D.

SHEBOYGAN, WIS.—The Council is again considering establishing a municipal light system. The company now furnishing lights will expend $15,000 if the contract is renewed. Address Edward Hammett, general manager.

METTER, GA.—The Metter Co-operative Light & Power Company has been organized here with a capital stock of $20,000 and will establish and operate an electric light plant here. The incorporators are J. R. Dixon, W. J. Brown and others.

KENT, O.—A thorough investigation of municipal ownership of lighting plants throughout Ohio is being made by Mayor M. L. Davy, with the view of making recommendation to the Council that a municipal plant shall be installed here. J.

BALFOUR, N. D.—The Village Council here has granted a franchise to Schimel Brothers, owners of the Balfour mill, giving them the right to install and operate an electric light plant. The franchise provides that the plant must be installed by May 1.

TUSKEGEE, ALA.—The installation of a new water distribution system and an electrical system at the Tuskegee Normal and Industrial Institute was authorized by the Board of Trustees. Work will begin this spring. Address the Secretary of the Board.

MONTPELIER, VT.—Bread Loaf Mountain Power Company has been incorporated with a capital stock of $5,000. The company will develop electric energy and sell the same for light and power from Middlebury River and its branches and the Lamoille River.

BIRMINGHAM, ALA.—The Birmingham-Tuscaloosa Railway & Utilities Company is reported as issuing $600,000 bonds to build a central generating station and gas holder at Tuscaloosa, Ala., to extend gas distributing system and electrify and extend its steam railway.

CORDOVA, ALASKA.—City Council has under consideration the application of H. H. Knox for a franchise to install and operate an electric light and power plant in this city, and if same is granted, which is probable, work of construction will begin at an early date. O.

MERCHANTVILLE, N. J.—The Borough Council has had estimates made for the installation of a municipal electric lighting plant, and is now considering the various features. The station as planned is estimated to cost about $17,400, and have a capacity of 400 40-candlepower lamps. A.

SOUTH BEND, WASH.—With the filing by Frank McKean of Seattle, of water appropriation rights on the South Fork River and the closing of negotiations with owners of property along the river, the first steps in actual development of 1914 for Willapa Harbor and South Bend have been taken.

VICTORIA, B. C.—The Canadian Power & Land Company has made application to the Dominion Government for a license under the Water Act to divert water from the Cowichan River for hydroelectric power purposes. A 10,000-horsepower plant is to be built about six miles from the outlet of Cowichan Lake. O.

HOOD RIVER, ORE.—The latest step in the movement for cheaper lights in the Hood River Valley was the appointment of a committee to draw up a petition calling for the organization of the lower valley into a municipality for the purpose of establishing a municipal power and light plant.

SPOKANE, WASH.—The Trustee Company has been granted a franchise by the City Council to use city streets for laying pipes, wires, conduits, etc., for steam or hot water heating, and for electricity for light and power, etc. The Company will build a $100,000 plant in this city, plans having been prepared for same. O.

MONTAGUE, MASS.—A meeting of citizens was held March 11 to consider the organization of a lighting district. It is reported that the Franklin Electric Light Company, Turner's Falls, is negotiating to take over the Montague company and supply electricity to the territory at prices somewhat below those now prevailing. W.

MANSFIELD, O.—The lighting equipment of the city will be doubled, according to plans which will be submitted to the Council not later than March 10, by H. Whitford Jones, consulting engineer of Cleveland, who has been employed as expert by the local authorities. Nitrogen tungsten lamps will be used exclusively. J.

TONOPAH, NEV.—Articles of incorporation have been filed for the Colorado River Hydro-Electric Company with a capital stock of $5,000,000, by Henry C. Smidt, W. R. Williams and William Forman. The company recently secured valuable water rights on Colorado River near the Nevada line.

EVANSVILLE, IND.—The Y. M. C. A. Board of Directors has decided to install its own power plant for the new building now under construction. The building committee composed of Dr. J. C. McClurkin, G. A. Trimble, C. H. Battin, W. B. Miller and A. F. Karges has been authorized by the directors to obtain bids for the plant at once.

SANDY, ORE.—The Portland Railway, Light & Power Company, of Portland, in a recent communication to City Auditor C. D. Purcell announced that $3,000 would be spent in constructing a transmission power cable from Portland to this city. The city has decided to install 12 arc lamps when the improvement has been made.

LAPWAI, IDAHO.—The City Council has granted the application of the Lewiston Light & Power Company for a franchise, permitting the erection of poles and operation of light and power lines through the streets of this city. The franchise is for 25 years, and provides that the light and power must be supplied to this locality on or before July 15 of this year. O.

WORTHINGTON, O.—Bids will soon be called for on the construction of about two and one-half miles of cluster-light posts and wiring to connect this village with nearly the same mileage of lights extending northward from Columbus. When this with other features of the general improvement is completed there will be a splendid suburban boulevard, ornamentally lighted over its entire distance of nearly five miles. J.

COLUMBUS, O.—The electrical features of a new theatre about to be built here are expected to be fully equal to those of the Majestic Theatre, just completed, which cost $4,000 exclusive of the fixtures. The building entire, to be three stories and basement, of concrete and steel, will involve an outlay of $80,000. H. L. Chapman, a millionaire coal man, is the owner, and Dawson & Holbrook the architects. The theatre has already been leased and must be ready to turn over by August 1, 1914. The plans will soon be ready for bidders. J.

NEWPORT, ORE.—A. Welch and C. E. Welch, construction engineers of Portland, who recently purchased the local light and power plant, have announced that extensive improvements will be made at once. A generating station will be installed in Toledo, near here, from which power will be obtained for both this city and Toledo. The construction of a high-power voltage line, on which electric current will be transported to Newport, will be commenced immediately. That the present operations in Lincoln County are significant of great future development is foretold by the probable acquisition of the telephone lines of the county and of a prospective trolley line connecting this city and Toledo. O.

TELEPHONE AND TELEGRAPH.

(*Special Correspondence.*)

WILSON, N.C.—Carolina Telephone & Telegraph Company will expend $15,000 improving its system.

SANBORN, IOWA.—Sanborn Telephone Company has been incorporated with a capital stock of $20,000. W. H. Barker is president.

OLYMPIA, WASH.—The West Side Rural Telephone Company has been incorporated by C. E. Starr, Marion George and others.

GAGE, MONT.—The North Side Telephone Company has been organized to build about 20 miles of line. Address James Batschelete, president.

JUNCTION CITY, WIS.—Junction City Rural Telephone Company has been incorporated with a capital stock of $2,000 by T. J. Pitt and others.

GENESEE, IDAHO.—A telephone company will be organized here with a capital stock of $20,000. Address R. W. Gillan, of Pullman, Wash., in regard thereto.

DAHLONEGA, GA.—The Caney Creek Telephone Company has been incorporated with a capital stock of $5,000 by J. W. Justus, F. J. Williams and others.

HOODSVILLE, W. VA. — The Hoodsville Telephone Company has been incorporated with a capital stock of $2,500 by W. D. Barb, Lee Swisher and others.

COLUMBUS, O.—The Columbus Citizens Telephone Company, is preparing to extend its lines and general service. Frank A. Davis has been re-elected president of the company.

LITCHVILLE, N. D.—The Gladstone Pearl Lake Telephone Company will branch out to the north as soon as the weather will permit, the line will have a direct connection with Litchville. C

EUGENE, ORE.—The Pacific Telephone Company will build 222 additional miles between Eugene and Albany, to cost $15,450. Address C. P. Van Houte, superintendent, for further information.

ST. CLOUD, MINN.—The Spring Hill Telephone Company has been organized for a rural telephone system for the town of Greenwald. J. J. Winter and Peter Krantz, of Spring Hill, are the incorporators.

DRYAD, WASH.—Charles Roundtree and C. H. Sweeney, of Klaber, are contemplating the installation of an up-to-date telephone system in this city and Doty. It is understood work will begin shortly and be completed in about three or four months. Franchises have been secured in both cities.

BENTON HARBOR MICH.—Estimates have been approved by the president of the Michigan State Telephone Company, covering the replacing of iron wire in the toll-line circuit between New Buffalo and Lakeside with copper wire which will entail an expense of $1,273. Address A. E. Huntley, manager, for desired information.

CHEHALIS, WASH.—The Bunker Creek Rural Telephone Company, and Mary E. Coffman, have made application to the Lewis County Commissioners for a franchise to build a telephone line along certain roads in the western part of the county. The Crego Telephone Company has also applied for a franchise, its territory being southwest of Chehalis.

ELECTRIC RAILWAYS.

(*Special Correspondence.*)

WINSLOW, ARIZ.—J. F. Mahoney has been granted a franchise for an electric car system in this city.

BRAINERD, MINN.—George Reed is promoting an electric road to connect Brainerd and adjoining towns.

WASHINGTON, D. C.—The Southern Railway, with general offices here, is planning the construction of an automatic electric signal system between Knoxville and Morristown, Tenn. G.

GLOBE, ARIZ.—Articles of incorporation have been filed for the Globe & Miami Traction Company, with a capital stock of $250,000, by Joseph B. Ryan, Charles W. Gift, Jr., and Richard West.

CLARKSVILLE, TENN.—Plans for an electric railway from this point into Southern Kentucky are being made. The proposed line will be 35 miles long. Capt. Edward Martin, Big Rock, Tenn., may be addressed. G.

LAWTON, OKLA.—A franchise to the Lawton Lighting & Railway Company for the use of the streets for street railway purposes was granted at a special election here. The company's plans also include an interurban to Fort Sill. P.

LAWRENCE, KANS.—Hocker & Dixon, promoters of an electric road from Zarah to Lawrence, have announced that work will begin in the spring. C. B. Hosford, who has charge of the right of way work, has secured about half of that between Eudora and DeSoto.

OCALA, FLA.—The board of governors of the Ocala Board of Trade met to discuss the feasibility and devise ways and means of building an electric interurban electric car line from this city to Silver Springs. Address the secretary of the Board of Trade for desired information.

ROCKVILLE CENTER, N. Y.—There are rumors afloat in Rockville Centre that a company will be formed in this village to construct a trolley line to connect Hempstead, Oceanside, Rockville Center, East Rockaway and Long Beach. Several very prominent citizens are very enthusiastic over the project.

ELWOOD, IND.—Articles of Incorporation for the Windfall & Central Indiana Traction Company have been filed. The capital is $10,000, and the purpose is to operate an electric railway from Tipton to Marion, *via* Windfall. The directors of the concern are E. N. Todd, Thomas E. Dean and Guy Dean.

DETROIT, MICH.—Detroiters and others identified with water power plants at Holly and Linden, Mich., are promoting the construction of an electric car line between those cities. Dr. Oliver H. Lau, 693 John Road, Detroit, has applied to the State Railroad Commission for permission to issue $50,000 worth of stock in the company to be incorporated.

MARION, ILL.—The Southern Illinois & St. Louis Railway Company will soon begin the construction of an electric line extending from Marion through Johnson City and West Frankfort to Benton, Ill. After its completion this line will be connected with the Eldorado Carrier Mills branch, the connecting road being built from Harrisburg to Marion. W. H. Schott, of Chicago, is president and general manager.

NEW INCORPORATIONS.

MASON CITY, IOWA.—The Clark Electrical Company has been incorporated with a capital stock of $5,000 by E. J. Clark, O. P. Strickler and others.

QUINCY, ILL.—The Ellington Electric Company has been incorporated with a capital stock of $1,500 for the purpose of manufacturing, dealing in and selling electric apparatus, appliances, etc.

LOUISVILLE, KY.—The Safety Door Securer & Manufacturing Company has been organized with $20,000 capital stock and will require motors for the operation of its factory. G.

BOSTON, MASS.—The Engineering Company of America has been incorporated with a capital of $10,000. The incorporators are Henry E. McDowell, George F. Tarbell and George K. Willard. W.

GARY, IND.—A. B. Harris Electric Company has been incorporated with a capital stock of $20,000 to deal in electrical fixtures. The directors are Arthur B. Harris, Cecilia R. Harris, W. B. Brockhouse.

BOISE, IDAHO.—Garrecht Extensible Electric Light Fixture Company has been incorporated with a capitalization of $50,000. The directors are Frederick Garrecht, E. Straus, William Warner and E. W. Barry.

CHICAGO, ILL.—Bodine Electric Company has been incorporated with a capital stock of $50,000 to manufacture and sell electrical apparatus and machinery. The incorporators are Carl D. Bodine, John P. Bodine and Paul J. Bodine.

YOUNGSTOWN, O.—The Electrical Maintenance Company has been incorporated to engage in general contracting. The capital stock is $25,000 and the incorporators are Max Hain, Samuel Hain, Rebecca Hain, Mark Gunlefinger and Ethel Gunlefinger.

NEW YORK, N. Y.—Electrical Review Publishing Company, Incorporated, has been granted articles of incorporation, capitalized at $450,000. The incorporators are Charles W. Price, Henry D. Lyman and John K. Berry, of this city.

PORTLAND, ME.—Acme Register Company has been incorporated to manufacture, sell and deal in electrical devices or machines for registering, signaling, etc. The capital stock is $500,000. R. A. Worth is president of the company, and E. C. Keith, treasurer.

BUFFALO, N. Y.—Ampere Control Corporation has been incorporated to deal in control systems for autos, aeroplanes, etc. The capital stock is $100,000 and the incorporators are Ernest W. Jones, Ralph E. Heard and L. C. Kinnius, of Buffalo.

BROOKLYN, N. Y.—Acorn Insulated Wire Company, Incorporated, has been granted articles of incorporation for the purpose of manufacturing insulated wire, cable, etc. The capital stock is $100,000 and the incorporators are Walter V. Donovan, Joseph Quittner and Joseph T. McMahon, of New York City.

NORTH PELHAM, N. Y.—Sartiron Utilities Manufacturing Company, Incorporated, has been granted articles of incorporation to manufacture electric and has pressing irons, etc. The capital stock is $100,000 and the incorporators are M. C. Downs, H. D. Downs and L. B. May, all of New York City.

PROPOSALS.

RUBBER-INSULATED CABLE.—Sealed proposals will be received at the United States Engineer Office, Washington Barracks, D. C., until March 16 for furnishing 650 feet 41,700-circular-mil cable on one reel, duplex rubber-insulated and lead-sheathed. For further information apply to Joseph E. Kuhn, lt. col., Corps of Engineers, U. S. A.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 31, for furnishing 18 portable desk lamps, as per Schedule 6500, two blinker and speed-light controllers, miscellaneous indicators and telegraphs, two blinker and truck lights, miscellaneous contact makers, two telephones, types A, B, C, P and CN, all as per schedule 6507, for delivery at the Navy Yard, Annapolis, Md.; one fire-control system, as per Schedule 6506, for delivery at the Navy Yard, Brooklyn, N. Y., and 200 storage batteries for gun firing, etc., as per Schedule 6501, for delivery at the Navy Yard, Philadelphia, Pa.

NEW PUBLICATIONS.

FUEL BRIQUETTES.—The Bureau of Mines has issued bulletin No. 58 entitled "Fuel Briquetting Investigations," by C. L. Wright. This covers tests carried out during the years 1904 to 1912. It contains much useful information regarding the use of different binding materials and the tests to which the briquets were subjected. The report comprises 277 pages and is illustrated.

FRENCH POWER STATIONS.—The "Annuaire de L'Èlectricité" has been published by *La Lumiere Electrique* for the year 1914. It contains a list of the central stations operating in France, with details of the voltage, frequency, capacity, etc., and additional chapters covering electric traction companies, manufacturers, officials, legal enactments, colleges, and publications. It constitutes a volume of 440 pages and the price is 80 cents.

ACTION OF ACID ON INSULATION.—The Bureau of Mines has published Technical Paper No. 58 entitled "The Action of Acid Mine Water on the Insulation of Electric Conductors," by H. H. Clark and L. C. Ilsley. This is a premilinary report describing the tests which have been carried out and the results obtained. Rubber insulation was not affected, but with cambric and other special material it was found to open the path for the entrance of moisture.

ELECTROLYSIS IN SPRINGFIELD.—A report on the electrolysis conditions in Springfield, O., by representatives of the Bureau of Standards, the city of Springfield and the public utility companies in that city, has been made to the city manager and published. The committee concludes that the insulated-return-feeder system is the best means of dealing with the electrolysis problem where the tracks are not insulated from the ground. This method should be combined with thorough track bonding so that the resistance of each rail joint is less than the resistance of eight feet of rail. No metallic connections between water or gas pipes and railway return circuits should be permitted. The report includes the results of tests made in determining potentials and potential gradients at various points in the city.

FINANCIAL NOTES.

The annual meeting of the stockholders of the American Telephone & Telegraph Company will be held in New York, Tuesday, March 31, at noon. Books close March 20, and reopen April 1.

J. P. Morgan, & Company, Kuhn, Loeb & Company, the First National Bank and the National City Bank, of New York, offered recently $10,000,000 Central District Telephone Company first-mortgage 30-year five-per-cent sinking-fund gold bonds at par and accrued interest, which were over-subscribed.

The Chesapeake & Potomac Telephone Company of Virginia, a subsidiary of the American Telephone & Telegraph Company, has sold $1,000,000 first mortgage five-per-cent bonds dated May 1, 1913, and due 1943. The bonds are being offered in Virginia and Maryland at 96, to yield over 5.25 per cent.

Consolidation of public-utility plants in seventeen towns near St. Louis was revealed when $100,000 of Southern Illinois Light & Power Company first-mortgage sinking-fund six-per-cent bonds was offered at 100 and interest, yielding six per cent upon the investment. Electric-light and gas plants and street railways are included in the properties. The towns include Hillsboro, Collinsville, Caseyville, O'Fallon, Gillespie, Nokomis, Coffeen, Maryville, Taylor Springs, Witt, Raymond, Harvel and Irving. The corporation has outstanding $300,000 of six-per-cent preferred stock and $700,000 common, with a total of $550,000 first-mortgage six-per-cent bonds out of $5,000,000 authorized.

The Allis-Chalmers Manufacturing Company reports a surplus on December 31, 1913, of $755,124, representing the profits of the company from the beginning of business on April 16 to December 31, 1913. The unfilled orders on hand at the close of the year amounted to $3,350,000. J. H. McClement, chairman of the board of directors, said in the report there had been a decided falling off in business since August 1, in sympathy with the general slackening throughout the country. The result, he asserted, was reflected in a large reduction of profits each month since October 1, and as yet there was no improvement. Directors have voted to defer dividend action "until such time as profits and business prospects will justify the expectation that they can be declared and maintained at a specific rate."

Dividends.

Buffalo General Electric Company; the regular quarterly dividend of one per cent on the common stock, payable March 31, to stock of record March 20.

Central States Electric Company; regular quarterly of 1.75 per cent on the preferred stock, payable April 1 to stock of record March 10.

Chicago City Railway Company quarterly of 2.5 per cent, payable March 30.

Consolidated Gas, Electric Light & Power Company; semi-annual of three per cent on the preferred and quarterly of 1.5 per cent on the common, payable April 1 to stock of record March 20.

Electric Properties Corporation; quarterly of 1.5 per cent on the preferred, payable March 10 to stock of record March 1.

Interborough Rapid Transit Company; quarterly dividend of 2.5 per cent, payable April 1.

Manila Electric Railroad & Lighting Corporation; quarterly of 1.75 per cent, payable April 1 to stock of record March 18.

Muskogee Gas & Electric Company; quarterly of one per cent on the preferred, payable March 16 to stock of record February 28.

Narragansett Electric Company; the regular quarterly dividend of two per cent on its stock, payable April 1 to stock of record March 7.

Standard Gas & Electric Company; quarterly scrip dividend of two per cent on the preferred stock, payable March 16 to stock of record February 28.

St. Joseph Railway, Light, Heat & Power Company; quarterly dividend of 1.25 per cent on the preferred stock, payable April 1 to stock of record March 16.

United Traction & Electric Company; quarterly of 1.25 per cent, payable April 1.

West End Street Railway Company; a quarterly common dividend of $1.75 per share, payable April 1 to stock of record March 1.

Western Electric Company; regular quarterly dividend of two per cent, payable March 31 to stock of record March 24.

Report of Earnings.

SOUTHERN CALIFORNIA EDISON.

	1914.	1913.
January gross	$ 404,757	$ 397,103
Net after operation...	197,067	185,003
Balance after charges.	126,337	118,686
Balance after depreciation	76,337	53,686

CAROLINA POWER & LIGHT.

The Carolina Power & Light Co., which, in addition to the properties owned and operated, also controls all the common stock of Yadkin River Power Company and the Asheville Power & Light Company, reports income account for the year ended December 31, 1913, as follows:

	1913	1912
Gross earnings	$525,213	$446,019
Operation and taxes...	334,558	302,488
Net earnings	190,655	143,531
Other income	*50,000	*30,000
Total income	240,655	173,531
Interest	92,453	67,206
Sundry credits	43,183	34,099
Balance	105,019	72,226

*Dividend from Asheville Power & Light common.

The above earnings do not include those of Yadkin River Power or Asheville Power & Light. Carolina Power & Light December 31, 1913, supplied service to 7,813 customers, carried 2,294,201 street railway passengers in 1913 and has approximately 10,000 horsepower of electric generating capacity, with an output of 70,418,900 cubic feet of gas in the year.

PERSONAL MENTION.

MR. RICHARD C. SMITH has resigned as sales agent for the Safety Insulated Wire & Cable Company to become traveling representative of the Bishop Gutta-Percha Company, of New York City, which duties he assumed on March 1.

MR. GEORGE H. HARRIS has been appointed general superintendent of the San Francisco-Oakland Terminal Railways Company, now under process of reorganization under its new owners. Mr. Harris was formerly with the Birmingham Railway, Light & Power Company.

MR. F. N. JEWETT, sales manager of the Wagner Electric Manufacturing Company, has had to temporarily relinquish the duties and responsibilities of his position because of a recent nervous collapse. He will, however, retain his connection with the Wagner Company in the capacity of assistant to the executive officers. For the present he will devote his energies primarily to the restoration of his health and vigor, and will undertake only such duties that the state of his health will permit. Mr. Jewett's many friends are gratified to learn that his condition is showing very satisfactory, though somewhat slow, improvement, with the assurance of complete recovery in time. Mr. Jewett is a graduate of Cornell University, class of '93. After graduation he entered the experimental department of the Payne Engine Company, Elmira, N. Y., where he remained until 1895, when he entered the New York sales office of the same company, remaining there until 1896, when that company went out of business. From 1896 to 1899, he was with Evans-Almirall & Company, of New York, as salesman; and from then until 1906 was western manager of the same company, with headquarters in Chicago. In 1906 Mr. Jewett resigned to accept a position with the Wagner Electric Manufacturing Company, as manager of the Chicago district, with Chicago headquarters, and in 1909 was made sales manager, which position he has held to date. Mr. Jewett is a member of the American Society of Mechanical Engineers, of the Society of Heating and Ventilating Engineers, and an Associate of the American Institute of Electrical Engineers.

F. N. Jewett.

MR. R. E. RICHARDSON, formerly general manager of the Kansas City Electric Light Company, will shortly return to that city. Mr. Richardson resigned the management of the City Electric Light Company in 1910 to join the Commonwealth Power Company, at Kalamazoo, Mich.

MR. R. E. BRIAN, Louisville manager of the Federal Sign System (Electric), was toastmaster at a banquet given by employees of the company in honor of MR. ROBERT MONTGOMERY and MR. R. E. FLOWER, manager and assistant manager, respectively, of the commercial department of the Louisville Gas & Electric Company, and others. The banquet was given at the Henry Watterson Hotel, Louisville.

MR. HARRY REID, vice-president and general manager of the Kentucky Utilities Company, at Lexington, Ky., has been appointed president of the company, succeeding MR. MARTIN J. INSULL, of Chicago. Mr. Reid's headquarters will continue to be in Lexington. The company operates a number of properties in Kentucky, and is planning putting into effect a power service for a large number of coal mines in Eastern Kentucky.

MR. P. J. KEALY, who recently severed his connection with Bion J. Arnold, the street railway valuation expert, to become assistant to R. J. Dunham, chairman of the Board of Directors of the Kansas City Railway & Light Company, will give all of his attention to the appraisement of the Kansas City Electric Light Company in the immediate future. The stock in this company is held by the Kansas City Railway & Light Company, which also controls the Metropolitan Street Railway Company.

MR. LOUIS R. KRUMM, chief radio inspector of the Bureau of Navigation, Department of Commerce, is touring Southern California, and is making his headquarters in Los Angeles. One of the objects of his trip is to inspect the wireless stations located in Los Angeles, Catalina Island and San Pedro. He is also looking after the amateur wireless operators who are causing the government considerable trouble. Those who can comply with the law will be licensed, while a watch will be kept of the irresponsibles. "The uses of the radio telegraph are so important to the world and humanity that its use should be and will be restricted to those who are willing to comply with the law and take out licenses," said Mr. Krumm. There are 700 wireless apparatus on as many ships, according to this authority on the subject, and 200 commercial stations throughout the country. The Government has just completed the equipment of a station at Arlington that will enable an operator to talk to Mare Island.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 9	Mar. 2
American Tel. & Tel. (New York)........	120⅞	120½
Commonwealth Edison (Chicago)........	136¼	136½
Edison Electric Illuminating (Boston)........	262	260
Electric Storage Battery common (Philadelphia)........	53¼	53¼
Electric Storage Battery preferred (Philadelphia)........	53¼	53¼
General Electric (New York)........	146	147
Kings County Electric (New York)........	120	120¼
Manhattan Transit (New York)........	1	1
Massachusetts Electric common (Boston)........	11	11¼
Massachusetts Electric preferred (Boston)........	62	61¾
National Carbon common (Chicago)........	155	155
National Carbon preferred (Chicago)........	115	115¼
New England Telephone (Boston)........	138	138
Philadelphia Electric (Philadelphia)........	26¾	26¾
Postal Telegraph and Cables common (New York)........	84	86
Postal Telegraph and Cables preferred (New York)........	69	69¾
Western Union (New York)........	63½	63
Westinghouse common (New York)........	70¾	70¾
Westinghouse preferred (New York)........	116½	115

MR. FRED B. FRESSEN, representing the Luminous Unit Company of St. Louis, is in Salt Lake City covering the trade on the products of this company.

MR. W. W. TORRENCE, manager of the General Electric Company, at Salt Lake City, Utah, left this week for Schenectady, on his regular visit to the home offices of the company.

MR. ERNEST F. SCHETTLER, chief clerk of the Intermountain Electric Company, of Salt Lake City, is back at his desk, after suffering a severe case of small pox, which kept him in quarantine for some time.

MR. C. B. HAWLEY, president and general manager of the Intermountain Electric Company, has returned from a trip East where he attended the Jobbers' Convention at Washington, D. C. While away he visited New York.

MR. BERT H. PECK, formerly associated with the firm of D. C. & Wm. B. Jackson, Chicago, Ill., as electrical engineer, has assumed the position of City Telephone Inspector, in charge of the Telephone Bureau of the City of Chicago. This bureau was created by the Telephone Rate Ordinance passed by the City Council on May 26, 1913, and is invested with the duties of investigating reasonable complaints of telephone service in the city, the enforcement of laws and ordinances relating to telephone service, the analysis of the rules and regulations of the various telephone operating companies in the city, and the collecting and compiling of statistical information regarding telephone service in this and other cities.

MR. E. A. REED, general manager for the receivers of the Central Union Telephone Company, with offices in Columbus, O., has resigned an associate position as general manager of the Cleveland Telephone Company, and will give his entire time to the Central Union, having charge of the Ohio business. MR. ALLARD SMITH, who has been engineer for both companies, takes Mr. Reed's place with the Cleveland concern, and will at once remove to that city from Columbus. MR. ROLLO R. STEVENS, commercial superintendent of the Ohio division of the Central Union, has resigned to enter the service of J. P. Morgan & Company in connection with their Ohio companies, with headquarters in Columbus. His successor is to be MR. W. S. CRATER, formerly in charge of the connecting department of the Central Union for Ohio. MR. A. J. WALKER has been appointed state engineer for the Central Union, to succeed Mr. Smith.

MR VAN RENSSELAER LANSINGH has been appointed manager of a recently organized department in the National Lamp Works of General Electric Company, with offices at the National Lamp Works, Nela Park, Cleveland, and will have general supervision over the manufacture and sale of reflectors, both glass and metal. Mr. Lansingh has been prominent in the activities of the Illuminatnig Engineering Society, in fact was one of its founders. He was general secretary in 1906 and president for the term ending in December, 1912. Since then Mr. Lansingh has also served as treasurer, vice-president and president, and is perhaps in the minds of central-station men more closely identified with the advancement of scientific principles in regard to the use of reflectors of light sources than any other man in this country. Mr. Lansingh graduated from the public schools of New York City, and attended the College of the City of New York from 1888 to 1891. He entered the University of Chicago in 1892, graduated January, 1896. From February, 1896, to June, 1898, he attended the Massachusetts Institute of Technology, receiving the degree of Bachelor of Science in electrical engineering. He joined the testing department of the Western Electric Company in February, 1899, and in July, 1900, formed the V. R. Lansingh Company in Chicago, sales agents for Holophane globes and reflectors. In September, 1904, he was appointed general manager and chief engineer of the Holophane Works of General Electric Company, Cleveland, the headquarters of which have recently been located in that city. In the Johns Hopkins University course of lectures on "Illuminating Engineering," Mr. Lansingh gave the lecture on "Shades, Reflectors and Diffusing Media." Mr. Lansingh has very frequently contributed to the proceedings of the Illuminating Engineering Society, and to the technical press of this and other countries. His book "Practical Illumination," written in collaboration with Mr. J. R. Cravath, has had a very wide circulation and is not only in the library of every man interested in lighting, but has been used in many educational institutions as a text book.

V. R. Lansingh.

OBITUARY.

MR. PATRICK DORE, owner of the lighting plant at Westville, Okla., was shot and killed in that city recently. Mr. Dore was interested in other lighting plants in Oklahoma, as well as the one at Westville.

MR. FREDERICK J. NEWMAN, president of the Chicago Electric Motor Car Company, died at his residence in Chicago, Ill., on March 8, in his thirty-sixth year. Mr. Newman was a member of the American Institute of Electrical Engineers and of the Society of Automobile Engineers. He was born in Milwaukee, was a graduate of the University of Wisconsin, and came to Chicago 10 years ago.

MR. HENRY GREEN, pioneer manufacturer of X-ray tubes, died at his home in Hartford, Conn., on March 4, of carcinoma of the liver induced by X-ray poisoning. He was born in England 54 years ago. He developed the first focussign tubes to be successfully operated and gave many public demonstrations, later beginning the manufacture of tubes on a commercial basis. John L. Bauer, a glass blower, who aided in the development of the tubes, died from the same disease in 1906.

MR. EDWARD J. DUNNE, superintendent of distribution for the Public Service Corporation of New Jersey and one of the best known street-railway men in the country, died suddenly while being operated upon in St. James' Hospital, Newark, N. J., March 5. Mr. Dunne began his street-railway experience in Cleveland, O., 30 years ago, later going to Detroit, where he superintended the construction of most of the trolley lines in that city. In 1903 he went to New Jersey. Mr. Dunne is survived by his wife, three sons and a daughter.

MR. BERT CROUCH, assistant sales manager of the Western Electric Company's St. Louis branch, was lost in the fire which destroyed the Missouri Athletic Club at St. Louis on Sunday, March 8. Mr. Crouch recently made his home at the Missouri Athletic Club. He was about 30 years old. He was born and raised in Kansas City and received his education in the public schools there. Eight years ago he joined the Western Electric Company, and made such rapid progress that after two years' experience, he was sent to St. Louis as salesman. Mr. Crouch was widely known because of his athletic prowess. Because of this work, he made his home at the Athletic Club in St. Louis. He has a mother and sister in Kansas City.

DATES AHEAD.

American Railway Engineering Association. Annual convention, Chicago, Ill., March 17-20. Secretary, E. H. Pritch, 900 South Michigan Avenue, Chicago, Ill.

Minnesota Electrical Association. Annual convention, Minneapolis, Minn., March 18-20. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society. Bureau of Standards, Washington, D. C., April 24-25. Secretary, A. D. Cole, Ohio State University, Columbus, O.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Rateau Steam Regenerator Company, New York City, announces that it has issued a license under Rateau United States letters patent to the Terry Steam Turbine Company to manufacture mixed-pressure turbine regulators.

The C. & C. Electric & Manufacturing Company, Garwood, N. J., announces that the Indianapolis territory will temporarily be taken care of by its Cincinnati representative, F. A. Gaylor, Sixth and Vine Streets, Cincinnati, O.

Westinghouse, Church, Kerr & Company, 37 Wall Street, New York City, engineers, have established a laboratory for the purpose of testing concrete aggregates, waterproofing materials, and for investigating paints and preservative coatings for steel and concrete.

Sangamon Electric Company, Springfield, Ill., has issued a bulletin No. 37 describing its mercury-type direct-current watt-hour meters. This 32-page bulletin is well illustrated, explains the theory of the meters, describes their electrical and mechanical details, and gives their performance characteristics.

Duncan Electric Manufacturing Company, Lafayette, Ind., has prepared a large wall chart on which are illustrated over 30 meters and transformers representing the various types of its products. This chart is a valuable one for reference to show the variety of instruments and apparatus that the company manufactures.

Allen-Bradley Company, Milwaukee, Wis., announces that its Chicago representative, Frank L. Gohl, has removed from 540 Commercial National Bank Building to 307 Webster Building, 327 South La Salle Street, Chicago, Ill. This change was necessitated by a decided increase in business, his old offices proving too small to accommodate the same.

Pittsburgh Reinforcing Pole Company, Pittsburgh, Pa., announces that it has transferred its business to Hubbard & Company and leased to that firm the exclusive right to manufacture and sell Orr reinforcing material under its several patents. This action is due to the desire of Hubbard & Company to make its line of electrical hardware as complete as possible.

Corbett & De Coursey Company, Columbia Bank Building, Pittsburgh, Pa., announces that J. A. Wahlgren, who was formerly connected with the Western Electric Company's branch in Buffalo as assistant salesmanager, has become salesmanager of the Pittsburgh firm. This company is now representing the Flexlume Sign Company, of Buffalo, together with its other lines in the territory contiguous to Pittsburgh.

The Hess-Bright Manufacturing Company, Philadelphia, Pa., has added a considerable number of new data sheets of its series 336. These give detailed diagrams of various bearings with interesting comments on their design and use. Sheet 83A, which is one of the latest ones issued, is devoted to ball-bearing mountings for vertical armature shafts of electric motors. This should prove of considerable interest to motor manufacturers and users.

Wagner Electric Manufacturing Company, St. Louis, Mo., is sending out a little folder pointing out the value of the Wagner rectifier for charging small storage batteries. This device is suitable for connection to any ordinary lighting circuit and charges six-volt or similar storage batteries, such as used for ignition in automobiles. The folder calls attention to the value of electric lighting of an automobile which is facilitated by the use of this rectifier for charging the battery.

Current Electric Company, 22 East Kinzie Street, Chicago, manufacturer of the new electric furnace for heating soldering irons, has made a change in its No. 3 furnace, which is said to be a very desirable improvement. This furnace is now being made double in the form of two cylinders instead of the oval shape, thus conserving the heat. Users of soldering irons are said to be highly pleased with this improved method of heating, and the sales of the furnaces are increasing rapidly.

Holtzer-Cabot Electric Company, Brookline, Mass., is preparing plans for a new factory to be erected on Amory Street, in the Jamaica Plain district of Boston. The building will be about 300 feet long by 80 feet wide, of five stories, with an ell extension. It will be on the line of the New York, New Haven & Hartford Railroad, with excellent facilities for shipping. The company intends to combine its manufacturing activities under one roof. At present it manufactures its specialties in the Brookline works, and its motor department is conducted at Albany Street in Boston.

Columbus Electrical Works Company, Columbus, O., which for the past seven years has been located at Chestnut and Front Streets, has purchased a site at Town and Front Streets, and will put up a building of three stories during the coming summer for its exclusive use. The arrangement will be such that heavy machinery can be loaded inside the plant. The company will be the first in Columbus to have a home of its own built especially to meet the needs of an electrical business. It specializes in motor work and other equipment for coal mining.

New Process Gear Corporation, Syracuse, N. Y., is now erecting a new three-story 40 by 100-foot concrete and steel building to provide additional machinery facilities for spur and bevel-gear work. This new building is to be absolutely fireproof, with brick curtain walls and concrete floors, and will contain entirely new equipment. Among machines already ordered are 17 Gleason bevel-gear generators, 14 Potter & Johnson automatic turret lathes, 6 Gould & Eberhardt bevel-gear blocking machines and 2 Fellows spiral-gear shapers, all to serve as additions to the larger batteries of similar machines now in service in the main plant.

Western Electric Company, New York and Chicago, announces that its sales during the year 1913 totaled about $78,000,000, which is an increase of over eight per cent over the sales in 1912. Orders in the early part of the year were received at a higher rate than that shown for the entire year on account of falling off in business in the latter half of the year. However, the company states that it has added over 4,000 customers during the past year, bringing the total to approximately 6,000. The increase in business applies to telephone companies, central stations and also contractors. The export business of the company in 1913 was the largest in its history.

Sprague Electric Works of General Electric Company, New York, N. Y., has issued catalog No. 329; this is the 1914 catalog of electric fans which comprise an unusually complete line both of Sprague, Lundell and General Electric fans. Desk fans of both stationary and oscillating types, various ceiling and column fans and a number of exhaust fans are included. The Sprague Works has also issued bulletin No. 49,000, which describes portable ozonators manufactured for household and other uses in which a compact equipment is of service. Two types of these ozonators are made, one taking 60 watts and another 75. The construction of these outfits is well explained and illustrated in the bulletin. Price list No. 852 covers the portable ozonators referred to.

H. W. Johns-Manville Company, announces that the necessity for larger space and better facilities to handle increased business compelled the Indianapolis, Ind., and Louisville, Ky., branches of the company to seek larger quarters. The new address of the Indianapolis branch is 408-410 North Capitol Avenue, that of the Louisville branch, 659-661 South Fourth Avenue. Both of these branches will include ample warehouse accommodations, in addition to showrooms for the display and sale of this firm's varied line of asbestos roofing, pipe coverings, insulating materials, lighting fixtures, automobile accessories, etc. In connection with the last-named line, unusual pains have been taken in the equipment of service departments for the benefit of the customers who desire speedy adjustments, repairs or replacements.

Record of Electrical Patents.

Issued by the United States Patent Office, March 3, 1914.

1,088,686. Transmitter for Wireless Telephony. Ditcham, Twickenham, England. The microphone is inductively connected between the antenna and a high-frequency quenched-spark circuit.

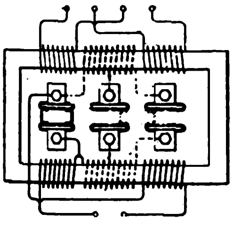
1,088,687. Electric Fan for Railway Cars. E. I. Dodds, assignor to Kerner Mfg. Co., Pittsburgh, Pa. Can be swung into or out of a pocket in the compartment wall, either position being an operating position.

1,088,695. Photographic Apparatus. E. Goldensky and P. H. Bartlett, Philadelphia, Pa. Includes a number of incandescent lamps, first connected in series and then in parallel, the latter connection being made by a switch electro-magnetically operated simultaneously with the camera shutter.

1,088,704. Alternating-Current Regulator. V. E. Johannesen, assignor to General Electric Co. Consists of a special transformer and a reactance in series with its winding, the reactance comprising two coils so connected to the windings that the voltages oppose each other. (See cut.)

1,088,707. Trolley-Wire Connector. J. Kirby, Douglas, Ariz. On either side of an insulating trolley-wheel guard are extensions of the wire terminals.

1,088,708. Telegraph System. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Line currents of opposite polarity represent dots and dashes; the receiving circuit includes a sensitive master relay and a set of polarized relays.


1,088,704.—Alternating-Current Regulator.

1,088,722. Chandelier. W. Potts, Elkhart, Ind. A telescopic gas fixture with telescopic electric ignition conductors.

1,088,734. Carbon Electrode Having Protective Covering and Process for Producing Same. C. H. Schroers, assignor to Gesellschaft für Teerverwertung M. B. H., Duisburg-Meiderich, Germany. Has imbedded in its surface a protective layer of loosely arranged particles of granular material unaffected by oxidizing gases.

1,088,736. Magneto. L. J. Sevison and L. E. Sevison, Elkhart, Ind. Includes a circuit-breaker frame mounted so as to be oscillated about the shaft for adjustment.

1,088,740. Method of Producing Light. C. P. Steinmetz, assignor to General Electric Co. Consists in producing an arc between terminals, surrounding the arc by an inclosing chamber and modifying the color of the light by the addition of anhydrous iodides of lithium and sodium.

1,088,769. Switch. H. W. Cheney, assignor to Allis-Chalmers Co., Milwaukee, Wis. A double-throw switch.

1,088,771. Electromagnetic Device. W. W. Dean, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. A telephone ringer with a pair of electromagnets and a tuned reed carrying the armature and hammer.

1,088,776. Lamp Socket. C. E. Godley, assignor to Edmunds & Jones Mfg. Co., Detroit, Mich. For an automobile headlight; includes a plug adjustable with respect to the reflector.

1,088,780. Electromedical Exercising Apparatus. G. J. Katz, Chicago, Ill. One end of a dumb-bell contains a dry cell, the other end an induction coil.

1,088,781. Electric Generator. J. F. Kelly, Pittsfield, Mass. A multicircuit compound-wound dynamo designed to supply independent external circuits with currents of different voltage.

1,088,796. Steering Wheel. C. T. Schroyer, Chester, S. D. The wheel can be electrically heated.

1,088,807. Traffic-Controlling Apparatus. C. J. Coleman, assignor to Hall Switch & Signal Co. New York, N. Y. Sections of the railroad track are supplied with current giving the rails opposite polarity and a stop device carried by the train is actuated thereby.

1,088,814. Railway-Vehicle Magnet and Roadway Therefor. A. H. Fox, New York, N. Y. A car having a magnet device adapted to be drawn by its own attraction toward a roadway armature structure magnetically continuous between control points.

1,088,821. Trolley Head. O. N. Iverson, Hills, Minn. The top of the pole is hinged to the main part.

1,088,838. Combined Reflector and Refractor for Lamps. H. Pickhardt, assignor to Phoenix Glass Co., Pittsburgh, Pa. Has a reflector about the lamp socket and a diffuser and refractor about the body of the lamp.

1,088,839. Bearing for the Shafts of Measuring Instruments. W. H. Pratt and J. R. Fiego, assignors to General Electric Co. Jewel bearing for the lower end of a meter shaft.

1,088,856. Hard Body for Wearing Surfaces and the Like. E. Weintraub, assignor to General Electric Co. A meter jewel formed of a fused body of boron and carbon.

1,088,866. Lamp-Supporting Device. R. B. Benjamin, assignor to General Electric Co. A separable high-tension series socket for street lighting.

1,088,867. Electric Lamp Socket. R. B. Benjamin, assignor to General Electric Co. A modification of the above. (See cut.)

1,088,868. Lamp-Supporting Device. R. B. Benjamin, assignor to General Electric Co. A further modification, including a dielectric supporting plug adapted to be inserted between the lamp and shade.

1,088,869. Illuminated Sign. J. A. Bergmann, Toronto, Ont., Canada. Motor-driven drums formed of glass of different colors are rotated around the lamps.

1,088,870. Relay. J. A. Birsfield, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. For a telephone switchboard.

1,088,878. Electromagnetic Device. H. P. Clausen, assignor to Stromberg-Carlson Telephone Mfg. Co. A telephone relay.

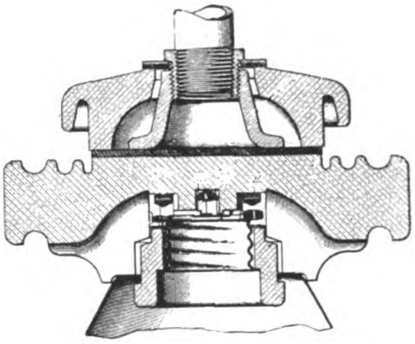
1,088,879. Telephone System. H. P. Clausen, assignor to Stromberg-Carlson Telephone Mfg. Co. Includes a pair of relays adapted upon display of both supervisory signals to sever talking strands of the cord circuit.

1,088,884. Pneumato-Electric Tracker-Bar for Musical Instruments. C. W. Dorriscott, assignor to Electrelle Co., Philadelphia, Pa. Includes movable and fixed electric contacts.

1,088,887. Electrical Heater. G. A. Edmison, and L. Edmison, Los Angeles, Cal. An air warmer with large double-wall vertical tubes having an air space between and a heating coil wound about the inner tube.

1,088,893. Automobile Horn. H. H. Frey, Chicago, Ill. Includes a sounding diaphragm electromagnetically actuated from the alternating-current ignition system.

1,088,897. Electrical Measuring Instrument. K. Gyr. Zug, Switzerland. Includes a prism disposed in an opening so as to reflect the dial reading in a vertically readable image at the opening.


1,088,867.—High-Tension Series Lamp Socket.

1,088,901. Arrangement for Protecting Electric Circuits and Apparatus. P. V. Hunter, Newcastle-upon-Tyne, England. Circuit-breakers at the ends of a section of a power-distributing system with two conductors in parallel are actuated when leakage occurs from either conductor.

1,088,902. Cable for Electric-Current-Distributing Systems. P. V. Hunter. Each conductor of the cable is subdivided into two parallel and symmetrical parts with a thin insulating wall between them so that disturbance in the proportion of the currents carried by the two parts is rendered pronounced through mutual induction.

1,088,907. Process of Manufacturing a Substitute for Vulcanite. E. Knoll, assignor to Metall- und Isolier-Werke G. M. B. H. Meiningen, Meiningen, Germany. Consists in pulverizing a vulcanized mixture of gelatinous regenerated rubber, powdered slate, refuse oil and sulphur, and in vulcanizing the mixture with a caoutchouc substitute, a pigment, oil, wax, resin and sulphur.

1,088,914. Incandescent-Lamp Socket. H. Marks and S. Helsel, Johnstown, Pa., assignors of one-third to W. C. Howland. A locking key socket with rotatable screw shell.

1,088,923. Electrical Sound-Transmitter. M. E. Pearson, Seattle, Wash., assignor to Long Distance Telephone Equipment Co. Special construction for long-distance telephone use.

1,088,943. Means for Compensating Tachometers for Temperature Variations. E. M. Thompson, Beloit, Wis., assignor to Stewart-Warner Speedometer Corporation. Thermostatic regulator for a magnetic speed indicator.

1,088,948. Speed-Indicating Instrument. C. H. Warner and A. B. Cadman, assignors to Stewart-Warner-Speedometer Corporation. An electric lamp carried by the casing reflects its light directly onto the dial and pointer.

1,088,963. Electric Conduit. N. W. Buch, assignor to Safety Armorite Conduit Co., Pittsburgh, Pa. A galvanized iron pipe with an interior layer of oil paint and a layer of flexible enamel superimposed thereupon.

1,088,997. Connector Plug. G. C. Knauff, Chicago, Ill. Has a metal shell mounted on one end and electrically connected to one terminal and a central spring contact connected to the other wire terminal.

1,089,030. Electrical Chemical-Testing System. J. E. Angell, St. Louis, Mo. An indicating and recording instrument is in circuit with electrodes to indicate the quantity of chemicals in the water. (See cut.)

1,089,045. Circuit-Breaker. C. E. Carpenter and A. J. Horton, assignors to Cutler-Hammer Mfg. Co., Milwaukee, Wis. An electromagnetic series overload switch with laminated and auxiliary contacts.

1,089,051. Switch Mechanism. W. Herskovitz, Chicago, Ill. For a pull-chain socket.

1,089,077. Electrical Machine. W. A. Price, Teddington, England. Includes a commutator and electrolytic condenser for conversion of direct into alternating current.

1,089,081. Electric-Current Controller. P. J. Ray, Lakewood, O. Includes a compressible resistance column having zero or positive temperature co-efficient.

1,089,091. Receiving Device for Wireless Systems. W. E. D. Stokes, Jr., and G. W. Davis, assignors to W. E. D. Stokes, New York, N. Y. Has an element composed of iron pyrites having carbonaceous shale imbedded therein.

1,089,137. Brush-Lifting Device for Dynamo-Electric Machines. G. H. Krauskopf, assignor to Westinghouse Electric & Mfg. Co. A pawl and ratchet means for moving the brush in the holder.

1,089,138. Guard for Incandescent Electric Lamps. C. A. Lehman and P. A. Lawrence, assignors to McGill Mfg. Co., Valparaiso, Ind. Consists of continuous guard wires and a lamp-socket handle, two of the wires being removably secured to the ring about the socket.

1,089,142. Brush-Lifting Device for Dynamo-Electric Machines. E. Mattman, assignor to Westinghouse Electric & Mfg. Co. A modification of No. 1,089,137.

1,089,146 and 1,089,147. Duplicating Machine. S. A. Neidich, assignor to American Multigraph Co., Cleveland, O. Electric drive and control for the mechanism that feeds sheets of paper between a printing couple.

1,089,167. Starter-Switch for Dual Ignition Systems. G. W. Wacker, assignor to Simms Magneto Co., New York. Includes a push button in line with a spring-actuated contact for moving it into engagement with a vibrating contact.

1,089,180. Socket Shell and Holder Combined. L. W. Andersen, assignor to Plume & Atwood Mfg. Co. Waterbury, Conn. The shade-holder forms an extension of the upper part of the shell.

1,089,181. Speed-Reduction Gearing. V. G. Apple, assignor to Apple Electric Co., Dayton, O. An internal gear for a magneto housed within the machine casing.

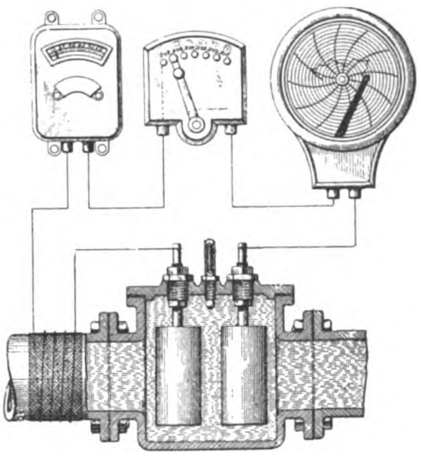
1,089,191. Train-Stopping Device. J. Eirich, Brooklyn, N. Y. Electrically operated semaphore.

1,089,192. Meat Saw. A. E. Erquhart and C. Duclos, Coalinga, Cal. Motor-driven horizontal band saw.

1,089,197. Street and Station Indicator for Cars. A. Fernandez, Mobile, Ala. Motor-driven.

1,089,202. Rail Bond. T. C. Folsom, Tampa, Fla. Special means for upsetting the terminal in the web of the rail.

1,089,244. Spark Plug. J. R. McDowell, Auburn, Ind. Has a dead point adjacent the spark points.



1,089,030.—Electric Chemical Tester for Water.

1,089,256. Spark Advancing and Retarding Mechanism. E. L. Pardee, Marne, Iowa. For an internal-combustion engine.

1,089,267. Automatic Train-Stopping Apparatus. J. M. Roe, Sunnyside, Wash., assignor of one-half to J. Alexander. Includes a sectionalized resistance grid located on the roadway and a train-carried shoe adapted to ride over the grid, gradually cutting out the resistance, so that the controller will operate and bring the train to a gradual stop.

1,089,277. Bed Cooler or Heater. G. F. Shepard, Dodge City, Kans. Includes electric heating coils.

1,089,300. Electric Furnace. C. C. Whitmore, Butte, Mont., assignor of one-half to W. B. Carroll. Includes approximately parallel tubular electrodes with means for supplying cooling liquid, and mechanism for shifting at will one of the electrodes relatively to the other.

1,089,336. Indicator for Measuring or Weighing Machines and Devices. T. W. Fitzgerald, Boston, Mass. Includes an electrically controlled friction clutch-forming mechanism having parts carried by primary and secondary indicating mechanisms to rotate therewith, and means for controlling parts of the clutch-forming mechanism.

1,089,343. Socket Structure for Electric Incandescent Lamps. J. P. Naylor, London, England. A third contact is so arranged as to insert in the circuit an electrical resistance equivalent to that of the lamps, when lamp is removed from socket.

1,089,352. Combined Receptacle-Cover and Shade-Holder. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. A combination of an electric lamp receptacle, a cover adapted to detachably engage the sides of the receptacle, and a shade-holder detachably secured to the receptacle.

1,089,359. Treating Petroleum Oils with Ultra-Violet Light. C. Ellis, Montclair, N. J., assignor to Ellis-Foster Co. Comprises process of removing fluorescence of heavy oils by exposing same in thin layers to action of high-voltage ultra-violet light at temperature below decomposition point.

1,089,384. Electric Braking with Alternating-Current Motors. E. F. W. Alexanderson, assignor to General Electric Co. Means for operating series motor as a braking generator comprising a transformer and leads connecting the motor armature.

Reissues.

13,693. Automatic Block-Signaling System. D. J. McCarthy, assignor to Union Switch & Signal Co. Original No. 867,563, dated Oct. 1, 1907. An alternating-current system including a slot magnet, a reversing relay, and an auxiliary device controlled by track circuit for maintaining the circuit of the slot magnet while relay is reversing.

13,694. Engine Valve-Gear. R. C. Stevens, assignor to Skinner Engine Co., Erie, Pa. Original No. 1,072,786, dated Sept. 9, 1913. The combination of a steam engine cylinder, an exhaust valve, electric devices for operating the valve and automatic means to control this operation.

Patents Expired.

The following United States electrical patents expired March 9, 1914.

578,345. Thermal Circuit-Closer. H. F. Maxim, Norfolk, Va.

578,380. Call-Ringer for Telephones. J. A. Wililams and S. Abbott, Cleveland, O.

578,386. Telegraphic Register. C. E. Beach, Binghamton, N. Y.

578,420. Electric Gas-Lighter. F. N. Pike, New York, N. Y.

578,422. Device for Operating Signals. S. S. Bogart, Schraalenburg, N. J.

578,430. Electric Meter. E. Thomson, Lynn, Mass.

578,464. Contact Finger for Electric Controller, E. C. Parlham, Johnstown, Pa.

578,471. Electrical Cane. W. N. Sherman, Merced, Cal.

578,520. Telephone Transmitter. N. Lombard, Boston, Mass.

578,539. Trolley Support. E. Blamey, Jersey City, N. J.

578,595. Electric Lamp Post. J. Buckner, Boston, Mass.

578,611. Electrotherapeutic Syringe. J. D. Rively, Pittsburgh, Pa.

578,643. Electric Cutout. D. B. Kinch, Pittsburgh, Pa.

578,670. Telephone. J. Weigel, Boston, Mass.

578,673. Magnetic Apparatus. A. Boetcher, Philadelphia, Pa.

578,695. Turn-Button for Electrical Switches. J. S. Gibbs, Hartford, Conn.

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GEORGE WESTINGHOUSE.

In the death of George Westinghouse, on March 12, there passes a truly great man. He was not only an inventor of versatility and possessed of the most prolific genius for the development of new ideas, but he was indeed a creator of new conditions and a builder of industry. Not only did he contribute to the solution of engineering problems which have brought about the greatest advances in civilization, but he also, through his mastery of material and resources, developed great organizations for the economic production of these necessary and needed utilities.

Mr Westinghouse lived a wonderful life in a wonderful age, and his achievements are all the more noteworthy because they form so conspicuous a part of the greatest development that has been known in the history of the world. While a great many of his most notable inventions were singular and apart from other epoch-making inventions discovered by other men, it was a part of this great man's foresight and rugged pertinacity to see in his own creations the ultimate possibility of merging into the coherent development of an enlightened civilization.

With all his greatness as an inventor and as a master of industry, the human side of the man appears never to have been repressed. He was just as notable for his pioneering in welfare work on behalf of those who labored for and with him as he was for other more material and spectacular accomplishments. He was the good friend and kindly counsellor for hosts of minor inventors, and he was ever on the alert to do a good turn for a legion of friends. As an employer his name is revered, and not only among the 50,000 odd occupied in the vast industries connected with his name, but throughout whole communities where his influence for good was felt and his example of fair treatment emulated.

It is difficult indeed to sum up the measure in which he was entitled to the world's encomiums. Probably few men knew him or understood him better than Arthur Warren, and hardly anyone could express a more fitting tribute, so it is with gratitude that we are able to quote from a letter by Mr. Warren, published in the *Evening Post,* of New York, the following paragraph:

"It is not easy to name his dominant trait or faculty. Some will say it was initiative, others that it was fearlessness, others persistence, and many will say it was foresight. All these he possessed, and that indefinable power which is genius. He was radio-active, ceaselessly giving out energy, yet parting with none. He seemed tireless though he worked incessantly. Big-bodied, big-brained, kind-hearted, sincere, he looked what he was—an incarnation of power. When he willed a course of action, the act was as good as done; when he spoke, his word was taken because it was his word. His integrity was superb. He was no speculator or gambler; he never juggled with stocks, never manipulated markets. In financial quarters it was sometimes said that he was no financier. But it is known now that the recent reorganization of the Electric Company, which he founded, was due to the adoption of a plan which he originated and which he carried through successfully with full protection to creditors and stockholders and without interruption to the work of the thousands of employees. His plan was carried in preference to those recommended by eminent financiers. Its success has caused it to be looked upon as a remarkable constructive achievement in finance."

THE REGULATION OF PUBLIC UTILITIES.

Whether it be for good or evil, the regulation of public utilities by some form of commission is with us. No matter what the reason for the evolution, no matter what the conditions which led up to the demand for this control of public utilities, the commission in some form or other in many states now forms a most important and indeed vital part of public utility opportunity.

The necessity for or the wisdom of public utility regulation of this character, and the hazard of ineffectiveness always present may be questioned. There would be little satisfaction, however, if the whole proposition should prove to be wrong, in view of the distress that must accompany such a consummation. In order that the greatest success may obtain in the development of public utilities under sane regulation and control, every element involved must be educated. The dissemination of information respecting the news of utility commissions, the close analysis and commentary upon the hearings and opinions of these commissions, and the thorough exposition of the debatable points which lead to a clarifying of every situation are essential.

In order that the readers of the Electrical Review and Western Electrician may be served to the best advantage in this respect we have arranged with Mr. William J. Norton to conduct the department of this publication devoted to matters relating to public service commission news and the regulation of public utilities. Mr. Norton is preëminently qualified to act for our readers in this capacity. He has been intimately connected with the study of rates and regulations, and the methods of procedure and characteristic attitude of mind of public service commissions ever since their inception. He was assistant secretary of the Public Service Commission of the First District of New York. He was first secretary of the Rate Research Committee of the National Electric Light Association, and editor of *Rate Research,* the notable bulletin upon this subject published by that committee, and he is also author of the publication entitled "The Illinois Public Utility Law."

In this department of the Electrical Review and Western Electrician we will present all items of news respecting the work of the various commissions. In this way the public-utility operators will be kept informed by the highest authority available today. Of the greatest value, however, to the public-utility operators will be Mr. Norton's contribution in analyzing the various decisions and commenting upon the debatable points as they affect a constructive building up of a proper public service regulation. Notable in this connection is the article entitled "Competition in New Jersey," referred to below.

In this article, published on other pages of this issue, Mr. Norton presents a clear and frank summary of the decisions respecting competition in the public-utility field as rendered by commissions in earlier hearings. It is of great importance in viewing the progress of regulation broadly that the bases for the establishment of these precedents be considered carefully. It is therefore suggested that the central-station manager bring this analysis and commentary to the attention of every element at interest, both inside and outside of his organization, so that there may be a complete understanding of the relations involved.

Our readers are invited to give to this department their strict attention. We will be glad to have suggestions and Mr. Norton will answer questions relating to this subject that may be propounded by our readers.

COMPETITION IN NEW JERSEY.

Perhaps no subject is of as vital interest to the central stations in the United States, as the matter of protection from competition from the various public service commission laws.

The complete laws of such states as Massachusetts, Wisconsin, New York, New Jersey and Indiana leave very little to be desired as model pieces of legislation, dealing fairly with the utilities, and based upon sound economics.

It is gratifying that in general the commissions have thoroughly recognized the responsibility of enforcing such laws without fear and without favor, and the compilation of such decisions as we print in this issue shows the thorough mastery by the old commissions of this important part of commission regulation.

Such laws as those of Oklahoma, Illinois and Missouri are clearly defective in that the commission is given no power over duplication of utility property if the duplication is made by the municipality itself. It is to be hoped that these states will amend their laws so that commissions are given complete jurisdiction in the determination of whether or not convenience and necessity require a duplication of utility property.

It is with regret that we notice that the New Jersey Commission, whose decisions have heretofore been in line with the best decisions of the other commissions, has, in the case of the Phillipsburg Light, Heat and Power Company, approved a competitive franchise without giving the existing company reasonable time to improve its service.

The California commission several years ago attempted to bridge over a very difficult situation which confronted it at the beginning of its administration, by advancing the theory of "development duplication". This decision already has embarrassed the California commissioners, and we believe that it will still further embarrass them, and that in the end it must be abandoned. The New Jersey Commission, however, has not the excuse of the California Commission, and in the Phillipsburg case has openly departed from the very sound doctrine which it laid down in its early cases. A careful reading of the clauses contained in the decision leads us to believe that this decision was handed down against the better judgment of the Commission and that some issue, political or otherwise, has influenced the Commission in making such a reactionary decision.

The general public, influenced as it is by irresponsible criticisms of public utilities, has a right to look to the utility commission of President Wilson's own state for the soundest economic doctrine. We believe that a careful study of the facts in the case as here presented, should be of great benefit, not only to the utilities, but also to the public.

THE ELECTRICAL ENGINEER AND THE DEPARTMENT STORE.

In the stress and strain of department-store activities the engineering phases of such work have been too much neglected, but better days are on hand for technically trained men in this important mercantile industry. The modern retail dry goods house of large size has many demands upon the engineer which require comprehensive treatment beyond the capabilities of the janitor force and which often deserve a broader study than can be given by men whose experience has been confined purely to power-plant operation. The electrical engineer has a real field of usefulness here, and as fast as store owners and managers realize this, the addition of such men to the staff will become an ordinary occurrence.

At present engineering work in established stores is very exacting, involving long hours and crowded duties, in which the direction of steam-plant operators, wiremen, inspectors and other employees must be conducted in the face of imperative demands for quick changes in the physical arrangements of the house, and with constant regard for the safety of life and property. Much of this work must be done at night and on Sundays and holidays, and the pressure which it puts upon an engineering executive can be properly carried only by a man of tact, energy and sound technical ability. But while the work is strenuous, it is filled with interesting problems; it is closely related to the ultimate success of the establishment from the money side; and is well provided with opportunities to take advantage of the latest progress in equipment applications in both mechanical and electrical lines.

The work of the electrical engineer in this field is extremely varied. Whether the store operates its own plant or purchases electricity, the economical use of light and power in the face of the continual departmental changes in displays characteristic of the business is a fertile subject for study; the opportunities for introducing efficiency methods are numerous, and the possibilities of designing new power-driven displays, of improving general and local illumination and of working out specially efficient and distinctive advertising by electrical methods are as yet but little realized in many quarters. Improved standards of electrical inspection are desirable in many stores, and the prevention of fire through the misuse of electrical equipment, through the installation of carelessly wired temporary apparatus or incomplete protection of heating devices, lamps and automatic switches is a matter well worth the attention of trained men. Such installations are continually shifting in their makeup and subdivided usefulness and something beyond easy-going tolerance is necessary to insure safe and effective results in the handling of equipment.

Within the last year or two the thoroughly equipped department store has been utilized to some extent as a field for thesis investigation by students in engineering courses, and the practical interest of such work is considerable, being closely concerned with electrical matters. The problems dealt with range from tests of coal-handling apparatus to comparisons of the cost of central-station and isolated-plant service and they frequently suggest lines of improvement which can be carried out at moderate expense. Researches of this character are well worth the study of operating electrical engineers and through their aid data of much value can be obtained in many cases where properly qualified and carefully supervised students are permitted to analyze conditions. The power requirements of fine stores are often large on account of the elevator, escalator, pumping and air-compressor service regularly maintained; the load characteristics are diversified, and seasonal changes in trade produce interesting variations in plant output. The larger the store, the more necessary its proper electrical superintendence becomes, and the complex work of such establishments, the large number of persons housed in them through business hours, and the value of the stock maintained for storage and sale justify a broader employment of electrical engineering ability than has formerly been the usual practice.

Electrical Exports for December and January and for the year 1913.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has completed monthly summaries of imports and exports of the United States for the months of December, 1913, and January, 1914. The following data respecting electrical exports for these two months and also the total for the year 1913 are derived from this source.

During December the total electrical shipments maintained the average of the year quite satisfactorily and were also somewhat greater in volume than those of the corresponding month of the preceding year. For the four classes for which numbers of articles are reported, there were shipped during December, as follows: electric fans, 1,513; arc lamps, 215; carbon incandescent lamps, 120,031; metal-filament lamps, 71,651.

In the following table are given the classified figures for last December and also for the corresponding month of the preceding year, as far as the detailed figures of the latter are available:

Articles	Dec., 1913	Dec., 1912
Batteries	$ 45,928	....
Dynamos or generators	181,407	$ 261,167
Fans	19,012	11,602
Insulated wire and cable	190,090	....
Interior wiring supplies	52,125	....
Lamps—		
Arc	2,776	18,236
Carbon-filament	14,785	14,278
Metal-filament	21,267	29,329
Motors	376,122	363,113
Static transformers	134,213	....
Telegraph instruments (including wireless apparatus)	31,999	9,693
Telephones	159,030	89,341
All other	1,005,245	1,392,055
Total	$2,233,999	$2,186,264

In the following table are given the monthly totals for the year 1912, this showing the fluctuation of the figures from month to month:

Months, 1913	Electrical Exports
January	$2,217,625
February	2,219,969
March	2,489,374
April	2,551,131
May	2,558,887
June	2,314,732
July	2,318,502
August	2,279,015
September	2,254,254
October	2,516,583
November	2,243,460
December	2,233,999

In the following table are given the yearly totals for the past five years. From this is shown the remarkable growth in electrical exports, which in the year 1913 broke all previous records:

Years	Electrical Exports
1908	$12,613,730
1909	13,027,550
1910	17,001,126
1911	19,355,536
1912	23,212,813
1913	28,197,363

As shown by the following tables the electrical export figures for January of this year show a slight falling off in the total compared with January, 1913. The number of electric fans exported was 2,829; arc lamps, 511; carbon-filament lamps, 70,021.

The following table gives the classified figures for this month and also for the corresponding month of a year ago:

Articles	Jan., 1914	Jan., 1913
Batteries	$ 43,892	....
Dynamos or generators	199,046	$ 165,469
Fans	43,236	29,771
Insulated wire and cable	174,321	....
Interior wiring supplies	46,452	....
Lamps—		
Arc	9,204	5,850
Carbon-filament	13,910	29,185
Metal-filament	21,840	29,509
Motors	346,782	376,864
Static transformers	128,788	....
Telegraph instruments (Including wireless apparatus)	12,788	9,458
Telephones	70,265	83,952
All other	837,122	1,487,567
Total	$1,947,646	$2,217,625

◆

Meeting of Philadelphia Vehicle Section.

The monthly meeting of the Philadelphia Section, Electric Vehicle Association of America, was held on the evening of March 11 in the meeting room of the Philadelphia Electric Company. The paper of the evening was by D. B. Wilson, of the General Electric Company, and was entitled, "Charging Apparatus Used in Public and Private Garages."

Mr. Wilson went very thoroughly into this subject, explaining in detail the various kinds of rectifiers and charging boards, showing illustrations of them, and the practical application of the several types of rectifiers. He called particular attention to the improvement of the present rectifier over the old style, and stated that further improvement was expected to be made. He referred briefly to the new iron-tube rectifier, which is not yet ready for the market, but on which experiments are being made.

The paper was discussed by Messrs. Bartlett, E. R. Whitney, F. E. Whitney, Gross, Nealey, Wallis and others.

There were over 40 present at this meeting and the officers are very much encouraged over the success of the new section.

◆

Utah Jovians Plan Rejuvenation.

John C. Jones, statesman for Utah of the Jovian Order, called a meeting on March 11 to arrange the details for a rejuvenation to be held on April 21 concurrently with a general meeting of the local representatives of the Utah Power & Light Company which is to be held in Salt Lake City on that date.

◆

American Society for Testing Materials.

The executive committee of the American Society for Testing Materials has announced that the seventeenth annual meeting will be held at Atlantic City, N. J., June 30 to July 4, with headquarters at Hotel Traymore.

The Electric Club of Chicago.

At the meeting of The Electric Club of Chicago held on March 12, Arthur H. Young, supervisor of labor and safety of the Illinois Steel Company, Chicago, made a very interesting illustrated address entitled "The Wonderland of Steel." Mr. Young described the various chief steps in the production of several kinds of steel, starting from the mining of the ore in the Northern Michigan mines, its transport to the docks and shipment to the steel works, unloading, storing, and charging of the blast furnaces. He briefly explained how electric power is derived from the waste gases and then described the conversion of the iron from the blast furnace in a Bessemer converter, also in the open-hearth furnace and in the Heroult electric furnace. He explained the method of rolling rails and of rolling structural and plate steel.

Taking up the human side of the industry, Mr. Young spoke of various means that are used to promote the welfare, not only of the employees, but also of their families. He explained the pension system in use, the system of visiting nurses, clubs and other welfare work. Mr. Young concluded his address with a brief reference to some of the methods used to promote safety and carefulness among the employees and showed a number of appliances that have been used to reduce the hazards to a minimum. Throughout Mr. Young's address he showed a great many lantern slides of the various stages in steel making and of other views connected with the industry.

◆

Electrical Association of Wilmington Holds Meeting

At the March meeting of the Electrical Association of Wilmington, N. C., held March 5, W. C. Andrews of the Edison Storage Battery Company, Orange, N. J., gave a talk on the construction and operation of the Edison alkaline-nickel-iron battery. The association is now in its second season with a membership of sixty drawn from the electrical interests about Wilmington—central station, railway, telegraph and telephone, contractors and dealers, and the electrical engineering department of the Atlantic Coast Line which has its main office in Wilmington. Monthly meetings are held at which practical subjects are discussed, that for the April meeting being current consuming appliances with a paper by R. H. Bouligny of the Western Electric Company's Richmond office. The club owes its present enviable success to the hard work of its president, Raymond Hunt, superintendent of the Tide Water Power Company and its vice-president, Charles R. Sugg, of the Atlantic Coast Line.

George Westinghouse Dead.

George Westinghouse, the famous inventor and engineer, died of heart disease at his New York City residence on Thursday, March 12. His health had been failing for some time and consequently his death, though a great shock to his thousands of friends and acquaintances all over the country, was nevertheless in a measure anticipated.

The mental alertness and wonderful vitality that had so characterized his brilliant career remained with him to the end.

Although actively associated with a large number of industries, he had, during the last few years, begun to transfer his responsibilities to the shoulders of his trusted lieutenants, the fortunate selection of which has always been one of the leading characteristics of his varied career.

His demise, therefore, will not cause any material change in the policy or operation of the companies so indelibly linked with the name Westinghouse.

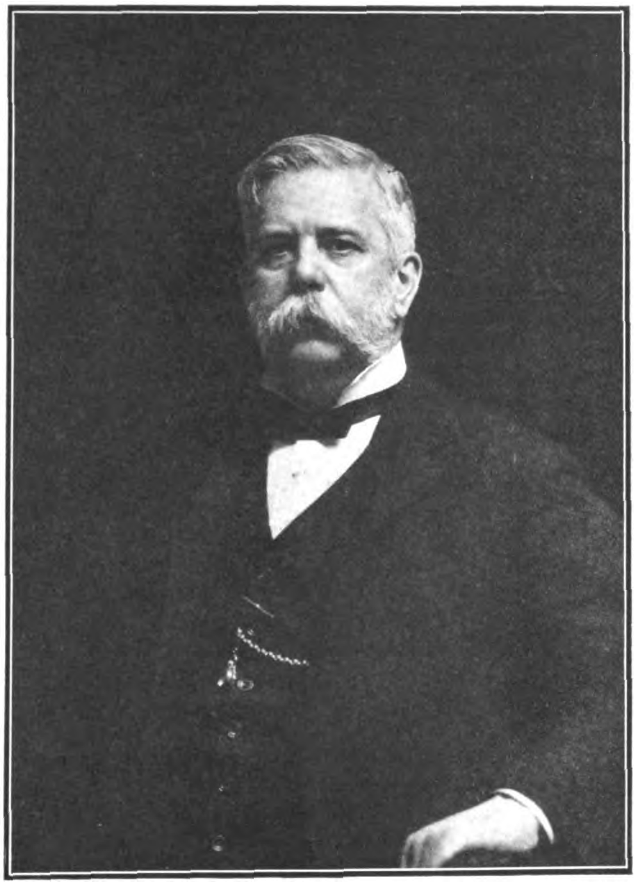
George Westinghouse was born at Central Bridge, Schoharie County, N. Y., on October 6, 1846; his parents were George and Emeline Vedder Westinghouse. The father's ancestors came from Germany and settled in Massachusetts and Vermont before the Revolution; the mother's were Dutch-English. Mr. Westinghouse's father was an inventor, who, in 1856, removed his family to Schenectady, N. Y., where he established the Schenectady Agricultural Works.

The boy attended the public and high schools of the town, spending much of his leisure time, after studies, in his father's machine shop. What to other lads would have been regarded as irksome and confining young Westinghouse found to be a source of amusement and instruction. Before he was fifteen he invented and made a rotary engine, and passed at an early age the examination for the position of assistant engineer in the United States Navy.

In June, 1863, though barely seventeen, he enlisted in the Twelfth New York National Guard. He was discharged at the end of November of the same year, and joined the Sixteenth New York Cavalry, being chosen corporal. He was honorably discharged in November of the following year, and a month later accepted an appointment as third assistant engineer, United States Navy, reporting for duty to the "Muscota," from which he was transferred to the "Stars and Stripes" and detached and ordered to the Potomac flotilla, June 28, 1865.

At the close of the war, resisting solicitations to remain in the Navy, and wishing to continue his college studies, Mr. Westinghouse tendered his resignation and was honorably discharged, August 1, 1865.

On his return he entered Union College, where he remained until the close of his sophomore year, and, obedient to his impulse toward experiment, abandoned his classical studies and entered upon active life, to find a wider scope for his inventive genius.



George Westinghouse.

In 1865 he invented a device for replacing railroad cars upon the track, which, being of cast steel, was manufactured by the Bessemer Steel Works, at Troy, N. Y.

Going to Troy one day, a delay caused by a collision between two freight trains, suggested to Mr. Westinghouse the idea that a brake under the control of an engineer might have prevented the accident. His first thought was an automatic brake attached to the couplers which was unsuccessful. This was followed by steam, which proved also to be unsatisfactory because by the time it reached the brake from the engineer's cab it lost its power. Finally it occurred to him to investigate the use of compressed air. Drawings of the air-pump, brake cylinder and valves were made, but considerable time elapsed before a practical trial of the brake was obtained. The first patent was issued April 13, 1869, and the Westinghouse Air Brake Company was formed on July 20, following.

Many changes and improvements were being made in the brake all the while, the business flourished, and the manufacturing works, begun in 1869, were completed in 1870. In 1870 Mr. Westinghouse went abroad to introduce the air brake in England—a difficult problem, as the trains in Europe had hand brakes upon only what were known as "brake-vans," there being no brakes upon the other vehicles. Not only did this require the spending of seven years in Europe, between the years 1871 and 1882, but it taxed his inventive ability to meet the new conditions.

In the meantime, Mr. Westinghouse invented the "automatic" feature of the brake which overcame the imperfections in the first form, and removed the danger from the parting of trains on steep grades. In 1886 he invented the "quick-action" brake, the improvement being made in what is known as the "triple-valve." By this valve it became practicable to apply all brakes on the train of 50 freight cars in two seconds. The automatic and quick-action brakes are regarded by experts as surpassing the original brake in ingenuity and inventive genius, being not mere improvements, but distinct inventions.

About 1880 Mr. Westinghouse became interested in the operation of railway signals and switches by compressed air, and soon after there was developed and patented the system now manufactured by The Union Switch & Signal Company. The "Pneumatic Interlocking Switch and Signal Apparatus," whereby all the signals and switches are operated from a given point, using compressed air as the motive power, and electricity to bring that power into operation, has been successfully introduced in Boston, Jersey City, Philadelphia, Chicago, St. Louis, and many other places.

In 1886 the Westinghouse Electric

Company was formed for the manufacture of lamps and electric lighting apparatus, Mr. Westinghouse having become interested in the subject. The business rapidly developed and in 1889 and 1890 this company absorbed the United States Electric Company and the Consolidated Electric Light Company. In 1891 all these properties were reorganized into the Westinghouse Electric & Manufacturing Company, which owns extensive works at East Pittsburgh, employing over 22,000 people.

In 1892 Mr. Westinghouse secured for the Electric Company the contract for the electrical equipment of the World's Fair at Chicago, and in 1893 the contract for the large generators at Niagara Falls, both of which marked epochs in the progress of the electrical industry.

In 1895 the Electric Company outgrew the small quarters at Garrison Alley and moved to East Pittsburgh and the same year works of the British Westinghouse Company were established at Manchester, England.

The question of the steam turbine and its applications was investigated by Mr. Westinghouse and he secured the patent rights of Charles A. Parsons, of England, on the turbine in 1897-98. This development of a new prime mover soon led the inventor to consider the use of the turbine as a prime mover for ships. The trouble was the high speed. Mr. Westinghouse then developed and brought out one of the most ingenious devices of modern engineering. This was the mechanical reduction gear for reducing the inherently high speed of a turbine to the slow speed of a ship propeller or direct-current dynamo. He accomplished this work in collaboration with the late Admiral George W. Melville, U. S. N., and John H. MacAlpine. Within the last few years he also occupied himself with the development of an air-spring for automobiles and motor trucks which rapidly came into favor.

Mr. Westinghouse rendered an invaluable service to the electrical development of the world, when, in spite of opposition, ridicule and efforts to crush his alternating-current system, he remained steadfast in his belief that this class of high-tension transmission would make distant electrical distribution possible. The world today recognizes its debt to his genius and courage.

A struggle almost identical with that of the earlier fight for alternating-current transmission, is the recent development of alternating-current traction by means of the single-phase motor which the Westinghouse Electric and Manufacturing Company has now wrought into an accomplished reality in the case of a number of traction lines, railroad terminals and tunnels.

The value of natural gas to the manufacturing industries of Pittsburgh was foreseen by Mr. Westinghouse, who organized a company to develop this vast resource of Western Pennsylvania, and who met in characteristic fashion the engineering problems involved.

Originating with one of the most important inventions connected with railways, the growth of the various Westinghouse industries has been largely identified with railway progress, and it is interesting to note that this progress has represented increased security of life, increased capacity of the railway and reduced cost of operation. It is simply stating a simple fact to say that Mr. Westinghouse has been a great factor in the advance of civilization as represented by the important part he has played by introducing improved means of transportation.

Chance has had no place in the success of this man. It has been due to his foresight, courage and technical skill. As with his first invention, the air brake, the different kinds of apparatus has been developed to answer actual needs, in some cases acknowledged generally, and in others foreseen by him with remarkable prevision. When the apparatus had passed the experimental state and was ready for commercial exploitation, he established factories which are themselves models, and which show the same anticipation of future development. Not only are the buildings handsome and well equipped with the best tools, but the comfort of the employees has been considered in every respect. It is worth noting that the nine-hour day, or rather the fifty-four-hour week, was started in the Air-Brake Works in 1869, and has been adopted in all the other works..

Owing to his many achievements in mechanics, electricity, steam and gas, his name was known the world over, and he had many honorable distinctions conferred upon him for his achievements and in recognition of the services he rendered the various branches of engineering. His alma mater, Union College, of Schenectady, conferred upon him the degree of doctor of philosophy. He was decorated with the order of the Legion of Honor, with the order of the Royal Crown of Italy, with the order of Leopold of Belgium. He was the second recipient of the John Fritz medal. He received the degree of doctor of engineering from the Koenigliche Technische Hochschule of Berlin, Germany. He was an honorary member of the American Society of Mechanical Engineers, of which body he was also president in 1910. He was one of the two honorary members of the American Association for the Advancement of Science. He was an honorary member of the National Electric Light Association of America. He was awarded the Scott premium and medal by the Franklin Institute of the State of Pennsylvania. He received the Edison gold medal for meritorious achievements in the alternating-current system of electrical distribution. He received the Grashof gold medal from the Society of German Engineers in Germany, which acknowledged him the greatest American engineer.

Mr. Westinghouse was president of the Westinghouse Electric & Manufacturing Company for nearly a quarter of a century. Following financial difficulties in 1907 the company, after a 14-months' receivership, was reorganized and in July, 1910, Mr. Westinghouse was succeeded by Robert Mather as president of the company. At that time he held the offices of president and director in sixteen companies, including the Canadian Westinghouse Company, Limited, the Cooper Hewitt Electric Company, East Pittsburgh Improvement Company, Nernst Lamp Company, Pittsburgh Motor Company, Security Investment Company, Societa Italiana Westinghouse, Paris Société Anonyme Westinghouse, St. Petersburg Société Electrique Westinghouse de Russie, Paris; Union Switch & Signal Company, Westinghouse Air Brake Company, Westinghouse Brake Company, Limited, of London; Westinghouse Cooper Hewitt Company, Limited, of London; Westinghouse Electric & Manufacturing Company, Westinghouse Lamp Company, Westinghouse Machine Company. He was also chairman of the board of directors of the British Westinghouse Electric & Manufacturing Company, Limited, of London; the Société Anonyme Westinghouse, Paris; Westinghouse Electric Company, Limited, of London, and director of the Consolidated Car Heating Company, the Electric Power Securities Company of Niagara Falls, Electric Properties Company, Traction & Power Securities Company, Limited, of London; Westinghouse, Church, Kerr & Company, Westinghouse Foundry Company, Westinghouse Metal Filament Lamp Company, and the Westinghouse Metallfaden Gluhlampenfabrik, G. m. b. H., of Vienna. After his retirement from the presidency of the Westinghouse Electric & Manufacturing Company, Mr. Westinghouse resigned from his offices in several of the other companies allied with this concern.

The Westinghouse Companies employ 50,000 men on whom 150,000 persons are dependent. The total capitalization of all the companies is $200,000,000.

Mr. Westinghouse was married August 8, 1867, at Brooklyn, N. Y., to Marguerite Franklin Walker. They had one son, George, who is a graduate of Yale, and was recently married to the Honorable Evelyn Violet Brocklebank. His wife and son survive him.

Prominent Men Attend Westinghouse Funeral.

More than 1,500 persons, including every grade of industrial and scientific attainment, men whose names stand high in the commercial and scientific world, attended the funeral services for George Westinghouse, which were held in the Fifth Avenue Presbyterian Church, New York, on Saturday afternoon. There was a brief service at Woodlawn Cemetery where the family and friends attended the interment.

The honorary pallbearers who preceded the coffin into the church at half past two o'clock, were Charles Francis Adams, Horace F. Andrews, Charles J. Canda, Charles Crane, George Gibbs, T. A. Gillespie, J. M. Guffey, J. H. Gantt, W. S. Hawk, E. M. Herr, W. T. Kerr, A. L. Humphrey, Alexander C. Humphreys, T. B. Kerr, Walter M. McFarland and J. R. McGinley.

The chief mourners were Mrs. George Westinghouse, the widow, H. H. Westinghouse, a brother, and Mrs. Westinghouse, and Mr. and Mrs. George Westinghouse, Jr.

The Rev. Dr. J. H. Jowett, pastor of the Fifth Avenue Presbyterian Church, opened the services with prayer and an address was delivered by the Rev. Dr. Samuel J. Fisher, of Pittsburgh. Dr. Fisher and Mr. Westinghouse were lifelong friends, and the former paid a glowing tribute to the work and character of Mr. Westinghouse.

The coffin was banked high with floral offerings from every part of the country, including an orchid wreath from the President and Mrs. Woodrow Wilson, and a piece composed of orchids and violets from William G. McAdoo, secretary of the treasury, who had been a long-time friend of Mr. Westinghouse.

The active pallbearers were eight veteran employees who had served with Mr. Westinghouse since he opened the mechanical and electrical shops in the Turtle Creek Valley, near Pittsburgh. They were headed by Christopher Horrocks, the oldest employee of all.

Telegrams and cablegrams of sympathy and respect were received by Mrs. Westinghouse from all parts of the world. Many delegations of national engineering and scientific organizations attended the funeral services, the delegation from the American Society of Mechanical Engineers attending in a body and consisting of James Hartness, president; Dr. A. C. Humphreys, Jesse M. Smith, Ambrose Swasey, Worcester R. Warner, Henry R. Towne, Col. F. D. Meier, Dr. W. F. M. Goss, Prof. R. R. Hutton, E. B. Katte, I. E. Moultrop, H. G. Stott, H. L. Gantt, E. E. Keller, H. G. Reist, Charles J. Davidson, Henry Hess, George A. Orrok, W. B. Jackson, H. M. Leland, Alfred Noble, A. M. Greene, Jr., John Hunter, Elliott H. Whitlock, Robert M. Doxon, William H. Wiley, and Calvin W. Rice.

The National Electric Light Association was represented by a delegation officially appointed by President McCall, comprised of Past-Presidents H. L. Doherty, Frank W. Frueauff, Dudley Farrand, and Arthur Williams, Secretary T. C. Martin and Assistant Secretary S. A. Sewall. The New York Electrical Society was represented by Past-President M. I. Pupin and Secretary G. H. Guy. Others who attended were Charles A. Terry, Nikola Tesla, H. H. Vreeland, Paul D. Cravath, Arthur Warren, George B. Oliver, Samuel Rea, L. B. Stilwell, Guy E. Tripp, W. D. Updegraff, Daniel Willard and F. D. Underwood.

Memorials to Mr. Westinghouse.

Two thousand and more persons assembled in the Welfare Building at Wilmerding, Pa., on the afternoon of March 14, to attend the memorial exercises of Mr. Westinghouse. John McNaughten, president of the United Presbyterian Theological Seminary, delivered the principal address. The building in which the exercises were held was presented to the Y. M. C. A. of Wilmerding, which town he founded, by Mr. Westinghouse.

The directors of the Westinghouse Electric & Manufacturing Company adopted the following resolutions on the death of Mr. Westinghouse:

"The history of this organization from the time of its creation by Mr. Westinghouse to its present magnitude is the story of the genius, wisdom, courage and foresight which placed him among the foremost men of his age.

"By his death a high minded and inspiring leader of men has been taken away. There has been a great public loss.

"It is with sorrow that the board registers this last sad memorial among the chronicles of the company built by him and orders it engrossed and forwarded to his family."

Commission Control Proposed for Massachusetts Hydroelectric Companies.

The subject of the regulation and control of hydroelectric companies in Massachusetts by the State Gas and Electric Light Commissioners was argued at a hearing before the Public Lighting Committee of the Massachusetts Legislature March 11. A bill, introduced by Senator Francis J. Horgan, provides that these companies shall be subject to the same jurisdiction by the Commission as are the lighting companies. Senator Horgan asserted that the water powers of the State are virtually controlled by a single interest. He held that the companies should pay the State for the use of the powers.

Other proponents of the measure advocated full publicity of the affairs of the companies, together with supervision by the Commission. They held that not only the consuming public but also the investors would benefit by reason of the well maintained values of the securities which would result from State supervision, citing the stability and high repute of lighting companies' securities in the State.

H. I. Harriman, of Chase & Harriman, engineers for the Connecticut River Power & Transmission Companies, said the companies he represents "are not opposed to reasonable and proper regulation."

The bill as drawn provides a penalty of $1,000 for each failure to comply with the rules, regulations and authority of the Gas and Electric Light Commission.

Mine Telephone and Signal Circuits.

The British regulations relating to uses of electricity in mines contain a rule reading: "Where electricity is used for signaling the pressure in any one circuit shall not exceed 25 volts." This has been interpreted by some mining authorities to relate also to water-tight telephones and to require that the voltage of magneto generators should not exceed that figure. The Telephone Manufacturers' Association, therefore, found it necessary to approach the Home Office Department, pointing out that it was commercially impossible to provide telephones with a generator which will ring bells satisfactory with a potential of only 25 volts. The authorities have now cleared the matter up by stating definitely that the rule relates only to signaling and not to telephones.

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It is estimated that water powers in France possible of development aggregate about 4,500,000 horsepower, of which only 800,000 is now utilized.

Public Utilities Discussed by Western Society of Engineers.

At a meeting of the Western Society of Engineers held on the evening of March 16, at which Vice-president B. E. Grant presided, the subject for general discussion was a symposium on public utilities. This was intended partly as a continuation of the discussion at the annual meeting of the Society, at which Dean M. E. Cooley of the University of Michigan had presented a paper entitled "Factors Determining a Reasonable Charge for Public Service;" an abstract of this paper was presented in our issue of January 17, 1914.

At Monday's meeting the subject was introduced by a paper entitled "Government Regulation of Railroads from the Investor's Standpoint," by Andrew Cooke. He opened his paper by an expression of regret that the Interstate Commerce Commission had not yet passed on the case of the Eastern railroads who are seeking a five-per-cent raise of freight rates; an early decision on this matter would be desirable to put railroad securities on a better footing. The government ownership of railroads has been urged, because the government can secure money at a very low rate of interest. However, if railroads were enabled to finance improvements at similar low interest rates this argument for government ownership falls to pieces. Mr. Cooke showed how this can readily be done. Railroad investments can be made more secure by better and fairer tax laws, by regulated competition and by reasonable regulation of rates based on fair valuation. He recommended that rates be determined on such a basis which should be liberal to the corporations; any surplus earnings derived in especially good years should be used for betterments of the system without charging same to the capital account.

Samuel O. Dunn, editor of the *Railway Age Gazette,* then presented a paper dealing with appraisals of railroad property. The fundamental principles of government regulation are appropriately based on the fifth and fourteenth amendments of the United States Constitution regarding condemnation of private property. In all rate regulation the fair present value of the property should be the same as that which is used in condemnation proceedings. Mr. Dunn discussed the valuation of land in particular and combated the statement frequently made that the unearned increment be not credited to the railroads; such a policy would be gross injustice to these utilities. He agreed with Mr. Cooke in advocating the use of surplus earnings for betterments in the property, but these earnings, while not put into the capital account, should be allowed for in the valuation. Such a valuation of a railroad system must give the depreciated value of the physical property. A reasonable going value must be allowed for. In making assessments for taxation intangible values are usually taken into account, therefore why should it be more difficult to allow for them in valuations for rate making?

The third paper of the series was presented by Harold Almert; it was entitled "Rate Regulation from the Standpoint of the Public and of the Engineer." Nearly 40 states have now passed laws regulating utilities and similar laws are pending in other states. This shows that utility regulation is a very live topic. The great majority of the public means to be fair, although there is always an element that is unscrupulous in its demands. The public wants merely to have good service at reasonable rates. As a rule the public is not well informed as regards investments of utilities. The only information available is that of investment brokers or bankers and unfortunately in too many cases this does not disclose all of the truth. There are nearly always present in a community so-called reformers and actual demagogues who are ready to stir up trouble. The newspapers are really under obligation to clear up the situation in regard to utilities.

Mr. Almert stated that many utility laws were evidently poorly considered and drafted. Many utility commissions also are not well constituted, because their members are not versed in the subject. The importance of keeping politics from commission regulation cannot be emphasized too greatly. If a commission has a good engineering and accounting staff and is broad minded, even though the members themselves may not have had special training in utility work, the prospects for satisfactory regulation are fairly bright. In several states such commissions, well organized and with good assistants, are to be found and their rulings are rightly looked upon as precedents because they actually constitute ideal commission regulation. The broad subject of utility regulation is a very complicated problem. Its solution lies not with the lawyer alone but probably best with a broad-minded engineer who has had some study of law and of economics. Such an engineer can be relied upon to present all sides of the question fairly. He must study the problem in detail and state his conclusions frankly, regardless of whether they are in favor of the utility or of the public.

The general discussion of the subject was opened by John W. Alvord, who stated that regulation and valuation of utilities was started about 16 years ago when the franchises of a number of water-works companies began to expire. The subject has become more important from year to year and at the present time about one billion dollars of utility property is appraised yearly for regulation purposes. Although the subject of regulation is an intricate one with many sides to it, one of the chief difficulties arises because the public has not decided what it wants to appraise. One party believes that only the actual money spent in the utility must be allowed for in the valuation; another party believes that the utility property must be accorded the same rights as other private property and on this there must be allowed a fair return. Although most appraisal work is of an engineering character, it must in all cases be based on a clear definition of the law. All valuations must be the co-operative work of the lawyer, engineer and economist or business man. Mr. Alvord discussed briefly the confusion existing with regard to going value of a utility concern and he gave an excellent example, which he had recently cited before a commission, showing the difference between a carefully appraised dead horse and a live horse. On the whole, however, despite their lack of technical knowledge in many cases, the state utility commissions are doing quite satisfactory work.

W. B. Jackson said that the problem of regulating utilities is still in its early stages and a comprehensive solution has by no means been reached. He stated that utilities should be looked upon in the same way and be given the same consideration as other industries, such as manufacturing for instance. In general, it is less important to have low rates than it is to have good service at reasonable rates; the latter would permit the use of excess earnings for improvement of the property. However, Mr. Jackson was not in favor of using excess earnings without capitalization.

James E. Quan, chairman of the Illinois Public Utilities Commission, made a brief address, and W. A. Shaw, also a member of this commission, said that he was pleased to find the Western Society of Engineers taking up live topics of the day. On behalf of the Illinois Commission he said that it was attempting to meet the issues presented before it fairly as they arise. In the matter of regulation of utility rates the Commission would quite certainly allow a fair return on the investment. Lyman E. Cooley spoke of utilities as public bodies. He was in favor of having utilities issue but one kind of security with amortization features, as is done so successfully in France. A. C. King, deputy city electrician of Chicago, spoke briefly of the use by utilities of streets, alleys and other public property, for which the public is entitled to receive some return, which should be taken into account in rate determinations. Prof. Morgan Brooks, of the University of Illinois, spoke of the importance of maintaining quality of service. If service is of high quality, the question of rates is of less importance and probably would never have been raised.

Electricity in Breweries.

By F. M. Welles.

This complete description of a Baltimore brewery which has recently discarded its obsolete isolated-plant equipment and installed central-station service, indicates clearly that electric drive is essential to the production of a high quality of product. Incidentally, many operating economies have been effected since the change was made.

As an example of one of the very few breweries in the eastern part of the United States which employs exclusively central-station power throughout, the accompanying views of the Gottlieb, Bauernschmidt, Strauss Brewery, at Conway and Hanover Streets, Baltimore, Md., are both timely and interesting.

Early in 1912 when this company was perfecting the formula for its proposed new beer (later named the "Arrow"), due cognizance was given to the necessity for, first, superior quality of ingredients and, second, superior quality of equipment. Accordingly, it was decided to use only the purest and most wholesome barley malt and imported German hops, flaked corn, etc., to install the most up-to-date manufacturing and storing apparatus, and to employ central-station power for all available purposes.

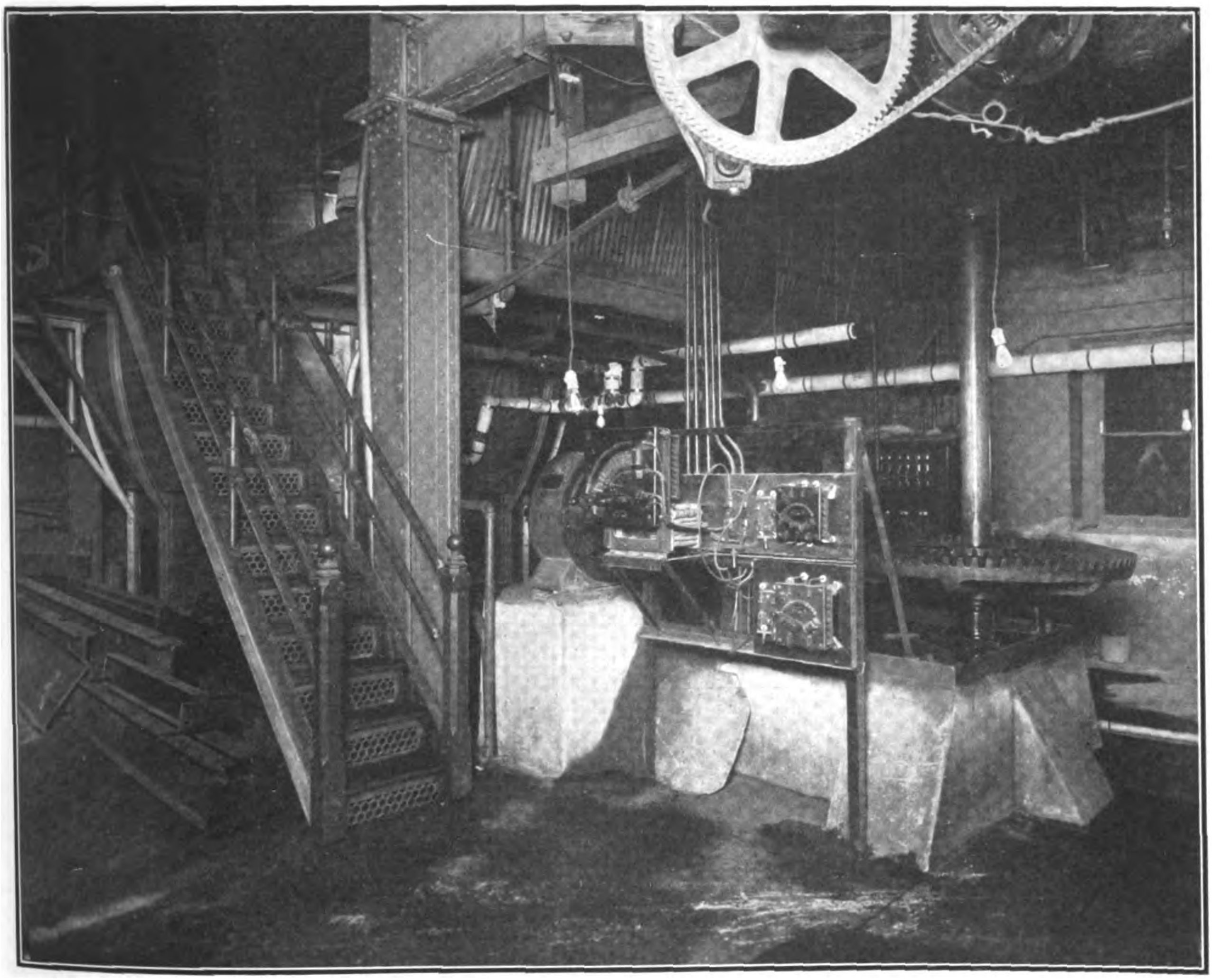

Fig. 1.—Mash Tub Driven by 20-Horsepower Motor Coupled to Original Gearing.

About July, 1912, further plans for a reorganization of the company's various local plants began development towards a centralization in the Hanover Street plant. This scheme included the abandonment of the Darley Park Brewery on Harford Avenue, of the Central Avenue and Fawn Street bottling plant, also the bottling plant of the Eigenbrot Brewery. With the initial operation of the new bottling plant at Hanover Street in July, 1912, 120/240-volt Edison service was introduced from the underground system of the Consolidated Gas, Electric Light & Power Company to operate this machinery and from this time until the summer of 1913 the process of evolution from steam to electric drive has steadily proceeded, until at the present writing every available application of electricity has been made and the original 450-horsepower boiler plant supplies steam only for heating and brewing. The "Globe" Brewery, as it is more familiarly known, has a present capacity of 365 barrels per day brewed, or 100,000 barrels per year.

The changes which have taken place here can best be realized by a parallel study of the beer-making process with the drives employed in their proper sequence.

First, regarding the chemical composition of beer, we find it to be a beverage obtained by a process of alcoholic fermentation, mainly from cereals (chiefly malted barley) hops and water with various substitutes for the two former, and certain preservatives. In order to explain the constituents of the finished product and their derivation, it is necessary to make sure that certain materials and terms are thoroughly understood.

The malt itself is the barley grain in which germination has proceeded to a certain point, where it is then arrested by removal of water and the application of heat, resulting in a softened raw grain. During this process, which forms a separate industry in itself, there are developed in the grain certain enzymes, which are a non-living organism found in the constitution of plants and animals and whose function is to decompose certain carbon compounds occurring in association with them. The germinated barley contains starch and diastase, the latter being a soluble nitrogenous ferment formed in germinating grain and having the property of converting starch and dextrine into sugar.

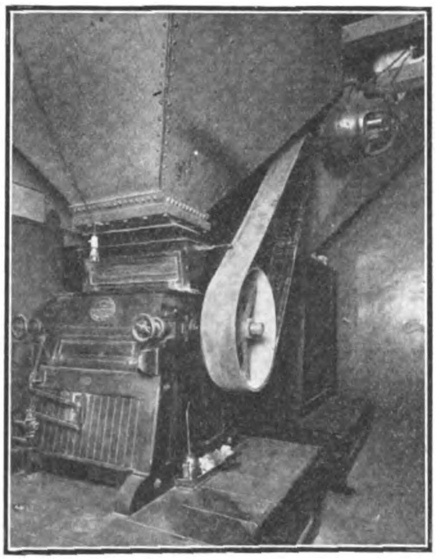

Fig. 2.—Motor-Driven Malt Mill.

Underlying the process of all beer making there are two essential chemical processes: (1) The conversion of starch by means of diastase into certain soluble substances, one of which is a fermentable sugar; (2) the decomposition of this sugar by means of the yeast organism into alcohol and carbon-dioxide gas (CO_2).

Having the above in mind we can now better appreciate the reason for the use of the substitutes previously mentioned. The diastatic enzyme or ferment of malted barley is present in that material in great excess, and a part of this surplus energy may be usefully employed in converting the starch of unmalted grain into sugar. Brewing operations are also simplified and accelerated by the use of a certain proportion of substitutes and thereby the turn-over with a given equipment can be very materially increased. Also certain substitutes, such as sugar, unmalted corn, rice, cereline, maize, etc., are cheaper than malt, although brewers seldom use more than 15 to 20 per cent of substitutes, as a larger percentage would seriously impair the quality of the beer.

In its earliest forms the beers were strongly alcoholic, but with the advent of tea, coffee, cocoa, etc., much lighter beverages became the vogue. The general run of beers now contains 3 per cent to 6 per cent of alcohol and 4 per cent to 7 per cent solids, the remainder being water and certain flavoring and preservative matters derived from the malt, hops and other materials employed in their manufacture. The solid, i.e., the non-volatile matter contained in solution in beer consists mainly of maltose, or malt sugar, of several varieties of dextrin, of substances which stand in an intermediate position between the sugars and the dextrins proper, and of a number of bodies containing nitrogen, such as the non-coagulable proteids, peptones, etc. In addition there is a considerable quantity of mineral matter, chiefly phosphates and potash. Dietetically regarded, therefore, beer possesses considerable food value and moreover the nutritious matter in beer is present in a readily assimilated form.

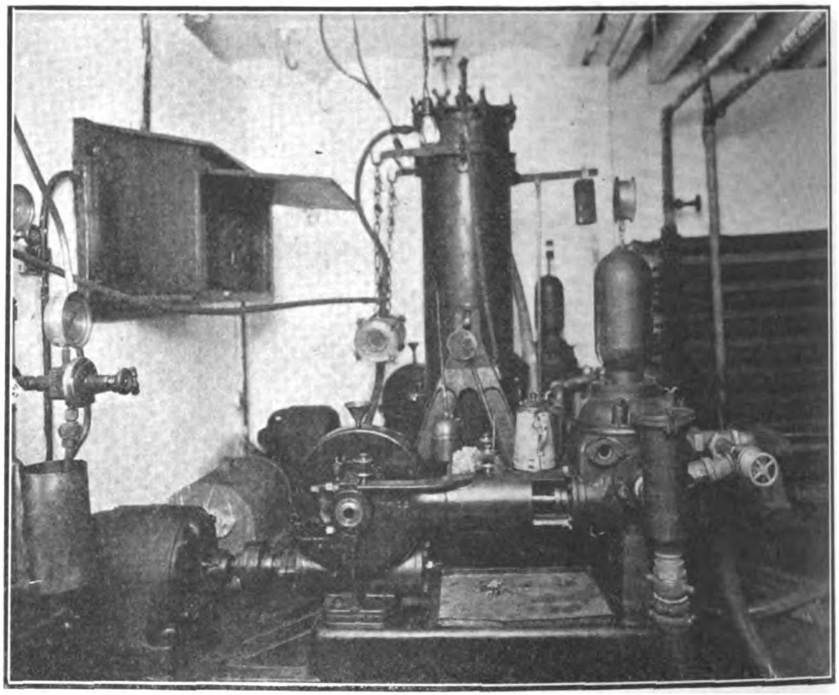

Fig. 3.—Motor-Driven Pumps for Racking the Beer; Carbonating Machine in Center.

In short, the general scheme of mechanical operations in any brewery consists of seven distinct processes, as follows:

(1) Grinding: The malt, after cleaning and grading is conveyed to the malt mill, where it is crushed.

(2) Mashing: The ground malt or grist, as it is then called, passes to the "grist hopper" and from the latter to the mashing machine, in which it is intimately mixed with hot water from the hot-liquor vessel (water is called liquor in a brewery). From the mashing machine the mixed grist and liquor pass to the mash tubs, where the starch and the malt is rendered soluble.

(3) Boiling: From the mash tub the clear malt passes to the kettle, where it is boiled with hops. From the kettle the boiled malt passes to the hop jack where the insoluble hop constituents are separated from the malt.

(4) Cooling: From the hop jack the malt passes to the cooler, from the latter to the refrigerator, thence to the fermenting room.

(5) Fermenting: The liquid passes finally to the fermenting vessels, in which the malt is transformed into "green" beer.

(6) Cleansing: The beer is next separated from the products of fermentation and filtered.

(7) Racking and Storing: After filtering the beer is carbonated and either racked off to kegs or stored in the cellars for bottling.

The process in the Globe Brewery, which is, however, much the same in any other, begins with the storing of the malt. Brought to the malt house in bags of 90 pounds each, it is emptied into the boot of a 10-horsepower motor-driven bucket elevator which delivers to the large storage bins. From

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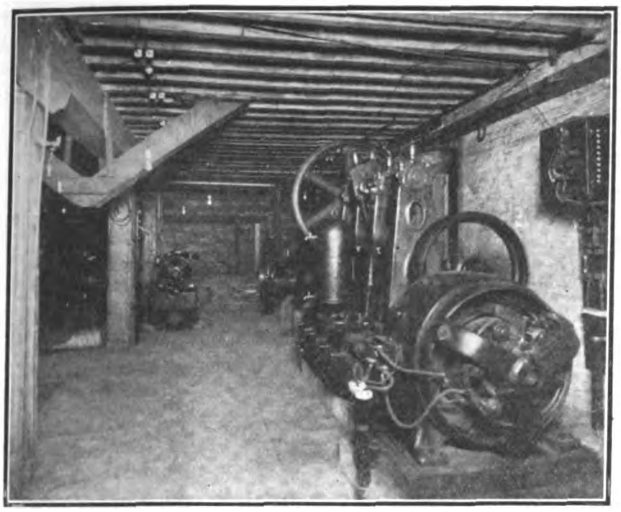

Fig. 4.—Pump Room.

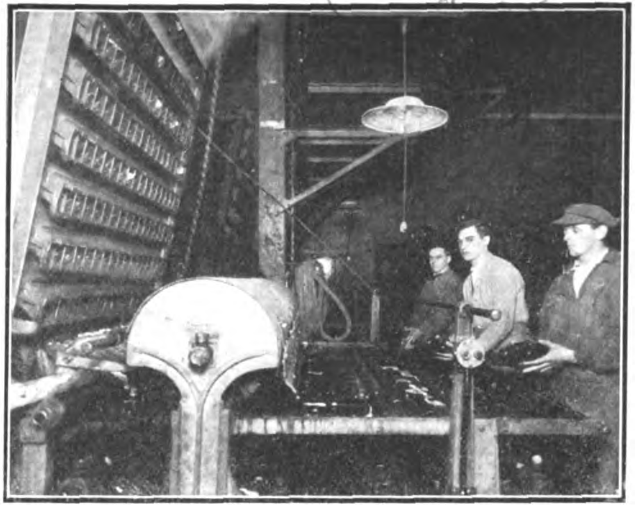

Fig. 5.—Soakers and Rinsing Machines.

these bins a worm conveyor takes the malt across to the brew house where it passes first through the cleaning process. Two suction fans of 24-inch diameter each extract the dust and the material passes through a rotary screen to an automatic measuring machine. Hoisting by bucket elevator next delivers to the malt mill, from whence a second bucket elevator and a worm conveyor deliver the ground malt or grist to the mash tub. The exhaust fan, the two screens, the two worm conveyors and two bucket elevators mentioned above are driven by a belt-connected 20-horsepower motor.

The malt mill shown in Fig. 2, with 15-horsepower motor consists of two corrugated rolls, 12 inches in diameter and 30 inches in length, each revolving toward the other and the normal capacity is 300 bushels an hour. The malt must be watched carefully in the grinding. If it is ground too fine difficulties arise in regard to efficient drainage in the mash tub and subsequent clarification. On the other hand, if the crushing is too coarse the subsequent extraction of soluble matter in the mash tub is incomplete and the quality of the beer lowered.

The grist having been carried over to the mash tub, the mashing process now takes place. This consists mainly in extracting, by means of water at an adequate temperature, the soluble matter pre-existent in the malt and in converting the insoluble starch and a great part of the insoluble nitrogenous compounds into soluble and partly fermentable products. Mashing is, without doubt, the most important of the brewing processes, for it is largely in the mash tub that the character of the beer to be brewed is determined. The malt and the mashing "liquor" are introduced into the mash tub simultaneously by means of a mashing machine. This is a cylindrical metal vessel, commanding the mash tub and provided with a central shaft and screw. The grist enters the mashing machine from the grist case above and the liquor is introduced at the back. The screw is rotated rapidly and so a thorough mixture of the grist and liquor takes place, before the material enters the mash tub. Another method of accomplishing similar results, and which is used here, introduces cold liquor at the beginning and hotter liquor after the mashing process has gone on for some time.

Fig. 1 shows the present drive on the mash tub, the tub itself being just above and having its raker arms operated through double reduction gearing by the vertical shaft shown. The mash tub is a large metal vessel, of 250-barrels capacity, fitted with a false bottom of perforated plates to permit a proper separation of the "wort" (as the liquid portion of the finished mash is called) from the spent grains. The mash tub is also provided with a stirring apparatus to intimately mix the grist and liquor, and an automatic sprinkler or sparger is employed to wash out the wort remaining in the grains.

After being boiled for half an hour, the mash is mixed in the mash tub with corn flakes that have been brought from a nearby room by a two-horsepower motor-driven screw conveyor. The rakes are set going until the mass becomes thoroughly homogenous and

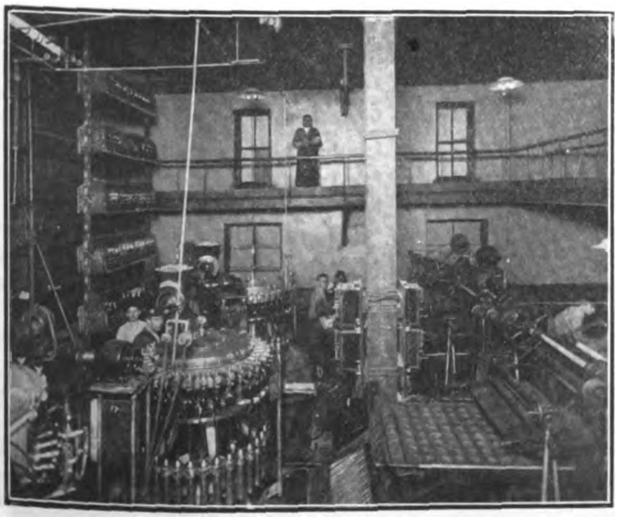

Fig. 6.—Rinsers, Fillers, Cappers and Sterilizers.

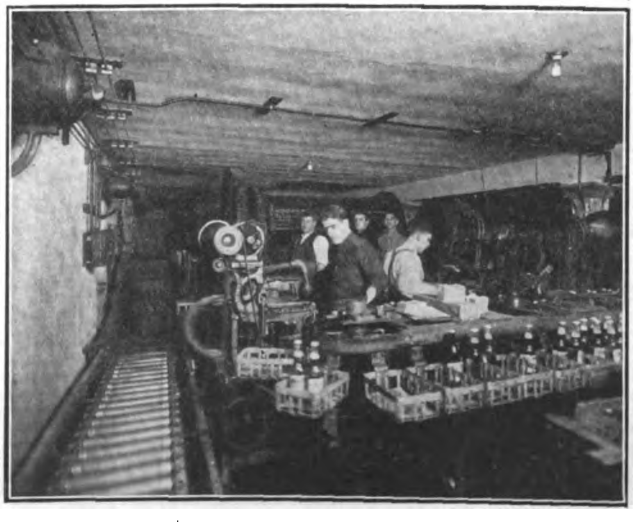

Fig. 7.—Carryalls, Labelers and Conveyor to Loading Platform.

the mash is then allowed to rest, usually for a period of about two hours. Communication is then established between the mash tub and the kettle, and the sprinkler, or sparger is started. In this manner the whole of the wort is extracted from the grains. The quantity of water employed, in all, amounts to about 130 barrels to every 100 barrels of beer. This is necessary to cover the loss of water (1) to the spent grains in the mash tub; (2) by evaporation in the copper; (3) through retention by the hops in the hop jack.

From the mash tub the spent malt grains are removed to the outside of the building by two screw conveyors, 19 feet and 34 feet long respectively, and driven by chains from a two-horsepower and a 3.5-horsepower motor. These spent grains contain a little starch, the insoluble portions of the malt, a little oil from the malt and a good deal of digestible fiber. They, therefore, possess high value as cattle feed and have about the same feeding and manurial value as wheat.

The wort from the mash tub passes to the kettle, which is a large copper vessel with a dome-shaped head, and heated by steam. When the wort has been raised to the boil, the hops are added and the boiling is continued.

The objects of boiling are: (1) sterilization of the wort; (2) extraction from the hops of substances that give flavor and aroma to the beer, (3) the coagulation of the nitrogenous matter which if left in would cause cloudiness and fret in the finished beer; and (4) the concentration of the wort.

Three distinct substances are extracted from the hops in boiling: (1) hop tannin, which combining with a part of the proteids derived from the wort, precipitates them; (2) hop resin, which acts as a preservative and bitter; and (3) hop oil, to which much of the fine aroma of the beer is due.

The quantity of hops employed varies from one to five pounds per barrel of beer, depending on the kind of beer.

When the wort has boiled the necessary time, it is turned into the hop jack to settle. The hop jack is a metal vessel with a false bottom; the latter retains the spent hops, the wort being drawn after a brief rest into the cooler. The cooler is a rather shallow vessel of great area and the result is that a part of the hop constitutents and other substances in the wort are rendered insoluble, besides allowing the wort to absorb oxygen in this areation process.

Located directly under the hop jack, a triplex 15-horsepower motor-driven pump, of 140 gallons per minute capacity is now used to pump the wort from the hop jack to the cooler. From the cooler the wort flows to the refrigerator, which brings it to about 41 degrees, Fahrenheit, the proper temperature for the fermentation stages.

The refrigerator allows a thin stream of wort to trickle over a series of pipes through the first portion of which cold water, and through the latter portion ammonia gas is circulated. The circulating water is furnished by a 85-gallons-per-minute triplex pump with a 10-horsepower motor, while the ammonia compressors which will be mentioned later, supply the ammonia for cooling.

From the refrigerator, the wort flows by gravity to the fermenting rooms, where it is converted into beer. By the addition of living yeast cells the sugar contained in the wort is split up into alcohol and carbonic-acid gas and a number of subsidiary reactions occur. The two main systems, designated by the position of the yeast in the cask are: (1) top fermentation; (2) bottom fermentation. The bottom fermentation obtains here and the low temperature method.

The wort, generally at 40 degrees is "pitched" with liquid yeast at the rate of one to four pounds to the barrel. After a few hours a slight froth or scum appears on the surface of the liquid gradually becoming lighter and more solid.

This hardens to a compact mass which emits great bubbles of gas with a hissing sound. At this point the "cleansing" of the beer (the separation of the yeast from the liquid) commences and the beer is let down into other casks for complete separation.

During fermentation the temperature rises considerably and in order to prevent an excessive temperature (50 degrees should be the maximum), the fermenting vessels are fitted with "attemperators," i. e., a system of pipes through which brine is circulated at 34 degrees, Fahrenheit, by a 120-gallon-per-minute triplex pump geared to 10-horsepower variable-speed motor.

The carbonic-acid gas generated during fermentation is collected by a Witteman gas compressor geared to a 7.5-horsepower motor whose operation is governed by the pressure of the gas, and which delivers to storage tanks from whence it is drawn again for the carbonating process.

After the fermentation and cleansing operation, the beer is racked off from the settling tanks into storage vessels or trade casks. Two of the four Witteman, 80 to 90 barrels per hour capacity, beer-racking pumps with a three-horsepower motor, also one of the carbonators, are shown in Fig. 3. An additional two-horsepower motor-driven portable pump is used in the cellars.

The transferring of the beer from the tanks to the pumps is done by carbonic-acid gas and compressed air which is also used in the bottling department to force the beer from the storage casks in the Government cellar up to the filling machines, and for holding pressure on the storage tanks to prevent the beer from foaming. The air compressor equipment at the Globe Brewery consists of an automatically operated 60-cubic-feet-per-minute compressor geared to a 11-horsepower motor, and a 15-horsepower motor-driven compressor (100 cubic feet per minute belt-connected), which operates constantly with an unloading device which only brings the cylinder into positive action between the fixed minimum and maximum pressures. These outfits may be seen in part in Fig. 4.

Both the bottled and the racked beer are carbonated. The beer when ripe for racking is first "chilled," or cooled to a very low temperature. As a result there is an immediate deposition of much matter which would otherwise require prolonged time to settle. The beer is then filtered and so rendered quite bright and finally in order to produce immediate "condition" is "carbonated," i. e., impregnated under pressure with carbon dioxide (carbonic-acid gas), the source of which has already been mentioned.

The filter is located in the same cellar with the racking pumps and carbonator. The filter-mass washer with five-horsepower motor is located in an adjoining cellar.

In the racking department there are a five-horsepower motor on keg elevator, and five-horsepower motor on keg-washing machine. In the bottling department there is now installed an aggregate of 41 motors, or 54 horsepower, some idea of the use of which may be gained from the following, which considers the work in its proper sequence.

Fig. 5 shows an end view of the two-bottle soakers with a two-horsepower motor each. The function of these machines is to facilitate the removal of old labels and accumulated dirt, the bottles being inserted into the soaker from the basement and delivered to the workers after about 40 minutes travelling through caustic soda and water at 212 degrees. The capacity of these machines is 78,000 bottles, or 250 barrels per day each. The bottles are passed from the soakers to the rinsers directly in the rear. These four rinsers with 0.75-horsepower motor each appear in the right of Fig. 6, and by following the process toward the left we see two of the four filling machines each capable of filling 72 to 90 bottles per minute with 0.5-horsepower motor each, two of the four crowning machines with a one-horsepower motor each and an end view of one of the two pasteurizers with respectively 10-horsepower and 1.5-horsepower motors. The bottled beer after being pasteurized through six upward and downward passages in the pasteurizer filled with water at 180 degrees is removed from the other end in Fig. 7. Two of the four carryalls with a 0.75-horsepower motor each are shown in use, and two of the nine labelling machines with 0.25-horsepower motor each.

The labelling machines are placed between two of the circular carryalls and the bottles are taken from the carryall on the right, labelled and placed in carryall tray on the left. The packers then place the labeled bottles in cases and set the cases on the railway by which they pass by gravity to the first floor and out to the loading platform.

In addition to the above equipment other motor drives in the bottling department are a 7.5-horsepower motor on freight elevator, two horsepower on conveyor which carries empty crates from cellar to second floor; one horsepower on empty crate conveyor in cellar; one horsepower on filled-crate conveyor on first lift of the railway; two horsepower on hoist for pasteurizer trays; three horsepower on hoist for filled cases from first to third floors; two horsepower on barrel hoist, first to third floors; two 0.5-horsepower on two ventilating fans; 0.5 horsepower in machine shop; two horsepower on conveyor from front to rear of second floor and two horsepower on filled-case hoist second to third floors. The bottling department here has a capacity of 500 barrels, or 156,000 bottles per day.

Miscellaneous motor drives in other departments are: 7.5 horsepower on elevator in brew house; 7.5 horsepower on food chopper and one horsepower on horse-cleaning brush, both of these latter in the stables.

Inseparably correlated with the art of brewing and indispensably aiding at a great many points in the process, are to be found the ammonia compressors without whose assistance the business of brewing could not be conducted on its present enormous scale. In Fig. 8 may be seen the two new 125-ton vertical York ammonia compressors installed in the Globe Brewery belt-driven from two 250-horsepower motors.

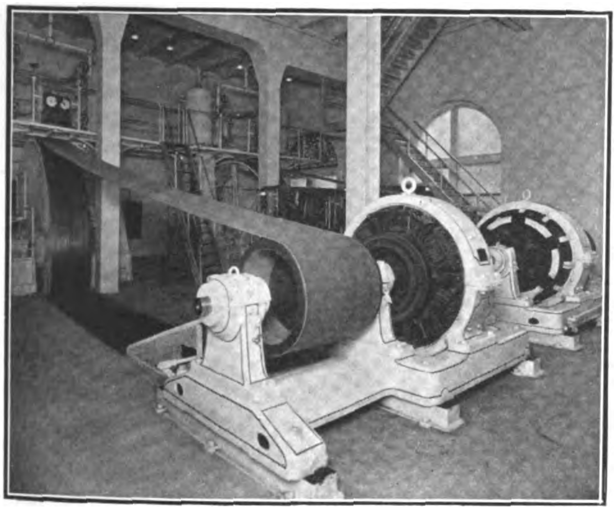

Fig. 8.—Ammonia Compressors in Old Engine Room.

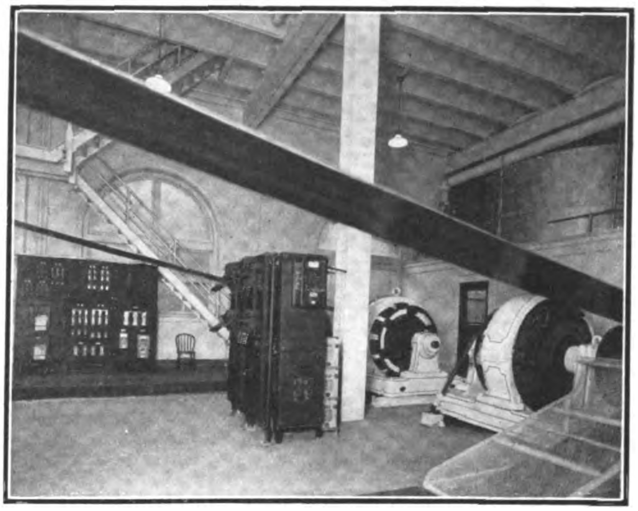

Fig. 9.—Switchboard and Motors.

Fig. 9 is a view of the engine room after the old equipment had been removed and motors installed and shows what may be done with electric drive towards eliminating bulky steam equipment and unsightly piping. The same is true of the pumping equipment which in its new forms is shown in Fig. 4. The latter shows, besides the attemperator, the beer and brine pumps, and air compressors already mentioned, a variable-speed, 25-horsepower motor-driven triplex pump for supplying water to condenser coils used in conjunction with compressors.

The important part played by the ammonia compressors is best realized when we consider their functions. First, they supply direct expansion refrigeration for the beer refrigerator coils, where the wort from the kettle is reduced to 41 degrees Fahrenheit to start fermentation. Second, they cool the brine which is circulated through the attemperator coils at 34 degrees Fahrenheit. Third, they co-operate with the attemperator coils by maintaining the fermenting room at the proper temperature. Fourth, they preserve the storage cellars at a suitable temperature of about 34 degrees Fahrenheit.

It is thus evident that the electrical load will be much higher during the summer than in the winter months, which makes such an industry a welcome addition to the central-station load. As for the benefits accruing to the customer, the eight months of full operation have already sufficed to demonstrate the fact that the saving in coal alone is almost enough to balance the cost of purchased electric power; this too, in spite of the necessity for continuance of steam generation from the boilers of the original plant to the extent of about 3.5 tons of coal per day.

Summarizing, we find steam to be required to heat the hot liquor for the mash tub, to raise the temperature of the wort in the mash tub, for boiling the wort and hops in the copper, for heating the water solution in soakers and pasteurizers, for the keg-washing process and finally for heating the entire group of buildings consisting of brewhouse, bottling house, office building and stables.

And the end is not yet in sight. Improvements are constantly being made and new applications of electric power are continually coming to light. Two four-ton and two two-ton electric trucks of General Vehicle Company manufacture are used by the Globe Brewery. These gave exceptionally prompt service in the recent Christmas and New Year periods of heavy business.

A second mash tub with the latest form of worm-gear drive from a 30-horsepower motor is being installed which will make a total of 800 horsepower, and a recent experiment with electric beer-vat heaters proved such undoubted superiority over the old charcoal method that the latter will be abandoned as early as possible.

The introduction of electric drive at the G. B. S. Brewery was simultaneous with the installation of the most up-to-date manufacturing and storage equipment and the placing on the market of the new Arrow Beer. The production of this beer by central-station power with such satisfactory results should serve to demonstrate to local industry of all characters the extremely versatile economy of which this method is capable, a hint which promises not to be without results judging by the number of local and out-of-town members of the brewing and electrical fraternity who have displayed an interest in the transformation.

The tabulation accompanying, although incomplete due to the comparatively short period of time during which the operation from central-station service has obtained, gives, however, an idea as to the division of power consumption which may be expected in an installation of this character.

RECORDS OF KILOWATT-HOUR CONSUMPTION.

Date	Ammonia Compressors	Miscellaneous Power	Lighting	Total		Bottling Dept. Lighting	Bottling Dept. Power
Jan. 20th, 1913	.....	.....	....	5,040	Up to Feb. 1913, service was supplied only to small pumps, elevators, etc.		
Feb. 18th, 1913	.....	.....	....	8,400	Bottling house started Feb. 1, 1913.		
Mar. 20th, 1913	.....	.....	....	9,600			
Apr. 19th, 1913	.....	.....	....	34,860	Electric driven ammonia compressors started April 9, 1913.		
May 19th, 1913	.....	.....	....	61,390			
June 18th, 1913	.....	.....	....	74,010	Separate meters for ammonia compressors cut in June 29, 1913.		
July 19th, 1913	66,800	5,000	2,536	113,196			
Aug. 18th, 1913	110,700	7,960	4,081	122,741			
Sept. 19th, 1913	91,000	9,990	4,145	105,135			
Oct. 20th, 1913	59,000	11,520	3,308	73,828			
Nov. 20th, 1913	31,400	8,130	2,468	41,998	Submeters installed in bottling department Nov. 20, 1913.		
Dec. 20th, 1913	28,100	8,540	2,366	39,006		1,580	2,380
Jan. 20th, 1914	18,000	7,930	2,567	28,497		1,740	2,390

Commercial Practice Management, Rates, New Business

Philadelphia Company Celebrates Twenty-fifth Anniversary.

The twenty-fifth anniversary of the founding of the Edison Electric Light Company in Philadelphia, Pa., was celebrated on March 12 at the Continental Hotel in that city under the auspices of the Engineering Department Branch of the Philadelphia Electric Company Section of the National Electric Light Association. There was an anniversary dinner at 6 p. m., at which there were short after-dinner talks by the executives of the company. W. C. L. Eglin acted as toastmaster. This was followed by a meeting at 8 p. m., which was attended by about 350. P. H. Bartlett and J. D. Israel, both told of the trials and tribulations of the early days just after the first Edison central station had been started. Short addresses were also made by President J. B. McCall, Vice-President W. H. Johnson and Manager A. J. De Camp. An original poem, written for the occasion, was read by B. Frank Day.

Medals of gold were presented to employees of the company whose names appear on the roll of honor, as follows: Joseph D. Israel, Thomas Tacey, Sr., George Broom, W. H. Johnson, James T. Maxwell, R. Frank Williams, James Gray, W. C. L. Eglin, J. Meikle Eglin, Charles Schiller, Timothy Foley, H. A. Koockogey, B. Frank Day, P. H. Bartlett, Frank Ruschmann, H. B. Seche, Charles Agnew, William Broom, T. H. Mumford, Bernard Dougherty, Charles Stasen, Harry Day, Charles Alcorn, William J. Lochart, Thomas Tacey, Jr., Patrick Neill, A. R. Granger, John Gallagher, Patrick O'Hara, Michael Mulvey, John Meyer, Patrick McCabe, Thomas Taggart, Herman Wenzel, Daniel Corcoran, John Christine, Ferdinand Becker and Charles Bennett.

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Power Campaign in Manchester.

An effective advertising campaign calling attention to the advantages of motor drive in factories, is being carried on by the Manchester Traction, Light & Power Company, Manchester, N. H., with excellent results. This New Hampshire city is well-known as a great manufacturing center, and while some of the larger cotton mills have motorized equipment driven from their own generating plants, the central station is doing an increasing power business, not only in the city but also in the surrounding farming country, where motor-driven farm apparatus is being introduced by progressive agriculturists.

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Safety First in Philadelphia.

The Philadelphia Electric Company has appointed a committee to further the "Safety First" movement among its employees. The chairman of this committee is H. C. Lucas. Instructions and information will be issued by the committee from time to time and an effort made throughout the organization to minimize accidents.

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Report on Houston Rates.

The city of Houston, Tex., has had a report made by Lamar Lyndon and Henry E. Elrod regarding the adjustment of rates of the Houston Lighting & Power Company. The report recommends a reduction of about 40 per cent in the rates to small consumers and a graduated reduction of present rates to large consumers, together with a new rate schedule for power consumers.

In case these reductions are not accepted by the company, the mayor has threatened to start a movement for the establishment of a municipal plant, which it is estimated would cost in excess of $1,000,000.

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Booklet of Salt Lake City Company.

The Utah Power and Light Company, with headquarters at Salt Lake City, has just issued an attractive booklet giving information on its electric service in the state of Idaho, which outlines the company's policies and gives the rates which it has recently adopted and filed with the Public Utilities Commission in compliance with the requirements of the public utilities law.

The application of the rates to various classes of business is carefully explained and considerable valuable information to customers is given.

Central-Station Conditions in Des Moines.

Some interesting statistics have recently come to hand regarding the growth of central-station business at Des Moines, Iowa. In 1912 the output of the Des Moines Electric Company was as follows: steam generation, 11,539,669 kilowatt-hours; water-power generation, 326,995 kilowatt-hours. The output during 1913 has run monthly about 20 per cent in excess of 1912 so that the total output in 1913 was approximately 14,200,000 kilowatt-hours, that is, including both steam and water. The water-power output during 1913 was less than in 1912 owing to the dry weather.

The customers numbered December 31, 1911, 5,963; December 31, 1912, 7,214; December 31, 1913, 8,835. The present retail rates are as follows:

For Business Houses:

10 cents per kilowatt-hour for that number of kilowatt-hours used each month, which is equal to the number of 25-watt lamp equivalents connected, and 5 cents per kilowatt-hour for all additional.

For Residences:

12 cents per kilowatt-hour for the number of kilowatt-hours each month equal to one-third of the 25-watt lamp equivalents connected, and 6 cents per kilowatt-hour for all additional.

Stated otherwise, this rate is about as follows:

For Business Houses:

10 cents per kilowatt-hour for one and one-half hours' use of the total connected load and 5 cents for all additional used.

For Residences:

12 cents per kilowatt-hour for one and one-half hours' use per kilowatt-hour of one-third of the connected load and 6 cents per kilowatt-hour for all additional used.

The last reduction was in the retail business rate, and was made July 1, 1913, and amounted to 16.66 per cent, the rate having been before then 12 cents and 6 cents per kilowatt-hour, and since 10 cents and 5 cents per kilowatt hour, the turning point being the same for one rate as another. This was a voluntary reduction. Quite as important a reduction was made in 1910, which was also voluntary.

The present capacity of the power house as installed is a rated capacity of 8,575 kilowatts in steam driven generators. The total peak load on the station in the fall of 1913 was 5,500 kilowatts.

The Illinois Traction Company owns and operates in the state of Iowa properties in the towns of Valley Junction, Colfax, Prairie City, Montezuma, New Sharon and Oskaloosa, all of which are managed from the Des Moines office. At present the company only supplies Valley Junction with current from the Des Moines station.

W. H. Thomson has been general manager of the properties since January, 1912. He was president of the Iowa State Electrical Association last year, and is now a member of the Executive Committee.

The company is contemplating building this year a transmission line from Des Moines to Oskaloosa, from which it will supply power to all the towns owned in the state. This will require considerable addition to the power house.

The business section of Des Moines is one of the best lighted commercial districts in the United States. This distinction has been gained through the popularity and energetic work on the part of the Des Moines Electric Company.

Block Lighting Plants Not Looked On With Favor in Kentucky.

Efforts are being made to restrict the operations of small electric light and power plants in Louisville and other Kentucky cities, which operate only in the blocks in which they are located, and are able to put up stiff competition to central stations covering the entire city. House Bill 285, which is now in the hand of the Public Utilities Committee of the lower house of the Kentucky Legislature, prohibits the sale of a franchise for a limited area, covering the sale of gas, water or electricity.

Mayor Buschemeyer, of Louisville, is opposed to the operation of block plants, terming them "undemocratic." He said, among other things, "The company that must supply everybody is forced to a certain extent to meet the competition of the block plant in the block where it operates. The cost of this competition is borne by patrons who do not live in territory supplied by block plants, because it postpones indefinitely the time when, by economical regulation and operation, rates all over the city could be reduced. It takes from the many to enrich the few. That makes it a special privilege. No company or individual should be given a franchise to use the public streets and alleys unless the service is to be given over the entire city."

Reduced Rates at Riverside, Cal.

The purchase of electrical apparatus and the use of electricity in Riverside, Cal., has been stimulated by the material reduction in the price of energy by the municipal lighting plant. The rates soon to take effect are as follows: domestic lighting, first 150 kilowatt-hours per month, seven cents per kilowatt-hour; next 100 kilowatt-hours per month, six cents per kilowatt-hour; all additional per month, four cents per kilowatt-hour. Power rates, domestic, first 500 kilowatt-hours per month, three cents per kilowatt-hour; all additional per month, two cents per kilowatt-hour. Pumping rates, first 100 kilowatt-hours per month, 1.5 cents per kilowatt-hour; next 100 kilowatt-hours per month, 1.4 cents per kilowatt-hour; all additional per month, 1.25 cents per kilowatt-hour.

Results of Electric Cooking Tests.

Some tests on electric cooking were recently conducted in Kansas City, Kans., under actual working conditions. The lighting plant there distributed several appliances among its patrons and requested that accurate records be kept of their performance. Three, types of cookers were used: (1) Open heaters, such as frying pans, etc.; (2) ovens, containing heating plates, mostly inclosed, but not air tight; and (3) inclosed cookers, practically air tight.

The results obtained are shown in the table, the cost of energy being three cents per kilowatt-hour.

OPEN PLATES

Frying half pound steak	$0.007
Breakfast of four eggs, fried, four slices bacon and two quarts of water boiled	.02
Breakfast for four persons—twelve pieces fried mush, six medium potatoes fried, four eggs fried, one and a half quarts coffee and one gallon of water to boiling	.06
Dinner—Nine medium potatoes, three fourths pound veal steak, one can corn, one quart water for tea, one gallon boiling water	.07

SEMI-INCLOSED OVENS

Baked six large potatoes	$0.12
Four-pound roast and six large potatoes baked	.03

It is to be noted that the cost of cooking with this type is less than with the open plate.

AIR-TIGHT COOKERS

Four-pound roast, six large potatoes and one quart tea	$0.015
Boiled dinner—One small head cabbage, three pounds ham, boiling piece, twelve medium potatoes	.015
Two-pound steak, one quart spaghetti, twelve potatoes	.027
Three-pound pork roast, six large sweet potatoes, can corn, warmed one pound of fruit pudding	.027

New Advertising Co-operation at Byllesby Utility Properties.

More than 100 newspapers in cities where utility properties are operated by H. M. Byllesby & Company will advertise the Panama-California Exposition at San Diego in 1915 in connection with the regular advertising of the local utility companies. The Byllesby companies are constant users of newspaper advertising space and each of their advertisements for a period will carry the lines "San Diego Exposition—All 1915—San Diego, California" in a panel at the foot. This is the first time, so far as known, where a syndicate operating utilities in various parts of the country has utilized local advertising toward the success of a project in which one of the cities served is interested. The suggestion was made by H. H. Jones, manager of the San Diego Consolidated Gas and Electric Company. It will be carried out by 34 Byllesby operating companies serving a population of 1,500,000 without any special or additional advertising expenditure, and illustrates one of the many ways in which the syndicate operation of electric, gas and street railway companies may be made of indirect benefit to the communities served.

Electric Sign Data

Selecting an Electric Sign.

The "flexibility" of the electric sign as an advertising medium is almost without limit, but nevertheless care must be exercised in the selection of a sign, as the desired results will not be obtained if inappropriate designs are selected. The sketches which have been presented in this section for the past few weeks have been submitted in an endeavor to assist the prospect in selecting a design that would, in a measure, be fitting for the purpose at hand. Responsible manufacturers also are always willing to give the prospective customer the benefit of their information and experience, either directly or through the central-station company. The purchaser of an electric sign should always bear in mind that such advertising is unique in circulation in that everyone on the street must read it—day and night—and therefore considerable care must be exercised not only in the selection of the design and lettering but in the construction and erection. Substantial construction is, of course, a basic necessity. Better no sign at all than signs which appear flimsy or in which any danger lurks. Perhaps the greatest difficulty the conscientious sign salesman has to overcome is to persuade his customers that quality in construction is the basis of sign cost.

In a recent issue of *Signs of the Times* some valuable suggestions were made in regard to the points to consider in selecting a sign. It is stated that if it is the desire of the user of the sign that it serve also to illuminate the sidewalk and street, a raised letter will better serve the purpose.

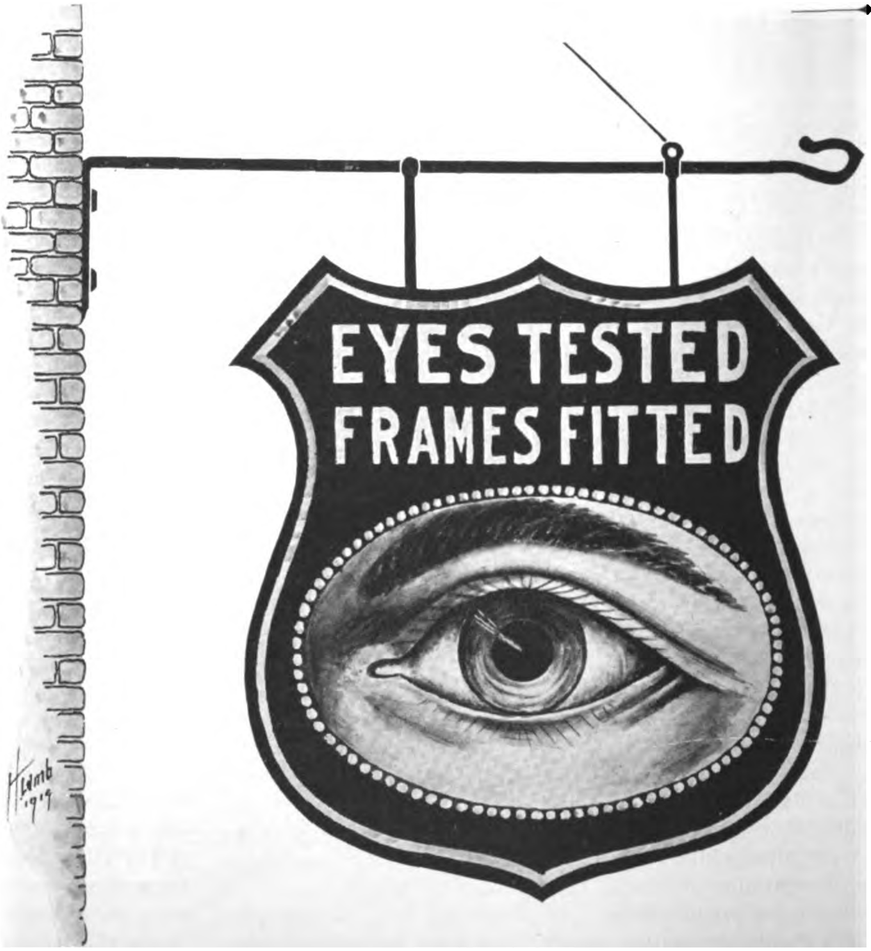
However, a raised letter cannot, as a rule, be read at as great a distance as can a grooved letter, nor can it be read at so great an angle unless the letters are made unusually wide and far apart.

A raised-letter sign is best where non-electric letters are also to be used. A few more lamps are necessary in the raised-letter sign generally, but this is not a large item.

If it is desired that the sign be read from a great distance, and if an exposed-bulb sign be desired, then the grooved-letter sign is most desirable. Also because of its more distinct outline, this letter can be read at an angle.

Of course, there are other signs besides the exposed-bulb signs. Manufacturers have produced some excellent results through prism signs, and some very beautiful effects are secured through this kind of a sign. The current consumption is necessarily lower where fewer lamps are used, and this is an advantage to the user of the sign, but not so great an advantage to the lighting company; however, it may be said to the credit of the lighting companies that the progressive ones promote both the exposed-bulb sign and the inclosed-bulb sign.

For roof signs the grooved-letter sign is generally more desirable in order that the sign can be read at a considerable distance.



Sign sketch submitted by the Greenwood Advertising Company, Knoxville, Tenn. This is a double-face sign admirably suited for opticians, etc.

Sign measures five feet wide by five feet high and contains 80 receptacles outlining the eye and the main border. The lettering is flat on a metal background. The eye is transparent. Any colors desired are provided.

Price of the sign complete is $100.

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Central-Station Co-operative Sign.

An evidence of the co-operation between wide-awake central-station companies and at least their large customers is to be seen in the electric sign now hanging on the Van Buren Street side of the Fort Dearborn Hotel, nearing completion in Chicago. This hotel will be thoroughly up-to-date, and has contracted for all its electrical supply from the Commonwealth Edison Company. That company is justly proud of the contract and to boost the new hotel has hung a large sign, one and a half stories high, proclaiming:

Fort Dearborn Hotel
All Light Power
Elevator Service
Furnished From
Edison System.

The sign is made from the standard interchangeable letters of the Federal Sign System (Electric).

Electrical Construction

WISCONSIN ELECTRICAL RULES.

Hearing by the Industrial Commission of Wisconsin on Proposed Electrical Code.

The Industrial Commission of Wisconsin held a hearing in the State Capitol Building, Madison, on March 13, in regard to the proposed electrical code for governing installations in that state. This proposed code was printed in full in the issue of March 7, together with additional suggestions for lighting and power companies and industrial companies for formulating their own rules. The hearing was concerned only with the orders of the Industrial Commission, which it is proposed to make mandatory.

The tentative rules had been drawn up by a committee made up of representatives of manufacturers, power companies, electrical contractors and the Milwaukee Federated Trades' Council. After calling the meeting to order, C. H. Crownhart, chairman of the Commission, explained the purpose of the hearing and of the proposed orders, and called upon P. A. Schroeder, a member of the committee, to preside at the hearing. There were about 30 present.

The orders[1] were read in succession by Charles W. Price, assistant to the Industrial Commission, and comments were made by the various men in attendance at the hearing. Those taking part in the discussion included E. J. Hutchins, of the Western Union Telegraph Company; C. R. Phenicie, of the Wisconsin Public Service Company, Green Bay; William Bennett, of the Chicago & Northwestern Railroad and vice-president of the Association of Railway Telegraph Superintendents; R. S. Hartley, of Superior; L. H. Lathrop, of the Menominee & Marinette Light and Traction Company; H. E. Bloomer, inspector for the Milwaukee Board of Fire Underwriters; E. H. Kifer, of the Madison Gas & Electric Company; H. O. Seymour, of the Wisconsin Telephone Company; C. M. Jansky, of the University of Wisconsin; W. L. Smith, of the Badger State Telephone Company and president of the State Telephone Association; J. N. Cadby and P. B. Turner, of the Wisconsin Railroad Commission; and M. G. Lloyd, of the ELECTRICAL REVIEW AND WESTERN ELECTRICAN. C. H. Crownhart and J. D. Beck, members of the Industrial Commission, were present and participated in the discussion, as did also Thomas E. Barnum, W. F. Gute, S. B. Way and C. W. Price, members of the committee which drew up the tentative orders.

It soon became evident that the interests of the telephone and telegraph industries had not been very fully considered by the committee, and it was proposed that one or more members be added to the committee so that the problems involved in these lines of work might be adequately considered. Mr. Crownhart stated that the Commission would be glad to make such an appointment on the committee if the men interested would agree upon suitable representatives. Matters involving telephone and telegraph lines will be taken up fully by the committee at its own meetings, and consequently these matters were not fully discussed at the hearing. Objections were noted, however, to the fixing of 300 volts as the line of separation between circuits which should be considered dangerous and those not so considered. This was especially urged by Mr. Bennett, since there are certain telegraph circuits which slightly exceed this value. He urged the classification of circuits according to the use to which they were to be put rather than according to voltage. This point was also urged by Mr. Hutchins and it was stated that a considerable burden would be put upon the telephone companies in conforming with the orders as formulated. The representatives of the telephone companies pointed out that many of the regulations governing outside wiring would place a large amount of existing construction under the ban and pointed out that it would be almost impossible to comply with the orders. Mr. Smith and Mr. Turner especially emphasized these points and the lack of any need for such requirements in sparsely settled rural districts where there are no electric light or power lines.

There was considerable discussion as to where the line should be drawn between voltages which are dangerous and those which are not. While some objections were made to the value of 300 volts set by the committee, no definite suggestion was made for any other value. It was suggested that Order 601 be modified to include the suggestion as a sign of danger of the zig-zag line with arrowhead as a conventional representation of the lightning stroke.

With respect to Order 602, which provides for grounding the frames of generators, motors and transformers rated at 300 volts or over, it was pointed out that the National Electrical Code recommends the insulation of such frames up to 550 volts. This order will consequently conflict with the rules of the insurance companies and perhaps cause an increase in insurance rates. The fact that it is difficult to provide perfect insulation between the winding and frames of such machines was considered by the committee an argument in favor of this rule, since otherwise a shock might easily be received from such frames. Mr. Bloomer suggested that the voltage limit in this rule be raised to 550 so that the customary 440-volt motors would not be affected by it.

In connection with Order 603 regarding switchboard construction, it was suggested that the definitions of the words "switchboard" and "isolated" should be modified so as to make the application of this rule reasonable. The last sentence in this order regarding single-throw switches will be modified so as to permit mounting for a horizontal swing as well as vertical swing.

Mr. Bloomer suggested that Order 604, referring to clearance back of switchboards, should be made to conform with the rule in the National Code, but as the underwriters frequently make exceptions to this rule the committee did not deem it desirable to make the same provisions mandatory. Mr. Hartley considered this stipulation for clearance unnecessary where the wiring is on the front of the board.

In Order 610, requiring grounding of the neutral, it was stated that the committee intended grounding this neutral in the building on the load side of the fuse. Most companies already have the neutral grounded outside, so this would insure a grounded neutral whether the fuse was in place or not.

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[1] These orders are given in full in the issue of March 7. In Order 616 the word "insulated" should read "uninsulated."

In connection with Order 617, requiring lightning arresters on all overhead circuits, there was some discussion as to whether this should be limited to circuits over 300 volts. Since a grounded neutral fills to some extent the function of a lightning arrester, it would be a hardship to require the latter upon low-voltage circuits. It was suggested that the provision for a copper ground wire be modified so as to permit an equivalent, as some companies prefer to use a galvanized-iron wire.

It was suggested that Order 618 be modified so as to require arc lamps to be placed at least 10 feet high instead of eight feet, as specified in the order; also that series arc-lighting circuits be permitted in car barns and certain other buildings, as well as electric generating stations; also that the limiting height be specified for arc lamps placed indoors in shops and factories.

There was considerable discussion with regard to Orders 619 and 627, fixing a limit to the length of span in outside wiring, but nothing definite was agreed upon. There is already a statute in Wisconsin requiring that at the crossing of railroad tracks spans shall not exceed 100 feet in length where the right of way permits.

Orders 620 and 621, referring to cross-arms, bracing, etc., will probably be modified to permit of customary practice on telephone lines. There should, however, be a definite precautionary rule applying to crossings between telephone lines and high-voltage lines. The question of cross-arm spacing will be further considered by the committee.

Mr. Turner suggested that Order 623, which refers to guying, be made applicable to new construction only, as otherwise it would require the rebuilding of many lines.

The wisdom of requiring insulation on high-voltage lines up to 5,000 volts, as specified in Order 626, was questioned, since it is well known that the weatherproof insulation usually used soon deteriorates so that it is not a protection against the line voltage. The expense, therefore, seems unwarranted and the apparent protection may be a source of real danger. On the other hand there is objection to the use of bare wire on account of contacts from swinging wires and as an additional hazard to wiremen, especially where green men are handling the circuits and are helped by the insulation to identify the different wires. Mr. Hartley objected very strongly to the use of bare wire on 2,200-volt circuits. He advocated strongly a greater clearance over roofs than that specified.

Mr. Cadby gave a summary of fatal accidents which had occurred during the past year, as compiled by the Railroad Commission. This showed more fatalities had occurred in the course of line work than from any other cause, viz., 9 out of a total of 30. Of these, seven resulted from a contact between telephone wires and power circuits.

In connection with Order 629 it was pointed out that there should be similar protection where telephone wires cross other circuits.

At the close of the hearing Mr. Hartley related a number of incidents showing how accidents had occurred due to the ignorance of wiremen and due to their being set at work under dangerous conditions. He thought responsibility should be placed definitely for seeing that wiremen are properly instructed in the work they are to do and the conditions under which they are operating, and also for seeing that such conditions are proper and safe.

It was announced that the committee would be glad to receive further suggestions in writing from anyone interested.

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Illinois Contractors Select Special Representative.

At the January convention of the Electrical Contractors' Association of the State of Illinois a proposal to appoint a special representative to devote all his time to the work of the Association and visit contractors in all parts of the state was discussed and favorably acted upon. As a result, E. J. Burns, of Rock Island, has been appointed to this position and is now engaged in a campaign among contractors of that state.

A Model Operating Room for a Moving-Picture Theater of Moderate Size.

The extraordinary popularity of moving-picture displays has in the past few years directed close attention to safeguarding such theaters and particularly the operating room, which is the chief source of the fire hazard in such establishments and therefore, also, of the resulting danger to life. Nearly all communities of even moderate size have special ordinances regulating the installation and equipment of moving-picture machines, and the National Board of Fire Underwriters has drawn up regulations for the installation, operation and maintenance of such machines which are intended to reduce the hazards to a minimum.

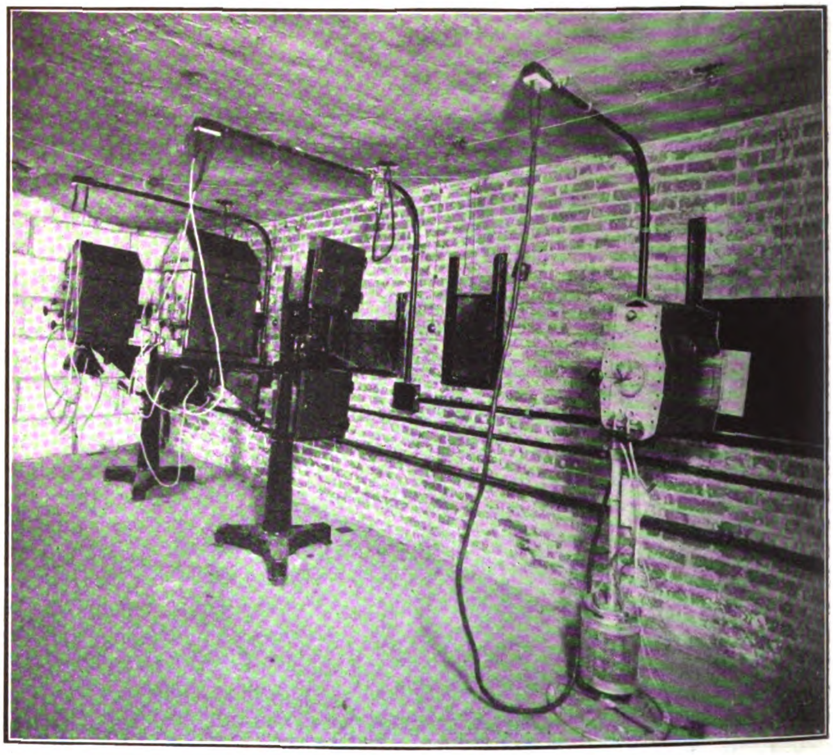

Fig. 1.—Operating Room of Moving-Picture Theater.

In a theater of this kind of considerable size the outlay for the equipment can, of course, be more generous than in a theater erected in a very small town or in the outlying district of a city. Nevertheless, even in the latter case, equipment of high character and a thoroughly satisfactory installation can be made at moderate cost, as is shown by the illustrations herewith.

These illustrations are from photograghs taken at the Windsor Park Theater, Chicago. This establishment is of moderate size and is located at Seventy-fifth Street and Railroad Avenue, which is in one of the outlying districts in the southeastern portion of the city. Although the theater is of medium size and has all its seats on the ground floor, it is a new establishment and thoroughly up to date.

The operating room, shown in Fig. 1, is the center one of a series of three rooms located directly above the foyer. To the north of it, that is to the left of the room as shown in this illustration, is a separate room for a powerful motor-driven ventilating fan. To the right of the operating room is a separate room, shown in Fig. 2. This contains the rotary converter for supplying direct current from the three-phase, 60-cycle, 220-volt alternating-current distributing system of the Commonwealth Edison Company; it also contains a control board for this machine and a switch and cutout cabinet.

The brick wall shown in Fig. 1 is the rear wall of the theater auditorium. The brick wall on the opposite side of the room has a convenient tool rack. The floor in the operating room is of concrete, the partitions between this room and the two adjoining rooms referred to are of tile, and the entire surroundings are made as fireproof as possible. The display equipment consists of two hand-driven Simplex motion-picture machines shown at the left in the illustration: there is also a spotlight shown at the right. The openings in the brick wall between the operating room and the auditorium are closed by gravity-operated steel sliding doors. These and the damper in the ventilating flue running up from the ceiling of the operating room can be held open by means of light fishline, in the manner prescribed, so that in case a fire breaks out in one of the film machines these cords will be destroyed and the openings immediately close. The bottom one of the three conduits shown along the brick wall carries the 220-volt supply circuit and runs to the steel cabinet shown at the right in Fig. 2. The upper conduit supplies the spotlight and also the first picture machine. The middle conduit supplies the further picture machine. The conduits are run to a point overhead each of the projecting arc lamps so as to make the flexible connection between the conduit outlet and its corresponding lamp as short as possible.

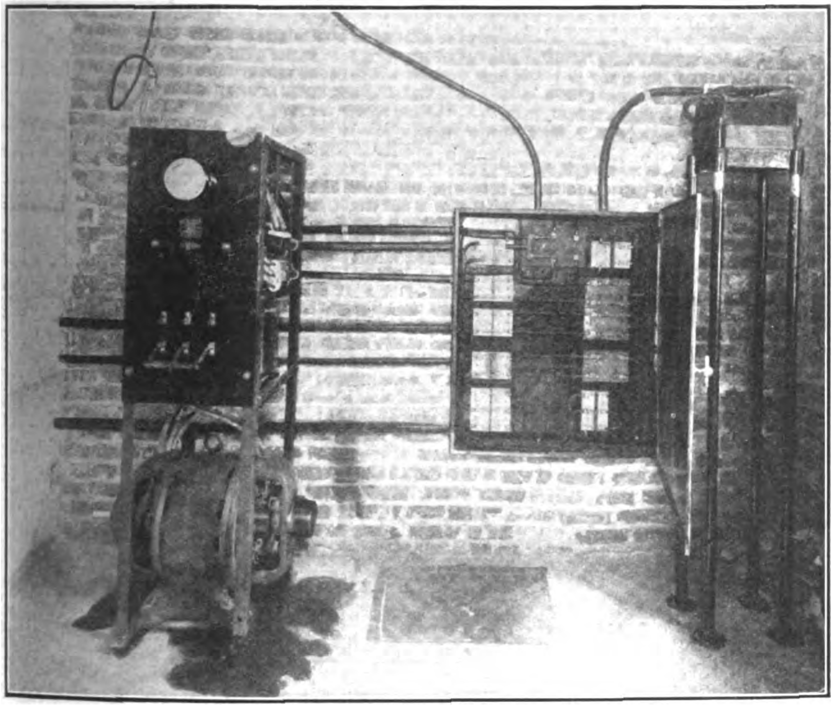

Fig. 2.—Rotary Converter and Control Boards.

It had been intended originally to use a mercury-arc rectifier for obtaining direct current for the projecting lamps from the alternating-current supply; some of the equipment in the room shown in Fig. 2 was secured for that purpose. It was finally decided, however, to install a Martin five-kilowatt rotary converter instead of a mercury-arc rectifier. This machine develops direct current at 70 volts and runs at a speed of 1,800 revolutions per minute; it was supplied by the Northwestern Electrical Company, Chicago. The control panel directly above the machine contains a three-pole switch; it also contains a direct-current voltmeter. Mounted back of the panel is a transformer for reducing the 220-volt alternating current to an appropriate voltage so as to give 70 volts direct current after passing through the rotary. Above this are two grid resistances; one for each of the moving-picture machines.

In the steel cabinet shown in Fig. 2 there is a double-pole, double-throw switch at the top, by means of which the circuit for the projecting lamps can be thrown from the direct current supplied from the rotary to the alternating-current supply, the current in the latter case passing through the Compensarc transformer mounted on pipe standards and shown in the extreme right of Fig. 2; this reduces the alternating current to a suitable voltage for the lamps and makes it possible to run the lamps if something should happen to the rotary converter and thus make direct current unavailable. There is a switch for each lamp and also a main supply switch at the bottom. The switches ordinarily would be fused switches but there had already been obtained an equipment suitable for a mercury-arc rectifier, as mentioned above. Consequently the fuses for these switches were mounted on separate gear blocks without wasting any of the material already at hand. A circuit is also run from the alternating-current supply through a conduit that is shown curved above the cabinet and which leads to the ventilating motor.

The electrical installation was made by the contracting firm of J. L. Burgard, 753 West Fifty-fourth Place, Chicago.

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Underground-Construction Department Organized by Freeman-Sweet Company.

If any evidence were needed of the extent of business and the enterprise of the Freeman-Sweet Company, Chicago, Ill., it is available in the announcement just made that a department for underground construction has been organized by the company. A number of jobs of this character have recently been executed by the company with much satisfaction to all concerned, and it was therefore decided to undertake such work as a regular branch of the business. This department will be in position to install any kind of underground and electrical lines, whether for transmission, light and power, telephone, fire alarm, ornamental street lighting or other purposes. Practically any kind of conduit construction will be undertaken and armored cable will also be installed. An interesting feature of the work will be the supply of competent cable splicers.

The Freeman-Sweet Company is fortunate in getting a most capable head for the new department in George L. Chamberlain. Originally hailing from New York City, Mr. Chamberlain early became associated with the Standard Underground Cable Company, of Pittsburgh, and for 18 years he retained his connection with that organization. He was engaged in underground construction work of all kinds and in all parts of the country. Starting in as cable splicer, he later became foreman and then superintendent of installation, his work being on some of the largest electric systems of the country. In 1911 he became superintendent of the underground cable and conduit department of the Chicago Railways Company and in the last few years he was engaged in installing for that company some 350 miles of underground cable in connection with the extensive rehabilitation of its street-railway lines.

LETTER TO THE EDITOR.

Static Charge on Belts.

To the Editor:

In the issue of February 28, Mr. N. G. Near states that slip on the pulleys and internal friction of the belt are the usual causes of static and to eliminate this slip and internal friction will also eliminate the static. It will be found that static is strongest at the middle of the belt and that where there is no slippage there is static. A belt moving rapidly through the air will cause static. It has also been found on systems where high pressure is used, that under certain circumstances parts of the system may be subjected to pressures very much higher than the normal. These effects, for want of a better name, are spoken of as being due to "static." They may be caused by any sudden change in the electromotive force of the system, as, for example, when a dead circuit is suddenly connected to live busbars, when a transformer is switched on to a circuit, when a circuit is suddenly cut off from the busbars, etc. These effects are not due so much to the static charges themselves, but to the fact that when a device is switched on to a circuit that is alive; a current wave at once tends to pass through the device and if this wave meets with opposition, pressures much higher than the ordinary pressure of the system may be set up; this is somewhat analogous to the case where a current of water is flowing rapidly through a pipe, there will be a certain pressure on the walls of the pipe, due to the head of the water, and this pressure will be practically constant. If, however, the flow of water be stopped by suddenly closing a valve in the pipe, the pressure will for an instant rise to a very high amount, producing the well known water-hammer effect. These sudden rises in pressure on high-tension circuits may result in puncturing the insulation of the transformer coils, armature coils, cable insulation, or other parts exposed to the high pressure. Take a case where a transformer is suddenly connected to a source of high voltage. The windings tend to become charged instantly, but owing to the self-induction of the coil, the current wave that tends to enter is choked back and a pressure may be set up between the various layers of winding that is very much higher than the normal.

The question of static is a serious one, especially on high-tension lines, and is such that it should be given consideration on almost all lines.

William T. Estlick.

Seymour, Conn., March 9, 1914.

[The surges on high-tension lines, which are transient, should not be confused with the charges which accumulate, on insulators such as belts. The latter are believed to originate through the repeated contacts of different substances or through electrostatic induction, as in the common electrostatic machines.—Editor.]

Chicago Contractors Institute Inspection.

The Faraday Electrical Association, of Chicago, has instituted a plan which should have the effect of improving the general standard of electrical work done in that city, as well as being an aid to the members in determining the quality of the work which their wiremen install. The association has appointed three inspectors of mechanical work and is paying them for their time. These inspectors work under the auspices of the local union of electrical workers and make mechanical inspection of all installations of electrical work for which permits have been issued by the Department of Electrical Inspection. This consequently covers all work done in that city. This inspection covers mechanical details which do not come within the scope of the city's electrical inspectors.

The reports of the inspectors are turned in at the office of the Faraday Association and at the end of the month the results of these inspections are compiled and the various contractors are informed of the defects which have been observed in the work of their wiremen. This will give them an opportunity of knowing any deficiencies which may crop up so regularly as to indicate the need of special instructions to the wiremen, and will enable them to improve the general quality of the work done.

In the past few years under the severe competition to which different branches of the construction field have been subject, it has been necessary to specialize in our workmen to such an extent that their efforts have become mechanical. As soon as a trade or an occupation gets to the point where it is unnecessary to use the brain very much, the efficiency in the trade deteriorates to a point of day labor. This is the case in the particular line of work that the members of this association are engaged in, and it is for this reason that they have taken up the matter of mechanical inspection with the idea of rectifying this condition.

Westchester Lighting Company Consults Contractors.

The electrical contractors of Westchester County, New York, met with the officials of the Westchester Lighting Company on March 6 at Mount Vernon to discuss the proposed use of meter service boxes and to promote closer relations between the contractors and the company. There were about 75 men present.

W. L. Seacord, of the new-business department of the Westchester Lighting Company, called the meeting to order, and F. J. Murman, superintendent of the meter department, explained and demonstrated the service boxes.

The subject was discussed by Stuart Wilder; Edward C. Ruth; C. A. Kirchoff; Alfred M. Hitchcock; Mr. Schmidt, of Schmidt & Carl; Mr. Austin, of the Westchester Electrical Supply Company; Mr. Youmans, of Yonkers; and Messrs. Levene and Cooper, of New Rochelle.

G. E. Brauen, of the Suburban Fire Insurance Exchange, discussed the subject from the point of view of the underwriters. A collation was served at the close of the meeting.

Among the Contractors.

The electrical department of the Long Beach Improvement Company, of which E. P. Magoon is manager, has just established a store at 236 Pine Avenue, Long Beach, Cal., for the wholesaling and retailing of electrical supplies and fixtures, of which a complete line is carried. Mr. Magoon has been engaged in the electrical business for a number of years, and enjoys a large acquaintance among the trade.

The Seiffert Electric Company has opened a store in Henderson, Ky., in charge of O. P. Seits, and will handle electric appliances, heating apparatus and motors, and operate a shop for electric repair work.

Albert S. Reed, manager of new business for the Rutland Railway, Light & Power Company, of Rutland, Vt., and Fay C. Warren, of Middlebury, Vt., have formed a partnership under the name, Warren-Reed Electric Company. The new firm will do general electric wiring, making a specialty of conduit work and will handle electric supplies, fixtures and appliances of all kinds.

The Beaver Electrical Construction Company, of Chicago, Ill., will install three 120-horsepower motors in the Soo Terminal building of Chicago, Ill.

The contract for installing 1,000 lamps and a 14 horsepower motor for the Gradler Photograph Company, of Chicago, Ill., has been awarded to the Freeman-Sweet Company of that city.

The Peerless Electric Company, of Chicago, Ill., will install two 265-horsepower motors and a number of lamps in the plant of the Ravenswood Ice Company at 4716 Ravenswood Avenue, Chicago, Ill.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President, 13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Harman, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison
Frank R. Daniel
James H. Fenton
F. G. Hartwell
J. E. Latta
James B. McCarthy
Thomas D. McColl
C. W. Mitchell
A. A. Moffitt
R. P. Strong

"LET THE CODE DECIDE."

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

"LET THE CODE DECIDE."

By Thomas Henry Day.

It is a frequent observation of today that one man's experience agrees closely with that of another engaged in a similar line of work. The writer has had considerable experience with the officers of several large corporations, operating in a number of communities, and is continually noticing that each of these corporations, while distinct and separate in corporate existence and operations, is in various ways benefiting by the experiences of the others. One agency through which this advantage of combined experience has been gained, is the interchange of ideas which are the outcome of thought and study on the part of well developed efficiency departments which these corporations have built up as a part of their systems; these departments having much to do with the success of the corporations, through the shaping of a definite policy and the establishing of a reasonable and intelligent standardization of methods.

May I digress for a moment to illustrate by a somewhat humorous incident the value of careful methods established in the clerical department of one of the companies I visit. It may help to present my view-point even though the point be somewhat obscurred.

I recently visited M. H. Mahoney, superintendent of the Franklin Electric Light Company, Turners Falls, Mass., where the following incident occurred.

It seems Mr. Mahoney's installation gang had completed a small job for a citizen of foreign extraction. The bill was sent, whereupon the customer appeared at the office with most praiseworthy promptness apparently, but as it turned out very much dissatisfied and displeased. He claimed that he had been charged for an item of work which he did not want done, had not ordered done and had no intention of paying for. Mr. Mahoney recalling his method of keeping accounts, as soon as he could get in a word, told his caller that the matter would certainly be adjusted, but that he felt sure that the bill was a true statement of the work performed and the materials used. This assurance did not appeal to the irate citizen who replied, "Your men did not cut a branch from my tree?"

"No," replied Mr. Mahoney, "my men did not cut any branches from your tree and we have not charged you for any such thing." "You have," exclaimed the excited man. "Well, let us see," calmly suggested Mr. Mahoney. Whereupon the bill (of which the following is an abstract with the prices omitted) was produced:

1 service cut-out ....
1 service switch ....
500 feet No. 14 rubber-covered wire.......
50 porcelain cleats ....
100 two-inch screws ....
1 branch cut-off ....

We will not go further with the bill as the customer pointed to the last item, and shouted, "See there! One branch cut off!" An explanation followed, the bill was paid and a satisfied customer secured. The point is there, as you will see on thinking it over.

Permit me now to approach the subject more directly. The person who accepts a standard and then consistently applies it, will find his operations in business to move much easier; and similarly an inspector who accepts the Code in its entirety will secure for himself a strong support in his attempts to obtain the carrying out of his requirements, should such be objected to.

For the judgments of an individual are not as good as the judgments of a number of trained minds, nor as a general thing, should the experience of one community be accepted when flying in the face of the combined experience of a commonwealth.

There have been, in a number of instances, departures from the requirements and suggestions of the Code, through the enactment of local ordinances and by-laws. It seems to me that if any municipality or department is passing through an experience for which the Code has made no provision, it would be a wise and an expedient thing to bring this new and perhaps unusual experience to the attention of the conference at which changes in the code are considered, to the end that the combined power of a number of minds may be applied toward correcting whatever unusual conditions the community has found to exist.

In my humble judgment this would be the wisest course to pursue, as I feel that it would surely bring about more good to us all because of the intelligent discussion by a large number of men, in addition to making the local department more effective.

In the preceding paragraph I made an effort to discourage local legislation on matters electrical, and to urge the acceptance of our slogan, "Let The Code Decide." Observe these points, one city of the country at one time differed from the Code in 115 points;

today it differs in but 18. In some instances the requirements of the Code have been changed to correspond with the city requirements, its requirements in these points being the needs of other cities. In other instances the requirements of the city have been changed to meet the experience suggested by the Code.

If the Code does not meet the needs of the time and place, if so reported to the proper source, together with all the facts which may be available, the Code will probably supply the need should such be shown to exist. In a word the Code represents the experience gained up to the time it was issued.

In a number of cities local ordinances have been enacted and have been found after trial to be faulty. Thus an ordinance was handed to me recently and my opinion as to its efficacy was requested. One section of that ordinance follows:

> "All electrical wiring, electrical work and electrical apparatus in the basement or cellar of any building in both the first and second fire districts shall be completely incased in a flexible steel cable."

As to its mandatory limitations I leave my readers to draw their own conclusions, but would it not have been better in this case to have gone a little further afield and have sought advice before *enacting* that ordinance? Some such words as "and the standard of all electrical installations shall be that set up by the National Electrical Code," would seem sufficient when the framing of new ordinances becomes necessary. The inspection department of the city would then have a very wide field of experience behind it and would thus start out, strong in position and in the confidence of those citizens of the municipality who really know anything at all of electrical matters. Even in the consideration of ordinances and local legislative enactments, "Let The Code Decide."

There is one other point I would like to bring to the attention of our members and the electrical fraternity at large. From its inception, the National Association of Electrical Inspectors has accepted the Code as it has been promulgated. For a number of years we have been actively represented at all conferences at which proposed changes in the Code were considered, by an accredited and recognized representative in the person of our delegate, former president James E. Cole. At these conferences and committee meetings, when our association has asked him to present our views, he has done so, even when he may have argued personally on the opposite side of the question in our own meeting, exercising proper care to state that he was presenting the formally expressed view of the association as its delegate.

Thus through him we have enjoyed the privilege of having a part in the making of the Code, and hence we must accept the result of the work of the body in which we have been represented with such efficiency by our delegate, if we would be consistent and deal squarely with him and with the committee which allows us a voice in its deliberations.

At no time has this association made an effort to influence legislation concerning the Code, prior to the time of engaging in such legislation.

We have, of course, considered privately among ourselves numerous suggested changes a number of which we have presented to the Secretary of the Electrical Committee. Then when the bulletin of suggested changes has been received from him, we have, and not before, considered and discussed the entire bulletin, and thus prepared ourselves to take a position one way or the other on each question and if deemed wise to offer further suggestions when the proper time has come. I feel that it would be wrong, that it would be against the best interest of all concerned and very much against the purposes of our association to lead it or to allow it to be led, into an active and aggressive effort to influence matters which may be before a number of associations at a later date in any other way.

May I be permitted then finally to ask that all of us be consistent and judicious at this and at all times and until a change (no matter how much we may personally desire it) shall have been formally incorporated in the Code, both now and then,—"Let The Code Decide."

Secretary's Message.

President Day's article is not only timely but important, and expresses what should be the definite aim of all inspectors. It is interesting to remember that President Day is conversant with both municipal and insurance inspection methods and purposes. I think it should hardly be necessary in view of the remarks which have from time to time emanated from my pen in these columns, to say that I am in most hearty accord with the text of our president's remarks, "Let The Code Decide." Perhaps, however, as a municipal inspector I interpret it a wee bit differently. I think one, and a fairly obvious meaning, is that *no* inspector should ever allow his sense of authority to run away with him. Once in a while we find a tendency to require a thing to be done and not to admit the possibility of another interpretation of the Code. Still, in spite of the phenomenal arguments which we all meet so frequently, when the attempt is made to explain why an apparently obvious requirement has been disregarded, there are numerous cases where it is possible to find inspector and wireman looking at two apparently entirely different things. These upon calm reflection will turn out often to be only opposite sides of the same shield, and in such cases a little joint examination of the Code will often clear the whole matter up. If it does not, the question should be referred to the department chief.

We are all apt to make mistakes sometime, and an inspector will gain far more by a sweet reasonableness in trying to find out the other fellow's point of view, and being willing to admit the possibility of an error of ruling on his part than by standing pat on a decision perhaps open to doubt.

Now, however, when we come to consider the question, "What is the Code?", I think the municipal authorities are possibly not altogether wrong in desiring a little flexibility, and certainly should be very sorry to see such a clause as is suggested in Mr. Day's article in our own municipal law. "The standard of electrical construction and installation in this municipality shall be the rules and requirements of the National Electrical Code, except in so far as they may be modified by the ———, after due notice of the intended change and public hearing thereon, if such be requested," is better, for it gives legally the opportunity for change, if necessary, without a new by-law.

The National Electrical Code is intended to apply anywhere in the country and to large urban as well as small rural communities; obviously, therefore, it must strike a fair average of what can reasonably be required in the way of safeguards. It would be unreasonable to expect that it could completely meet all requirements of a city of the first class, and not at the same time be burdensome to the village town. We could not expect it to forbid absolutely, knob and tube work nor wooden moulding, though that may well be precisely the thing which should be done in a large city.

Take the case of the city mentioned and it will be found that many of the 15 variations are of a type which either find a logical reason as above, or else relate to points wherein we touch clearly upon a neutral ground where the electrical questions meet and interlock with the clear interests of other departments, or where pole locations, wire heights, underground work, etc., must be adjusted to the particular case.

To illustrate, think of a bath room.

Say A is at the head of the department. Suppose A knows that even a low voltage alternating-current circuit may give a person, C, a serious shock through damp hands or feet, and, that C has certain heart conditions, even serious ones. If A says knowing this, "I deliberately allow fittings to be so located that while touching any of the toilet arrangements a person can come in contact with a wire supposedly innocent, and if a ground exists, able to cause him personal harm," then A certainly is liable to C. So is the municipality whose agent A is, since C proceeds to use the installed apparatus in the innocent belief that A has exercised his authority to protect him from danger to the best of his knowledge and the state of the art which legally A is supposed to know.

Accordingly A adds a requirement that in bathrooms and other rooms of the house where similar risks may be run, that keyless sockets or receptacles must be used, located out of reach of grounded fittings; except in special cases where permission is given to do otherwise for clearly reasonable causes, and invariably controlled by a double pole wall switch.

Again, B finds by experiments extending over considerable time that in his municipality, a large part of which lies along the bank of a slowly flowing stream which flows partly through meadows and flat bottom lands, that at certain times of the year local meterological causes produce fogs from the stream. These fogs he knows to be laden with somewhat chemically active emanations, which, without question, do attack joints in the wires and cause a slow progressive deterioration since these fogs occur concomitantly with very hot muggy days and damp chilly nights.

Accordingly, within certain areas B requires additional protection of joints, by an insulating paint carried back a certain distance along the wire.

I certainly do not think we should carry the American obsession for uniformity,—that same obsession which leads so many manufacturers to the "that's our standard design, take it or leave it" position, which coupled with an easy going, avoid bother temperament on the customer's part, is responsible for the painful disappearance of many a British Thermal Unit between furnace and switchboard, speaking only of one case. No two cases are precisely alike and though fortunately a very large majority are nearly enough so to fall into the same category, we should not, I feel, carry standardization so far that we run into a difficulty of overstandardization which is as bad and worse than none at all.

Up to recently as we know, the National Code has been essentially and definitely a fire code for obvious, entirely proper, and logically unquestionable reasons. Yet I feel that the builders of the Code were not unmindful of the other side and went as far as they could to protect against personal harm and would gladly have gone further could they have defended their position as fire insurance organizations, if an ingenious legal adviser had chosen to attack it.

This inevitably compelled municipal departments to modify the Code in some ways, which of course was recognized by intelligent officials as a more or less regrettable necessity.

Now we have a changed state of affairs and good reason to believe that before long we shall see the life and health risks formally given cognizance in the Code. Then one great argument for deviations therefrom will have vanished and any ordinary municipality will have to be extremely sure of its ground in enacting any such into law, if it wishes to avoid the appearance of merely wishing to show that it is "a free self-governing American community 'by heck'!" which does not propose to have any "fellers from such and such a place telling us how to run our town."

Seriously then, the time has come when it is entirely proper to expect that all over the country the National Electrical Code will form the basis of and supply the details for every Code which may in any way be made a part of the municipal law. It should be accepted in its entirety in the vast majority of cases, in others not a change should be made without the most serious and thoughtful consideration from all points of view. All interests should be consulted and if it be apparent to the majority that the modification is really of such reasonable degree of importance as to justify the taking of such a serious step, the modification will be justifiable in most cases.

Thus if we take of the Code of New York City, we find it has been recommended for adoption by an advisory board of six engineers, three representing the City and the other three being, F. J. T. Stewart, superintendent of the survey bureau, and J. C Forsyth, chief electrical inspector, of the New York Board of Fire Underwriters and George E. Bruen, superintendent of the electrical department of the Suburban Fire Insurance Exchange.

Certainly when a municipality can show that any changes it makes in the Code have passed through the hands of three men such as these, it may feel justified in its action and the rest of us will have confidence in the wsdom of the changes which were made for clearly local reasons.

Neither do I feel that any cavil would arise in any other case should a municipality present an equivalent in the way of expert authority for its action, *but in the absence of something like this, a municipality is extremely unwise, injudicious and open to just criticism if it does not simply accept the Code as it stands.*

Finally, once the Code is adopted every official working under it should be loyal to it, enforce its requirements uniformly, equitably, and to the best of his ability. If he sees points wherein he thinks it might be improved, it is his duty to present them to his superiors with his arguments and then let his suggestions pass through the routine course. But *publicly,* outside the office, it is his business to enforce the Code as it is given into his hands. It is unwise, a weakening of authority (for which we have none too much respect in this country), and altogether improper for him even to hint that Section X is in his opinion rather nonsensical, or that really it is his idea that fitting Y, even though not on the approved list, is just as good, possibly better, than fitting A which is found on it. It hardly seems as though this would occur, but it does as I personally know and it is very regrettable.

But I am afraid I have already said too much and only wish to add that these are merely my personal ideas, and I am not at all afraid to change them if necessary and to explain why. Any member of the association is perfectly at liberty to get out his hatchet. If he will write out his criticism and send it I shall see that the Secretary prints it. "Let The Code Decide."

Control for Three-Phase Motor.

Question 257. A branch circuit leads from a 220-volt three-phase service to a one-eighth horsepower, 220-volt three-phase motor, one wire leads straight through, the other two are broken by two double-pole switches placed in parallel so as to control from two points. Is this allowable?

Answer 1 (U). Yes, if switches are in sight of motor.

Answer 2 (W). There is no rule prohibiting.

Answer 3 (A). Nothing in the Code touches it specifically. I should like to see all three wires interrupted entirely killing the motor when not in use.

Answer 4 (H). I should say it was allowable.

Answer 5 (P). Yes. Since under Rule 8*c* single-pole control is allowed on motors of one-quarter horsepower or less, I do not see why the Code should be interpreted to require *all* the leads to a motor of this type and size to be broken.

Answer 6 (O). Yes, rule 8*c*. Of course, you could not use a single pole switch on a three-phase motor, but a double pole would violate neither the spirit nor the letter of the requirements. The use of two as suggested is unusual, but does not seem objectionable nor in violation of the Code.

Answer 7 (E). I do not know that the point raised is treated in the Code. Personally, however, I would prefer that all three phases passed through the switches.

Answer 8 (Q). This would be permissible under rule 8*c*, last paragraph.

Answer 9 (T). If a motor of the size and type specified is on the market, rule 8*c* will permit these switches.

Answer 10 (J). Rule 8*c* permits single pole switching for small motors, of the voltage given. I should consider the given case in the same light and approve the use of the double-pole switch. I see no objection to the use ot two in parallel provided each is in sight of the motor or permission has been secured to place them elsewhere.

Answer 11 (D .) The arrangement suggested is all right provided the third line is grounded, otherwise should use a three-pole switch.

Answer 12 (S). Yes, I think that this would come under rule 8*c*.

Answer 13 (B). As motor is less than one-quarter horsepower it is not necessary that controlling switch should open all wires and method suggested, considering capacity of motor, would be permissible.

Answer 14 (N). The only rule which touches this is rule 8*c* by analogy. The wiring is entirely proper and the only danger I can see is the possibility of one lead to the motor being alive if transformer insulation fails. This always leads me to give *advice* to open all three wires on three-phase motors, as these are mostly delta connected as is also the distributing circuit, and you cannot get a neutral point to ground without special devices.

Grounding Low-Potential Circuits.

Question 258. In a three-phase system, should the ground wire be of the same size as the line wires, when these are smaller than No. 6 B. & S. gauge?

Answer 1 (U). In alternating-current circuits ground wire never smaller than No. 6.

Answer 2 (W). Rule 15*d* ground wire never less than No. 6. This is clear for all alternating-current circuits.

Answer 3 (A). No. Rule 15*d* answers this question fully.

Answer 4 (H). No. Rule 15*d* provides ground wire must never be less than No. 6.

Answer 5 (P). Rule 15*d* requires ground wire in alternating-current systems must never be less than No. 6. I do not see why this question should be asked.

Answer 6 (O). Rule 15*d* provides that the ground wire on alternating-current systems shall never be less than No. 6 B. & S. gauge.

Answer 7 (E). The last sentence of rule 15*d*, first paragraph, is not changed in meaning by the language of the second paragraph of same section. If the line wires are smaller than No. 6, the ground wire must be No. 6. If they are larger than No. 6, the ground wire must have capacity equal to any one of them.

Answer 8 (Q). A ground wire having a carrying capacity equal to circuit would comply with the rule.

Answer 9 (T). No. Rule 15*d* places the smallest allowable as No. 6.

Answer 10 (J). The ground wire must not be smaller than No. 6. This general requirement is not annulled by the paragraph which follows, which is evidently meant to apply to cases where the mains are larger than No. 6.

Answer 11 (D). Ground wire is to equal in carrying capacity the main to which it is connected.

Answer 12 (S). Rule 15*d*. Ground wire must never be less than No. 6 B. & S. gauge.

Answer 13 (B). The ground wire must never be less than No. 6, no matter what the size of the mains may be.

Answer 14 (N). It must be at least as large as No. 6 B. & S. gauge. The wording of the next paragraph in rule 15*d* refers to circuits larger in size than No. 6. It is also, I have always thought, intended to cover the two cases of lines of equal power, either delta or star fed, the line currents differing in these cases.

Chicago Has Permanent Building Exhibit.

The entire second floor of the Insurance Exchange Building, of Chicago, Ill., is being devoted to a permanent and co-operative display and market of building materials, supplies and fixtures. The object of this exhibit is to interest and acquaint architects, contractors, builders, and subcontractors with the best of materials, supplies and devices known to the world. Efforts will be made to reach and interest in this exhibit all persons obtaining building permits in Chicago and in the principal cities of the Middle West. In this way the exhibit hopes to be of service to both the manufacturer and purchaser.

Almost a hundred companies have already taken space in this exhibit. Among these are several electrical firms exhibiting washing machines, vacuum cleaners, etc. By far the most complete and interesting of all exhibits is that of the Commonwealth Edison Company, which includes not only an exhibit of wires, wiring devices, and heating and cooking devices, but also a miniature house fully wired and equipped with modern lighting units, electric washers, vacuum cleaners and heating and cooking devices. The Burdette-Rowntree Manufacturing Company has an interesting demonstration of electric dumb waiters and a pneumatic elevator-door-closing device which automatically prevents the movement of an electric elevator until the doors are fully shut. Another interesting exhibit is that of Thomas & Smith, Incorporated, which shows the application of electric motors to sewage ejectors and other pumps.

Wilkes-Barre Contractors Win Victory in New Code.

The City of Wilkes-Barre, Pa., under the commission form of government, has adopted a new building code. A special committee of architects, builders and engineers, including a representative of the Wilkes-Barre Electrical Contractors' Association, was in conference on this matter for over a year.

This code, which is now a law, forbids the use of knob-and-tube work in any section of the city, requires metal outlet boxes and metal receptacles for wall switches, main switches, cutouts, panelboards, etc. The code also requires the annual registration of all firms, corporations and individuals engaging in the business of electrical wiring for light, heat and power.

Public Service Commissions

Conducted by William J. Norton

COMPETITION IN NEW JERSEY.

A recent decision handed down by the New Jersey Board of Public Utility Commissioners, approved an ordinance passed by the common council of Phillipsburg and thereby authorized a competing electric utility, the Phillipsburg Light, Heat and Power Company, to be established in the town of Phillipsburg, N. J., where the Eastern Pennsylvania Power Company had already established service. This is the only instance in which the Board has decided in favor of admitting competition and the decision may be criticized in the light of the Board's former rulings on the question of competition in the public utility field and also in the light of the well established precedents of other commissions.

THE NEW JERSEY LAW.

The application in the Phillipsburg case is one coming under the following provisions of the New Jersey public utilities law.

"No privilege or franchise hereafter granted to any public utility as herein defined, by any political sub-division of this State, shall be valid until approved by said board, such approval to be given when, after hearing, said board determines that such privilege or franchise is necessary and proper for the public convenience and properly conserves the public interests, and the board shall have power in so approving to impose such conditions as to construction, equipment, maintenance, service or operation as the public convenience and interests may reasonably require." (Sec. III of Chapter 195 of the Laws of 1911, paragraph 24.)

The Supreme Court of New Jersey has defined the Board's power under this statute upon an appeal of the Eastern Telephone and Telegraph Company from the Board's decision barring the company from furnishing competitive service under franchises granted by Cape May County and the Borough of Avalon.

The court has decided that the Board's power is not limited by statute to supervising the execution of the permission and consent granted by a municipality, but that the Board has a right to refuse to approve franchises granted by municipalities where it is deemed that the utility is not necessary for public convenience.

In this article Mr. Norton presents a comprehensive resume of the decisions which have been handed down by the public service commissions in the various states, relating to the matter of protecting established utilities against unnecessary competition. In the summary he indicates what apears to be a reasonable commentary upon the New Jersey Utility Commission's action in the Phillipsburg case.

POLICY OF THE COMMISSION.

In the Phillipsburg case the Board cites the following cases as showing the position of the Board in the matter of utility competition locally: Atlantic Highlands case, Vol. 1, 7; Consumers Gas Company of Millville, Vol. 1, 650; Eastern Telephone and Telegraph Case, Vol. 1, 733; and the decision of recent date in the matter of the petition of the New Jersey Power Company for authority to issue stock.

Atlantic Highlands Gas Case.

In the first mentioned case, the Board is asked to approve a franchise passed by Shrewsbury township granting the Atlantic Highlands Gas Company the right to furnish gas to residents within this township. The Consolidated Gas Company had been furnishing gas in this territory for a number of years and at the time of the application of the Atlantic Highlands Company was laying pipes and making other preparation for serving practically the same section of the township the applicant desired to enter. Under the circumstances in this case the Board decided against competition discussing the question as follows:

"In the case of ordinary industrial concerns competing or desiring to compete in serving the public, the traditional presumption is in favor of permitting such competition. That the consumer, under ordinary circumstances, has some considerable guarantee of fair prices and adequate service by diverting his patronage to an alternative seller, is incontestable. This presumption, however, commonly fails in the case of public utilities operating under franchises. Experience has gone a long way towards demonstrating that services afforded by public utilities tend eventually to be rendered under conditions of monopoly. It is true that for a time a public utility may compete with another supplying the same body of consumers with the same service. But experience demonstrates that such competition is likely to be short lived. The two competitors are influenced by the considerations of securing higher prices by the mutual concellation of their competition, and not infrequently by the possibility of reducing costs by a union of parts of their productive apparatus. Where actual fusion of the two erstwhile competing concerns does not result, a division of territory or joint agreements as to rates, prices or service not uncommonly operate to leave consumers at the mercy of a virtual monopoly. The low prices prove but temporary, and the transient gain is succeeded by a long period of loss. That public opinion has come to recognize the almost inevitable outcome of such temporary competition between public utilities is evidenced by much recent legislation. The creation of various boards and commissions with supervisory powers over public utilities, and often with eventual powers of rate-fixing, demonstrates that **the illusive doctrine of competition in this field is being superseded by an experimental regime of strictly regulated monopoly.**

"Two other influential considerations operate in the same general direction. Where competing companies, with franchises, serving the same consumers, finally unite, the unnecessary duplication of plant and appliances entails a permanent burden upon the public. Even where prices, after due hearing, may be prescribed by public authority, some regard must be paid to the interests of bona fide investors. The prices set must have some reference to the capital legitimately sunk in the equipment of the formerly competing plants. It not infrequently results that the prices eventually authorized are higher than they would need to be, if no more than the necessary amount had been originally invested in plant and appliances adequate for the supply of consumers. **Thus the evils of an ill judged competitive experiment in a field unsuited therefor perpetuate themselves and burden the consuming public.**

"It is hardly necessary to add that the unnecessary installation of pipe, conduits, mains, wires, tracks and the like by two competing public utilities in the same region augments unwarrantably the disturbance of traffic through the public thoroughfares, and creates gratuitous nuisance.

"Those general propositions would seem to require strong countervailing considerations in the particular case under review if the Board is to approve the ordinance passed by the Shrewsbury township committee on

November 17, 1910. It is true that conditions may exist in particular cases which might warrant such action. If the Consolidated Gas Company had been shown to be totally devoid of enterprise, and were now reluctant to extend the supply of gas into the parts of Shrewsbury township which the Atlantic Highlands Gas Company stands ready to supply, or if the service of the Consolidated Gas Company had been shown in the past, or in the present, to be inadequate; or if there was such disparity in prices and quality of service offered by the two companies that the exclusion of the Atlantic Highlands Gas Company must result in subjecting possible consumers in Shrewsbury township to hardship, extortion or poor service; or if the Atlantic Highlands Gas Company could demonstrate that it alone of the two companies commanded processes or methods which promised pronouncedly better service or lower prices than the Consolidated Gas Company, there might be ground to question the applicability of the general principle of regulated monopoly to the case at issue.

"The Board of Public Utility Commissioners cannot discover that such exceptional circumstances exist in the present case." (Vol. 1, 9-12.)

The decision in the Atlantic Highlands gas case has been presented at length as it is the first ruling of this Board on the question of competition and affords the basis for later decisions on applications involving competitive service.

Millville Gas Case.

The Consumers Gas Company received an ordinance from the city of Millville and applied to the Board for its approval granting the company the right to furnish gas service in competition with the Millville Gas Light Company. The Board was asked to reconsider its decision in the Atlantic Highlands case on the ground that it is in conflict with the constitution, the common law and the statute laws of New Jersey, especially Chapter 16 of the Laws of 1913 and that the reasoning upon which the decision was based is erroneous.

Chapter 16 of the Laws of 1913 was enacted subsequent to the statute creating the board.

The second section of this statute is as follows:

"Any person, or persons, being officers, directors, managers, or employees of any corporation or body who shall wilfully use, operate or control said corporation or body politic, or suffer the same to be used for the furtherance or promotion of any object, fraudulent or unlawful, under the laws of this state, or who shall use the same directly or indirectly in restraint of trade or in acquiring a monopoly when such corporation or body politic engages in interstate or intrastate commerce, shall be guilty of a misdemeanor."

The Board holds that this section lays a prohibition upon the officers, directors, managers or employees, prohibiting the use of any corporation in restraint of trade or in acquiring a monopoly, but that it in no wise lays any restriction upon a municipality or upon the Board in the exercise of powers vested by existing statutes.

"We have examined with care the provisions of the Constitution and statutes of the State to which we have been referred as indicating that the policy previously announced by the Board contravenes the settled law of the State. We find nothing in the constitution or statutes to justify this contention or to require the reversal of the position previously taken by the Board."

The Board then upholds its decision in the previous case in the following manner:

"The excerpt from the Atlantic Highlands case, it is averred, shows faulty reasoning. Higher prices by mutual cancellation of competition; union of productive apparatus owned by competitors, and a consequent reduction of costs; division of territory, and transient low prices; all these, urge the petitioners, are now impossible without the knowledge and consent of the Board. While this is true, it is not unfair to remark, in passing, that the excerpt quoted from the Atlantic Highlands case is not exclusively confined to 'reasoning.' It is, in part, history—history of what commonly happened, before the regime of regulation was instituted.

"The Board, moreover, is convinced that so much of the excerpt as emphasizes the unnecessary duplication of apparatus, and the permanent burden it imposes on consumers, where competition is allowed without being required by the public convenience, or without conserving public interests, is sound, and is unshaken by any consideration as yet adduced by the petitioners.

"In general, then, the Board holds that the decision reached in the Atlantic Highlands case was first strictly legal, not in conflict with the common law, or with the statutes or the constitution of this state, and, second, that it is in line with wise public policy." (Vol. 1, 655-656.)

The application of this policy to the Millville case is then carefully considered. Will public interests best be conserved by permitting a competitive company to enter the field? Testimony is offered to the effect that the present service is inadequate. The Board points out that there are "certain factional differences" existing between the supporters and opponents of the applicant company and that allowance must be made for such "individual bias as individual testimony may disclose." From the testimony it appeared that there were not more than 50 houses out of a total of 3,037 houses in the city which were not supplied with gas by the present company. In conclusion the Board says:

"Apart from the fact that the price of gas at Millville is certainly as low as in any place of similar size in this State, supplied by a local plant; apart from the fact that the physical apparatus in place is adequate for the complete supply of gas even at peak load, and at standard pressure, in all parts of the city at the present time; apart from the fact that a competing company in Millville must excavate miles of street to the inconvenience, at least temporarily, of the inhabitants, **the approval of the franchise in question would threaten or seriously impair the legitimate investment now existing in the works and mains of the Millville Gas Light Company, and by implication every investment similarly circumstanced in this State. Such impairment cannot be said to conserve the public interests. Bona fide investments in a public utility affording good service at a fair price are an essential part of the public interests."**

The application was denied.

Eastern Telephone and Telegraph Case.

The Eastern Telegraph Company applied for the approval of ordinances granting it the right to furnish telephone service in Cape May County and the Borough of Avalon in competition with the Bell companies operating in the territory in question.

It was contended that to deny the petitioner the right to take on new subscribers in Avalon will lessen and impair the value of the service to the petitioner's existing subscribers, and will inure to the benefit of the Bell companies.

"The Board has already put on record its conviction that the State by statute should require competing telephone companies to afford physical connection for proper toll charges over their respective lines. If this were done the refusal to allow a rival company to enter a place already served by another company would avoid the waste of duplicating plant and would secure the widest area of service possible . . . " (Vol. 1, 742.)

The Board withheld its approval of the ordinance protecting, in each case, the company installed, although it did not have the power to order physical connection affording the interchange of service necessary to provide complete telephone service.

In the cases just cited, the Board has established the policy of protecting utility companies from competition unless "strong countervailing considerations" in a particular case overrule the general and fundamental proposition and make competition under such individual circumstances best serve public interests.

In the Millville gas case, the Board has defended its right to carry out such a policy and its right under the statute has been upheld by the Supreme Court case cited above. Furthermore, the policy which the Board has outlined in these decisions is in line with the well established principles of the New York, Massachusetts and Wisconsin Commissions.

POLICY IN NEW YORK.

The policy of the New York Commissions may be best illustrated by the following paragraphs taken from the Long Acre Electric Light and Power Company case. (Vol. 1, 1st D. N. Y. p. 226, 247-254.)

"The whole electric history of New York City points the futility of competition. In the early years of the industry numerous companies were organized. From time to time these were absorbed, only to be followed by new companies frequently encouraged by the city with the idea that competition was the life of trade, and that the more competition there was the better would be conditions. But the same procedure occurred again and again. The new companies were merged or swallowed up, until at the present time there are but two electric supply companies operating in Manhattan, and these two companies, although nominally independent, are owned and controlled by the Consolidated Gas Company . . .

"In the first place, the existence of competing companies necessitates constant opening of the streets to provide service connections to the houses and street mains for the distributing wires . . .

"Competition also involves duplication of generating plants and substations. Each must provide sufficient plant not merely to supply the peak of the load, but to meet any accident which may occur. Machinery must at all times be held in reserve, and when there are several independent companies, no one of which may take a momentary advantage of the reserve of the other, they all must maintain reserves very much in excess of what one company must keep, where it may fall back upon any and all of its stations to meet a failure at one of them. Again, it is well known that one company can generate current for the whole of Manhattan much more cheaply than can several companies, each one of which undertakes to supply the entire borough. Further, the loss due to distribution is larger where there are several systems.

"The result of such duplication of capital and the less economical methods of production and distribution is, that the cost of delivering current to the consumer is larger under competition than under efficient monopoly. It may be, and often has been, true that competition has temporarily lowered rates and improved service, but this does not controvert the statement that the cost to one company of current is less than the cost to several. Competition has forced price nearer to, or below, cost for the moment, but everyone knows that when the rate war has ceased, due to agreement or merger, prices have gone up, and the consumer ultimately has paid the bill, and has continued to pay interest and dividends upon duplicate capital unless the state has stepped in . . .

"The applicant has not proved that the existing companies are not properly conserving the public interest and convenience, and that it would be to the advantage of the community to have a new company authorized to enter the field . . .

Similar decisions were made in the following cases by the New York Commission, 2nd District:

In re Appl. Lockport Light, Heat and Power Company, 1 P. S. C. Reports (2nd Dist.), 12; in re Appl. Kotonah Lighting Company, 1 P. S. C. Reports (2nd Dist.), 46; in re Bath Citizens Electric Service Company, 1 P. S. C. Reports (2nd Dist.), 336; in re Appl. Buffalo, Rochester & Eastern Railway Company, 1 P. S. C. Reports (2nd Dist.), 532.

POLICY IN MASSACHUSETTS.

In the Worcester Electric Light and Power Company case (Annual Report 1894, 23-26), the Masssachusetts Board of Gas and Electric Light Commissioners says:

"The evidence as presented to the Board seems to afford no reasonable ground for the expectation that the proposed company could afford its lights for less than the existing company . . . It does not possess and probably does not expect to acquire the exclusive control of any invention by which special saving in cost may be effected, and it cannot reasonably be expected to possess any higher technical or business talent than lies within the reach of the existing company.

"It is the duty of the board and its only purpose to secure to the people of Worcester, so far as it lies within its power, the best service at the lowest reasonable price. There is some reason to believe that the admission of the proposed company might seriously impede, perhaps wholly defeat, this object. It must be recognized that both companies are to be promoted and to be conducted for the sake of profit, and that they will be governed by the same laws as other companies in similar business . . . The history of corporations doing an electric lighting and similar business in competition in various parts of the country affords strong ground for believing that a new company, if allowed to engage in business, would not long remain by itself, as competition for a period would probably be followed, as elsewhere, by consolidation or absorption . . . But combinations, and consolidations, as is well known, affords the opportunity and usually a temptation to stock development too great to be resisted. Such needless outlay should be avoided and saved, for when it has once been incurred, or the money expended in an enterprise not required to supply the public wants, so great is the expectation of gain, and so persistent and unyielding the demands of capital for dividends, the remedy is not then easily found or applied, and the better policy avoids the evil at the outset by preventing the expenditure . . ."

The following are additional cases covering the same point:

Chelsea Gas Light Company, Annual Report 1891, 17; Chelsea Gas Light Company, Annual Report 1895, 8; Boston Edison Illuminating Company, Annual Report 1895, 17; Great Barrington Electric Light Company, Annual Report 1895, 19; Rockport Electric Light, Power and Heating Company, Annual Report 1896, 8; Easthampton Gas Company, Annual Report 1908, 32; Fitchburg Gas & Electric Light Company, Annual Report 1910, 50; Newton Gas Company, Annual Report 1889, 77; Boston Edison Electric Company, Annual Report 1895, 14; Stoneham Citizens Gas Light Company, Annual Report 1890, 91, 92; Clinton Gas Light Company, Annual Report 1890, 93; Roxbury Electric Light Company, Annual Report 1890, 98; Dedham & Hyde Park Gas & Electric Light Company, Annual Report 1890, 102; Middleboro Electric Light & Power Company, Annual Report 1890, 104; Marlboro Electric Company, Annual Report 1893, 14; Haverhill Electric Company, Annual Report 1908, 20; Worcester Electric Light Company, Annual Report 1910, 55 (2nd application).

(To be continued.)

ARIZONA.

Minimum Charge. The Corporation Commission has given notice of a general hearing in the matter of minimum charge for gas and electric companies and proposes to issue an order in the matter under the Weights and Measures Law of Arizona.

CALIFORNIA.

Pacific Telephone and Telegraph Company. The Railroad Commission made a modification of its order readjusting the long-distance telephone rates of the Pacific Telephone and Telegraph Company. The new rates which provide a reduction in the cost of long-distance service are to go into effect March 21, of this year.

GEORGIA.

Telephone Rates. The Southern Bell Telephone and Telegraph Company announced its intention of increasing telephone rates in the city of Columbus. The city entered a complaint against the proposed increase and an investigation in the matter is now in progress before the Commission. This will be the first exhaustive investigation into the subject of telephone rates to be made by the Georgia Railroad Commission.

ILLINOIS.

Secretary Appointed. Charles Nicholas Hebner of Chicago was appointed secretary of the Public Utilities Commission to succeed William Kilpatrick, resigned. The salary is $5,000 a year. Mr. Hebner had been employed in the office of the chief engineer of the Chicago City Railways Company.

The Fairburg Telephone Company has applied for approval of an increase in rates.

Chicago, Aurora & Elgin Company. Protests were received from patrons of the traction lines against the proposed increase in passenger rates of the Chicago, Aurora & Elgin Company and the commission issued an order suspending the proposed increase pending a hearing in the matter.

INDIANA.

New Franchises. The Public Service Commission informally rendered an opinion to the effect that it did not have authority to pass upon a new franchise granting the right to furnish a utility service in a territory in which no competing utility exists. This opinion was given in answer to a question of the Ft. Wayne & Northern Indiana Traction Company which has just received a franchise from the town of Lagro, Indiana.

The Indiana Fuel and Light Company, operating in Kendallville, Auburn and Garrett, was authorized to execute a new mortgage for $500,000. Of this amount $200,000 is to be used to retire outstanding bonds and $75,000 is to be used for construction and the remainder will not be used until legitimate expenses of the company show a further bond issue to be necessary. The $75,000 of new bonds are not to be sold below 85 per cent of their face value.

KANSAS.

Standard Electric Light Company. The Kansas Public Utilities Commission has issued an order reducing the annual rental of street lamps in Argentine, a section of Kansas City, from $65 to $55. The order followed complaint of officials of Argentine that the Standard Electric Light Company, which is serving the town, has been furnishing arc lamps to another city at the $55 rate. The Commission held that the minimum rate must be made general.

KENTUCKY.

Municipal Regulation. A bill has been introduced in the House and referred to the Committee on Public Utilities which would give municipalities of the second class the right to fix the maximum rates of electric companies, natural or artificial gas companies, street railway companies and water companies, and the right to acquire the property of the public utilities and to operate the same under such rules as may be established by ordinance.

MASSACHUSETTS.

Municipal Acquisition of Public Utilities. A bill is under consideration by the Massachusetts Legislature which provides that, after a city or town votes to establish a municipal plant, the municipality shall purchase an existing plant if the company shall elect to sell the same in the manner afterward described in the bill, unless the Gas and Electric Light Commissioners shall, upon the written petition of the city council, or selectmen, determine that the public interest does not require the purchase. The transfer of property shall include both a gas and electric lighting plant if they exist in combination. The value of the property shall be determined by a special commission, and in case of the necessary severance of a plant, so that the community shall acquire only that part which lies within its limits, the damages resulting shall be included in the purchase price. Enhancement on account of future earning capacity in the public streets shall not enter into the estimate of value.

Leominster Gas Light Company. The Gas and Electric Light Commissioners have approved the issue of 850 shares of new capital stock at $100 per share by the Leominster Gas Light Company, the proceeds to pay notes outstanding December 31, 1913. The company asked approval of an issue of 1250 shares. This request was opposed by the town of Leominster. On the date of the petition the company's indebtedness for plant expenditure was about $115,000. The commission holds that not less than $30,000 of the expenditures represented by notes of December 31, represented the cost of property substituted for other property abandoned, and should not be financed by a stock issue, it being essentially replacement of plant.

NEW YORK.

Resignation of Chairman. Martin S. Decker resigned as chairman of the Public Service Commission of the Second District and was succeeded by Seymour Van Santvoord, who was recently appointed to a place on the commission. Mr. Decker retains membership on the commission.

The Brooklyn Borough Gas Company has voluntarily agreed to write off $428,428 of excess capitalization following the suggestion of the Public Service Commission for the First District. The company proposes to charge off at once $178,428 and to amortize the remaining $250,000 by setting aside each year a special fund equal to five cents for each 1000 cubic feet of gas sold during the year. The Company's capitalization was found to be excessive in a rate case before the commission conducted by Commissioner Maltbie. In his opinion reporting the case to the commission, the commissioner commends the company for its action.

No Rent for Meters. An amendment introduced in the assembly proposes to amend section 66 of the Transportation Corporation Law as follows: "Sec. 66. No Rent for Meters to be Charged. No **electric light** or gas light corporation in this State shall charge or collect rent **or ready-to-serve charges** on its gas **or electric light** meters * * * and to constitute a part of the contingent or general fund thereof."

New York Telephone Company. The Public Service Commission for the Second District has decided against accepting the offer of the New York Telephone Company to set aside $200,000 of its own funds to defray the cost of a valuation of its property by the state. The commission held that it would be unlawful to accept the company's offer. The commission says: "That it is deemed unwise and improper for this commission to accept or use in its administration any private funds, particularly from a company whose practices and charges are under investigation and determination by the commission." The Legislature is urged to make the necessary appropriation for the proposed valuation.

PENNSYLVANIA.

Standards of Service. The Public Service Commission has under consideration the adoption of rules governing the use of gas, electricity, water and steam meters, the testing of meters, and the standards of service to be furnished.

WISCONSIN.

The Chippewa Valley Railway, Light & Power Company was authorized to issue $42,000 preferred stock for the purpose of buying the electric light plant and business of the Ellsworth Heat, Light and Power Company at Ellsworth, Wisconsin. This plant is in territory adjoining the Chippewa Valley Company's lines. The latter company is a large producer of hydro-electric power and supplies nearly all of the cities in the Chippewa Valley.

Unnecessary Duplification. The commission, on its own motion, made an investigation of the violation on the part of the Lisbon Telephone Company of Chapter 610 of the Laws of 1913, relating to the construction of competing lines by telephone utilities. It apears that the Lisbon Company had built a line paralleling one of the Pewaukee-Sussex Telephone Company's lines, without first obtaining a certificate of convenience and necessity. The commission, finding that the violation of the statute was not willful, conducted an investigation into the reasonableness of the extension as if such extension had not been made and found it a matter of fact that convenience and necessity did not require the building of the line in question. The Lisbon Telephone Company was instructed to discontinue service along the line or be prosecuted.

Telephone and Telegraph Meeting of the American Institute of Electrical Engineers.

The 292nd meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building, New York City, on the evening of March 13. This was a joint meeting with the Institute of Radio Engineers and was held under the auspices of the Telegraphy and Telephony Committee of the Institute. President C. O. Mailloux called the meeting to order at 8:20 p. m. Cloyd Marshall, of the Telegraphy and Telephony Committee, was called upon to occupy the chair during the early portion of the meeting, and John Stone Stone, vice-president of the Institute of Radio Engineers, presided during the latter half of the meeting.

The first paper to be presented was one by W. Lee Campbell, entitled "Traffic Studies in Automatic Switchboard Telephone Systems."

Traffic Studies in Automatic-Switchboard Telephone Systems.

The paper describes a telephone traffic-recording machine by means of which not only the number of calls for a given period, but also the average duration of each call, is mechanically registered on a moving tape. Observations which were shown, were taken on an automatic telephone system. The graphical record shows the exact duration of each connection, the number of connections made during a given interval, and the number of simultaneous connections in service at each instant. By means of these records it is possible to study the relative efficiency of small and large trunk groups, the average holding time of calls, and these observations permit the switches and trunks to be so arranged that the calls will be evenly distributed among the trunks in each group.

M. H. Clapp then presented a paper entitled "A Comparison of the Telegraph with the Telephone as a Means of Communication in Steam-Railroad Operation."

Telegraph and Telephone for Communication in Steam Railroad Operation.

Brief historical descriptions of the use of the telegraph and the telephone on railroads are given, the first train having been handled by telegraph in 1851 and the first handling of trains by telephone on long stretches of main line track having started as late as 1907. In comparison with the telegraph, the telephone circuits cost more to install and operate, but effect a saving in the operation of the railroad, both directly and indirectly, as it is possible to move trains over the road more rapidly. The advantages and disadvantages in comparing the telegraph with the telephone are summarized as follows: In favor of the telephone: Universality, saving of time, rapidity of transmission, psychological effects, promptness in raising offices, no necessity of specially trained operators, saving in expense of railroad operation, and best operation of circuit in heavy weather. In favor of the telegraph: Flexibility in handling circuits, simplicity in installing, maintaining and operating, circuit best adapted for long distances, effects of distance in transmission, saving in cost of installation and maintenance, and the standard of maintenance. As yet very few railroads are using the telephone as much as they could or should. Because many of the economies with the telephone are more or less intangible, railroad managers are rather cautious in authorizing its wholesale installation. They are usually ready to authorize telephone dispatching circuits, as the savings from them are more easily understood than in other applications. In the author's opinion, the up-to-date railroad of the future will handle its operating divisions entirely by telephone, the telegraph being used only for message work for long distances between the terminals and the general headquarters.

The discussion was opened by William Maver, Jr., who spoke of the development of the telephone for train dispatching and agreed with Mr. Clapp as to the advantages and disadvantages of the two methods. An important advantage of copper over iron wire in railroad work in addition to its electrical properties is that iron becomes valueless by reason of corrosion, while copper has considerable value as junk when it is displaced from service. For distances exceeding 200 miles he preferred the telegraph to the telephone for quick, reliable communication between expert operators. Conversation is more readily understood over the telephone when the subject discussed is a familiar one; otherwise there may be more difficulty in recognizing words. A disadvantage of the telegraph is that men require months or years to become proficient in its use. He pointed out that the telephone operator could cut in at any station as an eavesdropper if he felt so disposed. The telegraph operator normally hears everything that passes over the line and this is sometimes an advantage.

William E. Harkness said that certain classes of railway work can be handled more economically by telegraph and it is not likely that this means will ever be entirely eliminated. He referred to the figures given by Mr. Clapp for the expense of line construction and station equipment. The latter may reach $200 per station on trunk lines under complete telephone operation, but there are few roads of this class. Although telephone line construction costs more than telegraph, the facilities are more than doubled. Not only is the speed of transmission increased but an additional telegraph circuit can be arranged with slight additional equipment, or where there are two parallel telephone circuits, a third or phantom circuit can be secured. The telephone cannot compete with the telegraph for distances exceeding 1,000 miles. Traffic should be studied in any individual case before deciding upon long telephone lines. The success of the telephone for train dispatching depends not so much upon the telephone equipment as the means of selectively calling the individual stations. The more ready response of operators to selective telephone calls has led to the installation of selectors on telegraph lines by steam railroads. The idea that the use of the telephone would put many telegraph operators out of a job has not been realized. A more important element in employing men is a general knowledge of the railroad business rather than their specific knowledge of the telegraph apparatus. It has, however, given the railroads a larger field from which to select their employees.

R. N. Hill pointed out that in comparing costs the facilities of a single telephone circuit composed of two No. 8 copper wires had been compared with those of one iron telegraph wire working duplex or quadruplex. It should be recognized that one pair of telephone wires can supply also a telegraph circuit and that this circuit may be duplexed or quadruplexed. If there are two pairs of wires properly transposed they provide not only a train-dispatching and a message circuit but also a third telephone circuit and a telegraph circuit; in other words four circuits from four wires. It would be more fair consequently to compare the cost of one iron wire with one copper wire. On this basis telephony will show up more favorably in regard to initial cost. He referred to the use of booths at frequent intervals along the right of way and suggested the use of automatic switches to disconnect these from the circuit when not in use.

D. P. Grace said that Mr. Campbell's recording apparatus for trunk lines would be of considerable use in manual exchanges as well as automatic ones. He thought the use of train-dispatching circuits would be extended more rapidly if used in conjunction with automatic telephone systems in railroad terminals. Telephone apparatus should be made more rugged, as the maintenance of instruments usually exceeds in cost the maintenance of underground cables or overhead wires in many systems. Poor transmission has resulted in many places from a lack of knowledge on the part of railroad telegraphers and it would pay to have a thoroughly competent telephone transmission engineer to lay out the circuits and see that they are properly connected. Overhead construction along railroad lines must be improved by the use of steel or concrete poles, or else wires must be installed in underground conduits. The latter would be less expensive if there was co-operation between the railroads and the telegraph and telephone companies.

John B. Taylor inquired as to the relative disturbances on telegraph and telephone lines from contiguous power circuits.

W. Lee Campbell pointed out that the use of the telephone in railroad service might be very much extended by railroads operating their own telephone plants at terminal headquarters. In that way any official can talk directly to any station along the line. This is not possible where local service is through public telephone companies, as the latter object to having private equipment connected to their systems.

M. L. Clapp in closing the discussion stated that selectors had been used successfully on telegraph circuits but they are not generally in use. He did not approve of automatic switches in booths for disconnecting from the line but preferred permanent connections to a separate circuit. He considered it practical to use the automatic system on railroads, especially in connection with shops or at terminals, but there is a disadvantage in arranging for connection of long-distance lines to automatic lines. Electric power lines affect telephone circuits a great deal more than they do the telegraph circuits.

Emil E. Mayer then presented a paper entitled "The Goldschmidt System of Radio Telegraphy." This was illustrated by lantern slides.

The Goldschmidt System.

After paying tribute to the work of Tesla, Fessenden and Alexanderson in developing radio alternators, Mr. Mayer described the high-power radio alternators of Goldschmidt, particularly the 100-kilowatt alternator. He showed how the machine, starting with a frequency of 10,000, produced in the ordinary way, used the frequency through tuned circuits to produce an alternating field which, acting with the rotation of the rotor, produced a frequency of 20,000, and how this 20,000 frequency, through tuned circuits, combined with the rotation, produced a frequency of 30,000. He explained that this increase of frequency was only limited by copper, iron and insulation losses, while for the best output it was necessary to keep the magnetic leakage between the rotor and stator low; therefore it was found desirable to add not more than four or five times. A machine having 400 poles and revolving three times per minute, producing first 10,000 cycles and adding up to 50,000 cycles, was explained as an example. It has a rotating portion 4 feet in diameter, poles 0.4 inch wide, one conductor per slot, each conductor consisting of a bundle of insulated No. 40 wires, rotor and stator made up of iron sheets 0.002 inch thick, separated by paper 0.0012 inch thick, air-gap 0.03 inch. The rotor weighs 5 tons and has a peripheral speed of about 625 feet per second. The capacity of the windings to the iron of the machine, unless properly proportioned, sometimes served as a shunt path to ground. The exciter circuit takes about 5 kilowatts per 100 kilowatts output by the generator. Since April, 1913, a 100-kilowatt machine has been in use at Neustadt, Germany. This station and the Tuckerton (N. J.) station look more like electrical power plants than like the radio station with which we are familiar. The tower is 825 feet high, supporting a 36-wire double-cone antenna, stretched to 40-foot masts, in a circle of 1,500 feet diameter. The most notable feature of the receiving apparatus is the tone wheel, which makes and breaks the receiving circuit. When the receiving circuit is excited by a frequency of 50,000 and the tone wheel makes and breaks the circuit 50,000 times per second, no sound is heard in the telephone, but when the tone wheel makes and breaks the circuit 49,000 times per second, a note having a sound frequency of 1,000 is heard in the telephone. A similar effect may be obtained by running the tone wheel at a lower speed, say 24,500 breaks, but a smaller volume of sound is produced. This gives a musical note to penetrate static and permits of close tuning. Also, by adjusting the tone wheel to give break in synchronism with the frequency from an interfering station, this station may be cut out.

R. H. Marriott opened the discussion on this paper and pointed out the possibility of radiation in the form of equal-amplitude waves displacing the ordinary method, which uses groups of waves of decreasing amplitude. The tone wheel is a remarkable instrument in that it provides an efficient detector and an interference preventer in one. He pointed out that if the Tuckerton station sends equally well in all directions, its message must cover an area which includes Peru, Alaska and the North Pole. Since the range of a station varies greatly with atmospheric conditions, and this station in order to compete with ocean cables must have a minimum range not less than 4,000 miles, its maximum range must reach half-way around the earth. We may be near to a time when news will be sent from one or two powerful stations to many inexpensive receiving stations scattered all over the world.

E. F. W. Alexanderson compared the Goldschmidt alternator with the high-frequency machine which he had designed. He referred to the parallel operation of such machines and stated that his machine could be synchronized. He inquired whether the same was true of the Goldschmidt alternator. He agreed that it was perfectly feasible to regulate the speed with high accuracy. Regarding the use of the alternator for wireless telephony, he told of experiments with a trigger alternator excited by telephone current and giving 15,000 cycles. This was superseded by a device designated as a constancy-breaker device or amplifier. It is possible to build machines of higher frequency than those described and the development of such machines has given great impetus to radio communication by the continuous-wave system.

Lee De Forest compared the Goldschmidt system with the Poulsen arc for high frequency. The disadvantages of the Goldschmidt machine are high cost, absolute constancy of speed, complication of circuits, and lack of flexibility to change in wave-length. He pointed out that it is very important at times to be able to change the wave-length quickly on account of selective absorption in the atmosphere. Such a change cannot be readily made with the Goldschmidt system, where the key control is limited to one particular wave-length. With the Poulsen arc the disadvantages are the necessity for occasional changes of carbon and the accompanying attention; also the lower efficiency. However, the efficiency has been increased during the last three years from 30 to 60 per cent by American engineers. Among the advantages of the Goldschmidt alternator are the constancy of the connection giving the power supply. The large power has not been equalled by the Poulsen station, only 60 kilowatts having been attained at San Francisco. The Poulsen system has the advantage of ease of key control, simplicity in changing wave-length and the presence of a compensation wave with the sending wave, which adds to the secrecy. He stated that in Washington and in New Jersey messages are now being received daily from Hanover and San Francisco. The power at Hanover is 150 kilowatts and at San Francisco, 60 kilowatts, and signals from San Francisco are stronger than those from Hanover. At night signals are received from Honolulu, 6,000 miles away, with surprising loudness.

M. I. Pupin stated that he had included the principles of the Goldschmidt machine in his lectures at Columbia University seven years ago and that he was the first to solve the problems involved. He stated that he had detected as many as 136 harmonics in a machine of this kind and there are actually an infinite number of frequencies. The amplitude of the different tones depends upon the magnetic leakage and it is hard to keep this down in high-frequency machines on account of the large number of pole pieces and the shortness of the magnetic circuit. High magnetic leakage is one of the defects of the Goldschmidt machine. The introduction of external reactance increases the magnetic leakage and is equivalent to loosening the coupling.

It consequently means a reduction of the available energy, which is another weak point of the machine. His experiments did not agree with the author in regard to the intensities of the lower frequencies and he attempted to demonstrate that a large part of the energy was not radiated from the antenna at all. He had never had much confidence in this type of machine and has designed another type which will be presented in a future Institute paper. He referred to the heterodyne receiver and its use of beats. The tone wheel accomplishes the same purpose and anyone can also accomplish it by proper tuning of the receiver circuit. Since the tuning is never exactly right for resonance, there will be two periods with a slight difference and it is easy to get beats between these. The only thing necessary is to construct the circuit with a small damping constant. In closing, he expressed his admiration for the Goldschmidt machine, which required such persistency and care for the completion of its design and construction.

J. S. Stone said that the paper demonstrated the evolution of radiotelegraphy towards the use of increased wave-lengths and the departure from a highly damped wave train. The author regarded these two features as advantageous, but he considered shorter wave-lengths more advantageous. Thus with an antenna whose fundamental had a wave-length of 1,500 meters, operation was carried on with a wave of 6,000 meters. If the fundamental were used the radiating power of the antenna for a given current would be 16 times as great, and moreover the receiving power of other stations would also be 16 times as great. There are other advantages of shorter waves, but a wave of 1,500 meters requires a frequency of 200,000 cycles and this is beyond the capability of the generator. There is no question of the advantage from the use of continuous or undamped wave trains and these are likely to completely supersede the damped wave train, but this does not mean that high-frequency dynamos will be used to supply the energy, since they are not practicable on shipboard; the enormous gyroscopic effect would tear the machine to pieces if operated on anything but an immovable foundation. Moreover, ship antenna are too small to radiate or receive energy at the frequencies necessary with such generators. It seems as though we might be ultimately forced to use the undamped oscillator first suggested by Elihu Thomson in 1892.

The meeting then adjourned to the Institute rooms on the tenth floor where refreshments were served.

Future Institute Meetings.

The 293rd meeting of the American Institute of Electrical Engineers will be held in Pittsburgh, Pa., April 9 and 10. The meeting will be under the auspices of the Committee on Use of Electricity in Mines, and the following papers will be presented: "Mine Duty Controllers," by H. C. Reed; "Self-Contained Portable Electric Lamps," by S. W. Swoboda; "The Construction and Operation of Mine Substations," by H. Booker; "Motor-Generator Sets versus Synchronous Converters as Applied to Mine Work," by W. M. Hoen; "The Development of the Electric Mine Locomotive," by G. M. Eaton. There will also be a general discussion on rules for electrical installations in mines, and the following rules will be used as a basis of discussion: (*a*) German Rules, (*b*) English Rules, (*c*) Bureau of Standards Rules, (*d*) American Mining Congress Rules, (*e*) Pennsylvania Mining Law, Electrical Section.

The 294th meeting will be held in Washington, D. C., April 24 and 25, 1914. This will be a joint meeting with the American Physical Society, under the auspices of the Electrophysics Committee and of the Washington Section. There will be five papers presented on behalf of the Institute as follows: "A Theory of Corona," by Bergen Davis; "Some Investigations of Lightning Protection for Buildings," by T. M. De Blois; "A Milliampere Current Transformer," by Edward Bennett; "Some Simple Examples of Transmission-Line Surges," by W. S. Franklin; "Solenoids," by C. R. Underhill.

The 295th meeting will be held in the auditorium of the Engineering Societies Building, New York City, on May 19. This will be the regular annual business meeting of the Institute at which the announcement of the election of officers for the ensuing year will be made. Following the business meeting there will be a technical session under the auspices of the Committee on Electricity in Marine Work.

The 296th meeting will be held at Pittsfield, Mass., May 29, under the auspices of the Pittsfield Section. The principal subject of the meeting will be "Relative Advantages of Star and Delta Connections," and all the papers presented will be on this general subject.

Western Union to Share With Employees.

A profit-sharing plan for the employees of the Western Union Telegraph Company was announced recently by officials of the company. Under the plan blocks of the company's stock will be sold to its employees at a price below 63.5, the quotation for the stock on the Exchange. The company intends to sell 10,000 shares at 63 and 2,500 shares at 60.

Electric and Gas Fixtures for a Residence.

The Chicago Section of the Illuminating Engineering Society held a meeting on the evening of March 11, at which residence fixtures formed the subject of discussion. Preceding the two papers on this topic W. A. Durgin gave the third of his series of brief talks on the fundamentals of light and illumination, dealing in this case particularly with radiant energy.

Duplicate plans for a residence to cost $10,000 were given to the authors of each of the papers presented and they were asked to make a selection of lighting fixtures to cost not to exceed three per cent of the total cost of the building. Phil Polacheck, a fixture dealer of Milwaukee, Wis., made a selection of electric fixtures and C. A. Luther, of the Peoples Gas Light & Coke Company, Chicago, made a selection of gas fixtures.

Mr. Polacheck treated the subject from the standpoint of the fixture man. He spoke of the strong hold that electric lighting has in residence illumination and said that in his own business, although he deals also in gas and combination fixtures, fully 95 per cent of the fixtures he sells are electric fixtures. The dealer is too easily tempted to supply merely what is wanted, instead of what is needed. The public in general knows little about illumination and is likely to select an array of fixtures entirely unsuited to yielding the best illuminating results. The conscientious fixture dealer attempts to educate the public along these lines and supplies fixtures which, while coming within the limits of the amount set apart for their cost, serve best to give a satisfactory illumination and also a generally artistic effect. Too often the location of outlets and wiring are done without regard to the fixtures that are suitable for each kind of room. It is nearly always better to first select the scheme of illumination and the kind of fixtures to be used and fit the wiring and outlets to match, instead of making the fixtures fit the wiring, as is too commonly the case.

Drawings of the principal electric fixtures that Mr. Polacheck had selected for the particular house in question were shown. For most of the larger rooms he had chosen indirect fixtures, but for the dining room a semi-indirect fixture. In the bedrooms and bathroom, brackets with opal shades were provided on each side of the mirror. The total cost of the fixtures was estimated to be close to $290. With the lamps chosen it was believed that the maximum energy consumption on the average evening would not exceed two kilowatt-hours.

Mr. Luther opened his paper with

a criticism of the architect's plan submitted to him. This had shown lack of sufficient study in the layout of some of the rooms to accommodate the furniture to the best advantage; the lighting outlets likewise were poorly located in some cases. A selection of gas fixtures using almost exclusively inverted-mantle burners was made; this included a profusion of wall brackets, which were much in evidence in practically every room. Mr. Luther said the dining room was the easiest residence apartment to light properly, while the bedrooms were the hardest rooms in which to get satisfactory results. The fixtures Mr. Luther selected aggregated $282.50 for both floors in the residence, leaving $17.50 of the allowed total for incidentals and extras.

The general discussion of the subject which followed the presentation of the two papers covered critiscisms of the suggested lighting equipment as well as a comparison of the relative advantages of gas and electricity for residence illumination.

Historic Duane Street Station is Passing Out of Existence.

One of New York City's electrical landmarks, which had its origin in the mind of Thomas A. Edison and was developed under his skillful guidance, is about to pass out of existence, into the discard of things which have passed their day of usefulness. The old Edison generating station at Duane, Elm and Pearl Streets, which is within the area of the proposed civic center and is being abandoned largely on that account, is of historical importance in the annals of electricity, for the experiments and developments worked out there have been adopted the world over. Mr. Edison gave to New York the distinction of having the first large electric lighting system in the world, worked out by himself and now bearing his name. The Duane Street station, which was built in 1891, was then held to be a wonderful achievement—a show place which engineers came from everywhere to see. They laughed as they compared it with its predecessor, the Pearl Street station, in which Edison used to sleep all night during the period of its construction. The comparison between the half-million-horsepower Waterside generating station of today and the Duane Street station of that day is just as startling.

When the Duane Street station was in course of construction a water famine was threatening New York and the Company drove several deep wells to insure an uninterrupted supply, thereby discovering that the site was the best spot in the city for obtaining artesian water. The office equipment and other things have been transferred to the new headquarters of the New York Edison Company at Irving Place and Fifteenth Street, and the historic old Duane Street station will soon be only a memory.

Lynn Section Meeting.

On the evening of March 6, Walter C. Fish, manager of the Lynn, Mass., works of the General Electric Company, delivered an address in Burdett Hall before the Lynn Section of the American Institute of Electric Engineers on the topic "Side Lights of Our Work."

Instead of treating of things purely electrical, Mr. Fish took what he termed a couple of little side journeys into things fundamental in political economy and science leading up to the work of the professional man of today who co-ordinates and uses scientific facts. Though the work and worth of the engineer as a professional man is becoming better recognized each year, the speaker stated that he would like to see the electrical engineer stimulated to more and better reading along broad lines. For is it not a strange fact that with all the marvelous progress and development of our age in many directions, yet in the realm of mentality we are probably not superior to the ancients? The speaker here made running comments on the triumphs of the engineering of past eras, and showed that in that line, as in arms under Joshua and Alexander, or in the literature of Homer and Aristotle, the past had its wonders of execution and its matchless men.

Mr. Fish then touched on various economic and political problems that are awaiting solution by present-day thinkers and workers. The high cost of living, emigration, profit-sharing, etc., were referred to as not being as intelligently studied as they should be, the study of social science being specially neglected.

On the subject of electricians, Mr. Fish paid a high tribute to the work of Marconi, who realized a problem, set about its mastery, and achieved almost exactly what he set out to do.

At the conclusion of the address Dr. Elihu Thomson was prevailed upon to elucidate some recent experiments in electrical work, which he did in an effective way.

New Jersey State Telephone Investigation.

The New Jersey Legislature has passed a bill authorizing a legislative investigation of telephone rates throughout the state. A joint committee is to be appointed by the presiding officer of each house, composed of three members of the Senate and Assembly, respectively. This committee is to investigate the question of charges and unjust discrimination, and report its findings to the next legislature. It is empowered to subpoena witnesses to require the production of books, records and any data needed.

But slight opposition was offered against the bill, this being that the subject was one which should be dealt with by the Board of Public Utility Commissioners.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club of Salt Lake City, Utah, on March 12. In the absence of Chairman C. R. Seigel, who was in San Francisco, Leo Brandenberger presided. W. S. Cozad, president of the Colorado Electric Club, was present as a guest and extended the greetings of his club to the Utah Electric Club. He told how the Colorado Electric Club had grown so rapidly as to make it necessary to absorb the Traffic Club, which had formerly been the principal commercial club of the city. J. F. Greenwald, special representative of the Mountain States Telephone & Telegraph Company, recently transferred to Salt Lake City from Helena, Mont., followed with a few well chosen remarks. John D. Spencer, general agent of the New York Life Insurance Company, who has conducted a regular class in "Salesmanship" at the Y. M. C. A. for the last five years, delivered a talk on this subject as the regular speaker of the day.

At the regular weekly luncheon of the Utah Electric Club at the Commercial Club, Salt Lake City, Thursday, March 5, Miss M. Alisparo and Miss J. Betts, employees of the Mountain States Telephone and Telegraph Company, furnished a most entertaining musical program while luncheon was being served.

The talk of the day was given by Dorsey A. Lyon, acting chief metallurgist of the United States Bureau of Mines, on the subject: "The Electric Furnace, and Its Application in Electrochemistry and Electrometallurgy." He pointed out that the essential requisite for the application of the electric furnace to these processes is the availability of large quantities of cheap electric power. Where this is available, as at Niagara and in certain other places of the United States, electricity may be successfully and economically applied in the preparation of many special substances, as carbide, nitrates and ferro-alloys. There is one plant now operating on a commercial basis near Shasta County, Cal. Otherwise, the application of electricity to the mining industry in the West is confined principally to experimental plants.

POWER PLANT OF THE UNION CENTRAL LIFE BUILDING IN CINCINNATI.

An Exceptionally Fine and Complete Equipment.

The building recently erected by the Union Central Life Insurance Company at the intersection of Fourth and Vine Streets in Cincinnati, O., is the tallest building on the American continent west of New York. It requires but a passing view of the grandly imposing facades of the colossal tower mounting majestically to a height of 535 feet above the basement level, to confirm, in the mind of the observer, the truth of the claim made by the projectors of this monumental edifice, and by those whose enterprise and splendid spirit of civic pride has made possible its materialization, that it embodies the most up-to-date ideas in office-building construction. It presents a striking example of the beautifully impressive style of architecture that had its inception during the Italian Renaissance, and which so admirably adapts itself to the structural requirements of buildings of this character.

In ground area the building is 100 by 150 feet. The main tower extends 34 stories above the level of the street; while the extended structure at the rear rises to a height of eighteen stories. The pyramidal roof of the tower is inclosed by an ornamental balustrade that forms a parapet above the entablatures of four freely standing colonnades, the latter bordering loggias that look to the four points of the compass. The pyramid is crowned by a square pinacle or lantern which has been designed for use as an observaton gallery, whence a view of the surrounding country may be had throughout a range of many miles radius.

Engine-Room Equipment.

The engine-room equipment is completely modern in all respects. The main units consist of two Hamilton-Corliss tandem-compound engines with nonreleasing valve gears and inertia governors. These engines are of the dimensions 18 and 28 by 30 inches; they run at a speed of 150 revolutions per minute, and each is rated at 500 horsepower. Each engine is directly connected to a Triumph compound-wound generator of 300 kilowatts capacity, delivering, when fully loaded, 1,200 amperes of direct current at 240 volts. There is also a simple engine of the dimensions 16 by 30 inches, and of the same make as the large units; this engine is directly connected to a 150-kilowatt generator.

All of the foundations of the apparatus in the engine room are faced with white glazed brick, and each is capped with a four-inch layer of white concrete. The floor is laid with six-inch white flint tiling, and the ceiling is covered with two-inch asbestos block over which has been spread a half-inch veneer of hard asbestos plaster, there being an air space between the asbestos lining and the ceiling proper, and the whole forming a perfect insulator against heat for the floor above.

A three-wire system of electrical distribution being employed, two balancing sets have been installed to rectify inequalities of current consumption. These machines were supplied by the Triumph Electric Company, Cincinnati, O.

Union Central Life Building Illuminated.

The switchboard panels are of blue Vermont marble. The space in rear of the board is inclosed on top and at the ends with an ornamental iron grill. The board is furnished with a complete equipment of switching apparatus and recording instruments of the most improved type. There are I. T. E. reverse-current circuit-breakers, Keystone ammeters, illuminated voltmeters, Sangamo wattmeters, and flush-front bulls-eye pilot lamps. The main switches are of the single-pole double-throw variety. Double-pole switches are used in the power circuits, and triple-pole switches in the lighting circuits. Two sets of busbars have been installed. With this arrangement one of the main units can be operated for the lighting of the building, while the other supplies the power circuits; or, if occasion so requires, one machine can be made to serve both purposes. The voltage of the power circuits is 240, while that of the lighting circuits is 120.

The Electric Elevators.

Twelve Otis traction elevators, equally divided to form two batteries, are arranged along opposite sides of the main elevator lobby. The cars have wired-glass doors, and run at a speed of 600 feet per minute in shafts that are inclosed in fireproof partitions. The cars are made of bronze, and each has an emergency door that will permit the transfer of passengers to an adjacent car in the event of one of the cars becoming stalled between floors. Six of the elevators travel between the first and eighteenth floors, two run between the sub-basement and the eighteenth floor, and four run to the twenty-eighth floor.

The elevators are equipped with magnet control apparatus, and with automatic safety brake and limit stops. Each car is provided with an emergency switch. All terminal buffers are of the oil-cushion design.

The signal service consists mainly of the Armstrong flash-light system. In addition to this there is a complete telephone system by means of which the starter on the main floor can get into direct communication with the operator of any car at any point in the elevator hatchway. Annunciators have been installed for use after nightfall, the flash system being then cut out. In the main lobby on the first floor there is an elaborate position indicator; this device shows, by means of miniature electric lamps, the position of any car at any time.

Boiler-Room Equipment.

Four Heine water-tube boilers, rated at 250 horsepower each, furnish the steam for the various needs of the building. These boilers are set with Murphy furnaces, and can be operated singly or in battery of two or more, as the case may require. The trimmings and fittings of the boilers are highly ornate, the water-column piping, for example, being of extra heavy polished brass. Each boiler is fitted with two four-inch Consolidated spring-loaded safety valves, and a Schutte & Koerting automatic stop and check valve.

Coal for use in the boiler furnaces is delivered from the wagons into a bin which has a capacity of 600 tons. Steel cars, having a capacity of one ton each, are used for conveying the coal from the receiving bin to points within convenient reach of the firemen. Each car is run upon a platform scale en-route, and the exact weight of the contained coal is entered upon the regular boiler-room record. The ashes are thrown into special cars, which are run upon the platform of an electric hoist and dumped at the rear of the building.

Two Worthington compound duplex pumps, of the dimensions 8 by 12 by 6 by 10 inches, and of the outside-packed plunger type, and one 6 by 4 by 6-inch, simple duplex pump of the same make, are used for conveying the feed water. These pumps take their suction from the street mains and discharge the water through two Blackburn-Smith filters, whence it passes to an 800-horsepower Reilly multicoil feed-water heater, and thence through a Worthington metering apparatus to the boilers. Supplementary to the regular feeding apparatus, each boiler is equipped with a Metropolitan injector. Extra heavy brass pipe and fittings of the two-inch and four-inch sizes, and extra heavy Hancock valves have been used to form the feed lines. The steam supply pipe of each feed pump is fitted with a Mueller regulator, which will automatically check the flow of the steam to the pump should the discharge, from any cause, be accidentally obstructed.

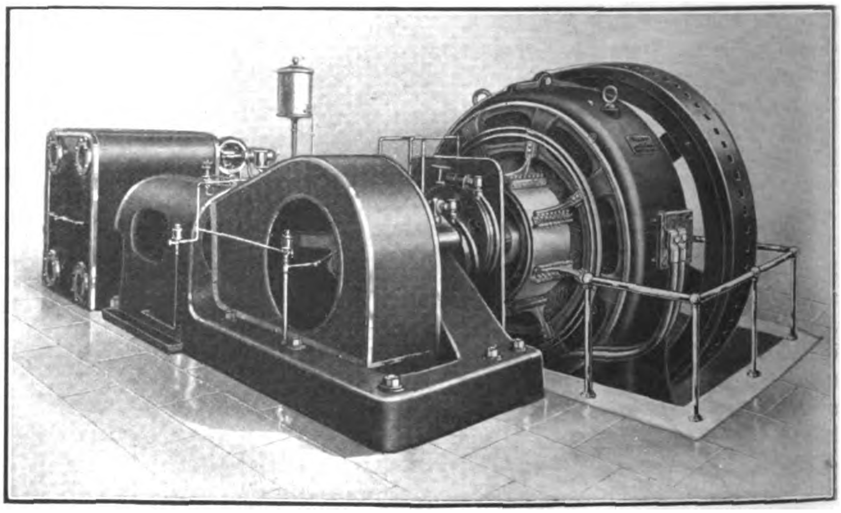
The stack is 535 feet high and is 5.5 feet in diameter, both at the top and bottom; it is made of steel, and it springs from the building at the apex of the tower. The main damper is controlled by an automatic regulator.

All of the masonry in the boiler room is faced with glazed brick which, with the highly polished brass trimmings, and the neatly covered and painted high-pressure piping, imparts to the whole an aspect of trim tidiness. The floor is covered with cast-iron plates in a setting of cement.

The boilers are connected by long radius bends to a twelve-inch main steam header, and to a seven-inch auxiliary steam header for supplying the pumps. All of the valves and fittings used in this system of piping are made of cast steel and the nozzles are electrically welded. The pipe flanges are of rolled steel and have the improved Kellogg type of joint. Open-hearth steel pipe has been used in all steam lines of six-inch diameter, and over, while extra strong wrought-iron pipe, with extra heavy cast-iron screwed flanges has been used in steam lines of less than six-inch diameter. Copper gaskets are used throughout.

All of the high-pressure steam piping, of four-inch diameter and over, is covered with a double standard thickness of 85 per cent magnesia; while the steam piping of less than four-inch diameter is covered with a single thickness of the same material. The magnesia insulation throughout is inclosed in an outer casing of asbestos paper, and a smooth, even surface has been imparted to the whole by sewing on a final covering of eight-ounce ducking, no bands having been used. This work was done by R. E. Kromig & Company, Cincinnati, O.

Steam-flow meters have been inserted in the various lines leading to extraneous points of steam consumption. All of the reducing valves used in the system are of the Atwood & Morrill make. The condensation in the steam lines, as well as in all of the other steam apparatus throughout the building, is drained through Anderson steam traps.



One of the Main Generating Sets, Union Central Life Building.

The Heating System.

The Dunham vacuum system of steam heating is used. The down-feed method is employed between the basement and the seventeenth floor; above this floor the up-feed method is used. The flow of steam and also of hot and cold water in the piping systems above the seventeenth floor is controlled from a pipe gallery which occupies the entire area of the tower at a level midway between the sixteenth and seventeenth floors. A similar arrangement of controlling valves has been installed in the basement for regulating the supplies of the commodities mentioned to the systems of piping below the seventeenth floor.

All of the horizontal runs of piping to the radiators have been carefully insulated and laid in galvanized-iron conduits, which have been imbedded, for concealment, in the cement floors; this device leaves the pipes unhampered in the matter of expansion and contraction. The steam and return risers, with expansion joints suitably placed, are similarly concealed in the columns of the building.

The 14-inch main exhaust riser, which enters the stack at the level of the twenty-third floor, is fitted at its lower extremity with a suitable back-pressure valve for deflecting the exhaust from the engines into the heating system. To forestall any emergency that may arise, a supplementary 14-inch exhaust pipe is connected to the stack at the basement level. A vitrobestos lining, extending 30 feet above the point of entrance of the principal exhaust riser, amply protects the steel plate structure from the moisture passing in with the exhaust steam.

Hot water for the building is secured by means of three Goubert generators equipped with thermostatic controlling devices. One of these generators supplies the building from the first to the seventeenth floor, another from the seventeenth floor to the summit of the tower, while the third is held in reserve. The three generators are cross-connected.

Pumping and Refrigerating Equipment.

Two Fairbanks-Morse compound duplex pumps, of the dimensions 12 by 18 by 7 by 12 inches, elevate the water for house purposes to a 7,000-gallon tank which is mounted at the height of the thirtieth floor, and also to a 12,000-gallon tank set at the eighteenth-floor level. These pumps are fitted with Fisher governors.

A 16 by 8.5 by 12-inch underwriters' fire pump of the Fairbanks-Morse outside-packed plunger type has been installed for protection against fire. To further guard against the danger of local conflagrations that might break out here and there, 100 fire extinguishers have been distributed throughout the building.

Two 8 by 10 by 12-inch Burnham pumps, equipped with Fisher regulators, are used for discharging the returning condensation from the heating system and for creating and preserving the necessary degree of vacuum therein.

One Clayton automatic steam-driven air compressor, of the dimensions 5 by 5 by 5 inches, and one electrically-driven air compressor, are used for supplying air at the proper tension to a pneumatic ejector, which elevates the accumulations of waste water in the sub-basement to the level of the discharge into the sewer. There is also an electrically driven Gardner air compressor, for use in connection with the thermostatic valves of the heating system.

The main unit in the refrigerating equipment, of ten tons capacity, which supplies the cold storage and drinking water needs of the occupants of the building, is a Frick compressor, driven by an Eclipse-Corliss engine. This unit is lubricated by means of a gravity oiling system. The cooling effect is produced by means of a brine circulating system. A 6 by 4 by 6-inch duplex pump is used for keeping the cold brine in circulation to the height of the seventeenth floor. Two 6 by 3.5 by 6-inch duplex pumps maintain the circulation in the system of piping which conveys the water to the drinking fountains located upon every floor up to the twenty-ninth. Recording thermometers are attached to the drinking-water system.

Miscellaneous.

Two 14 by 10-inch Blaisdell vacuum cleaning machines, operated by Bullock interpole motors, have been installed. These machines are furnished with automatic controlling devices and each machine is of 10-sweeper capacity.

In the boiler room there have been fitted up three sets of Acme air-washing and purifying apparatus. One of these is for the Chamber of Commerce, another for the basement, and the third for the sub-basement. Besides these machines, there are two exhaust fans, one for the boiler room and the other for the engine room; the former is of 66-inch size, and the latter of 48-inch size.

There are three six-inch fire lines running up through the building, each line having an outlet convenient to each floor. Over 4,000 feet of fire hose, in lengths of 50 and 75 feet, have been placed in racks contiguous to these outlets. The building is also equipped with Gamewell's auxiliary fire-alarm system, 48 alarm boxes being placed at available points. When any box in the system is pulled, an automatic device will cause the number of the particular box to be struck upon a 10-inch gong in the engine room and not this alone, but it will operate to dispel whatever somnolence may prevail in that tranquil region by repeating the ringing of the number four distinct times.

The basement and sub-basement are lined throughout with tarred felt and pitch, and are thus made absolutely waterproof.

This interesting plant is under the supervision of Capt. W. M. McIntyre, who is well and favorably known to the engineers of Cincinnati and the neighboring cities. In direct charge of the power plant, as chief engineer, is C. B. Garrison, who for more than 15 years has been an operating engineer in Cincinnati.

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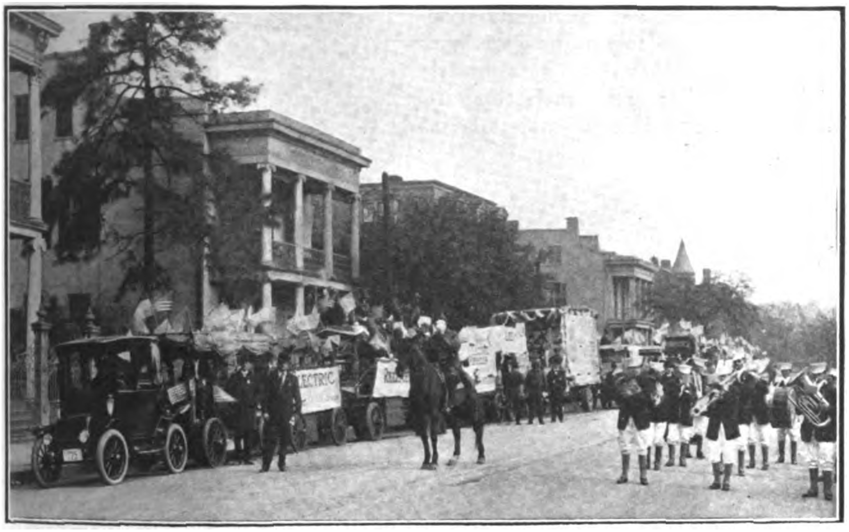
Exports of copper for the week ended March 12, totalled 10,870 tons, compared with 18,638 tons for that week last year.



Electric-Vehicle Parade in New Orleans.

Electric Vehicle Association of New Orleans Organized.

On March 6 there was organized at New Orleans, La., the Electric Vehicle Association of New Orleans. This followed an enthusiastic meeting held at the Hotel De Soto. T. B. Rhodes was elected president and W. E. Clement secretary. The organization includes representatives of the vehicle manufacturers, storage-battery interests, electric garages and central-station company.

The association determined to take a leading part in all civic improvements, such as improved pavement and maintenance of streets, building of good roads and the fostering of any project that will promote the more general use of electric vehicles, both of the pleasure and commercial types.

Leading up to the organization of the association was an electric vehicle parade on February 25 in connection with the Mardi Gras festivities. The illustration herewith shows the parade which was arranged by William E. Clement, head of the commercial department of the New Orleans Railway & Light Company. The parade was headed by a band, directly after which was a bugle corps, then there were 15 work trucks used by the Railway Company in its service department. There were also a number of electric trucks loaned for the occasion by several of the breweries and other commercial interests.

In New Orleans and throughout the South generally great interest is being manifested in the use of electric vehicles, and their quiet and smooth operation, absence of objectionable odors, ease of control and reliability are making many friends for this type of vehicle.

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Springfield, Mass., to Investigate Advisability of Municipal Plant.

The city government of Springfield, Mass., proposes to employ an expert electrical engineer to advise the city as to the desirability of installing a plant to supply the municipal buildings known as the municipal group. The city now pays seven cents a kilowatt-hour for energy supplied by the central station. In response to the Board of Supervisors' request for an estimate on the cost of the suggested installation, the Crocker-Wheeler Company and the Power Equipment Company submitted a joint bid of $15,000, and estimated the cost of producing the energy at four cents a kilowatt-hour.

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Successful Rejuvenation at Twin Falls, Idaho.

A most successful rejuvenation of the Jovian Order was held at Twin Falls, on Saturday, February 28, under the direction of E. A. Wilcox, Twelfth Mars. Sixteen initiates were taken into the order.

New Electrical and Mechanical Appliances

The Bristo Safety Set-Screws.

The Bristol Company, Waterbury, Conn., has recently put on the market a new improved line of Bristo patented safety set-screws. These are shown in the three accompanying illustrations. They are manufactured under the Goodwin patent of October 14, 1913. The patented design is shown in the cross section, Fig. 1, from which it may be seen that there are six dovetailed slots inside the hollow center of the set-screw, and six corresponding flutes on the outside of the special wrenches used therewith. The dovetailed design is such that when these set-screws are set up hard with the special wrench, the latter gives the screw a true rotary motion without the usual tendency to expand and crack the hollow head. The angles of the surfaces of the slots are such that there is even a tendency for the wrench to contract or compress the head of the screw. From this it will be seen that these screws are particularly well adapted for use where often taken out and in or where set up and loosened repeatedly, as for instance in lathe dogs which are adjusted frequently.

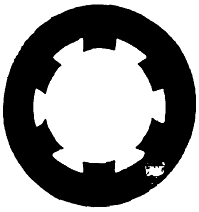

Fig. 1—Section of Bristo Safety Set-Screw.

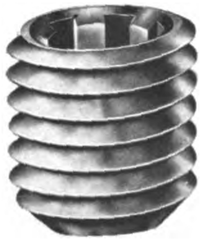

Fig. 2—Bristo Safety Set-Screw with Cup Point.

These screws are manufactured in a great variety of sizes, a few of which are shown in Fig. 3. They are made with five styles of point, namely: flat, cup, cone, dog and round points. The wrenches are fluted at both ends so as to permit screws to be put into deep holes or other places where a long wrench is needed. A special treatment process is used which makes the screws glass-hard on the outside and extremely tough on the inside, and samples have been found in actual test to be 100 per cent stronger than the old hex-style set-screws.

The "safety first" movement has progressed so far that great attention is now being given to changing the design of machinery to protect human life, and the elimination of the old-style set-screws with projecting heads is one of the things which safety engineers and insurance inspectors insist on. At the first International Exposition of Safety and Sanitation, which was recently held in New York City, a silver medal was awarded to the Bristol Company in connection with its exhibit of safety set-screws.

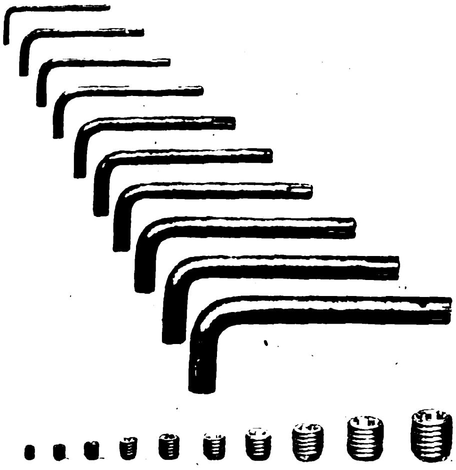

Fig. 3—Assortment of Safety Set-Screws with Their Respective Wrenches.

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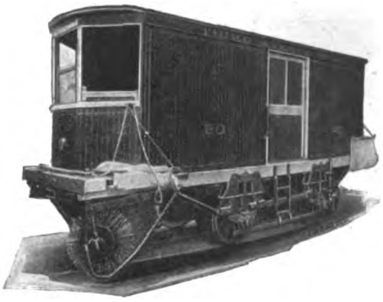
Storage-Battery Cars and Snow Sweepers Give Reliable Service.

The recent snowstorms which occurred in the eastern part of the country were particularly severe in New York City. The large fall of snow accompanied by wind caused drifts which seriously impeded traffic in the metropolis. Transit lines were demoralized and for some time street traffic was almost entirely suspended. In the midst of this chaotic condition of affairs, it is interesting to note the service which was rendered on both the lines of the New York Railways and the Third Avenue Railway Company by storage-battery cars.

When a number of the lines in New York City were crippled, the storage-battery cars of the Third Avenue system kept the Forty-second Street crosstown line in service and on Fifty-ninth Street and Broadway these cars were used with very satisfactory results, both to the operating company and to the public. The storage-battery cars operated by the New York Railways Company were also kept going through the storm of March 1 and 2.

The very heaviest work done in connection with cleaning away the snow was done by the storage-battery snow sweepers. These sweepers were kept in nearly continuous operation.

At a conference of city and railway officials held in New York on March 6 to discuss means of fighting snow, a letter from President F. W. Whitridge, of the Third Avenue Railway Company, was read by Superintendent Maher, in which Mr. Whitridge made this suggestion for cleaning the streets: "Why should not the city have a number of storage-battery sweepers, such as we use, and which work perfectly, to sweep the snow from both sides of the street into the middle. I believe it possible for 15 of these sweepers to keep Fifth Avenue from Washington Square to 110th Street perfectly clean, with a fairway on each side of the snow so banked in the center of the street."



Storage-Battery Snow Sweeper in Service in New York City.

There are at present 207 storage-battery cars used in New York City by the Third Avenue Railway Company and the New York Railways Company, all of these cars being equipped with lead-plate batteries. Of these cars, 175 are equipped with Hycap-Exide batteries, manufactured by the Electric Storage Battery Company, Philadelphia, Pa., as are also four battery snow sweepers.

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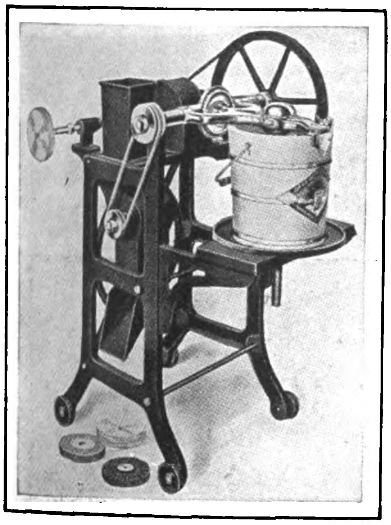
Electrically Driven Ice-Cream Freezer and General Power Machine.

A convenient-electric appliance designed for use in residences and small refreshment parlors has been developed by the Dana Manufacturing Company, Cincinnati, O. This machine primarily is a motor-driven ice-cream freezer, which also has attachments for crushing the ice and for various utility purposes; thus it can be used for operating a washing machine, for sharpening knives, hatchets and other edged tools, for cleaning and polishing silverware or for driving an ironer or mangle.

The power consumption of the machine is so small as to permit it to be attached to any lighting circuit. The cost of operation is very moderate. The manufacturer claims that because of its all-around utility it is more serviceable for general household purposes than where separate motor-driven washers, freezers and other machines are used. The machine is mounted on a sturdy iron framework and has a bracket for the freezer and a hopper and chute connected with the ice crusher. An auxiliary shaft provides means for driving a buffer or emery wheel and for connecting the machine to a washer or other appliances.



Motor-Driven Freezer and General Power Machine.

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New Outlet-Box Attachments.

There has been a demand for fittings that can be readily secured to the ordinary plain open outlet box or ceiling plate. This has been met by James C. Phelps, of Springfield, Mass., who is manufacturing a number of special covers for such boxes, and a rosette therefor. Fig. 1 shows the latter installed. This rosette is made of fine white glazed porcelain and makes a very handy fitting for the attachment of a drop cord to an open outlet-box cover plastered into the ceiling. Like the special covers and other attachments made in this line, these rosettes are attached to the outlet box by means of two stove bolts, the nuts of which turn in channels that extend into the box. The lower ends of the channels are inclined backward toward the center of the fitting so that the nuts can be held with the thumb and finger as shown in Fig. 2. When inserted into the box and when the screws are tightened up, the nuts move out on the inclined surfaces in the channels and engage the inner edges of the box cover. In this manner the fitting is securely fastened to the box without having to resort to any special ears or screws on the outlet-box cover.

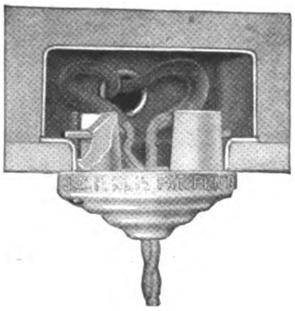

Fig. 1—Phelps Rosette Installed.

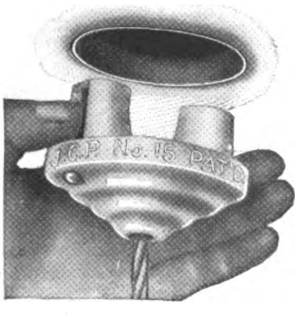

Fig. 2—Showing Ease of Installation.

Among the special covers made by Mr. Phelps is the one shown in Fig. 3, which is of galvanized iron and drilled to take a Perkins, Bryant or Arrow-E surface switch or wall socket. Another cover is made of galvanized iron and fitted with a flush receptacle. This can also be furnished without the receptacle, but so drilled as to take in one of several types of sign receptacles. A blank galvanized cover for closing an open outlet-box cover not in use is also made and forms a very convenient fitting.

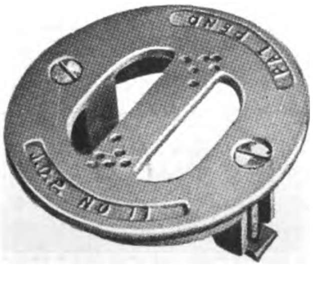

Fig. 3—Special Cover.

These fittings have been placed on the market by L. E. Frorup & Company, 232 Greenwich Street, New York City, who are the general sales agents for these devices.

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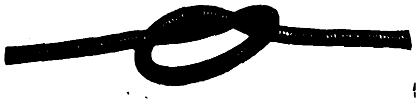
Realflex, a New Flexible Armored Conductor.

The development of flexible steel conduit and flexible steel-armored conductors has greatly extended the field of the electrical contractor and wireman by permitting him to install in a durable manner protected circuits in many places where formerly this was impossible. The ordinary flexible steel products of this character, however, introduce some difficulties in installation because their degree of flexibility is not sufficiently high; in some cases also the outer steel armor is liable to breakage when subjected to severe mechanical bending strain.

With the aim of overcoming these difficulties, the Western Conduit Company has placed on the market a new kind of flexible steel-armored conductor, which has appropriately been named Realflex because of its exceptional flexibility. This is made possible by making the armor of nearly round galvanized steel wires. The armor is in two layers which readily bend over each, because of the round contact between them, without greatly changing their relative position. Each layer is composed of two wires. The outer surface of the outer wires and the inner surface of the inner wires are slightly flattened to prevent the thickness of the armor from becoming excessive. A special grade of galvanized-steel wire is used which is made in the company's mills from the ore to the finished product, thus every step in the manufacture is under the company's control.



Realflex Armored Conductor.

Among the advantages claimed for this armor are extreme flexibility, great strength, unbreakability and neatness and evenness of the ends when severed. The cable can be bent into sharp bends and even tied into a knot without breaking the armor or injuring the insulation of the conductors within. Although the armor is as strong as a double layer of steel wire can make it, it can readily be removed or stripped from the conductors at the terminals or joints of a circuit. By cutting with a hacksaw nearly through the wires of the armor, each wire can in turn be given a sharp bend or twist and broken off.

The conductors have each an individual tested rubber insulation and upon this a braid covering. This braid is of different color for each wire to facilitate testing out. A second layer of braid surrounds the group of conductors. These armored cables are made with two or three conductors of Nos. 10, 12 and 14 B. & S. gauge wire. Similar cables are made with both lead sheath and steel armor for places where waterproof cable is needed. Standard armored cord and reinforced armored cord is also made with No. 14, 16 and 18 wire. The coils come in lengths of 100 to 250 feet, depending on the size of conductor and type of cable.

The Western Conduit Company is a subsidiary of the Youngstown Sheet & Tube Company. Its main offices are in the Stambaugh Building, Youngstown, O.

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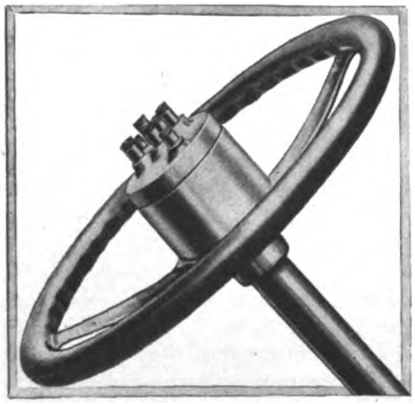
Electrically Operated Gear Shift to Replace the Hand Lever on Gasoline Automobiles.

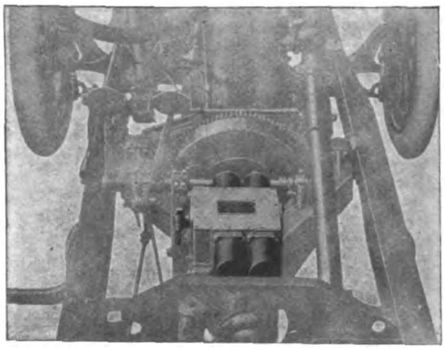
Gasoline automobiles of the immediate future will probably be as easily operated as the electric vehicle, because electricity will be used for lighting, starting and shifting of gears. Mounted on the steering wheel will be a group of buttons, one of which starts the motor, one toots the horn, three are used to shift gears for first, second and high speeds, one for neutral and another for reverse.



Steering Wheel with Control Buttons.

The Vulcan electric gear shift formerly made by the Vulcan Motor Devices Company, of Philadelphia, and now made and marketed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has already been adopted by a number of high-grade cars and other manufacturers are now negotiating with a view to making this device one of the features of their 1915 models.

The accompanying illustrations make clear the principle involved in the electric shifting of gears. Instead of employing a hand-operated lever to shift the gears, power for this work is supplied by a solenoid capable of exercising a 150-pound pull. In the Vulcan system four such solenoids, mounted under the car, control respectively the high, low and intermediate forward speeds and the reverse speed. These solenoids are energized by battery current controlled from push buttons mounted on the hub of the steering wheel, the forward speed buttons being marked *1*, *2* and *3*, (for first, second and third speed) and the reverse speed button bearing the letter *R*. In addition there is a neutral button (*N*) which is used for stopping the car, and two auxiliary buttons (*S* and *H*) which enable the self-starter and electric horn to be operated from the steering wheel.



Electric Gear-Shift Outfit in Chassis.

When one of the speed-changing buttons is depressed the circuit to the proper gear-shifting solenoid is partly closed but the actual closing of the circuit is not completed until the clutch pedal is thrown in, this pedal carrying a small master switch which completes the circuit to the battery. Very little current is used as none is consumed except at the instant the gear-shifting solenoid is energized. Actual tests have shown that the time of engagement of the master switch, and therefore the time that current is flowing from the battery, is less than one-third of a second for each gear shift. With an 80-ampere-hour battery it would be possible to drive a car from New York to San Francisco, shifting gears every quarter of a mile, without exhausting the battery.

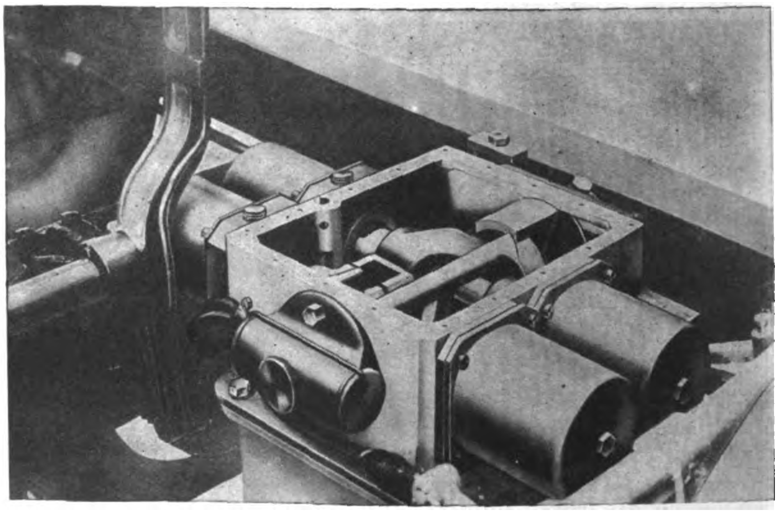
The principal advantages claimed by the manufacturer for the Vulcan electric gear shift are:

1. Ease of operation. There is no stooping over or muscular effort required as with the hand-lever gear shift. Merely push a button and depress the clutch pedal and the solenoids under the car respond with an instantaneous pull of 150 pounds.

2. It can be operated without removing the hand from the steering wheel, or the eye from the road ahead, thus eliminating two frequent causes of accidents.

3. It enables the gears to be shifted with almost incredible speed, a great advantage when worming one's way through the congested traffic of a city's streets.

4. It enables the driver to anticipate speed changes without actually changing the speed until ready to do so. The circuit to the gear-shifting solenoid is completed only when a push button is pressed and the clutch pedal is pushed *all the way down*. Pressing one of the selective push buttons produces no effect. Slipping the clutch produces no effect. But press a button and push the clutch pedal down to the floor board and the gears are shifted instantly.



Near View of Gear-Shift Solenoids and Mechanism.

5. The clutch is always fully disengaged and the gears are always drawn to the neutral position, mechanically, before a shift is made, thus rendering it impossible to strip a gear.

6. The amount of current required to operate the gear shift is very slight, as current is consumed only for a third of a second at the instant the gear-shifting solenoid is energized.

7. The Vulcan electric gear shift provides the one thing needed to make the gasoline vehicle an electrically controlled car. The elimination of the starting crank by the push-button-controlled self-starter was the first step in this direction. The elimination of the hand-lever gear shift by the push-button-controlled gear-shifting solenoid is the logical sequel. With starting, stopping, speed changes and reversing all controlled by push buttons the gasoline car becomes practically as easy to operate as an electric car.

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Selector-Type Disconnecting Switches.

The selector type of disconnecting switch is a transfer switch which does not require the circuit to be interrupted while making a change. It can also be used to connect two independent circuits in parallel. However, it is not designed for opening under load and therefore no attempt should be made to open it with current on the line.

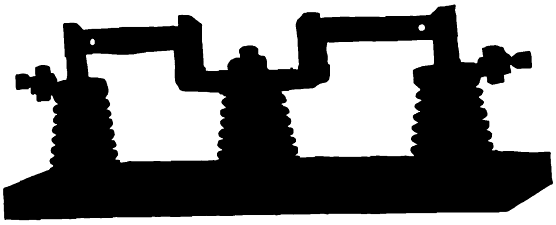

Fig. 1.—Westinghouse Selector-Type Disconnecting Switch for Front Connection, with Both Sides of Switch Closed.

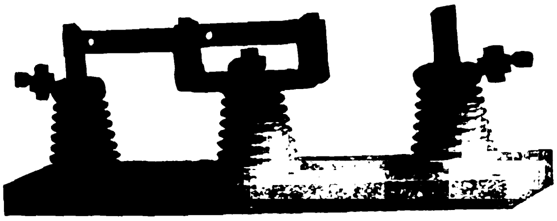

Fig. 2.—Same Switch with One Side Open.

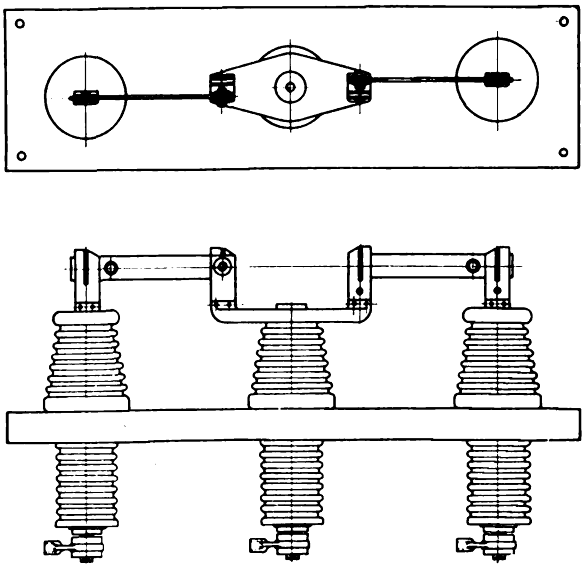

Fig. 3.—Plan and Elevation of Back-Connected Switch.

These switches are in effect two single-throw, single-pole disconnecting switches with the hinge jaws connected together and mounted on the same insulator. The hinge jaw is also provided with dummy jaws to hold either blade of the switch in the open position. Except for these differences in the hinge jaws, the construction of these switches is similar to the standard disconnecting switches of the same ratings.

Two types of these switches are made. One type is intended for wall mounting, the live parts being mounted on porcelain insulators carried on a cast-iron yoke or base. This forms a simple, but substantial, construction that is neat in appearance and moderate in price. All parts of this switch, but the porcelain insulators, are finished in black marine.

The other type is designed for indoor mounting on marble bases or switchboard panels. It is made for either front or rear connection or for any combination of front and rear connection desired. The copper parts are dipped and lacquered. These selector-type disconnecting switches are extensions of the regular line of disconnecting switches manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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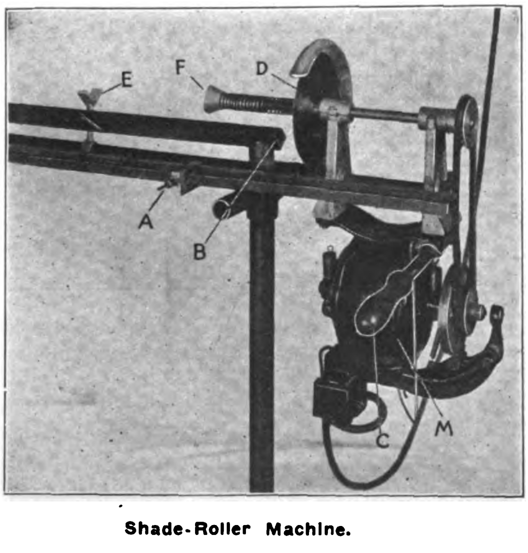
Motor-Driven Shade-Roller Measuring, Sawing and Boring Machine.

The motor-driven machine illustrated herewith is designed to saw and bore window-shade rollers and can be instantly set to bracket measure for any style bracket, the machine making all allowances. This eliminates many possibilities of mistakes in cutting rollers and assures perfect fit for the bracket measure taken.

The motor on this equipment operates a saw and drill, the saw operating on the swing-saw principle and the motor hanging below and balancing the saw. When the operator moves the handle on the machine, he automatically turns on the curernt, starts the motor and swings the saw forward. After cutting the end of the roller, a hole is drilled in the center of the roller by pressing it in the cone which surrounds the drill and which automatically centers the roller. The drill is in the center of the cone which is held by a spring that is pushed back while the drill is engaged in boring. Detailed operation of the machine is as follows:

Place rollers in trough *B*, turn lever *C* slightly to the left, which starts the motor *M*; press lever *C* down, which brings saw *D* across rollers, sawing them absolutely square. The sawing operation requires about one second. Place rollers in crotch *E* and insert end in tapered cup *F*, which centers roller of any diameter. Start motor by turning lever *C* slightly to left and roller is bored for pin end perfectly centered. Drive pin, which follows hole bored, thus eliminating all possibilities of wobbling when hung.



Shade-Roller Machine.

The motor runs only when cutting or boring and requires hardly enough power to start the meter. One machine in operation for eleven months cut 16,000 rollers at an average cost of 22 cents per month for power.

The machine occupies a space of 2 feet by 6 feet, and can be moved at will. The outfit is supplied by Mylod & Sons, Providence, R. I., the motor used being manufactured by the Diehl Manufacturing Company, Elizabeth, N. J.

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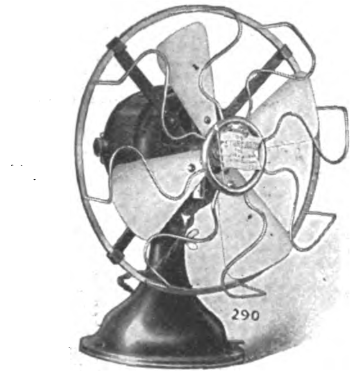
An automatic telephone exchange is being installed in Simla, India.

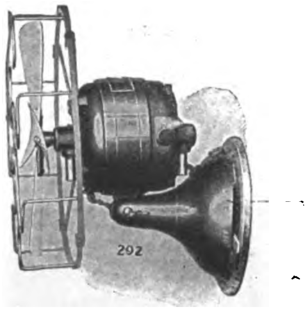
New Robbins & Myers Eight-Inch Desk Fan.

The illustrations herewith show the new eight-inch direct-current desk or bracket fan developed by the Robbins & Myers Company, Springfield, O., for the season 1914. This fan is made for both 110 and 220-volt circuits. By means of a speed-regulating coil and switch in the base, three speeds can be obtained: 1,700, 1,400 and 1,000 revolutions per minute. At these speeds the respective power consumption is 25, 20 and 15 watts.

A hinge joint provides for trunnion adjustment, adapting the fan for either desk or bracket service. The blades are made of the best grade of sheet brass, and are riveted to a punched speet carrier which is formed to give a uniform pitch to all blades, the pitch being such as to give maximum air displacement with minimum power. A strong durable guard surrounds the blades; it is fastened to the body by four steel supports which are fastened rigidly by screws. This guard is amply strong to permit the fan to be carried about by it without injury.



New Direct-Current Eight-Inch Fan.



Same Fan Used as a Bracket Fan.

The frame and base of the motor are highly finished in baked black enamel with fine gilt stripes. The blades are brushed-brass finish and lacquered. In all details the fan is built strongly; it runs quietly and meets the needs of the home or office where larger fans are not desired.

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Bristol Pneumatic Recording Tachometer.

The field of usefulness of recording tachometers is almost unlimited because there is a great need for measuring and controlling the revolutions of shafting, machinery, engines, etc. In some processes in mills it is desirable to have a certain speed or rate of revolutions maintained continuously or certain stops made periodically but not too often and the recording tachometer provides the superintendent or manager with information about the actual operating conditions maintained. For instance, blast-furnace blowing engines are driven at a certain predetermined speed but are usually slowed up once every four hours at casting time.

A pneumatic type of recording tachometer has been developed to be used in connection with blast-furnace blowing engines and for similar applications, such as for recording the speed of paper machines.

In many instances it is not convenient to have a recording tachometer installed in self-contained form and located near the revolving shaft. One of the special features of the new pneumatic recording tachometer is the flexible connecting tube, 25 feet long or longer, between the revolving mechanism and recording instrument which is mounted in any convenient position, as for instance on the wall of the engine room.

The patent on this pneumatic recording tachometer was issued on June 30, 1912, to Prof. Wm. H. Bristol, and these tachometers, as shown complete in Fig. 1, have now been perfected for use under ordinary shop conditions. Some of the first models of this new tachometer have been in successful service for more than 24 years.

The pneumatic principle of operation depends on the centrifugal action of air in a revolving tube which is connected on the recorder through a special oil seal and flexible connection tube.

Fig. 2 shows diagrammatically the construction of the revolving mechanism. In the diagram, *B* designates a hollow circular protecting base and at its upper surface is provided a bearing for a hollow shaft *D*. This shaft is arranged to be rotated from any desired mechanism through a set of gears and pulleys or sprockets.

A pulley *C* is shown over which a belt runs to a similar pulley attached to the shaft whose revolutions are to be measured and recorded. In practice most of these tachometers are being furnished with a special form of sprocket and chain instead of using the pulley and belt shown.

The lower end of the hollow shaft *D* terminates in a horizontal tube *A*, open at its extremities. The upper end of the hollow shaft is surrounded by a casing *E*. It is partly filled with oil and into this extends the free end of another tube *F*. This tube is stationary and is joined at its outer end to a flexible capillary connecting tube *G* leading to the recording instrument.

The recorder used with this patented speed-measuring device is a special low-range Bristol recording vacuum gauge. The recording instrument may be installed either near to or at a distance from the shaft or engine, the speed of which is to be recorded, and a suitable length of flexible copper tubing is furnished to connect the recorder with the revolving tube.

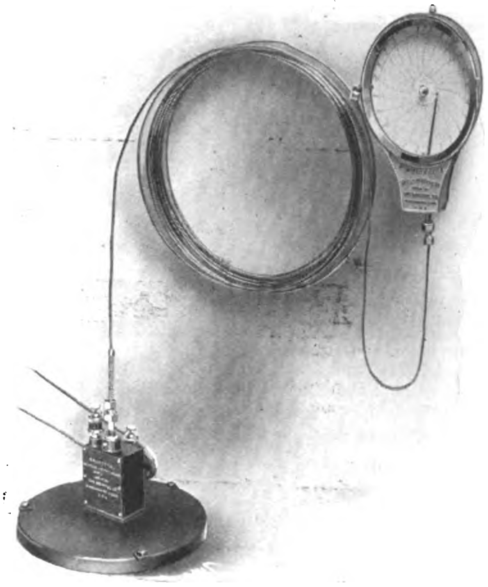


Fig. 1.—Bristol Pneumatic Recording Tachometer.

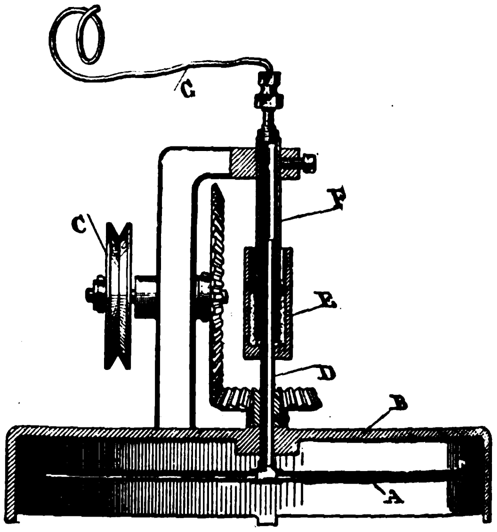


Fig. 2.—Diagram Showing Principle of Operation.

These patented tachometers are manufactured by the Bristol Company, Waterbury, Conn. This company also manufactures electrical tachometers.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

WILSALL, MONT.——C. S. Hefferlin has received a franchise to establish an electric lighting plant.

WAUBUN, MINN.—A franchise has been granted to Chandonnet & Son to install electric lighting here. C.

CANAL DOVER, O.—The city lighting will be improved. Address Edward Klar for particulars.

MOLALLA, ORE.—M. J. Lee, of Canby, Ore., is preparing to build a $25,000 power house near here this spring.

BRYAN, TEX.—The Bryan Power Company will construct five miles of three-phase 2,300-volt transmission line.

HAVELOCK, IOWA.—S. H. Gill and George Miller are investigating the cost of building a transmission line from Laurens. C.

RICHLAND, MO.—Richland Light & Power Company has been incorporated by W. I. Diffendeffer, B. J. Woodward and L. C. Harris.

MADISON, WIS.—A petition for an ornamental street lighting system was presented to the council by Alderman Frank Alford. C.

CARLYLE, SASK.—$30,000 will be expended improving and extending the electric system. Address Ed. Holmes for information.

SMITH MILL'S, KY.—The municipality is in the market for an engine and dynamo for installation in the city electric light plant. G.

WYMORE, NEB.—The Council is planning ways and means to install an electric system. Address M. L. Rawlings for information.

CLARKSVILLE, TEX. — The Clarksville Light Company will install a street lighting system. Address A D. Simpson, secretary.

CLYNDON, MINN. — A 15-year franchise was granted to the Clyndon Electric Light Company. Oscar Wangen is village recorder. C.

GALT, MO.—Galt Light & Power Company has been incorporated with a capital of $10,000 by A. D. Miller, D. H. Clark and N. D. Jordan.

MILES CITY, MONT.—The city engineer has been instructed to advertise for a new 200-kilowatt generator, cost not to exceed $1,800. O.

RYGATE, MONT.—Local citizens have started a movement for an electric-light plant here. The Village recorder may be addressed.

SYCAMORE, GA.—The J. B. McCrary Company, Third Nat'l Bank, Atlanta, has been granted a franchise to install an electric lighting system here.

ELIZABETH, N. J.—The Hillside Township Committee is planning for the extension of its lighting districts to the Lyons Farms and Saybrook sections. A.

LIVINGSTON, MONT.—The Municipal Ownership League has taken up the question of ornamental lighting. Address Joseph Brooks, president.

DOUGLAS, WYO.—The Douglas Electric Light Company will shortly install an entirely new equipment of machinery at a cost of more than $30,000.

FLANDREAU, S. D.—The Flandreau Light & Power Company, A. H. Savage, St. Paul, treasurer, will build a nine-mile, 13,200-volt transmission line. C.

WINNEBAGO CITY, MINN.—The Commercial Club is planning to install ornamental lighting on the business streets. Address the secretary of the club.

PULASKI, TENN.—The municipality is preparing to spend $20,000 in the completion of its electric light plant, work on which was started some time ago. G.

COLUMBIA, TENN.—John H. Carpenter of Nashville has been granted a franchise to construct and operate an electric-light, power and heating plant.

LOUISVILLE, KY.—John Rohrman, Second and Green streets, plans to manufacture ice machines, and will establish a plant. Motors will be required. G.

ALPINE, TEX.—The Alpine power plant has been sold to George Miller, of Marathon, for $10,000. The new owner will make a number of improvements, it is stated. D.

PITTSBURG, TEX.—The People's Light & Ice Company is being organized here and will erect a light plant and ice factory. Local capital is backing the company. D.

LIVINGSTON, MONT.—The Municipal Ownership League, of which Joseph Brooks is president, has taken up the question of ornamental street lighting. C.

DRESDEN, TENN.—Philip A. Porter, Clinton, Ky., has been put in charge of the construction of an electric light plant for the city at a cost of $27,000. G.

ELLENDALE, N. D.—J. L. Tucker has been granted a 30-year franchise to construct electric light plant. Address John King, city auditor, for desired information.

MORRISTOWN, TENN. — The Mims-Goodson Company will need an electric elevator for a six-story mercantile building, which is now being constructed. G.

HARDIN, KY.—The Hardin Light & Power Company is preparing to install a street-lighting system. Forty arc lights will be erected in the immediate future. G.

PASADENA, CAL.—The City Commissioners have passed an ordinance covering the installation of ornamental lighting on Madaline Drive and on Colorado Street.

ABBEVILLE, LA.—March 26 bids will be received for the machinery for the proposed water and light plant. Address Adolph Brasseux, mayor, in regard thereto.

MELSTONE, MONT.—The City Council recently granted a franchise to O. H. Bennett of Spokane, Wash., for constructing an electric light and power plant in this city. O.

CANBY, ORE.—M. J. Lee, of this city, will build a 20,000 power plant near Molalla, work to begin within the month. It is understood the plant will be in operation within 90 days. O.

ELLENDALE, N. D.—A 30-year electric light franchise has been granted to J. L. Tucker. Work will begin on the plant within 90 days. John King is City Auditor. C.

NEW CASTLE, KY.—The Kentucky Utilities Company, with headquarters at Lexington, Ky., is planning to extend its lighting service from Eminence to New Castle. G.

BRUNSWICK, GA.—The stockholders of the Mutual Light & Water Company are considering the proposed establishment of a new electric light plant by that organization.

BOSTON, MASS.—Architects Shepley, Rutton and Coolidge have prepared plans for Dormitories for Summer College. The specifications include an electric-light plant.

TEMPLE, TEX.—The City Council will soon receive bids for the erection of an electrical pumping unit at the river station of the city water works plant, costing about $4,000. D.

WAYNESBORO, MISS. — The Waynesboro Electrical Company, has been organized with C. C. Green, president. $6,000 will be expended constructing an electric-light plant.

COLUMBIA, TENN.—An electric power plant will be constructed here by John H. Carpenter, of Nashville, who was recently awarded a franchise to furnish light and power to the town. G.

ROSENDALE, WIS. — Wisconsin Light, Power & Milling Company will spend $10,000 building and equipping a hydroelectric plant and erecting transmission lines in this vicinity. C.

GOLCONDA, NEV.—J. A. Fayant has been granted permission by the county commissioners to maintain a power plant and erect a pole and wire system in this town for the transmission of electricity.

ROSENDALE, WIS.—The Wisconsin Light, Power & Milling Company, will spend $10,000 building and equipping a hydroelectric plant and erecting a transmission system in this vicinity.

JUNEAU, WIS.—This city has voted a bond issue to finance an electric light transmission and distributing system. Current will be purchased of the Horicon Light & Power Company.

LOUISVILLE, KY.—The Louisville & Nashville Railroad Company will need motors for equipment to be installed in a new car repair shop, for the construction of which bids are now being taken. G.

LOUISVILLE, KY.—The Kentucky Public Elevator Company will need motors for the operation of grain-cleaning machinery which it is reported will be bought. Frank C. Dickson is vice-president. G.

ST. PETERSBURG, FLA.—J. B. McCrary & Company, of Atlanta, have prepared plans for a $48,000 electric plant. As soon as bonds are sold contracts will be let for construction. Address the city clerk.

BELLINGHAM, WASH. — The question of bonding the city for the sum of $400,000 for the construction of a municipal electric-light plant is being considered. Address the city clerk for further information.

PERTH AMBOY, N. J.—The Board of Water Commissioners is planning for the installation of a high-pressure salt-water system, to include an electrically operated pumping station. Thomas Grieve is Water Superintendent. A.

LEXINGTON, KY.—The Federal Parquetry Manufacturing Company, New York, is planning the operation of a hardwood flooring plant, motor-driven machinery having been specified. I. Herz is to manage the plant. G.

HOPKINSVILLE, KY.—The Kentucky Public Service Company is preparing to purchase a new franchise, which will enable it to extend its lines to a number of points in the county. The local plant may be enlarged. G.

SABULA, IOWA.—Plans are being considered by J. A. Bradley of this town for erection of transmission lines into the country to furnish power and lights to the rural districts. Power is to be furnished by the local plant. C.

MERCHANTVILLE, N. J.—The Borough Council is considering a plan for the purchase of electric power from the Public Service Electric Company and the installation of a municipal substation and distributing lines for local service. A.

LEWISTOWN, MONT.—Plans for the installation of a cluster lighting system in the business district are being prepared at this time by the city engineer and it is understood bids for materials and installations will be received in the immediate future. O.

WILLIAMS, IOWA.—The Williams Electric Light & Power Company is making arrangements for running a transmission line to Blairsburg and for furnishing that progressive little city with electric lighting. F. R. Payne is manager.

GOSHEN, IND.—The Hawks Electric Company, and the citizens of Goshen, Ind., have petitioned the public service commission to permit the company to extend its electric lines to Waterford and New Paris at a cost of $4,000.

CLEVELAND, O.—City officials and architects have decided to build the power plants for the new City Hospital buildings before other improvements and extensions are made. It is planned to have the powerhouse in operation by October 1. R.

COLUMBUS, O.—Charles Pryor, of the city engineer's office, and John W. Alvord, consulting engineer, are investigating the practicability of utilizing the water at the storage dam for power to be used in operating the various municipal plants of the city.

KLAMATH FALLS, ORE.—Articles of incorporation have been filed for the Keno Power Company, with a capital stock of $250,000, by J. W. Kerns, B. E. Kerns and G. G. Kerns, former residents of Chico, Cal. The brothers propose to enter the local field.

LOUISVILLE, KY.—B. M. Henry, manager of the Louisville plant of the American Oak Leather Company, will shortly let contracts for the equipment required in the electrification of the plant, plans for which have been made by Ward Baldwin, of Cincinnati. G.

SPRINGFIELD, O.—The Industrial Bureau of this city has appointed a committee to investigate the project of erecting a modern power building, to meet the collective needs of small manufacturing plants, to which power and light will be supplied. J.

BURNEY FALLS, CAL.—The State Railroad Commission has authorized the sale of $65,000 preferred stock of the Pit River Power Company to be sold at not less than 80 per cent of the par value, the funds to be applied to the development of the company's hydroelectric system.

ATCHISON, KANS.—An ordinance has been passed authorizing the mayor to enter into contract with the Thayer Foundry Company for the construction and installation of a special lighting system on Commercial Street, between the east line and Fifth Avenue. Address C. C. Finney, mayor.

FT. GAINES, GA.—The Credille Fowler Power & Manufacturing Company, has been incorporated with a capital stock of $12,000 to establish a plant to generate electricity to be used for power in manufacturing plants and for lighting. W. T. Credille, M. L. Fowler, are named among the incorporators.

HOMEDALE, IDAHO.—The Homedale Water, Light & Power Company recently petitioned the Public Utilities Commission for a certificate of public convenience and necessity which will enable the company to furnish the city of Homedale with light and power, etc. The company is incorporated for $50,000, and contemplates the building of a light and power plant as soon as the franchise is granted. O.

BRANDON, MAN.—The first steps toward an inter-municipal hydroelectric power system have been taken upon a comprehensive scale, consisting of Winnipeg, Brandon, Portage la Prairie, and Carberry men, by the appointment of representatives of the Manitoba Grain Growers' Association to go into the entire matter and collect data as to cost, etc., the same to be subsequently submitted to the municipalities interested.

EL CENTRO, CAL. — Work will soon be started on the high-voltage line by which power of the Sierra Power company will be transmitted, under contract with the Holton Power Company, to the Imperial Valley. The company has secured permission to cross all county roads with the lines, which will be run along private rights of way. Work on this line will be rushed. C. E. Paris is superintendent of the Holton Power company. T.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

SPOONER, MINN.—The Border Telephone Company will begin work on a line to Loman. C.

HAZEN, N. D.—The Independent Telephone Company has purchased right of way through here for a long-distance line. C.

ELMDALE, KANS.—The Farmers' Mutual Telephone Company has filed articles of incorporation, capitalized at $3,000. M.

ROXBURG, KANS.—With a capitalization of $2,625 the Maple Grove-Olive Springs Telephone Company has been formed here. M.

WESTBORO, WIS. — Westboro Telephone Company has been incorporated with a capital of $2,500 by J. W. Kaye and others. C.

PLANT CITY, FLA.—Hartline and Sons have been granted a franchise to construct and operate for 30 years a telephone system here.

WEBSTER, WIS.—A. J. Cairns, John McArthur and George E. Miller have formed a company to build a telephone line between Webster and Gaslyn. C.

LUVERNE, MINN.—Northwestern Telephone Exchange Company has been granted a new franchise on the condition that the local system be rebuilt. C.

LARCHWOOD, IOWA. — Logan Township Telephone Company has been incorporated with a capital of $1,000 by John McCarty, William Bunte and others. C.

AKELEY, MINN.—The Akeley Telephone Company will make extensive improvements on the local exchange as soon as weather permits, which will include new cables. C.

HENNING, MINN.—Henning-Almora Telephone Company has been incorporated by J. M. Hursh, W. J. Henderson, George F. Johnson and others. The capital is $25,000. C.

OKLAHOMA CITY, OKLA.—South Suburban Telephone Company has been incorporated with a capital stock of $300 by I. N. Needham, H. G. Little and I. C. Dambold, all of this city. P.

INDIANAPOLIS, IND.—The Citizens' Telephone Company has been incorporated with a capital of $8,000. The directors are David Bales, George W. Fry, Milton H. Fry and others.

OKLAHOMA CITY, OKLA.—Trout Telephone Company has been granted articles of incorporation, capitalized at $400. The incorporators are J. C. Farmer, A. Nebers and J. V. Crass, all of Roff. P.

KANSAS CITY, MO.—The Home Telephone Company will spend $200,000 in Kansas City for improvements and extensions, according to an announcement by Theodore Gary, president of the company. A. F. Adams is the new head of the company in Kansas City. M.

NEWPORT BEACH, CAL.—At a request of interested parties the trustees of this city have advertised for sale a 50-year telephone franchise, the bids for which will be opened on the evening of April 20, when a franchise will be sold. By the terms of this franchise the company securing it will be compelled to furnish ten telephones free to the city and also to pay to the city two per cent of its gross earnings. T.

ELECTRIC RAILWAYS.

(Special Correspondence.)

FT. WAYNE, IND.—The Ft. Wayne & Lake Everett Railway Company, has been incorporated with a capital stock of $300,000.

NOWATA, OKLA.—Mayor Schwabe has been authorized to call a special election to vote on a franchise for the proposed interurban line between this city and Coffeyville. M.

MUSCATINE, IOWA.—Plans are being considered by Muscatine, North & South Railway Company for equipping its railway from here to Burlington for electrical operation. C.

NEW ALBANY, IND.—The New Albany & French Lick Valley Railway Company is prepared to let contracts for the construction of its 60-mile interurban line, it is reported. G.

HOT SPRINGS, ARK.—Commercial organizations of Hot Springs and Little Rock will assist in the sale of $200,000 worth of stock to finance the proposed electric road to be built between the two cities. M.

WASHINGTON, D. C.—The Capital Traction Company is authorized by the Public Utilities Commission to sell $360,500 of bonds for extensions, improvements, etc. Address D. S. Carll, secretary.

JONESBORO, ARK.—There is an agitation for an interurban line to connect this city and Paragould. The project is not a new one, but J. R. Brown is here promoting the venture, and it apparently meets with favor on all sides.

COLUMBIA, S. C.—The Columbia-Camden Railroad has been chartered with a capital of $250,000 and work was commenced on the electric line of railway between here and Camden. B. L. Abney and Senator Westeon and others are behind the movement.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company announces that the interurban line will be extended from Centerville to Farmington, a distance of five miles, during the coming year, and that ultimately the line will be continued through to Ogden. W.

FRANKLIN, TENN.—G. D. Howard & Company are engineers for the construction of the Shelbyville, Petersburg and Decatur Railway Company, and are preparing to let contracts. S. P. Kirkpatrick, Shelbyville, Tenn., is president and general manager. G.

ANDREWS, N. C.—The Hiawassee Railway Company has been incorporated to construct an electric railway from Andrews to Haynesville and Hiawassee, Ga., about 35 miles. J. W. Walker, of Andrews, and G. H. Haigler of Haynesville, are the incorporators.

MANHATTAN CITY, KANS.—The Manhattan City & Interurban Railway Company will shortly begin work on the completion of the electric road between this city and Fort Riley, Kan. A part of the road was built last year. Joseph T. West, Manhattan, is general manager of the company. M.

SAN BERNARDINO, CAL.—Announcement has been made that an electric railroad will soon be started from the south to the rim of Death Valley, this to be constructed by the Tonopah & Tidewater Railway Company. A branch will be built from Death Valley Junction to a point on the edge of the valley, 21 miles distant. It will tap the new borax deposits and the Saulsbury gold mines.

NEW INCORPORATIONS.

DETROIT, MICH.—Six-in-One Electric Battery Company has been incorporated, capitalized at $20,000.

DETROIT, MICH.—Victor Electric Supply Company has been incorporated with a capital stock of $15,000 by J. W. McNair, J. N. Burns and others.

COLUMBUS, WIS.—Hale Electric Company has been incorporated with a capitalization of $300,000 by J. T. Hale, W. M. Hale and H. S. Hale.

CLEVELAND, O.—The Federal Electric Company has been incorporated with a capital stock of $1,250. The incorporators are J. S. Kohn, L. M. Young and T. J. Wolf.

HARRISBURG, PA.—Braddock Electric Machine Company has been incorporated with a capital stock of $5,000 by W. J. Nowotny, of Braddock; and P. D. Remington, of Edgewood.

STEUBENVILLE, O.—The Swan Bower Company has been incorporated with a capital stock of $20,000 by George Swan, Matthew Swan, Sam Stark, E. D. Bower and James McCoy.

AMERY, WIS.—Apple River Milling Company has been organized to develop electricity and sell same. Those interested are E. J. Schneider, E. M. Fay and others. The capital is $40,000.

EUGENE, ORE.—The Eugene Electric Cone Manufacturing Company recently filed articles of incorporation with a capitalization of $20,000. The incorporators are Frederick H. Miller, Ernest House, and others, of this city. O.

SYRACUSE, N. Y.—Rogers & Hilton, Incorporated, has filed articles of incorporation as electrical contractors. The capital stock is $25,000 and the incorporators are Frederick Rogers, James S. Hilton and Thomas H. Hilton, Syracuse.

HURLEYVILLE, N. Y.—Mongaup Light, Heat & Power Company, Incorporated, has been granted articles of incorporation, capitalized at $9,000. The incorporators are Ellsworth Baker, Pearl Baker and Frank W. Laidlaw, all of this place.

MANHATTAN, N. Y.—The Stanley Utilities Company has been incorporated with a capital stock of $10,000 to deal in mechanical electrical and chemical appliances. The incorporators are Charles H. Stanley, Cynthia Stanley and Frank Hauser, New York City.

ROCHESTER, N. Y.—E. C. Sykes & Company, Incorporated, has filed articles of incorporation, capitalized at $25,000, to engage in electrical work, supplies, etc. The incorporators are Edwin C. Sykes, Earl D. Wilcox and Baran P. Sykes, all of this city.

LOUISVILLE, KY.—The Safety Door Securer & Manufacturing Company, organized with $20,000 capital stock, will need motors for the operation of metal-working machinery. Harry Catlett, manager of the Louisville Gas & Electric Company, may be addressed. G.

WORCESTER, MASS.—The E. W. Ham Electric Company has been incorporated with a capital stock of $99,000 to carry on the business of electrical contractors and wholesale dealers in electrical devices. The officers of the company are: President, J. Brinton Bailey; treasurer, Edwin W. Ham; clerk, Paul Fielden; directors, Messrs. Bailey, Ham and H. H. Ham.

NEW PUBLICATIONS.

MINERAL RESOURCES.—The United States Geological Survey has published Part I of "Mineral Resources of the United States" for the year 1912. This deals with metals and covers both industrial and precious metals. Values are given for production, imports, exports and prices.

CAROLINA COMPANY.—The Carolina Power & Light Company, which controls the Yadkin River Power Company and the Asheville Power & Light Company, has issued an illustrated pamphlet to the stockholders of the company describing the physical property and financial condition of the three companies. The president of the company is Charles E. Jackson, Raleigh, N. C.

CANADIAN MINERALS.—The Canadian Department of Mines has issued a preliminary report on mineral production of Canada during the year 1913, prepared by John McLeish. Figures are given for the production of the principal metals, as well as coal, petroleum and various other nonmetals. Statistics of exports are also given. The complete report for the year 19 2 is now available. It is a volume of 339 pages, giving complete statistics for all classes of mineral products.

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 15 for the lighting fixtures of a two-story building for the post office at Tarboro, N. C.; and until April 21 for the lighting fixtures for the post office at Camden, S. C. Drawings and specifications may be obtained from the custodians of the sites or the office of the Supervising Architect.

ARMORED CABLE, SWITCH PANEL, ETC.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until March 28 for furnishing under Canal Circular 834 lighting fixtures, switch panel and feeder boxes, cable hangers and armored cable for wiring within the batteries, Panama Canal fortifications. Blanks and general information may be obtained from any of the assistant purchasing officers, who are located in all of the large cities.

ELECTRIC WORK.—Sealed proposals will be received at the office of the Pennsylvania Panama-Pacific Exposition Commission, Executive Chamber, the Capitol, Harrisburg, Pa., until March 25 for the construction, plumbing and electric work of the Pennsylvania State Pavilion at the Panama-Pacific International Exposition to be held in San Francisco in 1915. Proposals to be addressed to Hon. John K. Tener, President of the Commission, in sealed envelopes marked "Proposal for Pennsylvania Pavillion" and deposited with the Secretary of the Executive Committee. Proposal shall be accompanied by a bond from an approved trust or surety company in the full amount of the bid conditioned upon the signing and faithful performance of the contract. Plans and specifications may be seen at the office of H. Hornbostel, architect, 1303 Peoples Bank Building, Pittsburgh, Pa.; the office of the commission, 1150 Real Estate Trust Bldg., Philadelphia, Pa., or the office of the Division of Works of the Exposition, San Francisco, Cal. Drawings and specifications may be obtained at the office of the architect at above address upon depositing $25.

FINANCIAL NOTES.

The Illinois Traction Company has listed 150,000 shares of common stock on the Montreal Stock Exchange.

Stockholders of the El Paso Electric Company at a special meeting voted to increase the common stock from $2,000,000 to $3,000,000.

The Rochester Telephone Company, in order to provide a fund of $200,000 for capital requirements, has asked its bondholders to fund two years' interest on their five per cent bonds.

The stockholders of the Northwestern Electric Company, of Portland, Ore., will vote April 8 on a proposition to increase the capital stock to $12,000,000, of which $2,000,000 shall be preferred.

The Cities Service Company has made the payment of $15 a share on the common stock of the St. Joseph Railway, Light, Heat & Power Company, due March 1, together with the interest on the unpaid amount of the purchase price.

The Des Moines & Central Iowa Electric Railway Company, a subsidiary of the Illinois Traction Company, has sold $1,150,000 of its six-per-cent sinking-fund bonds. Bonds are guaranteed, principal and interest, by Illinois Traction Company.

Authorization of a $162,000 five-per-cent bond issue has been granted the St. Joseph Railway, Light, Heat & Power Company by the Missouri Public Service Commission. The company proposes to use the proceeds for extensions and improvements.

At the annual meeting of the Electric Properties Corporation, held at Richmond, Va., Paul D. Cravath, Ernest B. Flippen, J. H. Grassman, Alvin W. Krech, J. R. McGinley and Albert H. Wiggin were elected directors, to serve until 1917. At the organization meeting the board of directors elected A. L. Kramer president, and John Seager secretary and treasurer.

Stockholders of the United States Light & Heating Company will hold a special meeting at Portland, Me., on April 9, to pass on an issue of $1,500,000 six-per-cent bonds for refunding outstanding indebtedness of the company and to provide additional working capital.

At a meeting of the Union Gas & Electric Company, of Cincinnati, a subsidiary of the Columbia Gas & Electric Company, the board was reorganized by the election of A. B. Beach as president; P. G. Gossler as vice-president, chairman of the board; W. W. Freeman, J. C. Ernst and W. Y. Cartwright, as vice-presidents; and T. F. Wickham as secretary-treasurer.

In accordance with action taken by the board of directors and stockholders of the Cincinnati, Dayton & Toledo Traction Company, the capital stock of the company has been reduced from $5,250,000 to $2,250,000. Under the former Ohio law companies were restricted from issuing bonds in excess of their capital stock, but this limitation has now been removed.

The Indiana Public Service Commission has authorized the Richmond (Ind.) Light, Heat & Power Company to issue $850,000 first-mortgage bonds to be sold at not less than 90. The proceeds are to be used to retire the $200,000 first-mortgage refunding five-per-cent bonds which matured on January 1, 1914, and the $500,000 three-year six-per-cent debenture notes due March 1, and to pay for extensions and improvements.

The capital stock of the United Gas & Electric Corporation, which controls the American Cities Company, has been increased from $45,000,000 to $57,000,000. New Orleans financiers were advised that the certificates of increase have been filed in Connecticut. The increase was brought about by the recent absorption of about 90 per cent of the common stock of the American Cities Company, which controls the local railroads in New Orleans, Birmingham, Knoxville, Memphis, Nashville, Houston and other points.

In view of the maturity of the $2,000,000 first-mortgage five-per-cent bonds of the Central Electric Railway Company on May 1, 1914, and the fact that large issues of bonds and notes of the Kansas City Railway & Light Company and the Metropolitan Street Railway Company, of Kansas City, the controlling corporations, have matured and are past due, John B. Dennis, James J. Storrow, Paul M. Warburg and W. K. Whigam have been appointed a protective committee for the Central Electric bonds.

Harris, Forbes & Company and N. W. Halsey & Company, of New York, have purchased from the Pacific Gas & Electric Company an issue of one-year five-per-cent notes, subject to approval by the California State Railroad Commission. The notes will be secured by $5,000,000 general lien 6s and $3,572,000 general and refunding 5s of the company, the same collateral that now secures the $5,000,000 of six-per-cent notes that are to be retired on March 25. This issue will probably amount to $7,000,000, and the proceeds over the amount required to retire the six-per-cent notes will be used for capital expenditures.

Dividends.

American Power & Light Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 24.

Arkansas Valley Railway, Light & Power Company; quarterly of 1.75 per cent on the preferred, payable March 16.

Asheville Power & Light Company, quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 23.

Augusta-Aiken Railway & Electric Corporation; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable March 31 to stock of record March 15.

Bangor Railway & Electric Company; quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 20.

Bell Telephone Company of Canada; the regular quarterly dividend of 2 per cent, payable April 15, to stock of record March 25.

Cincinnati Gas & Electric Company; quarterly of 1.25 per cent, payable April 1.

Cincinnati Street Railway Company; quarterly of 1.5 per cent, payable April 1.

Columbus Railway, Power & Light Company; quarterly of 1.5 per cent on series "A" preferred, payable April 1 to stock of record March 16.

Consumers' Power Company; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable April 1 to stock of record March 20.

Fonda, Johnstown & Gloversville Railroad Company; a quarterly preferred dividend of 1.5 per cent, payable March 16.

Halifax Electric Railway Company; the regular quarterly two-per-cent dividend, payable April 1.

Illinois Traction Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 14.

Lake Shore Electric Railway; quarterly of 1.5 per cent on the first-preferred, payable April 1 to stock of record March 21.

Michigan Light Company; quarterly of 1.5 per cent on the preferred, payable April 1 to stock of record March 23.

New Orleans Railway & Light Company; the regular quarterly dividends of 0.5 per cent on the common and 1.25 per cent on the preferred stock, payable March 31.

New York State Railways Company; the regular quarterly dividends of 1.25 per cent on the preferred stock, and 1.5 per cent on the common stock, both payable April 1, to stock of record March 24.

Otis Elevator Company; quarterly of 1.25 per cent on the common and 1.5 per cent on the preferred, both payable April 15 to stock of record March 31.

Ottawa Light, Heat & Power Company; quarterly of two per cent, payable April 1 to stock of record March 20.

Philadelphia Traction Company; a semi-annual dividend of $2 per share, payable April 1.

Southern Utilities Company; quarterly of 1.75 per cent on the preferred, payable April 1 to stock of record March 18.

St. Joseph Railway, Light, Heat & Power Company; quarterly of 1.25 per cent on the preferred, payable April 1 to stock of record March 16.

Virginia Railway & Power Company; semi-annual of 1.5 per cent, payable April 10 to stock of record March 21.

Washington, Baltimore & Annapolis Electric Railroad; the regular quarterly dividend of 1.5 per cent on the preferred stock, payable March 31 to stockholders of record March 21.

West Indiana Electric Company; the regular quarterly dividend of 1.25 per cent, payable April 1.

West Jersey & Seashore Railroad; the regular semi-annual dividend of 2.5 per cent, payable April 1 to stock of record March 15.

Western Union Telegraph Company; a quarterly dividend of one per cent, putting the stock on a four-per-cent basis. Since 1908 the rate has been three per cent annually. Dividend is payable April 15 to stock of record March 25.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 16.	March 9.
American Tel. & Tel. (New York)	122⅜	120⅞
Commonwealth Edison (Chicago)	138	136¼
Edison Electric Illuminating (Boston)	260½	262
Electric Storage Battery common (Philadelphia)	53½	53¼
Electric Storage Battery preferred (Philadelphia)	53½	53¼
General Electric (New York)	147½	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1⅛	1
Massachusetts Electric common (Boston	11½	11
Massachusetts Electric preferred (Boston)	62	62
National Carbon common (Chicago)	105½	155
National Carbon preferred (Chicago)	117	115
New England Telephone (Boston)	138	138
Philadelphia Electric (Philadelphia)	26⅞	26¾
Postal Telegraph and Cables common (New York)	84½	84
Postal Telegraph and Cables preferred (New York)	64¾	69
Western Union (New York)	63½	63½
Westinghouse common (New York)	75¼	70¾
Westinghouse preferred (New York)	116¾	116½

PERSONAL MENTION.

MR. MARTIN HOLDEN has been appointed traveling salesman for the Sterling Electric Company, of Minneapolis, Minn., severing his connection with the Electrical Engineering Company.

MR. JOHN F. GREENWALD, of the Mountain States Telephone & Telegraph Company, has been transferred from the public relations department of the company at Helena, Mont., to Salt Lake City.

MR. W. S. COZAD, general traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters in Denver, has been in Salt Lake City going over the company's traffic conditions in that state.

MR. ROSS PERRY has entered the employ of the Capital Electric Company, of Salt Lake City, as an electric-sign specialist, and will devote his entire attention to the enlargement of the sign business of this rapidly expanding concern.

MR. WILLIAM L. CUMMISKY has been appointed exclusive sales representative for the Steel City Electric Company, of Pittsburgh, Pa., covering the states of Missouri, Arkansas, Kansas and Oklahoma, with offices at 1117 Olive Street, St. Louis, Mo.

MR. A. B. RICHMOND, secretary of the Olsten Electric Stove Company of Los Angeles, stopped over in Salt Lake City on his way to Boise, where he had been called on business connected with the opening up of a market for their product in that territory.

MR. F. T. TAYLOR, Boston manager of the Cutler-Hammer Manufacturing Company, lectured before the Electrical Association of Wentworth Institute, Boston, March 13, on "Direct-Current and Alternating-Current Electricity." Lantern slides illustrated the lecture.

MR. ARTHUR WALSER, district manager of the small-motor department of the General Electric Company, has transferred his headquarters from Denver, Colo., to Salt Lake City, Utah, on account of the activity in the motor line in the territory served by the Salt Lake City office.

MR. C. R. SIEGEL, division traffic superintendent of the Mountain States Telephone & Telegraph Company, with headquarters at Salt Lake City, has resigned his position and has gone to San Francisco in an effort to improve his health, which has been failing for the past several months.

JOSEPH S. WELLS, general manager of the Utah Light & Railway Company, accompanied by engineers L. L. Dagron and O. A. Honnold, made a trip of inspection last week to Ogden to inspect the company's power dam and pipe line in Ogden Canyon which has recently been raised, enlarged and repaired.

MR. W. N. CASH, manager of the Wisconsin Telephone Company at Beloit, Wis., has been appointed district manager of the Janesville district of this company, succeeding MR. H. J. BENDINGER, resigned. Mr. Cash has had charge of the exchanges at Beloit, Eau Claire and Menomonie during the last 12 years.

MR. L. O. VESER, chief engineer of the Mahoning & Shenango Valley Railway and Light Company, Youngstown, O., has resigned to take effect April 1. He has been in the service of the company since 1909, previous to which time he was connected with various hydroelectric companies in the western states. His home is in Seattle, Wash.

DR. SAMUEL SHELDON will be tendered a testimonial dinner at the Hotel Astor, Saturday, March 21, in recognition of 25 years' of illustrious service and notable achievement as professor in the Polytechnic Institute of Brooklyn. Alumni and undergraduates of the Polytechnic, friends and professional associates, will assemble from all parts of the country to do honor to one of America's foremost educators, scientists and electrical engineers. T. Commerford Martin will preside as toastmaster, and addresses will be made by Dr. Fred W. Atkinson, S. O. Edmonds, William L. Bliss, and Ralph W. Pope.

MR. LELAND HUME, vice-president of the Cumberland Telephone & Telegraph Company, was the principal speaker at a recent meeting of the Louisville (Ky.) Commercial Club, his subject being "Government Ownership of Public Utilities." He expressed himself as being strongly opposed to the proposal of Congressman Lewis, of Maryland, to place telephone and telegraph lines under Federal control, characterizing the idea as "socialistic and fallacious," and declaring that the only ground upon which the Government should ever consider such a plan would be the absolute failure of privately-owned public utilities to come up to reasonable standards of efficiency.

MR. W. S. MURRAY has been appointed by the New York, New Haven & Hartford Railroad Company to be consulting engineer in general charge of all electrical engineering and construction, reporting to President Hustis, with offices at New Haven. Mr. Murray, following the substantial completion of the construction of the system for complete electrical operation west of New Haven, will enter into closer relations with the railroad company. His jurisdiction will hereafter be extended to also include the electrical features of operation in addition to electrical construction. He will continue with the firm of McHenry & Murray in general consulting practice as before.

MR. HUGH L. COOPER has been chosen as a consulting engineer for the Egyptian Government in the construction of a new hydroelectric dam across the Nile. He was selected for the post by Sir Ralph Wilcox, supervising engineering of the famous Assouan dam. Mr. Wilcox was recently in the United States and spent considerable time with Mr. Cooper in inspecting the Keokuk dam. Mr. Cooper has established a reputation as one of the foremost hydroelectric engineering equipment experts in the world. He designed and built the power dam across the Susquehanna River at McCall's Ferry, and he recently completed his operation as construction engineer for the Mississippi River Power Company in building the big Keokuk dam across the Mississippi.

OBITUARY.

MR. HENRY G. PATTERSON, who was for many years connected with the Thomas A. Edison Company, dropped dead at Decatur, Ill., on March 14, of heart trouble. Mr. Patterson installed the first electrical plants in Berlin, Germany, and Milan, Italy, and was well known among electrical engineers throughout the United States. For the past five years he had been connected with the McKinley traction system.

MR. ALDEN E. VILES, treasurer of the Boston Suburban Electric Companies and a director of the Middlesex & Boston Street Railway Company, the Lexington & Boston Street Railway Company and the Norumbega Park Company, died in Boston, March 15, aged 58 years. Mr. Viles was born in Waltham, Mass., and in early manhood was in the real-estate business. He was for two years a member of the Boston City Council. He was at one time president of the University Club in Boston and had membership in the Boston Art Club. His widow, a son and daughter survive.

MR. JOHN GOTT, chief electrician of the Commercial Cable Company, died at Brighton, England, on March 8. Mr. Gott was one of the pioneer submarine cable engineers and was one of the first men to operate the mirror galvanometer for transmitting and receiving cable messages. He was also one of the early operators of the siphon recorder which, until the invention of his new method of receiving cable code signals, was the only practicable manner in which they could be received. About a year ago he perfected an invention by which the Morse method of telegraph signalling could be transmitted in the same manner both over land and under the sea.

MR. S. REED ANTHONY, president and a director of the Manchester (N. H.) Street Railway Company, and treasurer and a director of the Manchester Traction, Light & Power Company and of the Mascoma Light & Power Company, died at his home in Boston, March 10, aged 50 years. Mr. Anthony was a direct descendant of Miles Standish and of John Alden. In early life he was in the employ of Kidder, Peabody & Company, and later organized the banking firm of Tucker, Anthony & Company, which became largely interested in electric railway development in the middle states. More recently the firm has been identified with water-power developments in Minnesota and California. Mr. Anthony was a member of the New York Stock Exchange and a director of the Northwestern Power Company. He belonged to numerous societies.

DATES AHEAD.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Institute of Electrical Engineers. Pittsburgh, Pa., April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Chelten Electric Company, Philadelphia, Pa., has recently obtained the approval of the United States Treasury Department on its Chapman type plug and receptacle, catalog No. 5559 for all work under the supervision of that department.

Stow Manufacturing Company, Binghamton, N. J., has issued several bulletins treating of its line of portable electric tools. These bulletins cover radial flexible boring machines, tool-post grinders, electric breast drills and electric bench grinders.

The R. K. Le Blond Machine Tool Company, Cincinnati, O., has issued a bulletin which deals with automatic motor control as applied to Le Blond motor-driven lathes. This well illustrated bulletin enumerates the desirable features of this type of drive.

Hart & Company, Chicago, Ill., are sending out samples of their Red-Cross lubricant for commutators, which has been on the market for a number of years, free upon request. This lubricant is made in a very convenient stick form and is easily applied to a commutator.

Steel City Electric Company, manufacturer of wiring specialties and fittings, announces that it has appointed William L. Cummiskey as its exclusive sales representative in Missouri, Arkansas, Kansas and Oklahoma. Mr. Cummiskey's offices are at 117 Olive Street, St. Louis, Mo.

Allen-Bradley Company, Milwaukee, Wis., has issued a new and well illustrated bulletin (No. B-541), to supersede an earlier publication on resistance starting switches for induction motors. The new bulletin shows many improvements which have been made on type H starters and contains information which is of great importance to those interested in alternating-current motor installations.

The Reynolds Electric Flasher Manufacturing Company, Chicago, Ill., makes the following statement: "All of the legal rights appertaining to Reco color hoods were unqualifiedly sustained by the United States District Court, Southern District of New York, on every point, in a decision rendered by the Honorable Judge Hand, March 10, 1914, in favor of the Reynolds Electric Flasher Manufacturing Company, Chicago and New York."

Mitchell-Rand Manufacturing Company, New York City, has issued a little folder on its "tungsten" carbon brushes and also folders on insulating paints and varnishes, mica products and varnished cloth, and insulation for various purposes. One folder contains samples of varnished silk, cloth and paper, varnished tape, rope, fish and whale-bone, paper, and press board. These samples are of considerable size and the various thicknesses and prices are given.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued bulletin No. 3508 on direct-connected exhaust fans and ventilating fan motors for alternating and direct currents. Bulletin No. 3913 just issued describes and illustrates direct-current and alternating-current motors for family sewing machines. Each of these publications clearly sets forth the latest Emerson equipment of each of these classes and replaces former publications now out of date.

Pelouze Manufacturing Company, Chicago, Ill., has just issued some new descriptive matter covering its well known electric heating iron, and combined electric curling iron, hair dryer and waver rod. These products are well and favorably known in the electrical field and have met with a constantly increasing demand. The Pelouze Company is offering an extra inducement to dealers at this time and those interested can learn full particulars by writing the company.

Wagner Electric Manufacturing Company, St. Louis, Mo., has ready a fine new publication designated as bulletin No. 104. It is devoted to Wagner portable instruments and, besides describing the various types of these instruments, it gives over 24 pages of most valuable general notes on electrical testing. A great variety of tests are described and errors likely to arise pointed out. The bulletin, which contains 48 pages, is most liberally illustrated with excellent line cuts and half-tones.

The Esterline Company, Indianapolis, Ind., manutacturer of curve-drawing instruments, announces the opening recently of several additional branch offices as follows: F. C. Morton, Walker Bank Building, Salt Lake City, Utah; G. W. Pieksen, Room D-19, Railway Exchange Building, St. Louis, Mo.; J. S. Black, 908 Hennen Building, New Orleans, La.; W. W. Geisse Company, McKnight Building, Minneapolis, Minn.; General Supplies, Limited, 122 Eleventh Avenue, W., Calgary, Alberta, Canada; G. L. Priest, 229 Sherlock Building, Portland, Oregon. The offices are each equipped with an expert engineering staff, full set of samples, together with all information necessary for promptly taking care of any questions that may arise in connection with the sale or use of graphic instruments.

The Electric Controller & Manufacturing Company, Cleveland, Ohio, has issued a reprint of an article by H. F. Stratton, entitled, "Application of Electric Power in the Foundry." This paper considers the control and operation of many foundry machines, considerable attention being paid to the uses and control of lifting magnets and safety features for cranes. Bulletin No. 1037, entitled "Type B Limit Stop for Direct-Current Motors," has recently been issued. This stop is designed to prevent overtravel of electric cranes, door hoists and other motor-driven machines. Its construction is fully described, several illustrations being included. Bulletin No. 1038 describes form H dynamic-braking dinkey controllers for direct-current motors. This controller is a modification of the standard-dinkey-ventilated controller in combination with two magnetic switches. The bulletin, which is illustrated, gives the details of the device.

Record of Electrical Patents.

Issued by the United States Patent Office, March 10, 1914.

1,089,394. Call-Recording System for Telephone Exchanges. E. E. Clement, assignor to Telephone Improvement Co., Attica, N. Y. The recording outfit includes a special motor-driven selector switch and printing mechanism for a semi-automatic telephone system.

1,089,401. Load Brake. E. H. Dewson, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrical means governed by the load on the car for controlling the adjustment of the brake.

1,089,404. Fire-Alarm Signal-Box for Automatic Telephone Systems. J. Erickson, assignor to Denio General Electric Co., Rochester, N. Y. The calling mechanism is arranged so it may dispatch alarm-recording impulses.

1,089,414. Automatic Trolley-Pole Controller. M. B. Jolliffe, New Haven, Conn., assignor of one-third each to J. V. Ryder and J. H. Meeks. An emergency valve for a compressed-air-operated trolley is automatically opened when the current is broken by the jumping of the trolley wheel from the wire.

1,089,415. Device for Supporting Trolley-Wires. C. de Kandó, assignor to G. Westinghouse, Pittsburgh, Pa. A steadying device for catenary trolley wires.

1,089,426. Translating and Registering Apparatus. E. C. Molina, assignor to American Telephone & Telegraph Co. A telephone switching system with selecting apparatus, a set of decimal keys, a register mechanism with corresponding terminals connected to the keys and a movable member co-operating therewith.

1,089,434. **Relay Apparatus.** A. Orling, assignor to Orling's Telegraph Instruments Syndicate, Ltd., London, England. For a siphon recorder.

1,089,461. **Jump-Spark Ignition Apparatus for Internal-Combustion Engines.** M. B. Crist, assignor to Colonial Trust Co., Pittsburgh, Pa. A high-tension oil-insulated and cooled coil.

1,089,466. **Moving-Picture Machine.** F. H. Frude, Chicago, Ill., assignor of one-third to S. I. Levin. A motor-driven machine with circuit-breaker opening the motor circuit on breakage of the film.

1,089,478. **Explosion Motor.** A. T. Kasley, assignor to Colonial Trust Co., Pittsburgh, Pa. Has an electric motor for operating the air and gas valves and means for varying the gas valve as the calorific value of the gas varies.

1,089,479. **Cable-Telegraph System.** I. Kitsee, assignor to American Telephone & Telegraph Co. At each end of a high-capacity cable are two sources, one of high and the other of low E.M.F., the sources at opposite ends opposing each other.

1,089,490. **Electrolier Fitting.** C. Messick, Hackensack, N. J. A pull switch is secured at the bottom of the central shell.

1,089,497. **Electrolier-Hanger.** L. C. Reed, New Orleans, La. A special hickey construction. (See cut.)

1,089,534. **Differential-Microphone Repeater.** J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. A cup partially inclosing the magnet has a cap carrying a diaphragm and a microphone transmitter.

1,089,540. **Lamp-Ignition Device.** L. M. Dull, Los Angeles, Cal. Has stationary and movable contacts carried by an insulating tube.

1,089,549. **Storage-Battery System.** E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Generator and load conductors are independently secured to the battery terminals so that they cannot become connected if separated from the battery terminal.

1,089,564. **Circuit-Controller.** S. P. Hull, Yonkers, N. Y. Includes a bar with a T-shaped slot into which engages the head of a T bolt.

1,089,589. **Electric Indicator.** C. Schenck and J. M. Graham, assignors to Elevator Supply & Repair Co., Chicago, Ill. A solenoid-operated annunciator.

1,089,597. **Squirrel-Cage Rotor.** F. W. Stefater, assignor to Jas. Clark, Jr., Electric Co., Louisville, Ky. Has a groove at each end cutting through the ends of the bars and the intermediate portions of the corresponding end ring in alternation, and a locking ring in the groove holding the parts together.

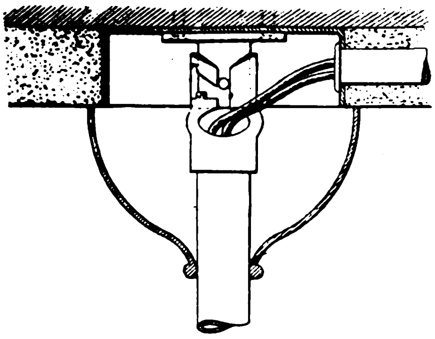
1,089,609. **Electrical Fixture.** E. S. White, Mount Carmel, Ill. To a shower pan is secured a globular body with side recesses for an opened loop to support the lighting fixture.

1,089,624. **Safety Attachment for Water-Heating Apparatus.** J. F. Cunningham, Springfield, Mo. An electric alarm.

1,089,642. **Support for Electric Conductors.** G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Notched insulating disks hold the conductors evenly spaced around a guide rod.

1,089,658. **Electrically Driven Planing-Machine.** G. E. Mason, Toronto, Canada. Motor-generator set and special controller to permit adjusting speed and length of cutting and return strokes.

1,089,659. **System of Control.** H. Maxwell, assignor to General Electric Co. A synchronous motor is arranged to have its exciting circuit opened by a polarized overload relay.

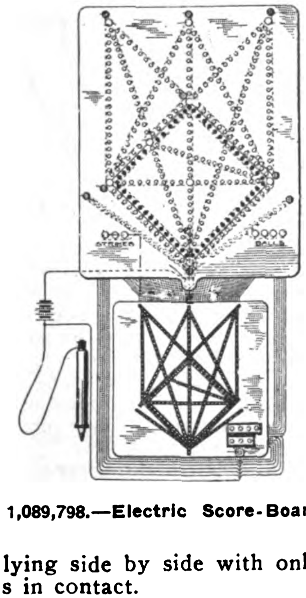


1,089,497.—Electroller Hickey.

1,089,673. **Telephone Cutoff.** R. J. Robison, Romulus, Okla. Associated with the switchhook of a party-line telephone.

1,089,680. **Cigarette-Making Machine.** R. A. Sloan and J. E. Lloyd Barnes, Liverpool, England. Includes an electrically controlled weighing device.

1,089,684. **Wire Cable.** J. B. Stone, Fresno, Cal. An electric cable consisting of series of relatively thin metal strips, each twisted to auger-like form and lying side by side with only their edges in contact.



1,089,798.—Electric Score-Board.

1,089,700. **Current Collector and Process of Making the Same.** E. G. Gilson, assignor to General Electric Co. A pigtail is connected to molded metal brush by imbedding the unbraided end of a stranded conductor in finely divided brush material containing some oxide, then compressing and firing in a vacuum.

1,089,744. **Recording Instrument.** R. P. Brown, Philadelphia, Pa. A clock-controlled electrically operated chart recorder.

1,089,749. **Electric Lamp.** H. A. Douglas, Chicago, Ill. An automobile headlight with special connecting plug.

1,089,750. **Reflecting Electric Lamp.** H. A. Douglas. Has special means for holding the housing, lamp socket and reflector together.

1,089,757. **Tungsten Manufacture.** T. W. Frech, Jr., assignor to General Electric Co. Process of reducing tungsten oxide and drawing tungsten for lamp filaments employing a compound of thorium.

1,089,759. **Filament Mounting.** E. S. Gardner, assignor to General Electric Co. Method of supporting incandescent lamp filament including use of a number of alternating long and short filament carriers mounted on supporting stem.

1,089,763. **Signal Apparatus for Mines.** A. J. Gurney, Herrin, Ill. An electrical signaling system controlled by the hoisting cage.

1,089,771. **Binding-Post.** C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Spindle with locking shoulder holds terminal and prevents its withdrawal without separation of clamping members.

1,089,773. **Method of Making Titanium and Other Alloys.** E. Kraus, assignor to General Electric Co. Process of producing fused ingot of metal utilizing the heat generated electrically by the introduction of reducing metals into the fusion.

1,089,778. **Electric Transportation System.** C. B. McLeer and J. F. McLeer, Brooklyn, N. Y., assignors to Electric Carrier Co. Motor members mounted on ribs on opposite sides of passageways co-operate with motor members on carrier to produce motion.

1,089,783. **Electric-Motor Drive.** K. A. Pauly, assignor to General Electric Co. In combination, a plurality of motors, means for causing the speed of one motor to depend upon its load, means for reversing the motors, and means for causing them to have different relative speeds after reversal.

1,089,785. **Electric Switch.** W. G. Peet, assignor to Bryant Electric Co., Bridgeport, Conn. For a pull-chain socket.

1,089,786. **Method of Working Refractory Metals.** Marcello von Pirani, assignor to General Electric Co. The process of reclaiming refractory metal which has become cracked during rolling which consists of electrically locally heating the same in an inert atmosphere.

1,089,787. **Intermediate Support for Bond-Wires and Nut-Locks.** W. M. Post, Elizabeth, N. J. A combined nut-locking and wire-retaining washer formed of a single piece of spring metal having a curved wire-retaining portion and a nut-engaging element.

1,089,798. **Electric Score-Board.** C. H. Smith, Worcester, Mass. A baseball score-board with electrical means for controlling same. (See cut.)

1,089,806. **Liquid-Mixer.** J. J. Wood, assignor to General Electric Co. Driven by a vertical-shaft electric motor.

1,089,814. **Testing System and Mechanism for Electrical Circuits.** C. E. Beach and H. W. Doughty, assignors to G. O. Knapp, New York, N. Y. Includes means for testing electrical circuits.

1,089,815. **Alternating-Current Motor.** A. C. Bell and T. R. Bell, Westfield, N. J. Includes a reversible motor having a commutator and controlling apparatus.

1,089,820. Control of Electrically Operated Switches. E. R. Carichoff, assignor to General Electric Co. A relay mechanism including switch contacts and a magnet for opening each of the contacts.

1,089,825. Telephone Transmission-Circuits. H. C. Egerton, assignor to Western Electric Co. Includes means of rendering articulation in one of two nearby receivers practically inaudible.

1,089,850. Switch Control. S. A. McConnell and B. Erickson, Portland, Ore. Includes an oscillating switch lever and an accurate member having stops for a depending pin.

1,089,884. Manifold-Heater. E. A. Vollbrecht, Detroit, Mich. Includes electric heating coils.

1,089,886. Electric Apparatus for Driving Clocks or Similar Mechanism. H. E. Warren, Ashland, Mass. Includes electrical means for giving impulse to the pendulum.

1,089,907. Electrical Contact. W. D. Coolidge, assignor to General Electric Co. An electrical make-and-break contact of tungsten.

1,089,919. Alternating-Current-Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Jersey City, N. J. Includes electromagnetic means for controlling and reversing induction motors.

1,089,920. Current-Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Includes means for controlling a resistance in series with the motor armature and an extra field permanently connected across the resistance.

1,089,921. Electrical Controlling Apparatus. E. L. Gale, Sr., assignor to Otis Elevator Co. Includes a switch-controlled electromagnetic brake.

1,089,937. Electric Elevator. C. B. Manville, assignor to Otis Elevator Co. Includes a normally shunted safety switch and means associated with a landing door for opening the shunt upon opening a landing door.

1,089,950. Direction-Indicating Signal. J. J. O'Connell, Rochester, N. Y. Includes electromagnetic means for controlling shutters in front of electric signal lamps.

1,089,951. Process and High-Pressure Furnace for the Direct Production of Iron and Steel. C. Otto, Dresden, Germany. Includes use of electrical resistances.

1,089,957. Trolley for Trackless Vehicles. W. B. Potter, assignor to General Electric Co. Includes a ball mounted on the trolley pole, a head comprising two blocks containing bearings for the ball, a tapered fin on the upper block, and contact shoes on opposite sides of the fin and extending to or below the horizontal plane of ball.

1,089,968. Trolley Attachment. F. A. Schmedinghoff, Kansas City, Mo. A trolley harp having an extended axle supporting rollers on each side of the trolley wheel.

1,089,982. Lighting Device for Ovens. A. Susslin, Gulfport, Miss. Includes use of incandescent lamp and controlling device.

1,089,990. Sterilizer. P. G. Triquet, Paris, France. Includes mercury-arc lamps and baffles.

1,089,993. Magnetic Separator. G. Ullrich, assignor to Fried. Krupp Aktiengesellschaft, Grusonwerk, Magdeburg-Buckau, Germany. A separator employing stationary and rotating magnetic poles.

1,089,995. Electric Generating Device for Railway Trains. J. Venge, Milwaukee, Wis.. A governor device for fluid motor of head-end train-lighting systems.

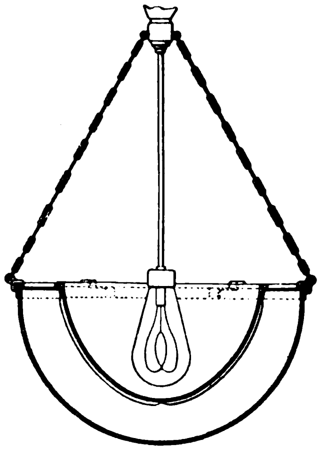
1,090,016. Speed - Limiting Device for Turbo-Generators. F. R. C. Boyd, assignor to General Electric Co. A fan arrangement with movable blades actuated by centrifugal force.

1,090,044. System for Treating Liquids With Ozone. M. Fuss, assignor to General Electric Co. Includes an electric ozonizer.

1,090,048. Continuous-Current Generator. K. Greuner, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Includes a main magnet-frame carrying a compounding winding and a separate magnet-frame carrying a differential winding, the saturation point of the last-named magnet-frame being considerably lower than that of the former.

1,090,053. Telephone-Locking Device. J. W. Harvey, Sunset, Tex. A mechanical device for locking the receiver arm of desk telephones.

1,090,076. Illuminating Appliance. V. R. Lansingh, New York, N. Y. A semi-indirect fixture with an upwardly facing translucent reflector surrounding the source and an upwardly facing diffusing bowl surrounding the reflector, the annular space between the bowl and reflector edges being closed. (See cut.)



1,090,076.—Semi-Indirect Fixture.

1,090,107. Electric Furnace. S. Peacock, Chicago, Ill. Includes use of a number of electrodes and means for adjusting one of them.

1,090,109. Means for Starting Motor Road-Vehicles. F. R. Simms, London, Eng. A combined ignition and lighting dynamo with means for connecting the lighting armature with an exterior source of current, whereby it may be employed as a motor for starting the engine.

1,090,111. Manufacture of Electric Filaments. C. Auer von Welsbach, Vienna, Austria Hungary. Consists in chemically treating a solution containing a salt of osmium and a salt of a refractory-oxide metal, highly heating the resultant precipitate in a reducing atmosphere and finally forming the mass into filaments.

1,090,118. Supporting Means for Swinging Objects. A. E. Rittenhouse, assignor to A. E. Rittenhouse Co., Honeoye Falls, N. Y. A motor-driven toy aeroplane suspended by electrical conductors.

Patents Expired.

The following United States electrical patents expired March 16, 1914.

578,707. Controlling Mechanism for Electric Motors. F. R. Bacon, Milwaukee, Wis.

578,710. Storage Battery. C. T. Barrett, Brooklyn, N. Y.

578,716. Telegraph Firehose. J. Buchtel, Portland, Ore.

578,750. Circuit-Breaker. H. P. Kelly, Philadelphia, Pa.

578,771. Cutout and Agitator for Dust-Transmitters for Telephones. S. B. Rawson, Elyria, O.

578,823. Charging Secondary Batteries. I. Kitsee, Philadelphia, Pa.

578,825. Insulator. H. H. Luscomb, Hartford, Conn.

578,829. Railbond for Electric Railways. T. J. McTighe, Brooklyn, N. Y.

578,840. Railway-Crossing Signal. C. Selden, Baltimore, Md.

578,853. Arrangement for Closing or Opening Bars at Railroad Crossings. H. Biermann, Breslau, Gremany.

578,867. Electric Battery. H. N. Farley, Warwick, N. Y.

578,870. Active Mass for Electric Accumulators. S. Hammacher, Berlin, Germany.

578,887. Paste for Electric Accumulators. R. Linde, Berlin, Germany.

578,893. Burglar Alarm. M. P. McDermott, Auckland, New Zealand.

578,925. Electropneumatic Organ Action. F. H. Hastings and F. J. Flaherty, Weston, Mass.

578,939. Electric Carrier Apparatus. H. M. Neer, Springfield, O.

578,954. Electrical Controlling Apparatus. B. C. Van Emon, San Francisco, Cal.

578,976. Electric Clock-Setting Mechanism. C. M. Crook, Elgin, Ill.

578,981. Lightning Arrester. W. K. Freeman, Fort Wayne, Ind.

578,984. Temperature-Controlling Apparatus. S. Green, New York, N. Y.

578,992. Multiplex Telephony. S. W. Holman, Boston, Mass.

578,997. Repeater. C. W. Leiser, Carlinville, Ill.

579,001. Battery. S. J. Martin, Detroit, Mich.

579,003. Telephone Transmitter. W. J. Moore, Elmer, Mich.

579,012. Dynamo-Electric Machine. G. A. Scheeffer, Peoria, Ill.

579,024. Electric Elevator. S. D. Strohm, Philadelphia, Pa.

579,028. Controller for Dynamo-Electric Machines. C. E. Woods, Chicago, Ill.

579,032. Electric Arc Lamp. T. E. Adams, Cleveland, O.

579,036. Telephone-Switchboard Plug. F. E. Bossong, Watseka, Ill.

579,051. Means for Protecting Electric Machines From Heat. J. P. B. Fiske, Alliance, O.

579,059. Construction and Regulation of Electric Machines. T. H. Hicks, Detroit, Mich.

579,062. Electric Motor and Dynamo. W. S. Horry, Gloucester City, N. J.

579,063. Regulator for Electric Motors. R. M. Hunter, Philadelphia, Pa.

579,075. Electric Call and Call-Answering Apparatus. E. H. Owen, C. N. Williams and F. H. Donaldson, Garvanza, Cal.

579,079. Electricity Meter. A. Raps, Berlin, Germany.

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SPECIALIZING IN TRANSMISSION-LINE DESIGN.

Electrical engineers desirous of doing highly specialized and useful work in a field of great commercial importance will find ample scope for their powers in the design of high-voltage transmission lines. Not that every engineer can perform signal work in this direction or even put his theories into practice, but the fact remains that at the present time some of the most powerful engineering concerns and some of the ablest specialists in electrical and structural problems associated with lines and networks are working at top-notch speed to find out the most economical forms of construction consistent with efficient and reliable operation. The fields of the civil and of the electrical engineer come very close together in this class of work, and the importance of thorough investigation in dealing with specific transmission problems cannot easily be overstated.

Until one undertakes to design a line according to modern requirements the number of variable factors involved is likely to be little realized. The inexperienced man assumes that once the size of wire is indicated by the allowable drop and voltage selection, the rest is plain sailing. Far from it. The longer the line, the more important it becomes to study at great length such questions as the influence of span upon bending and twisting stresses in the poles or towers; the stresses resulting from the breakage of different phase wires, from changes in sleet formation and wind pressure, the stresses on tower foundations of different design; effect of a broken ground wire; alteration of tower height or change in the position or height of conductors. The variation in mechanical stresses present in modern steel towers is evidenced by the fact that the sizes of steel members used in their construction range from 0.19 to 0.81 inch. This means that a comparatively slight saving in dimensions will effect a substantial economy in investment when a large number of towers are considered, provided the safe limits are not exceeded in the unit stresses. On important work the services of the structural specialist are worth many times their cost, and unless the electrical designer is also an expert steel man, as of course he may be, he will do well to consider the possibilities of co-operation before committing himself too definitely to rigid sizes and proportions in his supporting elements.

As more data accumulate on the ability of towers of specific designs to meet the test of service and time, and particularly as the results of steel-yard tests on typical sample towers are disseminated and digested, the selection of suitable structural designs for stated limits of span, spacing and conductor size will become a more settled problem. Beyond this, as more systematic line calculations are made for different conditions, the electrical industry will approach somewhat nearer that wise selection of equipment for holding its high-voltage circuits which is the outcome of real engineering rather than of scientific guesswork.

The whole subject of tower foundations needs broader study. Topographical conditions enormously complicate the study of line stresses, but if engineers figure and preserve calculations for varied conditions along straight lines, the difficulties will at least be somewhat narrowed and the expenditures better controlled. Even the problems of designing special spans and towers for such humble transmissions as 2,300 or 6,600-volt river crossings needs more thorough consideration, since the growth of central-station and tie-line service necessitates leaping over many obstacles of local character and the cost of such solutions is by no means small. Thus, in the face of the most careful designing a recent 900-foot river crossing of a 2,300-volt line cost no less than $10 per running foot of circuit, and the two towers required to provide sufficient clearance in mid-stream weighed in the neighborhood of 20,000 pounds each. Certainly there are few branches of engineering where better opportunities to save money through careful designing may be found than in the transmission of electrical energy upon the comprehensive scale required by modern civilization.

RESUSCITATION FROM ELECTRIC SHOCK.

Much has been said on the subject of resuscitation in recent years, especially since the committee of the National Electric Light Association and the American Medical Association issued instructions for first aid. Men are beginning to realize now that most of the deaths which have occurred from electric shock could have been obviated if the victim's associates had been able to apply the proper treatment immediately, and most operating companies are now seeing that their employees have proper instructions along this line.

The following quotation from a recent book by Dr. Charles A. Lauffer expresses a truth which should be driven home to the consciousness of every person having to do with electrical work.

"It is a fortunate trend of public opinion that makes it incumbent on every intelligent citizen to know how to give artificial respiration. It is no longer exclusively the role of a physician to give artificial respiration, for if men in dangerous trades do not think enough of one another to practice the method, in anticipation of any possible emergency, why should physicians bother about it? Why should a doctor risk breaking his neck in a mad race to reach the scene of disaster too late to be of any service? Artificial respiration must be begun instantly by the victim's comrades, and the supplemental assistance is peculiarly the province of the physician.

"While there are more physicians per 100,000 of population in the United States than in any other country, a physician, like the policeman, is invariably out of reach when an emergency arises. Laymen simply must learn how to bring back life in an apparently dead body, else the number of fatalities from these tragic accidents, fatal because of the ignorance of bystanders, will continue to appall.

"Some stand-patter may insist that we are hearing too much about resuscitation these days; that a generation ago the general public was not expected to know anything about artificial respiration. We should realize that we are living in the midst of more dangers than a generation ago; the score of gases encountered in the industries and in our homes, the wide application of electricity, combined with other causes, have added to the perils of modern life; never before was the diffusion of the knowledge of resuscitation so necessary as in the present age."

GOVERNMENT OWNERSHIP OF TELEPHONE AND TELEGRAPH LINES.

Quite recently the subject of government ownership of telephone and telegraph lines has received considerable attention. For a while the possibility of the Federal Government acquiring the wire facilities of the country as a proposition advanced by the present administration was imminent. Later on the matter was made the subject of an inquiry by certain post-office officials and a voluminous report thereon has now been made public. Ardent advocates of the idea of the Government acquiring the telephone and telegraph facilities of the country have given full scope to their imaginations and volumes of argument in favor of the proposition have appeared in the daily press and in current popular magazines. Undoubtedly the champions of this proposition mean well, and so far as their researches have taken them their discussion of the matter may in their opinion be based upon facts and figures, the authenticity of which they presume may not be doubted. In all of this discussion, however, but little has been said in refutation of the mass of material employed by the advocates of government ownership, and where there has been an intelligent and conscientious attack made upon the proposition it has not had the same widespread publicity that has been accorded to the arguments of the proponents of government ownership.

It is singularly gratifying then that in the annual report of the Board of Directors of the American Telephone & Telegraph Company to its stockholders President Theodore N. Vail discusses the matter very fully. Beyond any doubt Mr. Vail is better qualified to discuss every phase of this question than any other man in the world today. Under his administration of affairs the telephone and telegraph facilities of this country have reached a greater degree of usefulness and have experienced a greater growth both in plant and in engineering efficiency than had ever before been accomplished in the same period of time by the telephone and telegraph industry, or in fact any other industry. Mr. Vail has available resources of information, established facts and the results of undisputed experience that make it possible for him to discuss the question with authority; so far as his discussion being characterized by conscientiousness and patriotism, no one would dare gainsay the fact.

We quote at considerable length on other pages of this issue from Mr. Vail's comment in the annual report above referred to on the question of government ownership. Here is some philosophy that applies not only to the telephone and telegraph situation; it may be applied directly to practically every industrial corporation in its relation to the functions of the Government. Rarely have the issues been discussed so frankly and the disadvantages of governmental operation exposed in such uncompromising fashion. Leaving out of consideration entirely the technical difficulties always present in the operation of so delicate a service, the matter need only be considered upon a purely economic basis. Therefore. Mr. Vail's presentation should be read with care and analyzed completely. He has made a sturdy defense of his own particular interests, but in doing so he has established a basis upon which a safeguard may be built up for every other institution or industry thus unwarrantably assailed.

JOINT MEETINGS OF TECHNICAL SOCIETIES.

The rapid increase in recent times in the number of technical societies, both local and national, and in the number of local sections of national societies, has been largely responsible for the development of the movement for joint meetings. The increase in the numbers of national technical societies has been due principally to the increased specialization in all branches of engineering which has taken place during the last generation, and the increase in the local organizations has been largely due to increased engineering operations, evidenced by the ever increasing numbers of technical graduates of our colleges and universities, and resulting in a greater number of men interested in such subjects in local communities.

The movement was first manifested in a marked degree in the effort to center the energies of the local societies in our large cities. It is well exemplified in such places as St. Louis and Milwaukee, where instead of a series of meetings by each of the organizations there are held a series of joint meetings throughout the winter season, at which the subjects are either of a general nature which will interest men following different lines of activity, or are successively devoted to each of the interests involved. In addition to this there has been a tendency toward co-operation between the national societies where subjects of mutual interest have been brought forward for discussion.

The effect of specialization in technical lines was foreshadowed in scientific circles by the experience of the American Association for the Advancement of Science. This body, which is made up of scientists of all classes, found early in its career that scientific specialization had reached a point where separate sessions for those interested in the different departments of science were necessary; the result was the formation of a number of sections, each dealing with a separate branch of science. Specialization has now reached a point where even in a single science many of the workers are not familiar with the details of development in other branches of the same science, and even the papers presented at a single section will not interest all of its members. Moreover, this specialization in meetings largely detracts from the advantages which might be gained and which were intended by the meeting together at one point of scientists of all classes. The appreciation of this fact has led in recent years to the holding of joint sessions between different sections of the Association, at which subjects are presented which have, or should have, an interest for scientists generally and do not deal with the detailed problems of the specialists as such.

This idea should form the basic motive in the holding of all joint meetings of this character. Joint meetings of engineering societies should deal with topics which are either of general engineering interest or which bear upon the activities of two or more distinct and separate groups. It is through such meetings and the perusal of literature of a general engineering character that the specialist is able to keep in touch with general developments and not lose through his specialization the general appreciation of those broad phases of engineering which are necessary for the highest efficiency of every engineer, not excluding the specialist himself. Co-operation of this nature is seen to an increasing extent in both the joint meetings of local societies and in joint sessions of different national associations.

A somewhat different manifestation of the movement is seen in the action of the various engineering societies of Wisconsin, in holding joint conventions in the city of Milwaukee about one year ago and again last week. The report of this latest convention will be found elsewhere in this issue, and the large attendance at this convention indicates a real value in and need for conventions of this kind. A similar co-operation in an annual convention might be indulged in to advantage in other large cities where there are centered large numbers of local or state organizations and sections of national societies. To maintain their successful character, however, the essential elements of such conventions and their *raison d'etre* should be kept distinctly in mind. Their success will depend largely upon the proper selection of the program of papers and the giving prominence to those subjects which will either interest specialists in a number of lines or which are of general engineering importance. Papers which will interest only the narrow specialist should be barred.

Utah Electrical Club.

At the regular weekly luncheon of the Utah Electric Club held at the Commercial Club of Salt Lake City on March 19, George J. Henry, for several years engineer for the Pelton Water Wheel Company, gave some very interesting history and reminiscences connected with the installation of the first water-power plants in Utah and told something of the recent developments and performances of high-head plants now in operation.

W. F. Jensen, president of the Salt Lake City Commercial Club, the regular speaker of the day, took for his subject "The Building of a Metropolis." He pointed out the futility of attempting to build a great city without first developing the territory tributary to it, and indicated the prominent part which electricity is playing in the development of the territory contiguous to Salt Lake City, and how its use may be still further extended, particularly in its application to the farming, poultry and dairying industry.

Mississippi Telephone Suit Ended.

A little over a year ago the State of Mississippi brought a suit against the Western Union Telegraph Company, the Cumberland Telephone & Telegraph Company and the American Telephone & Telegraph Company for penalties on account of alleged infractions of its anti-trust laws.

The fundamental contentions of the State were based upon the ownership of Western Union stock by the American Telephone & Telegraph Company, and the agreement between that company and the Attorney-General for a disposition of that stock paved the way for an adjustment. An agreement has been made under which a decree will be entered, requiring the Western Union Telegraph Company, the Cumberland Telephone & Telegraph Company and the American Telephone & Telegraph Company to pay in the aggregate $50,000 in penalties.

No objection is made either to the organization of the Bell System or to the relation of the companies to each other, and their transaction of the telephone business in Mississippi is not criticised. The Legislature of Mississippi has approved of the adjustment by joint resolution.

This disposes of the only suit that was pending against any of the Bell companies, based upon a claim that any state anti-trust law was violated.

Philadelphia Jovians Prepare to Assist in N. E. L. A. Convention.

At a meeting of the Philadelphia Jovian League on March 19, the plans for the National Electric Light Association's convention to be held in Philadelphia during the first week of June were outlined by W. C. L. Eglin, vice-president and chief engineer of the Philadelphia Electric Company. It is expected the delegation will number 6,000 persons. All arrangements have been made for four special convention trains to be run into Philadelphia. The convention will be held at the Bellevue-Stratford and there will be an exhibition on the roof garden. The committee which brought the convention to this city, and of which Mr. Eglin is chairman, is doing everything possible to emphasize the importance and the ability of Philadelphia to handle large delegations. Mr. Eglin's committee will be assisted in handling the convention by the Jovian League.

Plans for a Big Electrical Show in Chicago Next Fall.

Preparations are under way for Chicago's 1914 Electrical Show, which will be held under the direction of the Electrical Trades Exposition Company at the Coliseum from October 31 to November 14. Chicago has not had an electrical show since 1911, the officers of the exposition company believing that the six former shows in as many consecutive years had satisfied the interest of the general public and that with a lapse of two or three years the old-time interest in an exposition of this character could again be created. All of the shows given in Chicago were successes, but the measure of success was not so great with the more recent shows as with the earlier ones.

"Consequently it was deemed advisable to give the public a rest," said Manager Homer E. Niesz, "and we came to the conclusion a few days ago that the time is now ripe from every standpoint for another big show. In former years we have held the show in January, running into more or less stormy weather which had a tendency to cut down the attendance. And we also found that four or five shows of other characters that preceded us in the Coliseum had a tendency to take the novelty away from Coliseum shows that came later in the season. So we decided to change the date and get in early. The Electrical Show will be one of the first of the winter season and we expect to make it such a big and attractive exhibition of trade products that the building will be crowded for the entire two weeks."

Manager Niesz has not sent out a formal announcement of the 1914 show to the trade, as it is his intention to give the exhibitors of the 1911 show an option until May 1 on the original space they occupied in the last show.

Electrical Show offices have been opened in Suite 546, Commercial National Bank Building.

Lecture Meeting of Columbus Jovians.

Another enthusiastic Jovian event was enjoyed by Columbus, O., electrical men on the evening of March 20. A hundred or more gathered at Rankin Hall to hear and see an illustrated lecture by M. S. Hopkins, of the Clark Management Corporation, whose headquarters are in Philadelphia. The lecture was descriptive of the corporation's hydroelectric plants, especially those operating under the name of the Tennessee Power Company on the Ocoee River. The system represents the highest achievement in this class of enterprise, both in modern equipment and amount of power generated.

By stereopticon views the process of installation was shown from the virgin ground to the completed plant. Mr. Hopkins, in his capacity as expert electrical engineer, was the man who recommended the location and oversaw the work of construction. He was formerly general superintendent of the Columbus Railway & Light Company, controlled by the Clark interests, and still has his headquarters in Columbus. S. G. McMeen, present superintendent of the local street railway and light corporation also made a very entertaining address.

Directors' Meeting of American Institute.

A meeting of the Board of Directors of the American Institute of Electrical Engineers was held on March 13 and a joint session with the Illuminating Engineering Society was authorized at the annual convention of the latter society.

Eighty-six applicants were elected as Associates; 55 students were enrolled; 10 elected and transferred to the grade of Member and four elected and transferred to the grade of Fellow.

President Mailloux was authorized to appoint three representatives upon a joint National Committee on Overhead Line Construction to include representatives of the following organizations: American Electric Railway Association, National Electric Light Association, American Railway Engineering Association, American Telephone & Telegraph Company.

Resolutions were passed referring to the death of Past-President Edwin J. Houston.

The report of the Committee of Tellers was read, giving the result of the balloting for nominations. The Board selected the following as directors' nominees; for president, Paul M. Lincoln; for vice-presidents, F. S. Hunting, N. W. Storer, Farley Osgood; for managers, Frederick Bedell, Bancroft Gherardi, John H. Finney, A. S. McAllister; for treasurer, George A. Hamilton.

Further Extension and Improvement in Chicago Street Lighting.

Negotiations are under way with every prospect of early conclusion for the installation and operation of an additional 1,000 flame arc lamps, or their equivalents, in the municipal street-lighting system of Chicago. This system was described at length in our issue of September 6, 1913, and it will be recalled that the present contract between the Sanitary District of Chicago and the City of Chicago calls for the installation and operation of 23,000 arc lamps of 450 watts each, or their equivalent in tungsten incandescent units.

The proposed additional contract provides that the energy for the 1,000 extra lamps shall be supplied at the same price, which is believed to be below the cost of production. It also calls for the replacement of about 7,000 old inclosed alternating-current arc lamps with the standard flame arcs used in Chicago, or with an equivalent wattage in other lamps. The possibility of using nitrogen-filled tungsten lamps is being considered by the engineers of the city and the district.

Automatic Control of Tools.

The third monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., Saturday evening, March 14, and was conducted by President Friedlaender, 72 members and guests being present.

After dinner an illustrated talk was given by H. W. Eastwood on "Electrical Aid to Factory Production." This dealt with the application of automatic control to machine tools. The following gentlemen participated in the general discussion which followed Mr. Eastwood's talk: O. R. Jones, W. O. Lumm, W. F. Detwiler, Walter C. Kennedy, and Paul Caldwell.

Rebates for Telephone Service Interruptions.

The New York Telephone Company has mailed notices to its New Jersey subscribers, whose telephone service was discontinued owing to line breakages in the recent severe snowstorm, that deductions will be made in current bills for this forced suspension of service; the company also asked indulgence while repairs were being made.

The Electric Club of Chicago.

March 19 was observed as a "Ladies' Day" by The Electric Club, Chicago, a large number of the members bringing their wives or sweethearts to grace the occasion by their presence. The Girls' Glee Club of Lewis Institute, under the leadership of George Lee Tenney, rendered several musical numbers and solos were sung by Misses Nathalie Gilmartin and Kathryn Wyre.

Louisville Jovians Have Secured Increased Numbers.

The Louisville branch of the Jovian Order, which until recently numbered only 15, was increased to the more respectable number of 83 on the evening of March 17, when the initiation of 68 new members was held, followed by an elaborate banquet, in which the novitiates, the old members and a number of visitors took part.

A uniformed degree team from Indianapolis, comprising C. S. Walker, O. P. Oblinger, H. Payne, [illegible]. Albright, N. Perry, H. Lehman, H. R. Victor, C. E. Roberts and F. L. [illegible]anaugh went down from the Hoosier capital on a special interurban car to assist in the initiation exercises, and in addition to these visitors, there were present in the city at the time, a number of electrical men, including Reigning Jupiter W. N. Matthews, of the national organization, C. M. Crofoot, of Crouse-Hinds Company, Cincinnati, O., Thomas A. Wynne, of Indianapolis, and B. B. Downs, of Hemingray Glass Company, Covington, Ky. The candidacy of Mr. Wynne as next reigning Jupiter was announced.

Plans for bringing the membership of the local branch of the order up to something like the strength which it should have, have been under way in Louisville for some time, and were fully carried out in the affair held the evening of St. Patrick's Day, at which James Clark, Jr., president of the electric manufacturing company which bears his name, presided.

In recognition of the Irish holiday, the menu cards, which were unusually handsome, were designed in green; the interest of all present in electricity being indicated by the use of electric terms throughout the menu in the designation of the various dishes. There was a full program of interesting addresses following the banquet, "the good of the order" covering the topics discussed comprehensively.

Now that the organization has secured an adequate membership in Louisville, it is the intention of those interested to keep it going. To this end the campaign for new members will not be relaxed until every man who is eligible has been brought into the order; and the Louisville Jovian League has been formed, as a sort of side-degree, to keep up the interest of all of the members by giving weekly luncheons, at which the social features will be emphasized, and matters of general interest discussed.

Boston Truck Show.

At the commercial vehicle section of the Boston Automobile Show, held last week in the Mechanics Building, Boston, Mass., two electric vehicle manufacturers and one battery company exhibited. The Buffalo Electric Vehicle Company, Buffalo, N. Y., showed a chassis for a one-ton truck, with driving and control apparatus in operation. The salient features of this truck are the straight-line drive, without the use of universal joints; and the double motor control, by which the foot lever provides variable-speed starting and reversing facilities entirely independent of the hand lever.

The General Motors Truck Company, Pontiac, Mich., exhibited a 1,000-pound chassis and a two-ton truck, with body. The noteworthy features of these vehicles are the high location of the battery, on top of frame, giving ample ground clearance, and the flexible drive shaft which tends to take up the shock, and relieves the motor of the abrupt variations in stress when the truck is passing over rough roadway.

The same company had on exhibition, one of its covered vans which has been equipped as an advertising car, for Bull Durham tobacco, by the Animated Advertising Company. The vehicle has glass sides suitably inscribed with the advertising matter; while inside a one-eighth-horsepower Holtzer-Cabot motor driven by an Exide storage battery, operates a flasher consisting of 18 fingers which depicts, in the painted glass sides of the car, a man making, and then smoking, a cigarette. This car, which is one of twelve thus equipped, goes by road to Kansas City, leaving Boston March 30.

The Philadelphia Storage Battery Company exhibited a group of four cells of the same type, which showed units manufactured in 1906, 1908, 1910, 1912. The most improved cell showed six added plates, a reduction of three pounds in weight, and an increase of 100 watt-hours over the cell of earliest construction. Another comparison of efficiencies was represented by a pair of balances, in one of which was a 21 W cell, weight 62.5 pounds, with 605 watt-hours' capacity. In the other balance was a 31 WTX cell, weighing 62.25 pounds, and having a capacity of 755 watt-hours. Another interesting feature of this exhibit was a fantastic lamp shade fashioned from diamond grid plates such as are used in the cells. In this cage was installed a 100-watt Mazda lamp.

The decorations and illuminating effects were practically identical with those used in connection with the pleasure car exhibition.

Chicago Mechanical Engineers Hold Meeting.

The Chicago section of The American Society of Mechanical Engineers held the third dinner meeting of the season in the Crystal room of Hotel Sherman on the evening of March 18. An exceptionally large attendance was caused by the discussion of the interesting subject, "Large Steam Power Plants," by men having responsible charge of several of the largest steam power plants in America.

Owing to the absence of Chairman P. B. Bird, Manager W. B. Jackson presided. Those who spoke were: I. E. Moultrop, Edison Electric Illuminating Company, Boston; J. W. Parker, Detroit Edison Company; John Hunter, Union Electric Light & Power Company, St. Louis; and W. L. Abbott, Commonwealth Edison Company, Chicago.

In opening the meeting acting Chairman Jackson announced that the sum of $2,000 had been given the national society by Mr. Hess of Philadelphia for prizes to junior and student members of the society. He then introduced I. E. Moultrop, vice-president of the national society, who discussed the progress that has been made in boiler-room equipment. It was only recently that instruments other than the steam gauge and water level have been used in boiler rooms. Load indicators, carbon-dioxide recorders and steam-flow meters are now being used, and a more intelligent grade of men is being employed, for the efficiency of a power plant is largely dependent upon the economy of the boiler room.

Mr. Parker then gave some of his experiences with the Detroit Edison Company, saying that this company will try distilled water as a means of reducing scale. Carbon-dioxide indicators, flow meters and draft gauges are in constant use. Field-controlled direct-current motors are used for driving the stokers and fans. Mr. Parker also emphasized the necessity for well trained men in the boiler room.

John Hunter then spoke on the work of the Union Electric Light & Power Company, of St. Louis. Power is now being received from the Keokuk power house at 110,000 volts, and transformed to 13,200 volts at the substation. Power for lighting is carried underground seven miles at this voltage to a substation delivering, 6,600 volts. Direct current and alternating current at 25 and 60 cycles are furnished. He stated that the iron water-cooling coils of the high-voltage transformers had to be replaced by brass, owing to the deteriorating effect produced on the coils by the strong magnetic fields surrounding the transformers. The old steam station is used as a standby, the prime movers floating across the buses or ready to pick up the load within a short time. He also gave some of his experiences with boiler-scale.

The subject, "Reducing the Cost of Electricity" was then discussed by Mr. Abbott. He states that further reductions in the cost of electricity may possibly be made by increasing the economy of the boiler room, by increasing the efficiency of condensers for turbines, and by the use of large generating units housed in simple buildings.

California Power Companies Declare Independent Possession of Distribution Systems by Municipal Government to be Impossible.

The Southern California Edison Company, the Los Angeles Gas & Electric Corporation and the Pacific Light & Power Company have recently issued a statement, declaring the plan of the city government of Los Angeles, Cal., to lease their light and power distributing systems and to assume independent possession of them, to be impracticable from both the legal and operative viewpoints until the city pays for the systems. The proposed plan embraced the possession, utilization and ultimate ownership of these distributing systems by the city. According to the power companies, such an arrangement would violate the covenants of the trust deeds securing their outstanding bonds, and in time would make it entirely impracticable to keep the companies' and the city's property apart, in that the city would utilize the companies' poles, ducts and substation buildings. Such a co-mingling of public and private property is said to be contrary to the constitution of the state of California.

The power companies have repeatedly expressed their desire to enter into a contract providing for the use of the companies' distributing systems for the distribution of such power as the city may generate, pending the time when the use of Owens River water by the city will be sufficient to develop all power required in the city, and pending the acquisition of a distribution system by the city. These companies have also offered to purchase the city's power at a fair price, as an alternative. Either one of these propositions, the companies claim, will produce an immediate revenue to the city of approximately $1,000,000 a year, instead of burdening the city with a debt of $5,250,000 necessary to construct another distributing system, and at the same time would assure consumers of the lowest possible rates (to be fixed by the city) and of no unnecessary duplication of distributing systems.

The city council has rejected these plans and is considering a bond issue of $6,500,000 for the construction of a municipal plant and distributing system.

Pittsburgh Jovians Adopt Westinghouse Memorial Resolutions.

The regular Jovian luncheon, held at Pittsburgh, Pa., on March 19, was in the nature of a memorial meeting in honor of the late George Westinghouse. Addresses were made on the life and work of Mr. Westinghouse by Col. H. G. Prout, president of the Union Switch & Signal Company, and by R. F. Emery, secretary-treasurer of the Westinghouse Air Brake Company.

An expression of the sentiment of the meeting was the unanimous adoption of the following resolutions:

Whereas, in the removal from the sphere of earthly activities of George Westinghouse, the Jovian Order has lost an honorary member who not only was a benefactor to the human race, but to whose unceasing efforts and keen foresight is due much of the wonderful advancement in the electrical industry, and

Whereas, his removal leaves a void in the industrial world, and his individual efforts in the field of engineering stand unique in the history of the world,

Therefore, be it resolved by the Pittsburgh Jovians here assembled that we feel a personal loss, and that the Jovian Order at large has been deeply afflicted in the death of our honored member, and

Further be it resolved that a copy of these resolutions be transmitted to the family of the deceased, and also that a copy be sent to the *Jovian Bulletin.*

Standardization of Electric Vehicle Charging Plugs.

The English Electric Vehicle Committee has approved of recommendations of its technical subcommittee relating to standard design of charging plugs. The 150-ampere size of concentric plug and receptacle recently standardized by the Electrical Vehicle Association of America was recommended as the standard for Great Britain. It is proposed that where a plug of somewhat larger capacity is required, it shall have the same standard diameters as the 150-ampere plug, the contact pieces being lengthened in proportion to the greater carrying capacity.

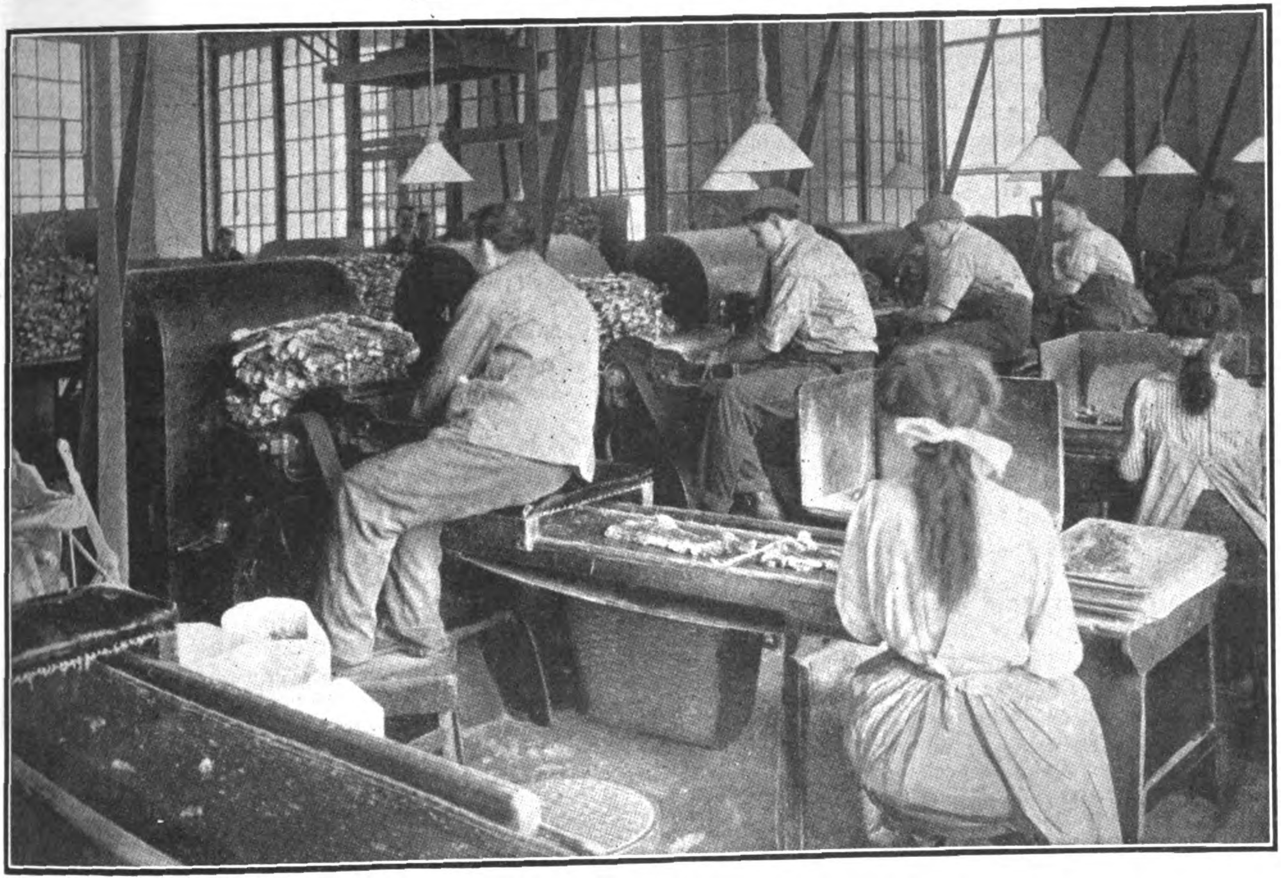
The question of grouting the shell of the plug and the receptacle as well as grounding the framing of the chassis, came under attention, but as charging would always be carried out at a pressure below 150 volts and the English Home Office regulations did not require grounding below that pressure, it was not considered necessary or desirable that in the design of the plug any provision should be made for it.

The Commercial subcommittee reported on rates and in consequence it was decided to circularize electric supply authorities in order to ascertain at what minimum prices they would be willing to supply electrical energy for charging the batteries of electric vehicles. In drafting the letter the secretary was directed to point to the desirability of making the prices as low as possible.

Electricity in Hat Manufacturing.

Although steam in limited quantities is essential in the manufacturing of hats, central-station service is justly becoming indispensable in this industry, due to the uniform speed of motor-driven machines, resulting in greatly increased output without additional cost for machines or labor, reduced fire risk and cleanliness. For the same reasons, also, electric heating is superseding gas appliances and, in fact, the heating question is sometimes the deciding factor in influencing the adoption of electric service.

The use of central-station service is rapidly gaining favor in hat-manufacturing plants because of the uniform speed of the motors, reduced fire risk and greater cleanliness. Electric heating is also indispensable in hat manufacturing and forms a very desirable central-station load. Data on heating and motor drive are presented in this article.



Group of Fur-Cutting Machines, Driven by 20-Horsepower Motor.

In all of the processes employed in hat manufacturing motor drive is being universally used, although even today many of the operations must necessarily be carried on by hand.

It is doubtful if there is any articles used by man, the watch not excepted, that requires better skill in its minute details or more delicate handling than the hat. The fur used in the manufacture of hats is taken from the skins of various animals, the principal being Scotch hare, Saxony hare, Russian hare, nutria, beaver, mink, otter, muskrat, Scotch rabbit, English rabbit, American rabbit, French rabbit, and Australian rabbit. It is interesting to know that the best quality of fur is that taken from the backs of the land animals and from the belly of water animals.

The skins bearing fur from which hats are made arrive in huge bales containing anywhere from 2,000 to 4,000 skins each. The first operation is to place them in large drums, which operate at a slow speed, in which they are thoroughly shaken up and cleared of dirt. Operators next take the skins and, placing them on a forked stick, slit them down the belly and trim the jagged ends. Then comes the dehairing operation. Placed in machines that either shear or pull the hair from the pelt, the final result is a soft mass of fur still left for further treatment. There is always considerable hair in each pelt and only one or two ounces of fur. Before the dehairing is done it is known just how much fur each pelt should produce. The washing drums are in most cases driven in groups of three by a five-horsepower motor.

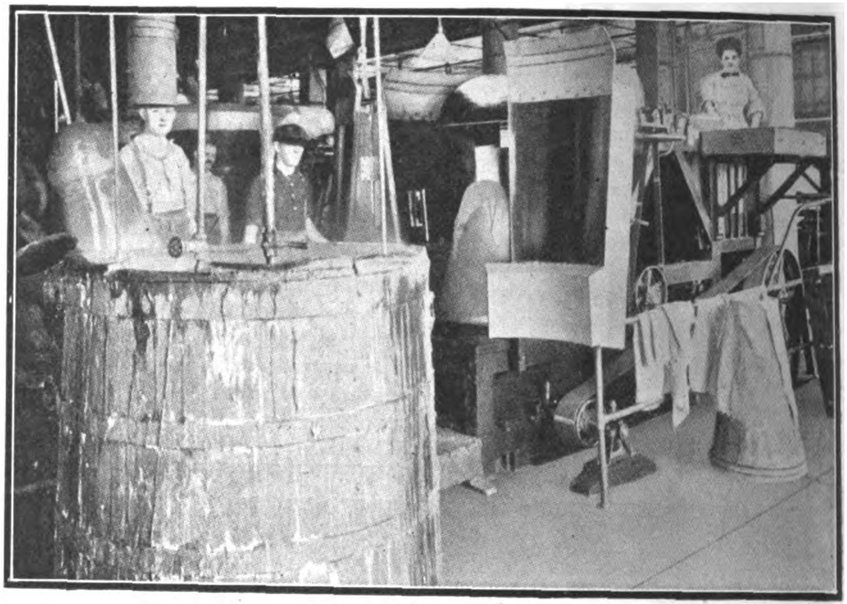
Raw fur does not naturally "felt" well, so the next step is to clean the fibers with water and then brush them with a solution of nitric acid and quicksilver. This is called "carroting" and without it the hat manufacturer would find it impossible to carry on his business. After drying in the air or in an oven, the fur is ready to be cut from the skin. The skins are fed into a machine that shaves off and deposits it on an apron moving along a table, where it is packed in paper packages and stored in the great storeroom piled high with the assorted packages of fur. The clipping machines are also usually driven in groups of three by 10 horsepower motors.

After carefully selecting the various kinds of fur necessary to make the hat wanted, it is mixed and put through a conical machine called a devil, which completes the mixing process.

From the devil the fur goes to blowers—a long frame contrivance open at the top save for wire netting—in fact, a series of chambers through which an endless belt runs. At the entrance to each chamber is a rapidly revolving spiked wooden roller in form not unlike the ordinary rolling pin. This whirls so rapidly that it makes the "fur fly" when the latter is fed to the machine automatically and at the same time the action also removes from the material the heavier particles of hair and other foreign substances which fall through an outlet in the floor of the chambers. In the meantime the good fur is caught again by the moving belt and carried down the line from chamber to chamber for further clarification, until it finally leaves the machine thoroughly clean.

The stiff and the soft hats go through practically the same processes until the stiffening solution is applied.

The section of the fur in each case is determined by the color of the hat it is proposed to make. If the hat is to be black, the operation is a simple matter; but if it is to be of a light shade the proposition is of much greater importance.



Group of Hat-Forming Machines, Each Driven by a 25-Horsepower Motor.

After fur leaves the blowers it is ready to undergo the first process of actual hat making. In an adjoining room operators sitting before delicate scales separate to a fraction of an ounce the amount of fur that is to go into each hat. The next step takes the fluffy fur to the forming room. Here the fur gets the first of its many baths that account for the great quantity of water that is required in the manufacture of every hat. Operators feed the fur into large cabinets from wide boards, suggesting a part of the old style cylinder printing press. Every time the doors of one of these cabinets are opened an operator places inside a copper cone about two and one-half feet high, which is hollow, perforated, and wet. Directly beneath it is a rapidly revolving fan, which constantly draws the air towards the cone.

When the cabinet doors are closed a flurry of fur—just enough for one hat—fills the compartment and the particles follow the air current and adhere to the wet surface of the slowly revolving cone. When the latter has drawn to itself all the fur, which requires only a few seconds, the doors are swung open again, wet cloths are wrapped about the covered cones to facilitate the holding properties of the fur and they are immersed in warm water. When the fur is finally slipped off it is a long, conical shaped, soggy object, resembling wet blotting paper, and therefore far removed from the suggestion of a hat.

At adjoining tables all the cones of felt are carefully inspected. So carefully has the material for each hat been weighed that although at this point it looks like anything but a hat, the operators know that with proper handling it will eventually shrink to the exact size required, becoming thicker and more thoroughly "felted" as the procession of processes continues. Passing into other hands, the steadily shrinking objects are plunged three at a time into hot water and manipulated by hand and rolled by machines until they finally reach the desired measurement—about one-third of their original size.

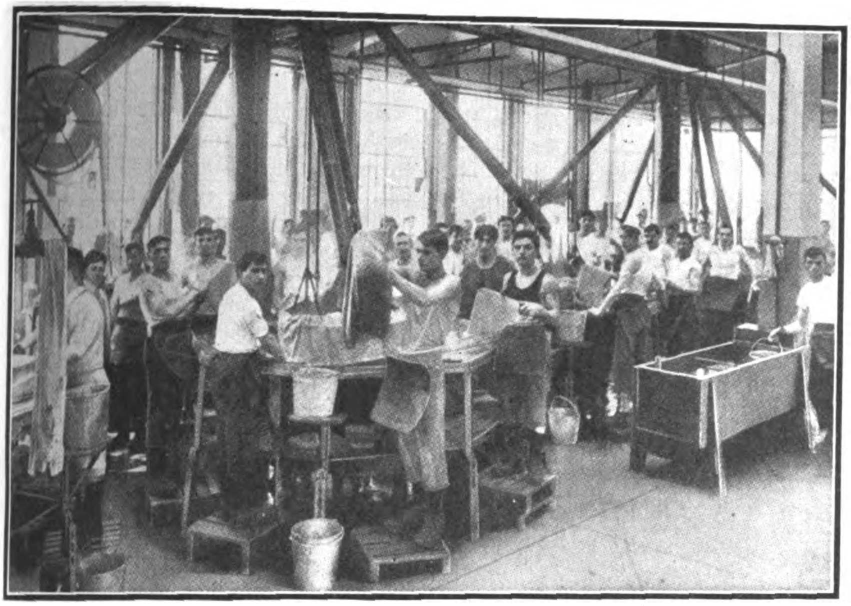
Finishing Department, Driven by Electric Motors and Using Electric Irons.

With the marks of each operator and the size marked in color or notched on the edge, the embryonic hats next pass to another room and are looked over for defects. The edges are trimmed by machines, and the next move is to the drying room, where a current of hot air is blown over the hats. From the drying room the hats go to the trimmers.

The dyeing room, where huge vats filled with the purest of dyes of various colors and capable of holding twenty-four dozen hats at one time are found, is the next objective point of the smooth, shallow, felted cones. They require about three hours properly to absorb the dye. From the vats the colored cones go to the extractors, a machine with a capacity for twenty-four dozen hats at one time—which literally whips the water out of them by centrifugal force.

After becoming thoroughly dry the material for the stiff hats goes to the stiffening room, where an operator dips that part of the cone which eventually will be the crown of the hat, into a preparation of shellac cut with alcohol, and then spreads it carefully with a brush. That part of the cone which will go into the brim is more thoroughly saturated with the same mixture by a machine, because it must show greater stiffness in the finished product. The cones then are placed in metal cylinders to "seat," and from them go to the reclaimer, which draws out all the alcohol by condensation.

From the condenser the cones go into steam boxes for several minutes so that the shellac may be melted and driven into the body. The felted cone next is dipped into a hot alkali bath. It instantly softens again, and any of the shellac adhering to the outside is dissolved and removed by a cold water plunge. It is at this point that one be-



Sizing Machines in a Hat Factory.

gins to see the material take the hat form. After another hot bath, the cones are placed in stretching machines and roughly formed. They then are placed over wooden crown blocks and shaped by hand, while the part that is to go into the brim is pulled out at the right angles. The application of cold water immediately brings back the snappy crispness to the article.

After being thoroughly dried, the material is ready to go to the finishing room and take its true form. After the entire fabric has been softened in a steam oven, the crown is placed in an impressed steel mold or die corresponding to the true type of crown that has been ordered. As the styles change, new steel molds are added to this equipment.

When the hat has been softened by heat and properly placed, the operator sets in motion with a lever a steel plate to which is attached a plain rubber bag. This bag drops squarely into the inverted hat. Cold water at a pressure of 500 pounds to the square inch is forced into the bag, and in expanding the latter makes the felted material conform exactly to the lines of the mold. With the steel touching the outside of the hat any slight inequalities that may arise appear only on the inside, while the outside surface is perfectly smooth.

The hat now has assumed the ephemeral characteristics of style and the last steps of finishing are begun. The product appears almost perfect as to its crown, but the brim still stands out at right angles, stiff and flat. The first operation is to give the crown its proper "feel" by placing the hat upon wooden blocks and rubbing the outside carefully with "pouncing" paper—a kind of sandpaper. This removes the rough surface. Next, the luster is brought out by an operation known as "leuring." The "leur" is nothing more than a piece of coarse muslin stuffed to the size of a brick for convenience in handling. It is heated by contact with electric stoves and with it grease is applied and thoroughly rubbed in. The crown now is finished, and the hat passes to the experts who are to trim and shape the brim to the size and style required. One machine cuts the brim according to specified measurements, and another one, after the hat has been softened by heat, curls up the edges—a rather wide turn on the sides and a narrow one front and back. Here the brim again is softened by heat and shaped by hand to the desired style. When this is completed, the hat has passed through the last of the actual manufacturing processes and the remaining work on it—the binding of the brim and the attachment of the sweat leather, the band, and the bow—is done by expert girls.

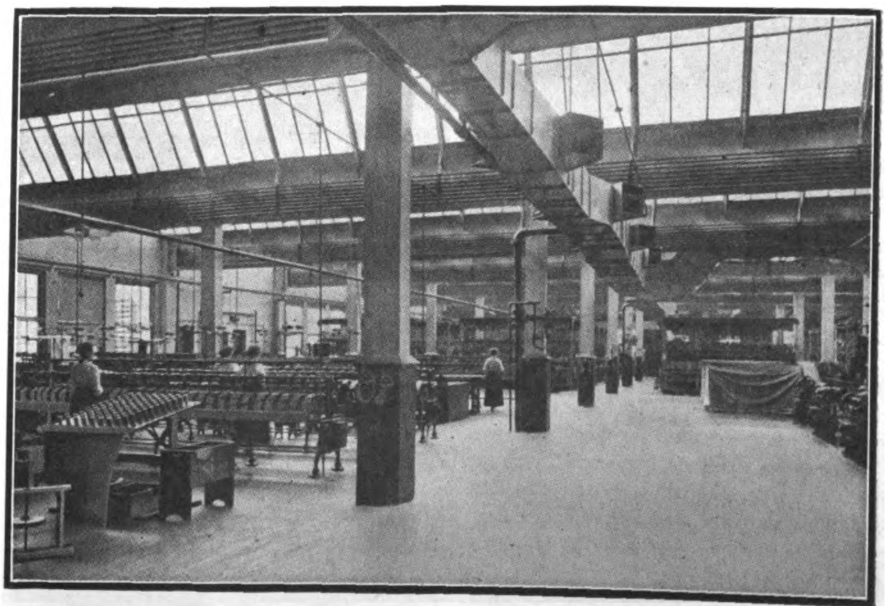
The stiff hat, or derby, now is complete, and after inspection it is packed for shipment.

All this time the soft hat has been proceeding rapidly toward completion over another road from the point where it separated from the stiff product. In the stiffening department it was treated with a much weaker solution of shellac, and, when blocked and dried, retained its identity as a soft hat. The proper surface was obtained by placing the hat in an oscillating machine and removing the excess hair by the application of sandpaper. After a heating, it was shaped by being drawn over a wooden block and thoroughly ironed. It was "pounced" and "leured," and the brim was ironed over a cold flange to give the desired shape.

In all of these various processes motor-driven machines are employed but as practically every factory uses special machines, usually of its own manufacture, no definite figures can be given as to horsepower requirements. Squirrel-cage induction motors are recommended for hat factories and these should usually be mounted on the ceiling or on the platforms so as not to be affected by water.

Electric Heating.

Heretofore gas-heated apparatus has been chiefly used in this industry. Now all the progressive plants are operated electrically. An electric heater can be arranged to provide any temperature obtainable with gas-heated apparatus. It is not affected by air drafts and does not fill the work room with soot. This cleanliness is of particular importance in the manufacture of light-colored felt hats. By its use, the fire risk is eliminated as there are no exposed flames. The worker is not exposed to the hot, ill-smelling waste-gases which rise from tools heated by the gas blast, and the problem of ventilating the hat factory is greatly simplified.



Weaving Room Where Silk Bands are Made—Individual Drive Throughout.

The favorable results, obtained through the adoption of electric heaters, are made evident to those concerns which use them by a very material increase in the output of the factory and by a reduction in manufacturing cost, while the cost of the heat required per unit of the article manufactured is decreased. The productive capacity of both skilled and unskilled labor is increased, and the conditions of the operatives greatly improved.

The electrically heated hand shells now in general use are patterned after those used for many years by journeymen hatters. They are employed in flanging and finishing, at pressures varying between 100 and 125 volts, and consume from 300 to 500 watts.

The heating element is proportioned to suit the service for which the irons are to be used; a moderate heat being required for finishing and a high heat for flanging and curling. These irons can be used on either alternating or direct-current circuits.

Machine irons are constructed in the same way as the hand shells, the heat being confined as closely as possible to the working surface. These irons are fast supplanting gas-heated shells, as the heat is constant, is not subject to jolt or draft, and is uniformly distributed over the entire working surface. One operator can tend to a group of irons, thus turning out more work.

It is well known that the successful operation of the ironing machines requires a fixed relation between the speed of the machine and the temperature of the shell. This relation is accurately attained by the use of the electrically heated machine shell; the speed can be considerably increased, so that a larger output can be obtained without increasing the number of machines or attendants.

Electric velouring stoves are made in several sizes, and are adapted for use in any position. They, too, are not affected by drafts and cause neither soot nor odor. They operate at various voltages, from 100 to 125, with a consumption of from 275 to 300 watts. They are particularly applicable for use in the packing and shipping room for the final "luring off" of the hats before shipment.

The electrically heated velouring stoves provide even temperatures over the entire working surface and are so designed that fine fur or dirt cannot collect below them, a condition not usually obtaining with gas-heated apparatus.

The shackle stove is constructed in the same manner as a velouring stove, but the working surface is divided into two portions. One part is worked at a high temperature for heating the hand tools, etc. The other portion has a slightly lower temperature adapted to keeping the hand shackle at the proper working temperature. These stoves consume from 500 to 650 watts. Electrically heated shackle irons can be made to give a curl of from about one-quarter to one inch.

Electric heaters for the ovens, in which stiff hats are heated before going to the hydraulic presses, are among the latest and most efficient electric apparatus used in the manufacture of hats. An oven can be arranged to be heated interchangeably by either electricity or steam.

Press heads for printing and embossing presses are hat-making devices for embossing the bands and tips. Here the use of electric heat is exceptionally economical and safe, as the heat is generated immediately below the working surface and transmitted directly to the point at which it is needed. The heating element is divided into a number of sections, which permits the localization of the heat in any section of the press head or the use of the entire head for work in hand.

Agar machines for soft hats and Turner machines for curling stiff hats are also among the electically operated hat-making devices. The electric heater for use on the Agar machine is semi-circular in shape so that it will fit closely against the revolving disk. The cleanliness of electric heat on this machine is an obvious advantage, particularly when light-colored goods are being handled.

Specially shaped machine irons, heated to a high temperature, are used on the Tweedy machine in curling stiff fur hats.

One of the most important devices used in the hat industry is the electrically heated flanging bag. It differs from the regular pattern in that the heat is applied directly to the sand by an electric heater buried in the sand. Instead of applying heat only to the working surface of the bag, by resting it on a steam-heated baker, the heat is applied internally. The heating element is flexible and readily conforms to any contour the bag may assume when in use.

Electrically heated flanging bags are usually installed with a compound pulley placed at the ceiling, by means of which the bag can be readily raised and lowered.

In heating or softening hat brims, instead of exposing a large heating surface, as does the steam baker, the oval plate of the electric brim heater is of practically the same dimensions as the brim of the hat. It has an opening cut in it slightly larger than the crown so that the surface through which heat is applied is of essentially the same dimensions as those of brim to be heated. The operating temperature of the heater can be easily made to suit the different kinds of work.

Commercial Practice
Management, Rates, New Business

Domestic Campaign in Philadelphia.

The Philadelphia Electric Company has inaugurated a most aggressive campaign of educational publicity looking to a radical increase in domestic use of electricity. Householders are first informed as to the economies attending the use of electricity, economies in time and labor. The next step shows the practical benefits resulting from heating, cooking and cleaning by electricity; body massage, hair curling, vacuum cleaning and the other domestic services possible with electricity. Then follows a proposition to install wiring on the deferred-payment plan and, later, an installment proposal covering all the devices used in a household. The plan has been worked out along logical lines and is in every way the best planned and most effectively executed advertising campaign ever attempted by the Philadelphia Electric Company. Daily newspapers, booklets and direct approach are being used.

New Electric Shop of Portland Company.

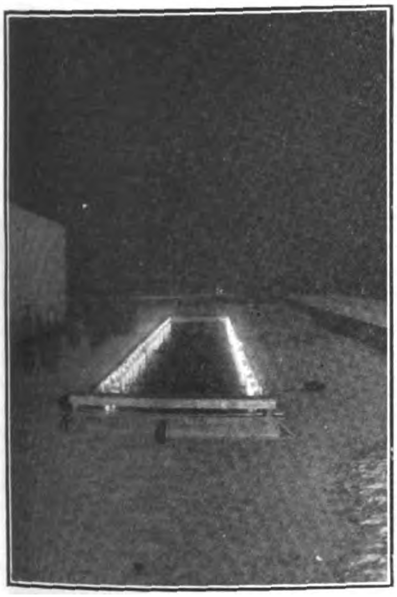
The Cumberland County Power & Light Company, Portland, Maine, just before the first of the year opened an "electric shop" in the heart of the shopping district of the city, where apparatus is displayed for the purpose of demonstrating to the public the variety of devices offered and their mode of use. The company installed a meter panel with two rows of lamps, of corresponding sizes, ranging from a four-candlepower carbon lamp to a 250-watt Mazda lamp. One of the two meters is connected to the top row of lamps and the other to the lower row, each lamp being controlled by a separate switch. By this means any lamp in one row can be compared with any lamp in the other row and their relative brilliancy observed by interested customers. For this purpose of illustrating the relative current consumption of the carbon and Mazda lamps, the carbon lamp of any size is thrown on one meter and the corresponding candlepower Mazda lamp thrown on the other meter and the relative speed of the two meters is shown to the customer.

The method of reading meters is also explained to customers, and the customers are urged to acquire the habit of reading their meters. Advertisements in the local newspapers urge the public to visit the apparatus exhibit and familiarize themselves with electrical processes so far as possible.

◆

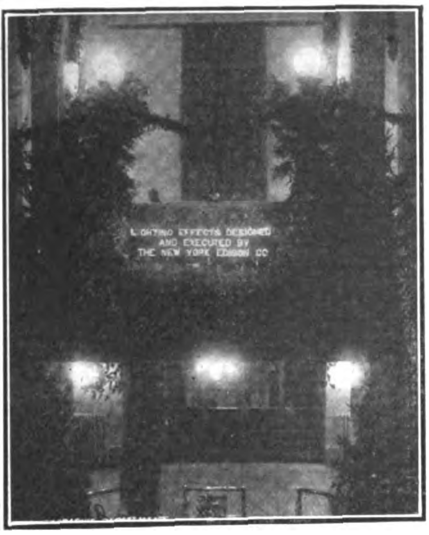
New York Edison Company Furnishes Special Illumination for Exposition.

At the recent Sportsman's Show held at Grand Central Palace, New York City, the New York Edison Company had charge of the special illumination which attracted unusual attention from every visitor. Special lighting equipment representing a connected load of 48,000 watts was installed and most pleasing effects were produced.



Illumination of Fly-Casting Tank on Roof of Grand Central Palace, New York.

The Edison Company's bureau of illuminating engineering arranged all the lighting for the exposition, replacing the usual lighting on the main floor of the building by 150- and 200-watt tungsten lamps, the bulbs of which were stained to produce a pale blue glow. Added to this was the light of nitrogen lamps placed in the urns around the balcony rail and suspended in the well of the building. There were 24 of these lamps, each in a glass reflector and shaded with green gelatine screens. The fly-casting tank and the trap-shooting range on the roof were illuminated by spot lights and incandescent lamps. A view of the former and a view of the main entrance are shown in the accompanying illustrations.



Main Entrance to Sportsman's Show, Held at the Grand Central Palace, Showing Special Illumination.

◆

Unique Method of Installing Electric Sign.

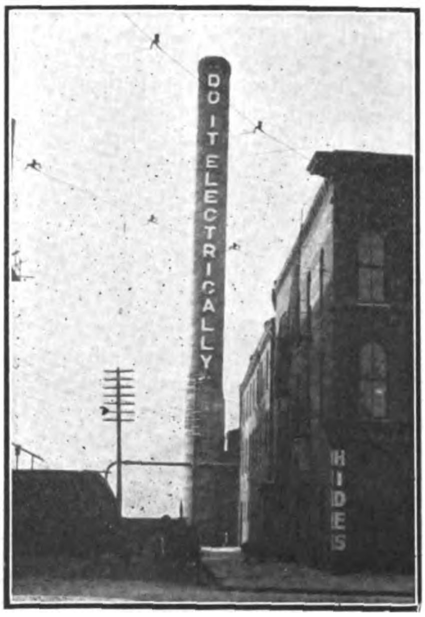
The accompanying illustration shows a novel electric sign recently erected by the St. Joseph Railway, Light, Heat & Power Company, at St. Joseph, Mo. The sign, which reads "*Do It Electrically*," was erected on a stack of reinforced concrete measuring 150 feet in height, and 9 feet internal diameter. The sign is approximately 100 feet long, beginning near the top of the stack.

It may be stated that the letters are each three feet eight inches high and three feet four inches wide and they are illuminated by double rows of 25-watt Mazda lamps with 40-watt lamps on the first letter of each word. The sign is operated by a flasher and is easily legible ten blocks away. The frame on which the letters are mounted is of structural steel with cast-iron hooks at the top which hook over the top of the stack. These hooks are three in number and weigh about 130 pounds each. The entire frame weighs approximately 3,000 pounds and the frame is held to the stack by means of seven-eights-inch steel rods girding the stack.

It is interesting to note that when the stack was erected it was not thought necessary to equip it with a ladder on account of the fact that, being of reinforced concrete, no repairs or other attention would be necessary. It was necessary therefore to find some method of reaching the top of the stack for installing the sign.

An ordinary 75-cent umbrella was used as a parachute inside the stack. A light seine line was attached to the umbrella and a long stick used to hoist the latter inside the stack to a point where the hot gases from the boilers caught it and took it out over the top of the stack. A steady and stiff breeze carried the umbrella away from the stack until it was rescued from the roof of a neighboring building. With this light line a heavier cord was pulled over and then a sash cord next. To the end of the latter was attached a single strand of No. 10 iron wire. A seven-sixteenths-inch messenger cable was then pulled over and a pair of blocks attached to the outside end of the cable and then pulled back until the blocks stood at the top of the stack.

Although the foregoing gives the method used, as a matter of fact several umbrellas were used up and many trials made before the heavy line was pulled over. The umbrella would refuse to raise a line which was too heavy and too light a line would part on attempting to pull it over the stack.



Electric Sign Erected on Stack Under Unusual Conditions.

By means of blocks and tackle a lineman was pulled to the top of the stack and other blocks hung, by means of which the sign was hoisted. The engineering features, construction of the frame and first scaling the stack were in charge of E. J. Billings, superintendent of power.

Data on Electric Shovels.

As a field for central-station power the electric shovel has been steadily increasing in importance and today this class of business occupies a position relatively as important as the many other electrically operated machines used in excavating, building, coal handling, etc.

For possibly 10 years prior to 1884 successful steam shovels were made and used on certain classes of work, but it was not until then that they were manufactured in quantities and began to play an important part in all classes of excavation. From that time up to the present day there have been gradual but continuous improvements on the original shovel, not only in the mechanical construction, but also in the design of boilers and engines best adapted to this class of service.

Some interesting data on the application of electric motors to shovels were presented recently before the American Institute of Mining Engineers, by H. W. Rogers, which show the possibilities in this field.

In proposing a change from steam to electric operation we have to deal with a steam equipment which has not only proved its worth, but has probably reached its highest stage of development and efficiency. That the electric shovel is a possibility cannot be denied, as at present from 12 to 18 shovels are in operation in this country. These shovels may be divided into three classes; the friction-electric, which is operated by a single constant-speed motor with friction clutches; the three or four-motor direct-current equipment, and the three or four-motor alternating-current equipment. It is the second and third classes that are discussed, as the friction-electric does not compare favorably with the steam shovel so far as speed is concerned, although it may be operated as cheaply.

There is probably no other class of machinery that presents a duty cycle as severe as that of the shovel. It is very short, varying from 7 to 12 seconds on the hoist, 7 to 12 seconds on the thrust, and 10 to 18 seconds on the swing, making a complete cycle in from 17 to 30 seconds. The motor to meet these requirements must have a sufficiently low armature inertia to permit of rapid acceleration and quick reversals under small power. It should also be a motor of rugged design, as it must be subjected to severe overloads and shocks and frequent reversals. This is especially true of the hoist motors and, to a lesser degree, of the swing motor; the thrust motor is practically stalled during the digging operation, although it may revolve or overhaul, according to conditions, and is operated at full speed only after the hoisting operation is completed.

In the case of the hoist, considerable advantage may be gained by using two motors of small capacity instead of one large motor, as the power required for accelerating is much less. For example, assume a shovel that requires a 150-horsepower, 425-revolutions-per-minute motor for the hoisting operation; this motor requires 117-horsepower torque to bring it to speed in one second whereas if we substitute two 75-horsepower, 500-revolutions-per-minute motors in place of it, each motor requiring 32.3-horsepower torque to bring it to speed in one second, or 64.6-horsepower torque to bring both motors to speed in one second, there would be a saving of 45 per cent in the power required to accelerate the motors alone.

Although there may be some demand for equipments to operate on direct-current circuits, the greater part will be required to operate on 60-cycle alternating-current circuits. The direct-current series motor has the characteristics of the steam engine, in that it gives its heaviest torque on starting, speeds up under light loads and slows down under heavy loads. It is much easier to control and requires considerably less apparatus, insofar as the control is concerned, than the alternating-current equipment.

The saving in operating expense of the electric shovel over the steam shovel will depend somewhat upon the comparative cost of coal and electric power and will vary for different localities; but it should be remembered that the electrically operated shovel eliminates the fireman, watchman, coal passer, teaming for one-half day, the use of water, and considerable waste. The natural increased wear and tear of parts having a transverse motion as compared with those having rotary motion and the elimination of boiler trouble should also be considered.

Labor per Shift	Steam	Electric
Shovel runner	$ 6.00	$ 6.00
Craneman	4.00	4.00
Fireman	2.50	....
Six pitmen at $1.75	10.50	10.50
One watchman	1.75	....
One coal passer	1.50	....
Teaming (½ day)	2.50	....
Oil and waste	1.50	.75
Total	$30.25	$21.25

For convenience in comparing the costs of operation on steam and electric shovels the costs are all reduced to a day basis.

		Electric	
	Steam	Direct Current	Equivalent Alternating Current
Interest at 6 per cent	$ 5.20	$ 7.75	$10.85
Depreciation at 4⅔ per cent	4.03	6.00	8.43
Repairs at 10 per cent	8.66	....	....
Repairs at 6 per cent	....	7.75	10.85
Labor per shift	30.25	21.25	21.25
Total cost per shift	$48.14	$42.75	$51.38

It has been assumed that, owing to weather conditions, delays, etc., the shovel working year consists of 150 days and the above figures are based on this assumption; also that the shovel is only working one shift a day.

In selecting a shovel equipment it should be remembered that although it is possible to operate with alternating current, it is cheaper to use the direct-current equipment, even with a motor-generator set, and have an outfit which more nearly approaches the characteristics of the steam shovel, and has much simpler control apparatus and requires considerably less power to operate it than the alternating equipment with transformers. In addition to this, any change in the frequency would mean a complete change in the equipment of an alternating-current shovel while it would mean only a change in the induction motor of the motor-generator set, with possibly a change in the generator fields, on a direct-current equipment.

◆

Advice to Users of Electric Trucks.

The New York Edison Company is distributing to users of electric trucks an attractive card containing pertinent advice to be observed in operating motor vehicles during the winter months. The following is taken from this card.

Don't try to accomplish as much in the snow as you have on clear asphalt.

Don't start out in the morning until you are satisfied that your battery has been fully charged.

Don't try to push a drift ahead of you. Leave it for the snow contractor.

Don't sit still while the wheels go 'round in the slush. Have a box of sand and a kitchen coal shovel handy. Use sand liberally. It is cheaper than electricity.

Don't throw your power on full. Work it up gradually, not forgetting the sand box.

Don't forget an anti-skid device. An improvised one may be made by looping three or four turns of a rope around your tires.

Don't forget that time may be gained by leaving your wagon at the corner and making side-street deliveries on foot.

Don't let your truck stay out all night for want of a boost. The New York Edison Company has twenty-four emergency charging stations in New York where your firm's credit is good.

◆

New York Edison Company Offices Change Location.

The general offices of the New York Edison Company were moved on March 23 from 55 Duane Street to Irving Place and Fifteenth Street.

The United Electric Light & Power Company will also move its general offices to this location on April 1.

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The Edison Electric Illuminating Company of Boston is the largest taxpayer in that city, contributing $373,085 to the treasury. The assessed valuation of its real estate for 1913 is $6,632,900, and of personal property $15,000,000.

Electric Sign Data

Location and Appearance of Electric Signs.

The cost and value of a sign location is a point which has not been properly considered in the past. Sign locations along Broadway, New York, on the Boardwalk at Atlantic City, on State Street, Chicago, or in smaller crowded districts, have a very real value. They bring—and are worth—high rentals. But many merchants having equally desirable space for their own signs do not realize these values and consequently do not take advantage of the opportunity to capitalize them.

A sign location should be classed as "advertising space." In the newspapers or magazines, space is valued according to circulation—by which is meant the number of people likely to see the page. Sign space should be valued the same way. If a merchant has a prominent roof, where hundreds or thousands would see his sign every day, he is wasting an opportunity—wasting real money—if he does not utilize it. Just imagine having a large and valuable piece of newspaper space and neglecting to supply "copy" to fill it. Another way to bring this point home, is to compare a sign location with a display window. Can you imagine a sane merchant leaving his display windows vacant?

The sign salesmen carefully study the location before recommending a sign. Such study includes careful analysis of the number and class of passers-by, the distance from which the sign could be read, and the advertising advantage of spectacular display which one merchant would have over his competitors.

Daylight Appearance.

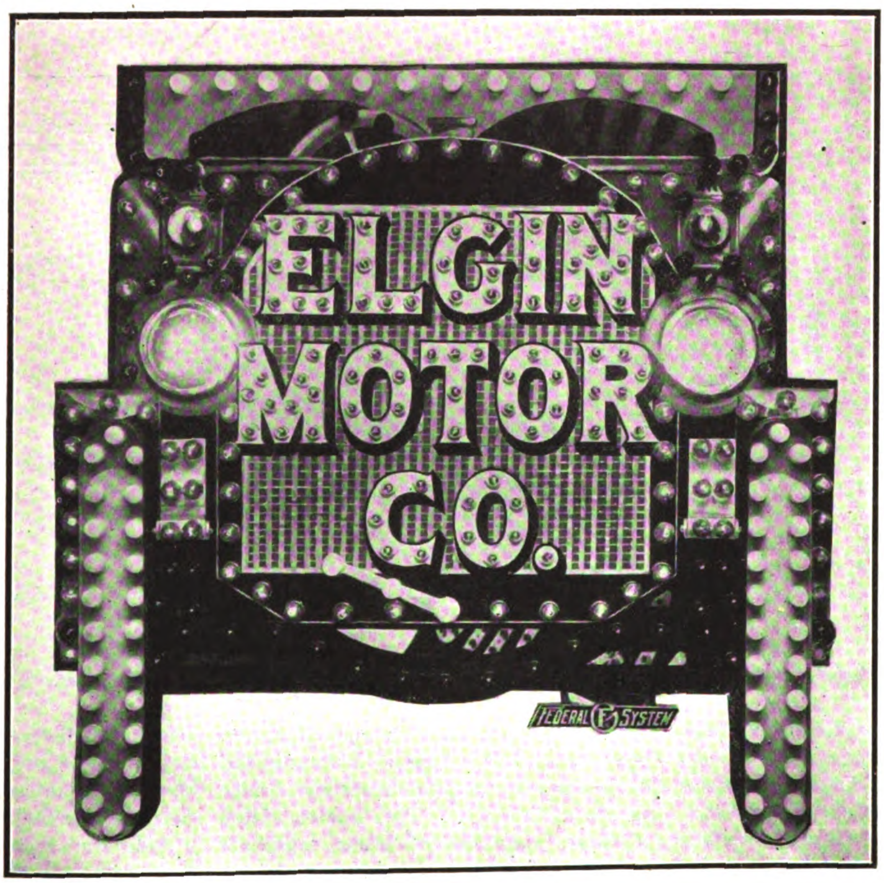
An electric sign should look well and carry its advertising message by day as well as by night. Daylight efficiency in electric signs sometimes adds to the cost, but it is worth the extra investment. Just as a merchant should light his display windows to get their after-dark value, so should he have a night sign which is effective by daylight.

It is difficult to lay down any rules regarding this matter which will apply generally. The best plan is to put the problem up to the sign manufacturer, explaining that daylight appearance is just as essential as the night display, and that designs submitted must stand the double test.

The most desirable colors are opal and yellow on account of their low absorption factors. Ruby is also much used as red light and is distinguishable at great distances. Green, blue and purple are not efficient for many practical purposes and are not to be generally recommended. Lamps of warm, contrasting colors give pleasing effects. In general a solid mass or continual line of color is more attractive than a mixture of colors as the introduction of different colors breaks the continuity of outline and thus detracts from the effect.

Color caps (color hoods) are a substitute for natural color glass lamps or dipped color lamps. The advantage over the former is that they are less expensive in the long run and over the latter, that they will stand the weather, while the color on a dipped lamp will generally wash off with the first rain. They also have the advantage of being readily changed, a man can have a red effect on his sign one week and blue the next week if he so desires at comparatively little extra cost.

By all means use color—but not too much. A touch of color gives charm and interest.



Sign manufactured by Federal Sign System (Electric) for Elgin Motor Company, Elgin, Ill.

Sign is approximately 8 feet square and represents the front of an automobile outlined in various colored lamps. Headlights contain 25-watt lamps, others being 5-watt.

Flasher gives effect of wheels revolving. Headlights burn continuously. Reading is displayed in 12-inch letters. Approximately 300 lamps are used. Sign cost, $300.

Electrical Construction

CIRCUITS FOR ELEVATOR SIGNALING.

Complete Installation for a Hotel.

In a hotel where the elevators are grouped close together, it is generally customary to have no elevator signal lamps or position indicators at the various floors, but to confine the signal apparatus to the cars themselves. The present paper describes an elevator signal system installed in Hotel La Salle, Chicago, Ill., by the Elevator Supply & Repair Company. This system employs an electric annunciator in each car in the form of a bank of low-voltage incandescent lamps. These annunciators are so wired, that upon the pressing of a signal button on any floor, the corresponding signal lamp is lighted in each of the cars in that bank, and continues to burn until one of the elevators takes on the passengers at the floor where the signal was given.

In order to make it easier for the reader to follow the explanation of this system, the wiring diagram shows the circuits for only one elevator and for only one of the push-button circuits.

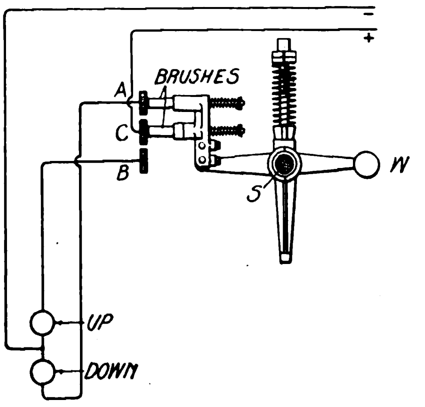


Fig 1.—Traveling Brush Holder.

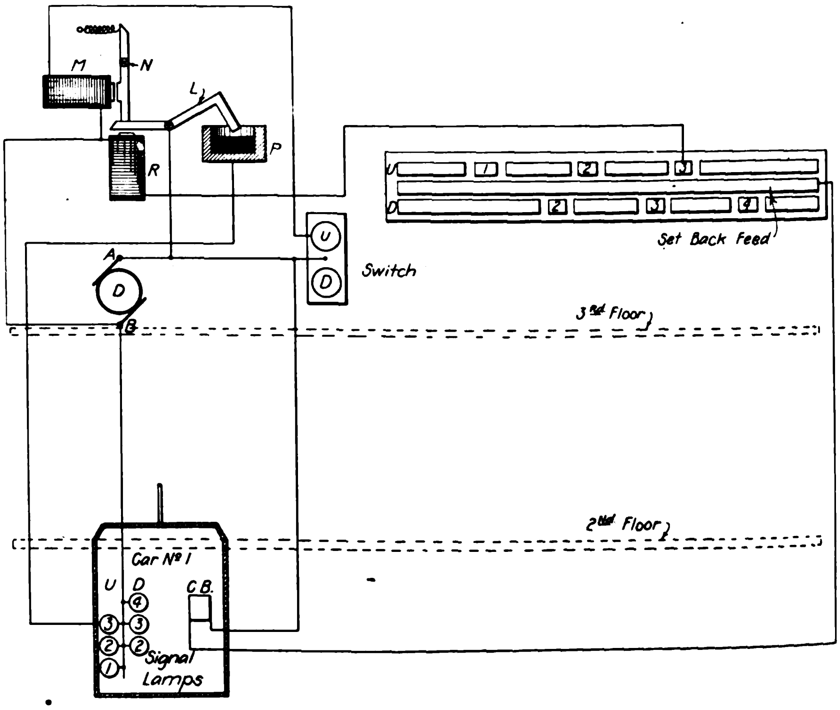


Fig. 2.—Wiring Diagram for Signal Circuits in Car.

The current for the signal circuits is generally obtained from a small motor-generator *D* located in the pent house, together with the fuses and signal operating apparatus. This motor-generator delivers about 10 volts, direct current, and supplies current for both the push-button and signal-light circuits.

Method of Operation.

Fig. 2 shows the push buttons located on the third floor of the hotel. If the upper button *U* of the push-button switch is pushed by a passenger waiting on that floor, current flows from the generator *D* through the solenoid *M* and back to the generator, thus energizing the electromagnet *M* and causing its armature to be drawn to the left so as to allow the lever *L* to drop into the mercury cup *P*. This permits current to flow from the terminal *A* of the generator through *L*, *P* and the "up" signal lamp for the third floor back to the generator, thus giving the elevator operator the signal to stop at the third floor.

After the elevator has passed the third floor, the circuit for the corresponding signal lamp is opened at the mercury cup *P*. This is accomplished by means of a commutating device shown to the right. This device, called a "slate," consists of brass segments fastened to a piece of slate as shown. Installed along the length of this device, and just in front of the brass strips, is a long threaded shaft which is driven through sprockets and a chain belt, by the shaft carrying the overhead elevator-cable sheaves. Upon this threaded shaft, whose direction of rotation is thus dependent upon the direction of elevator movement, is installed a traveling brush holder, whose brushes are electrically connected as shown in Fig. 1. The friction between the traveling nut of this device and the screw, holds the brushes against the set-back feed and the upper segments when the elevator has an upward travel, and against the set-back feed and the lower segments when the elevator has a downward travel. As the elevator passes the third floor these traveling brushes connect the center strip and the upper segment *3* electrically, thus completing a circuit from the generator *D* through the circuit-breaker *CB* in the car and the solenoid *R*. The electromagnet *R*, which is thus energized, attracts the lever *L*, causing it to break contact with the mercury in cup *P*, and thus opens the circuit for the "up" signal lamp for the third floor.

A separate mercury cup with the necessary levers and electromagnets is installed for both the up and down signal positions on each floor, and a separate commutating device is provided for each elevator. However, the corresponding parts of these commutators are connected in parallel, as are the signal-lamp circuits for all the elevators affected by the same push-button signals. In this way the pushing of any signal button, causes the corresponding mercury contact to close the circuits of the proper signal lamps in all the cars. As soon as any of these elevators traveling in the right direction, passes the floor from which the signal was given, the corresponding lamps in all cars are extinguished.

If a car passes the floor without taking on the passengers, the operator opens his circuit breaker as his car passes that floor, thus preventing the electromagnet *R* from becoming energized and opening the lamp signal circuit. The signal lamps in the various cars are thus kept burning until one of the elevators takes on the passengers.

In place of signal lamps various forms of annunciators may be used. Those used in the freight and servants' elevators in the hotel under discussion consist of white disks which are caused to cover circular openings when a signal has been given.

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Arkansas Association of Electrical Contractors Organized.

At a meeting of electrical contractors from all parts of the state of Arkansas, at Hotel Marion, Little Rock, Ark., on March 20, the Arkansas Association of Electrical Contractors, which is affiliated with the national association, was organized. In addition to 21 contractors, a number of traveling representatives of the large electrical manufacturers and a number of visiting central-station managers were also present. The constitution and by-laws to govern this association were adopted, and the following officers elected: J. C. Rush, Hot Springs, president; C. J. Dresse, Little Rock, vice-president; J. C. Dice, Little Rock, secretary; J. R. Bloom, Pine Bluff, treasurer; and W. S. Treadway, Little Rock, Ark., member of the national board of the association.

An address of welcome was delivered by C. J. Griffith, manager of the Little Rock Railway & Electric Company. B. C. Fowles, manager of the Pine Bluff Company, of Pine Bluff, and G. W. Hill, of New York City, national organizer for the association, told of the advantages and benefits which would follow the organization of the Arkansas association. In the afternoon the electrical contractors were entertained on an automobile ride to interesting parts in the city, and in the evening at a banquet and theater party.

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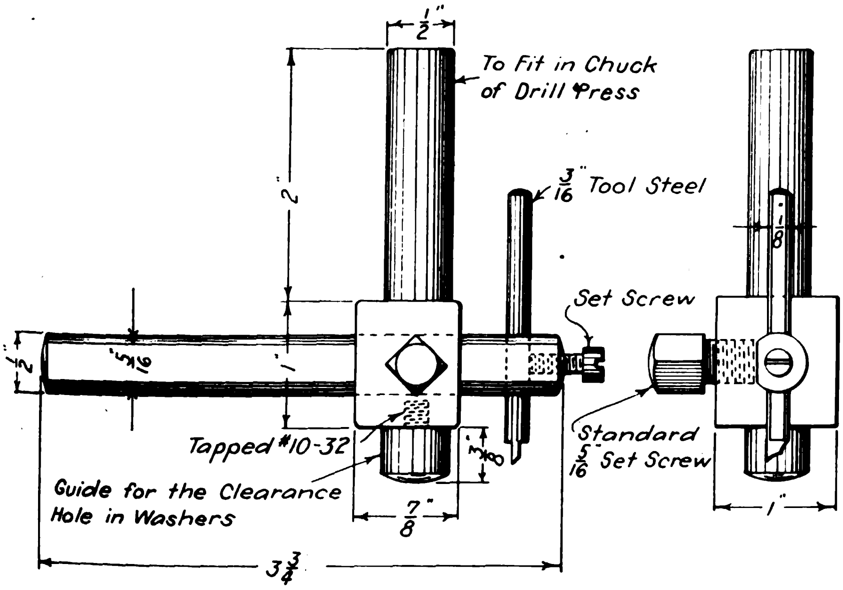
A Device for Cutting Out Fiber or Hard-Rubber Insulating Washers.

In repair shops or electrical machine shops where a large number of fibers or hard-rubber washers have to be made up not only cheaply but where a finished article is also desired, the device illustrated herewith will prove of value. It can also be used to advantage in the tool locker of a contractor doing a large power-house or substation job, where no lathe is available for turning washers up. The usual practice is to drill clearance holes in a sheet of fiber, cut out the washers in any old shape, clamp them on a bolt and then turn up the whole lot in a lathe.



Device for Cutting Out Washers.

With this device all that is necessary is simply a drill press. It is made up of a piece of either square or round steel, turned up, drilled and tapped as per sketch, a piece of one-half-inch-round steel for holding the tool, and a cutter made of three-sixteenths-inch-tool steel.

The guides for clearance holes in washers are to be made up for as many size washers as may be thought necessary, only four or five sizes are generally needed. These are each fitted with a small stud that allows them to be screwed into the bottom of head. In cutting washers, first the clearance holes are drilled in a sheet of fiber, leaving enough space between centers of holes as may be required for cutting outside of each washer. The device is then put into the drill press, the guide placed in the clearance hole that has been cut out, and the tool set at the desired outside diameter of washers. They can then be cut out as rapidly as in a lathe.

H. W. Parsons.

◆

English Central Stations and Electrical Contractors.

For some years past in England there has been an annual discussion regarding the extent to which electrical supply authorities (that is, central station and particularly municipal plants) should be allowed to do wiring and installation work. The electrical contracting firms through their organizations have been consistently determined against any infringement of their rights as private tax-paying traders by municipal corporations. The latter bodies have been equally determined that something should be done to place them in a more favorable position for carrying their parliamentary electric supply powers to their complete and logical conclusion. They complained of the handicap under which they operated as sellers of electricity if they were to be prevented from enabling the user to have the installation work in his premises facilitated.

But there is no great love between the powers in authority and the business people of England for an extension of municipal trading which shall infringe the rights of small traders. Yet it is difficult, when once the broad principle has been approved, to keep things within the originally intended limit, and at times it seems as vain as the Canute attempt to control the ocean: "Thus far shalt thou come, but no farther."

If the private contracting firms had been able to run efficient canvassing organizations cultivating a demand for electric supply business; if they were always doing good work and at reasonable prices; if good firms were available in every supply area—and so on, the question might never have arisen whether the municipal corporations should engage in such operations. And if corporations are to engage canvassing staffs to induce the public to adopt electrical service, as they must do if they are to properly fulfill their obligations, and to throw open showrooms which shall finally convince the prospective consumer, are they to throw work into the laps of contracting firms who do not try to get it in their areas?

All of these and many more points of a like kind periodically arise in the discussion of the subject and the case for co-operation is a very strong one. In past battles probably the municipal suppliers and the private contractors have gone too far in their demands and their objections. They have been urged again and again to compromise matters.

As a result of prolonged deliberations, the subject, it is hoped, has now been brought definitely to a head so that it may be cleared right out of the way, co-operative action enabling the electricity sellers, and the makers and vendors of apparatus, to conduct their businesses with full enterprise and without handicaps. The Incorporated Municipal Electrical Association has not succeeded in getting its proposals through Parliament in the past few years, chiefly because of opposition along the lines indicated above. Now it has produced a bill for the present session of Parliament and we give below the suggestions embodied in one of its sections for settling differences with the contractors:

(4) With the view to securing co-operation between any undertakers exercising the powers conferred upon them by this section and persons carrying on the business of supplying fittings (in this Act called "Electrical Contractors"), the following provisions shall apply:

(a) When the undertakers provide showrooms for the purpose of selling or letting fittings, they shall, at the request of any electrical contractor whose shop or place of business is situate within the area of supply of such undertakers, give to him when practicable reasonable facilities for enabling his customers whose premises are situate in the said area to attend such showrooms and to inspect the fittings therein.

(b) Any electrical contractor who shall, at the request, whether expressed or implied, of any undertakers, sell any fittings on their behalf, shall, subject to any agreement which may be made between them, be entitled to receive out of the purchase money paid to the undertakers, a sum calculated at the rate ordinarily allowed as discount in respect of such fittings by the makers thereof to electrical contractors, and based on the amount actually received by the undertakers in respect thereof.

(c) Any undertakers who pay a commission to the persons employed by them in respect of the sale or letting of fittings shall pay a commission at the same rate and under similar conditions to any electrical contractor upon whose introduction any fittings are sold or let by such undertakers.

(d) Undertakers shall not in the exercise of the powers of this section sell any fittings at a less price than the price (if any) which is determined and enforced by the makers of such fittings as the minimum price for the sale thereof to the class of customer to whom such fittings are sold.

(e) Undertakers shall not themselves execute the wiring of private property, except between the main of the undertakers' and the consumer's meter, but they may enter into contracts for the execution of wiring under subsection 2 of this section, provided that:

1. In making any such contracts for wiring undertakers shall not in cases where there are more than one electrical contractor whose shop or place of business is situate in their area of supply give any undue preference to any electrical contractors.

2. No undertakers shall be subject to the restrictions contained in this paragraph in any case where there is not effective competition between the electrical contractors carrying on business in the area of supply of such undertakers in regard to the execution of contracts on behalf of the undertakers.

(f) Any question which may arise between any undertakers and any electrical contractor under this subsection shall, unless otherwise agreed, be referred to an arbitrator appointed by the President of the Institution of Electrical Engineers, and the provisions of the Arbitration Act, 1889, shall apply to any such reference.

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Among the Contractors.

The Gangle-Harbaugh Construction Company, Akron, Ohio, has been incorporated for $10,000, and will do a general electrical construction business. F. Gangle, C. Harbaugh, W. E. Salber, D. McDonald and R. T. Foltz organized this corporation.

Robertson & Packard, of Santa Ana, have been awarded the wiring contract for the new $100,000 Polyclinic High School at Inglewood, Cal.; their bid was $2,300. The Standard Electrical Time Company was awarded the contract for the installation of the program clocks, their bid being $930.

K. T. Bennett has been awarded the contract for the placing of ornamental lights on St. Johns Street, Pasadena, Cal., the amount of bid being $1,896.

The season's work is opening up well with Childers & Waters, Louisville, Ky., electrical contractors, and several small contracts for lighting installations have been handled by the firm lately, including one of the public schools of the city.

The A. B. Harris Electric Company, of Gary, Ind., has been incorporated under the laws of the state of Indiana for $20,000, and will continue its electrical-contracting and engineering business. This company was incorporated in order to obtain more capital and to strengthen the organization. A. B. Harris will hold the position of president and manager; while C. M. Schuman, formerly local manager of the Central Illinois Public Service Company, of Beardstown, Ill., will hold the position of secretary, and take an active part in the work of the company. W. B. Brockhouse, of Beardstown, Ill., will be one of the directors for the first year.

The N. C. Pickard Electric Company is a new arrival in Kansas City, Mo. The company has taken quarters at 1323 Grand Avenue, fitting its new place of business up elaborately.

The Shiras Electric Company, of Kansas City, Mo., has secured the contracts for the new Orpheum Theater, in Kansas City, as well as the new home of the Taylor Dry Goods Company. Each contract is worth about $90,000, and calls for wiring, heating and ventilating work. The same company also is handling contracts of the same description on the new Hotel Deming, at Terre Haute, Ind.

H. S. Little, successor to John G. Sutton Company, of San Francisco, Cal., is completing the contract for the electric installation in the addition to the Saint Francis Hotel. In addition to this contract which amounts to about $12,000, he has been awarded the contract for the Van Ness extension to the Geary Street Municipal Railroad. This contract amounts to $33,000, and consists of furnishing and erecting reinforced-concrete trolley poles.

The Sterling Electric Company, of Minneapolis, Minn., has secured the contract for the electric wiring in the new four-story Loeb arcade building. The installation consists of wiring for a lighting load of 2,000 amperes and a power load of 500 amperes.

The L. K. Comstock Company, of Chicago, Ill., has the contract for wiring the Morr Hotel of that city. About 4,300 incandescent lamps and a number of large motors will be installed.

The Priddy Electric Company, of which C. F. Priddy is proprietor, has an attractive store at 450 Pine Avenue, Long Beach, Cal., where it does an electrical merchandising and contracting business, and specializes in motor work. Mr. Priddy, whose personality is not the least factor in establishing a successful business, has had considerable practical experience in the electrical line, and is a 1911 graduate of the Bliss School of Electricity.

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Banquet for Contractors.

A banquet was tendered the electrical contractors of Carbondale, Pa., by the officials of the Carbondale Electric Company. The guests met at the American House. E. T. Hollingsworth, presided. Addresses were delivered by Charles Berry, F. D. Collins, W. Y. Myers and others.

Public Service Commissions

Conducted by William J. Norton

This is the second part of an article in which Mr. Norton presents a comprehensive resume of the decisions which have been handed down by the public service commissions in the various states, relating to the matter of protecting established utilities against unnecessary competition. In the summary he indicates what appears to be a reasonable commentary upon the New Jersey Utility Commission's action in the Phillipsburg case.

COMPETITION IN NEW JERSEY—II.

POLICY IN WISCONSIN.

A fundamental decision on this question, laid down by the Wisconsin Commission in the first year of its regulation of public utilities, was rendered in the La Crosse Gas and Electric Company case (2 W. R. C. R. 3, 5).

"Duplications of such plants is a waste of capital, whenever the services can be adequately furnished by one plant only. It necessarily means that interest and maintenance must be earned on a much greater, if not twice as great, an investment and that the actual cost of operation is likely to be relatively higher. Competition in this service therefore usually means a bitter struggle and low rates, until one of the contestants is forced out of the field, when the rates are raised to the old level if not above it, or to a combination or understanding of some sort between them which also ultimately results in higher rates. In this case it often happens that the means which were thought to be the preventative of onerous conditions become the very agents through which such conditions are imposed. In fact, active and continuous competition between public utility corporations, furnishing the same service to the same locality seems to be out of the question. This has been shown by experience. Such competition is also contrary to the very nature of things. Two distinct and separate corporations are not likely to remain separate very long after it becomes clear that the services rendered by both can be more cheaply and more effectively furnished by only one of them."

In a more recent case the Commission, on its own motion, investigated the electric lighting situation in Milwaukee. The city is served by a number of competing utilities. In an attempt to secure the lighting business certain companies engaged in unjust and discriminatory practices which would lead to a rate war.

"Rate wars usually mean, for a time at least, lower than paying rates, failure to keep the plant in good operating condition, and in the long run inadequate service. They often result in financial ruin to one or more of the plants involved, the crippling of the rest, and in the ultimate consolidation of the remnants of all into one concern. When peace has in this way been restored, it is often necessary, in order to secure adequate service, to advance the rates, not only to the level which prevailed before the contest, but to even higher figures. This has been the history of rate wars from their beginning, and there is nothing to indicate that this would not be the result in these cases. If the war was permitted to go on, such results could not even be entirely prevented by the Public Utilities Law, for the only way in which ruined plants can be made to furnish adequate service is through the investment of additional capital, and this can only be had at rates that are high enough for reasonable returns. In one way or another losses and destruction due to rate wars are in the end almost certain to have to be borne by the public. In the end the customers also will lose more through bad service and higher rates than they gained through the temporary low rates which they enjoyed during the struggle. In the public utility field rate wars are so clearly against public policy that they should not be permitted under any circumstances. This is also recognized in the Public Utilities Law, for it is clearly in order to enable this Commission to prevent or stop such struggles that sec. 1897m-99 was included therein.

The Commission quotes its holding in the La Crosse case, cited above, and again states the disadvantages of competition.

"That competition in the very nature of things cannot be a proper regulator of rates and other conditions in the public utility field, would seem to be two well understood for discussion. As a real competition in this field means duplication of plants, which duplications, when once put in, are for the most part useless for any other purpose than that for which they were intended, and which duplication, unlike current capital, cannot be withdrawn from the service and used for other purposes. It also means excessive outlays for fixed and operating expenses. Again, it stands for unnecessary tearing up and occupation of already overcrowded premises, and for many other inconveniences and costs." (9 W. R. C. R. 541, 551, 553.)

OTHER COMMISSIONS.

Indiana.

In the case Hawks Electric Company vs. City of Goshen (September 8, 1913), the Indiana Commission, while stating that the application did not come under the statute requiring certificate of convenience and necessity, made this statement in favor of regulated monopoly.

"Plaintiff contends that this section (Section 98 of the Shively Spencer Utility Commission Act) is applicable to the conditions in this case. That the spirit of this act is monopolistic is clear. That a single utility furnishing a product or service, in the end leads to better service and lower prices, when properly regulated, is no longer questioned by economists."

New Hampshire.

In regard to admitting competition, the New Hampshire Commission says, in the Hudson Water Company case (July 14, 1913):

"If a utility in any case cannot meet the reasonable demands of the public for service, and some other utility can, then such other utility ought to be permitted and must be permitted to render the needed service.

"Or if a utility is in a position so that it can undoubtedly furnish service as good as that furnished by a utility already in the field, and at lower rates than that utility can serve and continue to operate efficiently, then it is entitled to permission to enter the field..."

"Before granting authority for the entrance of a competing utility into territory already occupied, the Commission must determine and find, upon a consideration of all the facts in the particular case, that the community will derive advantages from the competition created which will outweigh in importance any disadvantages or evil results which may be expected to arise therefrom. The course to be pursued will vary according to the facts in each case. Sometimes they will be such as clearly to call for the admission of the applicant. *Generally, however, the situation should be met by requiring the established utility to supply service at the rate which might be secured by admitting competition.*"

In this case, the Hudson Water Company was open to severe criticism for its delay in obtaining an adequate supply of uncontaminated water. The complainants urged that the Pennichuck Water Works Company be authorized to extend its service into Hudson. However, the Commission granted the Hudson company 60 days as a reasonable time within which to make improvements. In case the company fails to meet the necessary requirements, the decision says, the competitor may be allowed to furnish the service.

Georgia.

In the Macon Railway & Light Company case recently decided by the Georgia Commission, the decision says:

"We do not believe that a business which supplies to a community, a public utility like gas or electricity, is one in which full and free competition between two companies engaged therein, can be expected to permanently prevail. Experience has demonstrated the world over, as it has in Macon, that when there is more than one such company in a city engaged in the same business, while active competition may prevail for a while, sooner or later the competing companies find it to their interest to reach an understanding as to prices, or to a division of territory, or both, and in the great majority of cases the two companies either become one or the control of both passes into the same hands...

"We do not believe competition can ever be a consistent and proper regulator of rates and other conditions in the public utility field. Real competition in such a field means duplication of plants, which when once built, are generally useless for other purposes.

"In 1912 there was in Macon an established light and power company, with plant and capacity sufficiently large or capable of enlargement, to serve the city for many years. Instead of coming to this Commission for fair and reasonable rates or for improvement in service, if unsatisfactory; instead of taking steps to compel this established company to furnish all proper and reasonable service at fair rates, the City adopted the policy of granting franchises to another company to come in and share the business, or to compete for it. This company, before it could serve the public, had to provide itself with an expensive plant and equipment, as well as with business and operating organizations. The result is that real competition is now gone, and there is invested in these duplicate plants and organizations, in this city, much more property, much more labor, supplies and services for supplying electric light and power than is needed or would have been made with only one company, upon which, under the law, so long as bona fide devoted to public uses, the public must pay returns.

"As already intimated, it is not improbable that since both are now controlled by the same interests, one will gradually be dismantled, much of its property wasted and permitted to decay, and in some way and in the end, the public will have paid for it.

"The Commission earnestly believes that it would be wise if the Legislature would prohibit the building of duplicate public utilities, or the grant of franchises to such, prior to application to and issuance by this Commission of certificates of public convenience and necessity. In our opinion, the government which properly assumes to prescribe reasonable rates and compel adequate services by public utilities, should also protect such utilities and the public from unwise or useless competition and the wasteful investment of money in unnecessary plants..." (Decided February 24, 1914.)

California.

In the Pacific Gas & Electric Company vs. Great Western Power Company (Vol. 1, 203), the California Commission says:

"It certainly is true that where a territory is served by a utility which has pioneered in the field, and is rendering efficient and cheap service and is fulfilling adequately the duty, which, as a public utility, it owes to the public, and the territory is so generally served that it may be said to have reached the point of saturation as regards the particular commodity in which such utility deals, then certainly the design of the law is that the utility shall be protected within such field; but when any one of these conditions is lacking, the public convenience may often be served by allowing competition to come in. It has been urged in this proceeding that where a utility occupying a field has generally served such field so that the advent of a second utility would merely serve to divide the business, then if the existing utility has the ability, if it choose to do so, to furnish such territory efficiently and at as reasonable rates as can be legitimately accorded by the utility desiring to enter the field, even though it had, theretofore, charged excessive rates or given inefficient service, yet sound economy would require the authority, which has the power to regulate the rates and service of such utility, to require the existing utility to furnish such territory adequately and cheaply and to keep the second utility out. Theoretically much can be said in favor of this contention, but to attempt to apply it would, in practice, defeat the very intent of the Public Utilities Act in all cases where utilities did not voluntarily accord to their patrons those things which are their due, or, at least, would impose upon the public authorities the burden of forcing such utilities into a realization of what their proper relationship to the public is... (p. 209-210).

"Rather, do we announce the rule that only until the time of threatened competition shall the existing utility be allowed to put itself in such a position with reference to its patrons, that this Commission may find that such patrons are adequately served at reasonable rates. By announcing this principle, we hope we shall hold out to the existing utilities an incentive which will induce them voluntarily, without burdening this Commission, or other governmental authorities, to accord to the communities of this State those rates and that service to which they are in justice entitled, and to the new utilities we shall likewise hold out the incentive that on the discovery by them of territory which is not accorded reasonable service and just rates, they may have the privilege of entering therein if they are willing to accord fair treatment to such territory. We understand the certificate of public convenience and necessity to be in this State largely a precautionary measure. We have already dealt somewhat at length with the cases wherein we believe competition should be allowed, even though such competition will mainly serve to take patrons from the existing utility. If, however, a territory is completely served and the utility has, to the best of its ability, given fair treatment to its patrons, as already intimated, this Commission will be slow to permit a competitor to come into its territory..." (p. 211).

The Commission further defends its position by pointing out that they are applying this rule in a territory in a developmental period and that the same rule might not apply in the Eastern states or in territory practically covered by existing utilities.

"Competition does not necessarily become duplication unless the field covered by a natural monopoly is completely served. California has just begun her development. We have no doubt that as a rule in this State the going in of a second utility will develop a considerable amount of new business, while leaving an ample field for the existing utility..." (p. 211-212).

The position of the California Commission as laid down in this case is a departure from the well established policy of public utility commissions. It appears that the Commission has had some difficulty in holding strictly to the policy outlined in this case.

In a later decision, Oro Electric Corporation (April 29, 1913), the Commission still argues in favor of the policy above set forth. However, we find the following paragraph:

"Under this new state policy, competition between public utilities is not of itself necessarily a good thing. Whether or not it is a good thing depends upon the results which flow from it in each particular case. If just as good results can be secured by regulation and supervision under state authority of an existing utility which is a natural monopoly, so that the rates and service enjoyed by the public are as good as they reasonably could be under normal competition, the consuming public has nothing to gain by competition, while that portion of the public which invested its funds in the securities of an existing utility may have much to lose by a competitive condition, which, while not helpful to the consuming public, can be extremely hurtful to the investing public, and particularly discouraging to persons who are proposing to invest their money in the development of new utilities in this State in sections thereof where there are no existing utilities of the same character and where they are imperatively demanded for the development of the state." (Vol. II, 756.)

In this case the Commission did not adhere strictly to its stated policy but granted the company in the field 90 days in which to complete the reconstruction of its plant, and stated that in case the reconstruction work is complete, the service is adequate and the rates are as favorable as those of the applicant, the applicant will not be allowed to enter this territory. In a subsequent decision, the Commission found that the improvements made were satisfactory and the application of the competing company was denied.

From the following paragraph taken from the Oro case it would appear that the adopted policy had not had the desired effect of stimulating the company to voluntarily give proper rates and service.

"While we are discussing this point it is well to call attention to the fact that while our decision in the Pacific Gas & Electric Company has had a substantial effect upon the rates and service of the various utilities in the State in territory not under competition, yet up to the present time we know of very few instances where utilities under no fear of competition have gone as far in the revision of their rates and improvement of their service as we feel they should. We believe that our position heretofore assumed and herein affirmed is the correct one, but if after giving it mature trial, we find that the utilities do not voluntarily under the stress of potential competition afford the very best rates and the most adequate service which it is possible for them to accord in non-competitive territory, we shall be forced to the concusion that other methods must be adopted by us to bring about this result. It may be that if the utilities of the State do not in good faith accept the doctrine which we have held applicable in return for being protected from loss of revenue by competition, and accord to all their patrons that treatment to which they are entitled, voluntarily and without compulsion either from this Commission or under competition, we may be constrained to take the view that they may not justly demand protection from us. It will not avail the utilities anything to enter into understandings between themselves whereby the exclusive territory of one will not be interfered with by another, and under the protection of such agreements maintain unreasonable rates and inadequate service with such territory. This Commission is going to secure for the public reasonable rates and good service from utilities, and as soon as it finds that the method which it has adopted up to the present time, wherein it is sought to give the public the service to which it is entitled without injuriously affecting the utility, has not brought about the desired result, we shall resort to other methods. It cannot be expected if the utilities do not keep their faith that this Commission will continue to be solicitous for their welfare when such utilities, by their disregard of the public interest, have rendered what we consider the fairest solution of this question ineffective..." (Vol. II, p. 758.)

Idaho.

The Idaho Commission has expressed its policy in the matter as follows:

"The law (Public Utilities Act) was not enacted for the purpose of creating competitive action between two or more individual corporations furnishing such service, but rather to control and regulate them so as to avoid the evil effects of monopoly; and where a utility occupying a field has generally served such field so that the advent of a second utility would merely serve to divide the business, such competition becomes an economic waste by reason of the duplication of investment, which it was and is the intention of the statute to eliminate..." (Application of B. Gustad et al. for certificate of necessity, October 16, 1913).

In the case of the application of the Swan Creek Electric Company for a certificate of public convenience and necessity the company operating in the territory was rendering service inadequate and unsatisfactory. The decision says:

"Applicant hopes, if allowed to enter the field, to destroy the income of the present company entirely and render its investment valueless. Just how this is to be done is not made clear, but assuming for the sake of argument that this can be done, we do not believe that the purpose of this statute is to encourage or countenance such action. On the other hand, if the applicant shall fail to gather to itself all of the revenue derived from the village of St. Charles, it then follows that the two companies must divide what is already a very meager income for the one company already in the field, with a loss to both companies.

"We are, therefore, inclined to the opinion that no reasonable contention can be made that the present or future public convenience and necessity require or will require the construction of an additional transmission line and distribution system in the village of St. Charles and that the application must therefore be denied." (Decided December 15, 1913.)

In the Ashton and St. Anthony Power Company case (decided November 12, 1913), the Commission is without authority to prevent the unnecessary duplication. The applicant began construction before the public utilities law was in effect and, therefore, under the Idaho law had the right to proceed without obtaining a certificate from the Commission.

In this decision, however, the Commission says:

"The Commission is opposed to unnecessary duplication and in favor of protection from competition of a company already in the field."

Furthermore the Commission criticises the policy of the California Commission in admitting competition where the service of the utility in the field is faulty or its rates unreasonable. After citing the California Commission's policy toward delinquent utilities the decision says:

"As to this latter comment, we fail to see why such a condition of the inefficiency of an existing utility or its practice of exorbitant rates should exist or be permitted to continue. Under the present law such utilities are supposed to be always upon their good behavior, and if they are not furnishing adenuate service and at reasonable rates, inquiry upon the part of the Commission should be at once had and they be made to come within the requirements of the statute in this respect. The matter of rates can be investigated, and if too high can be at once corrected by the Commission. If their service is not adequate and cannot be made adequate, of course they forfeit the protection given by the statute against new utilities seeking to enter their field. The statute defines very clearly the attitude that public utilities shall assume and maintain toward the public."

In the Great Shoshone & Twin Falls Water Power Company vs. the Idaho Power & Light Company, and the Southern Idaho Water Power Company vs. Beaver River Power Company, two cases decided February 18, 1914, the Idaho Commission granted protection to the company furnishing service. The defendant, the Beaver River Power Company and its successor, the Idaho Power & Light Company, had begun construction preparatory to furnishing competing service in Twin Falls and Pocatello, respectively. The defendant claimed right to do this, without securing a certificate of public convenience and necessity, on the ground that construction in the cities in question was a part of a larger generating and distribution system, construction of which had been begun prior to the enactment of the Public Utilities Law under certain land rights and water permits granting the right to use certain of the waters of the Malad River in generating electric current to be distributed for use within a radius including Twin Falls and Pocatello. Local franchises granted by Twin Falls and Pocatello were not accepted by the defendant and work was not begun within these cities until after the Public Utilities Law became effective. The Commission, therefore, held that these franchises were subject to the Commission's approval.

"We cannot avoid the conclusion that we have heretofore reached as to the purpose of this statute, that it was enacted to avoid duplication of power plants in fields where the necessity for such duplication does not exist, thereby avoiding what is termed economic waste, and such being the case, by the terms of the statute only a limited latitude is given to such public service corporations when attempting to enter the field already served by another public utility. If such public utility desires to enter such field already served, it must apply to the Commission for certificate that public convenience and necessity require such service, and it can only enter such field after a hearing has been had before the Commission and the Commission finds that it had prior to the time the statute became effective begun actual construction work and was prosecuting such work in good faith, uninterruptedly and with reasonable diligence under a franchise granted it before the statute took effect."

The defendant is ordered to immediately desist and refrain from further constructing any equipment for the purpose of furnishing electrical energy in Twin Falls and to refrain from furnishing electrical energy for any purpose within the city.

SUMMARY.

The paragraphs cited from the decisions of the various commissions may be said to represent fairly the position of the leading commissions on the question of protection from competition. With the exception of the California Commission the policy appears to be well established, and generally recognized, that where the company in the field is furnishing or can be required to furnish adequate service at reasonable rates it is entitled to protection from competition and that the public interests are best conserved by a prevention of unnecessary duplication. The California Commission is in favor of protecting a company giving adequate service at reasonable rates. Its policy in favor of admitting competition when the established company is delinquent in the matter of rates or service as a means of penalizing such company and affording a warning to other utilities having similar shortcomings is clearly on trial. The California Commission is questioning the wisdom of adhering to this policy as is shown by its own statements such as were made in the Oro case, and this policy is open to such criticism as that stated by the Idaho Commission in the Ashton and St. Anthony case cited above.

Application to New Jersey.

It is important that the question of policy in cases involving competition where the company in the field is not affording proper service at reasonable rates be further investigated before considering the recent decisions of the New Jersey Board.

Excessive Rates.

In the Ettrick Telephone Company case decided by the Wisconsin Commission, October 17, 1913, the company desiring to compete, offered a $5 rate and the rate of the company established in the territory was $15 per year. The Commission held that the "objector is entitled to a rate which will pay reasonable operating expenses, depreciation, and a fair return upon its investment, and the fact that its competitor may choose to forego its dividends, neglect the greater part of its depreciation, and pay its operators less than a living wage, do not constitute a showing sufficient to warrant the entrance of applicant into the field as a competitor of the objector. It may be that the rates of the objector are excessive, but if they are, it will not be difficult for its subscribers to bring the matter up before this commission for determination..."

Should a similar case come before the New Jersey Board the same holding would apply. Under the New Jersey law the Board is given the power to fix rates just and reasonable. (See II, Ch. 195 Laws of 1911, paragraph 16 c.)

Inadequate Service.

The Wisconsin Commission has also said: "If it should be claimed that it (the company furnishing the service) does not keep its line in condition to give good service....the remedy to be sought is through a proceeding before this Commission to compel adequate service. (Owen Telephone Company, January 19, 1914.)

"Every company acting in good faith is entitled to a reasonable time within which to promote and complete the project for which an indeterminate permit is granted. This is in harmony with the spirit of the law as expressed by the supreme court in Calumet Service Company vs. Chilton, 1912, 135 N. W. 131, 144. In that case an operating company discontinued service for a period of several months because of insufficient revenue to maintain the plant, which was occasioned by the city council refusing to continue the contract for the lighting of the streets and public buildings of the city. The city attempted to construct a plant for municipal purposes and rested its right to do so upon several grounds, one of which was that the company had temporarily ceased to operate its plants. The court, speaking through Justice Marshall, says:

"'The words "operating under an existing permit" do not suggest necessarily, in continuous operation, absence of momentary or reasonable cessation. Excusable, temporary suspensions, involving no purpose to abandon, the owner being willing and reasonably, under the circumstances, able to resume and doing so, as in this case, satisfied the calls for a "public utility operating under," etc. The law must be given a reasonable,—sensible,—construction, at all points, to the end that the legislative intent shall not fail, instead of looking with favor upon technical assaults upon it.' (In re Interstate Lt. & P. Co. et al., October 21, 1912.)

"In the absence of clear proof that the company already rendering the service does not and can not do it adequately it is difficult to see how the Commission can find that public convenience and necessity warrant the new line." (Ettrick Tel. Co., October 17, 1913.)

The New York Commission decided in favor of regulation of the utility in the field in the Antwerp case.

The service of the Antwerp Company was shown to be inadequate. The Northern Power Company applied for authority to supply electric service in Antwerp. Upon the filing of this petition the Antwerp company took steps to increase its facilities by adding steam power and in negotiating for more water power. The Commission held that it should be given a chance to make its service adequate. The decision says:

"The town of Antwerp is supplied at present by the Antwerp Light and Power Company, which opposed the application of the Northern Power Company. The present service was shown to be inadequate and unreliable, as it depends upon water power which fails during dry seasons. But the company showed that since the filing of this petition it had taken steps to increase its facilities by adding steam power, and also is negotiating for more water power. The Commission therefore finds that it should be given a chance to make its service adequate, and that competition by the petitioner, the Northern Power Company, should not be allowed."

The policy of the New York and Wisconsin Commissions could be applied by the New Jersey Board under similar circumstances in New Jersey. The Board has been given the power to require any public utility to provide and maintain safe, proper and adequate service. (Sec. III, paragraph 18c and Sec. II, paragraph 17b.)

RECENT NEW JERSEY DECISIONS.

The application of the Jersey Power Company for authority to issue stock was before the Commission at the same time the Phillipsburg case was under consideration.

The Commission objects to the application chiefly on the ground that the company proposes to transmit over its system, for the construction of which the bond issue is desired, electric current which is to be generated by the Jersey Corporation at Boonton. This Corporation is not under the jurisdiction of the Board and, the decision says:

"It appears to this Board that a security issue cannot be said in the language of the statute 'to be made in accordance with law,' when said issue contemplates a purpose which, if consummated, renders the law regulating public utilities inoperative."

The application, moreover, would involve competition with the Morris and Somerset Electric Company and on this phase of the situation the decision says:

"The same grounds that would warrant the Board in withholding its approval of a franchise which should create competition locally between public utilities might be cited as grounds for the disapproval of the purpose of a security issue which would result in similar local competition between public utilities.

"It is to be noted in all of the three decisions quoted above (the Atlantic Highlands case, the Millville case and the American Telephone & Telegraph case) that the immunity from competition of the company in possession is rested upon its rendering adequate service at a reasonable price.

"Do the circumstances in the petitioner's case render its position so exceptional as to justify a departure from the Board's rule as regards utility competition locally?

"The Board is unable so to find. For. first, the petitioner is physically able to transmit current to the Morris County Traction Company without entering with transmission lines and substations into territory already locally supplied with electric current. * * *

"Moreover there is force in the position that if the petitioner once enters the territory adjacent to Morristown, the petitioner may be solicited to take on local business without the legal right to refuse. * * *

"This is a form of competition to which the Morris and Somerset Electric Company may reasonably object. The intervener, it appears, is giving adequate service throughout the district it serves. There is no complaint either of its service or its prices. * * * It replaced the inadequate electric lighting service formerly given in Morristown. It experienced for a time local competition therein to its own and to the public's detriment. It has paid dividends on its stock only for the past two years. Its physical equipment and its financial ability are adequate to cope with a considerable extension of electric business; and, if required, to take on the supply of this traction company. In this respect, it clearly differs from the Fitchburg and Worcester companies cited in Mass. Pub. Doc. No. 35, Jan., 1910. When, and if a case arises that shall disclose a public utility, a would-be invader of territory locally supplied, not legally disqualified from affording service in such territory, and capable of according service that cannot be matched in character or price by public utilities already affording the local supply of such service, this Board will consider whether the circumstances warrant a departure from the precedents already established by it in reference to competing service locally by public utilities. The present petitioner's case does not seem to come within the exceptional character indicated * * *."

The Phillipsburg Case.

The Phillipsburg Light, Heat and Power Company applied to the Board for approval of an ordinance passed by the common council of Phillipsburg granting the applicant the right to furnish electric service in Phillipsburg. The applicant company was organized by a group of men, all of whom belonged to the local board of trade, but outside of the regular activities of the board. Electric service is supplied in Phillipsburg by the Eastern Pennsylvania Power Company of New Jersey. After citing the Board's policy in regard to admitting competition the Board says:

"It was made clear to the petitioners in the case at bar that they must establish affirmatively that the service in Phillipsburg fails to conform to the standard of being safe, adequate and proper.

"On careful consideration of the record, the Board is of opinion that the petitioners have established this fact.

* * *

"The Board is not unmindful that in the early part of last year the generating plants in Easton were crippled for a time by a strike. Nor is the Board unmindful that some of the petitioner's witnesses have admitted subscribing to stock in the newly projected company.

* * *

"Much of the irritation with the inadequate service is founded on a prevalent feeling that with the generating plants in Easton, and with only a sub-office or agent in Phillipsburg, the Phillipsburg service is not accorded proper attention * * *."

Testimony was introduced by the Eastern Pennsylvania Power Company to the effect that additional generating apparatus is being installed at Easton and that a comprehensive plan of transmission and distribution lines are being devised which will include Phillipsburg, along with other places at which current is to be delivered from the Easton generating plant.

"Counsel for the Eastern Pennsylvania Power Company, while averring that ample power will be available shortly, does not hold out the prospect that the changes in the transmission and delivery lines in Phillipsburg will be completed until October of this year.

"The question arises whether a company holding a franchise and under legal obligation to furnish at all times safe, adequate and proper service may defer or postpone rendering such service or postpone putting its apparatus in proper condition to render such service, until a more convenient season when the locality to be served shall have been embraced within a comprehensive scheme of reconstruction allowing such service to be afforded.

"We do not believe that such postponement or delay is justified or justifiable.

"We shall therefore approve the franchise under consideration as necessary and proper for the public convenience and as safeguarding the public interests."

In granting the franchise the condition is exacted that the Phillipsburg Company file with the Board its written statement that it will construct and maintain its plant for the generation of electric current in Phillipsburg, and that it will begin the construction of said generating plant within six months from the date hereof, and of its lines of poles and wires within nine months from the date hereof, and that it will have completed, unavoidable accidents excepted, its generating plant and the main lines of its distribution system "within 18 months from the date hereof."

In the New Jersey Power case the Board asks: "Do the circumstances in the petitioner's case render its position so exceptional as to justify a departure from the Board's rule as regards utility competition locally?" and in that case the Board gave a negative answer. If the Board had asked the same question in the Phillipsburg case what would have been the circumstances "so exceptional as to justify a departure from the Board's rule?"

The reasonableness of the rates of the Eastern Pennsylvania Company is not questioned, and in case the rates are excessive the Board has the right in a proper proceeding to order their reduction.

The service has been and was inadequate according to the Board's finding, but there is no holding to the effect that the company is unable to furnish adequate service and cannot reasonably be required to do so. According to the company's statement, which is not questioned by the Board, it will be in a position to furnish adequate service in *eight months.* The Board objects to the delay and authorized the new company to give service, granting *eighteen months* in which to get ready.

The decision fails to point out any advantage to be gained to offset such well recognized disadvantages as are cited by the Board in the Atlantic Highlands and Millville Gas cases and yet in the Phillipsburg case the Board has admitted competition which "would threaten or seriously impair the legitimate investment now existing (in the property of the Eastern Pennsylvania Company) * * * and by implication every investment similarly circumstanced in this State." (Millville Gas case.)

The reason for rendering such a reactionary decision in this particular case does not appear from an analysis of the laws affecting such action nor from a comparison of this case with other decisions rendered by the New Jersey Board or the Commissions of other states. Judging from the concluding paragraphs, the Board rendered this decision *contrary to its best judgment.* Leaving out of consideration the effect of this order on the company serving the city, there is still to be considered the best interests of the promoters of the new company and the consuming public.

The Board in granting approval of the franchise seriously questions the estimate of cost and earning power of the new company.

"In case the petition for the approval of stock to finance the new company had embraced the issue of bonds, it would have been a serious question whether this Board's approval of bonds could have been granted. The stockholder takes a risk with his eyes open, and we do not feel disposed to say that he may not take such a risk."

Following this warning to stockholders the Board concludes the decision with warning and advice to the interested public.

"We suggest, however, to the petitioners in so far as they represent a civic and not a commercial movement, and to the town of Phillipsburg, that now they are legally competent to provide their own supply of electric current, it might be well to consider whether prompt amendment may not be exacted of the Eastern Pennsylvania Power Company as regards service; and whether—provided such amendment is secured—*the service and the price thereof for the future may not be more advantageous, secured from the larger generating unit at Easton than locally provided.*"

INDIANA.

Extensions of Service. The Commission dismissed the application of the Citizens Gas Company for authority to put into effect a form of contract, applying to extensions of service to remote parts of the company's territory, which specified that consumers pay the total initial cost of extending mains, such payments to be refunded when the income from these consumers had reached the amount it cost to place the mains. The Commission held that the utility law prohibited such private contracts with individuals and that the general method to follow in such cases was for the company to make extensions at its own cost, wherever practicable. In an informal ruling, the Commission held that a similar contract between the Indianapolis Water Company and an individual consumer was invalid, and the company refunded the amount paid by the consumer for the extension to his service under the contract in question.

Court Decision. The City of Valparaiso granted a contract to the Citizens' Light, Heat & Power Company whereby electric service was to be rendered the city at rates lower than those offered by the old company, the Valparaiso Lighting Company. This contract was entered into subsequent to the enactment of the utilities law and the Valparaiso Company appealed to the court. The Superior Court decided in favor of the applicant, holding that the change in rates, and the contract between the municipality and the company, are subject to the approval of the Commission. It was urged by the Citizens Company against the applicant that the majority of the officers and directors of the Valparaiso Company do not reside in Indiana, as required by the public utilities law. On this point the court held, in effect, that no legislature could pass a law which would require "individuals to sell their property—in this case their stock, or change their residence, in order to continue in the enjoyment of that which it was lawful for them to hold when they purchased."

ILLINOIS.

The Western United Gas & Electric Company has applied for authority to change rates for electricity and for permission to adopt and put into effect certain rules and regulations concerning discounts to the United States Government, cities and villages.

The Pitcher Telephone Company of Warren has applied for permission to change telephone rates.

The City of Villa Grove and the Central Illinois Public Service Company came to an agreement in the matter of rates to be charged for city, street, residence and commercial lighting service, for the period to March 1, 1915. Upon notice of this agreement between the parties the Commission dismissed the complaint of the city against the Public Service Company.

The Springfield Light & Power Company was granted permission to build a transmission line across the right of way of the Wabash Railroad Company in Springfield.

Conference With Telephone Utilities. The Commission has held a conference with representatives of telephone companies for the purpose of discussing the Public Utilities law in its relation to telephone companies. Similar meetings will be held with representatives of other utilities under the jurisdiction of the Commission.

MASSACHUSETTS.

The Board of Gas and Electric Light Commissioners has approved the issue of 300 shares of additional capital stock at par, $100, by the Blackstone Electric Company, Blackstone, Mass. Since its original stock was issued the company has made additions aggregating about $30,000.

The Public Service Commission made an investigation upon its own motion of the practice of the New England Telephone & Telegraph Company in the matter of charging for long distance telephone calls where the company is unable to locate the party called. The company has consented to abolish, after April 1st, all charges for such incomplete calls.

MISSOURI.

Uniform System of Accounts. The Commission has issued a notice of a hearings in the matter of adopting a uniform system of accounts for electrical, gas, water and heating utilities, both private and municipal. The utilities are to file any objections they wish to make, on or before April 10, and the public hearing is to be held April 15 in Jefferson City.

Joint Use of Poles. Mayor F. L. Ludermann, of Sedalia, Mo., has filed an application with the Public Service Commission asking for an order compelling the light, telephone, traction, telegraph and other companies of Sedalia to separate on different poles dangerous and non-dangerous wires.

NEW YORK.

Telephone Rates in New York City. The joint legislative committee appointed last year to investigate the matter of telephone rates for New York City has presented a preliminary report claiming that the rate should be five cents per message or below. The Committee asks for an appropriation of $50,000 to continue its work. It desires to appear before the Public Service Commission of the Second District which has taken up complaints asking for a reduction in the telephone rates for New York City.

Deposits. Hearings will be held by Commissioner Maltbie for the Public Service Commission, First District, beginning March 27, for the purpose of determining whether the Commission shall order gas companies to pay interest annually on deposits made by consumers, to keep accurate accounts thereof, and to take any other steps necessary to protect the interests of such depositors. The law now permits gas companies to exact from consumers a small deposit at the time the meter is installed. It requires companies to pay interest at 6 per cent on such deposits, but there is no provision for annual payments and it has been the practice of companies not to pay such interest until the consumers either stop the service or change residence. Preliminary inquiries made by the Commission show that the gas companies in the First District, at the close of the year 1913, held $3,557,173.31 of such deposits, exclusive of accrued interest.

The United Electric Light & Power Company is before the Public Service Commission, First District, in a determination of proper riders dealing with the matter of wholesale rates and tenants' sub-meters. It is proposed to charge 75 cents per month per additional meter of three kilowatt capacity or less and $1.00 per meter of larger capacity, in all cases where additional or sub-metering is required by the owner or lessee.

OHIO.

Valuation Order. All public utilities and interurban railroads operating or holding property within the State, except messenger and signalling companies, are required to furnish the Commission with inventories and complete detailed valuations of all property used and useful for the service and convenience of the public. The order contains an outline of the information desired. The appraisals are to be made as of date July 1, 1914 and are to be filed on or before the first day of August, 1914.

Standards of Gas Meters. The Commission has given notice of a tentative order fixing the standard of accuracy of gas meters and providing for the testing of such meters, and fixing the standards of purity and heating value of gas.

Gas Merger. The Commission approved a contract of the Columbus Gas & Fuel Company with the Ohio Fuel Supply Company whereby the former will control approximately four-fifths of the gas distributing business in Columbus.

Electrolysis. The Commission held that it did not have jurisdiction to make orders preventing electrolysis of gas and water pipes by escaping currents from electric railways or electric wires. The Commission was asked to review an ordinance passed by the City Council of Findlay, prescribing certain equipment to prevent escape of current causing electrolysis. The gas and water utilities urge the adoption of similar ordinances in all cities of the state.

VERMONT.

Telephone Rates. A reduction in telephone rates has been ordered affecting the rates of the New England Telephone & Telegraph Company; three of its subsidiaries, the Vermont Telephone & Telegraph Company of Montpelier, the Franklin County Telephone Company of St. Albans, the Champlain Valley Telephone Company of Brandon, and one independent company, the Springfield Local Telephone Company of Springfield. Toll rates were not modified. The New England Company intends to appeal from the Commission's order.

WISCONSIN.

Wisconsin Railway, Light & Power Company. To enable the company to offer a certain amount of its bonds in small denominations, the Commission authorized the issue of $10,000 par value of five-per-cent first mortgage and refunding gold bond certificate payment of which is to be secured by a pledge of a like amount of the company's five-per-cent bonds.

Gilmanton Mill & Electric Company. The Commission denied the application of this company for an increase in rates stating that because of the short time during which the company had been operating, conditions were such as not to warrant a general increase in rates. Considerable difficulty has been experienced through the lavish use of power by flat-rate consumers. The company was permitted to make rules regulating the use of all-night lights and flatirons, and was allowed to require violators of such rules to install meters at their own expense. A further ruling of the Commission was to the effect of exempting the utility from the necessity of supplying meters at its own expense. The Commission stated that an application for increase in rates would be entertained as soon as the utility was in a position to definitely ascertain the cost of operating the plant.

The August Light & Telephone Company was authorized to issue $3,140 of stock, the proceeds of which are to be used to reimburse the company for expenditures made during the year 1913, for additions, improvements and extensions to its plant and partly for further additions, extensions and improvements to be made to the plant.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 200.—ELECTRICALLY OPERATED PHONOGRAPH.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 204.—HIGHEST VOLTAGE.—What is the highest known voltage ever developed in any electrical apparatus?—M. L., Oak Park, Ill.

No. 210.—VOLTAGE DROP IN ARC LAMP.—What is the voltage drop across the arc of an open-type direct-current arc lamp using 30, 40 and 50 amperes? Also the voltage drop in an open alternating-current arc using the same currents.—J. S., Sagamore, Mass.

No. 211.—INDUCTION MOTOR ON UNBALANCED CIRCUIT.—A three-phase induction motor is operating at constant load on a delta circuit from which a lighting circuit is tapped off of one phase. The voltage on this phase is hand-regulated from 10 per cent buck (during the day) to 10 per cent boost (during the night); the other phases are left to shift for themselves. How does the current of the motor vary in each of the other phases? How does the power-factor vary? How does the efficiency vary?—C. E. R., Menominee, Mich.

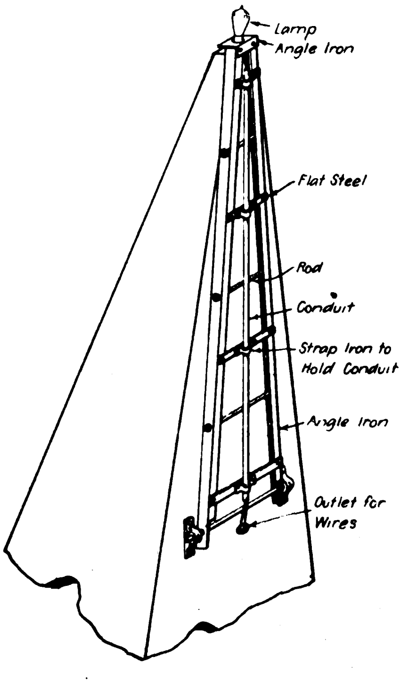
No. 212.—AMMETERS FOR THREE-PHASE CIRCUIT.—How should three ammeters be connected on a three-phase 2,200-volt switchboard when only two current transformers are available?—F. S. H., Calgary, Alta., Canada.

No. 213.—ELECTRIC MOTORCYCLE.—Is there on the market at the present time an electrically propelled motorcycle or quick-delivery car? If so, please describe same briefly and give manufacturer's address.—A. J. L., Hazelton, Pa.

No. 214.—ALLOWABLE LOAD ON LIGHTING CIRCUITS.—On account of the practically universal use of tungsten lamps, would it not be advisable to alter the present rule in the National Electrical Code so as to allow the use of 750 watts on a circuit, which would allow three 250-watt, five 150-watt, seven 100-watt, twelve 60-watt, eighteen 40-watt, or thirty 25-watt tungsten lamps on each circuit? At the present time the Code's limit is 660 watts on a circuit, based on the use of 55-watt carbon lamps. Since the introduction of tungsten lamps it has been a matter of local interpretation of the individual inspectors regarding the number of lamps per circuit; in some localities three 250-watt lamps are allowed, in other localities two only can be placed on a circuit; the same applies to 150-watt lamps, some inspectors allowing four and others five, and yet all inspectors will pass twelve 60-watt tungsten lamps on a circuit. If this matter could be definitely settled it would do away with a great deal of argument and at the same time bring the Code up to date. The slight additional amount of current over six amperes will in no way affect the circuit wiring nor the question of danger from fuses, as it is quite universal to use the N. E. C. cartridge fuse which does not explode upon a short-circuit.—G. E. D., Newark, N. J.

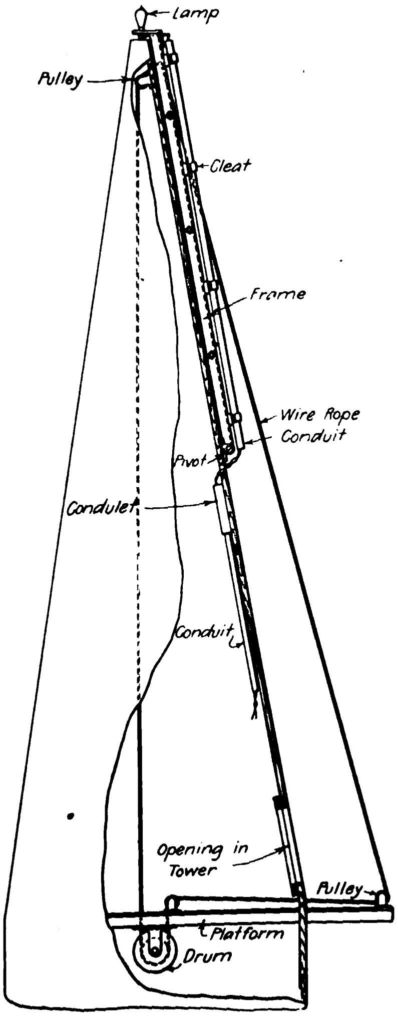
Answers.

No. 199.—STEEPLE LIGHTS.—We have a proposition of putting an electric light on top of a church steeple which is extremely high. The nearest opening to the top of the steeple is 30 feet below the apex. I should like to inquire through your columns whether any contractor ever had a job of this kind and as to how he arranged things so that the lamp would be protected from hail and easily lowered for replacement, so as not to require the frequent services of a steeple jack. Being a church tower, any device installed must, of course, be of sightly nature.—F. W. R., Freeport, Ill.



No. 199.—Fig. 1.

In meeting this problem I would mount a 15-foot two-part iron frame on the side of the steeple, hinging it at the base of the frame. On this frame I would attach a stranded wire rope at the top, which rope would run over a pulley, through a bushing into the steeple and down to the opening spoken of or lower. Another rope fastened at the top of the frame and projecting far enough from the steeple opposite the opening to give sufficient leverage would run over a pulley and into the steeple. This would provide a means of raising the top of the frame from the opening in the steeple to the top and lowering it. By using steel-armored conductor, a few condulets and a water-tight glass-inclosed receptacle with a tungsten lamp you would have the device you are looking for.



No. 199.—Fig. 2.

The method of construction and operation is made clear from the two accompanying diagrams. Fig. 1 shows the general arrangement and Fig. 2 is a partial section of the steeple to show how the ropes are run. The frame is pivoted at its base so that it can be swung through an angle of 180 degrees. The drum is used to operate the wire rope; it can be locked in any position, especially when the frame is turned up and down. The platform in the steeple has an outrigger to bring the outer pulley far enough from the steeple to give sufficient effort to start the lowering of the frame. The wire rope is endless and is arranged so that when the vertical part unwinds the horizontal part winds up on the drum. Only the main details of the outfit are shown in the illustrations.—H. E. W., Chicago, Ill.

No. 205.—Lamps for Blue-Printing Machines.—What kind of lamps are best to use for blue-printing machines, carbon arc lamps or mercury-vapor lamps? —H. I. N., St. Louis, Mo.

The light of the mercury arc lamp, although fairly rich in actinic rays, is of low intensity in comparison to that of the carbon arc. The prime requisite of a blue-printing machine is speed of operation. A carbon arc of the type usually used in blue-print machines will accomplish a given amount of work in a fraction of the time required by the mercury arc, with a corresponding saving in cost. The arc lamps usually installed in printing machines are inclosed arcs taking 6.6 to 7.5 amperes. A flame arc, however, if run on at least 15 amperes, has a much greater printing power, and its use shortens the printing time considerably. On direct current the lower electrode should be made positive and should be a flaming carbon. The upper or negative electrode should be a cored carbon of the type used in inclosed arcs. On alternating current both electrodes should be flaming carbons. The lamp in either case should burn without inclosure. In order to adapt the usual inclosed arc to the heavy current required for flaming carbons, suitable resistance must be shunted across the clutch magnets and the lamp resistance.—F. A. S., Cleveland, O.

Mercury arc lamps are especially suitable for blue printing, photo-engraving and similar work. They are rich in actinic rays and have a very steady light. When supplied with the same current used with carbon arcs they give about 40 per cent more speed. In a typical blue-print machine seven arc lamps each taking about 12 amperes give practically the same speed as when only two special mercury arc lamps each taking 15 amperes are used. The ordinary carbon arcs are unsatisfactory because they require too much time for printing.

If carbon arcs are used they must be of the intensified or flaming type, in each case requiring heavy currents from 10 to 15 amperes. Quartz-tube mercury-arc lamps have been tried for this purpose, but as yet these experiments have not been completed so as to make their use for blue printing a commercial proposition.—C. H., Chicago, Ill.

No. 206.—Short-Circuit Current.—If a short-circuit, consisting of a No. 4 copper wire, should occur across a 600-volt railway feeder of approximately 871,000 circular mils at a distance of 70,000 feet from a power plant which is the source of the current, what current would flow through the feeder and what would be the voltage at the source of supply, and how is it calculated? The power plant has a full-load capacity of 600 kilowatts with an overload capacity of 50 per cent of the full-load capacity.—J. G. M., La Marque, Tex.

In order to find the current flowing in any electric circuit, it is necessary to know the resistance of the circuit. The current flowing through the circuit is then found by dividing the voltage of the circuit by its resistance. To find the resistance of a conductor to direct current when the circular mils and length are given, divide the product obtained by multiplying the resistance per mil-foot of the conductor times the length of the circuit, by the circular mils of the conductor. Applying the above rule to the problem under consideration, we find that the resistance of a conductor 140,000 feet long and of 871,000 circular-mil area is about 1.688 ohms; and that a pressure of 600 volts will cause a current of about 355.4 amperes to flow in the circuit, provided that the No. 4 copper wire is not long enough to materially affect the resistance of the circuit. The capacity of the generating equipment will not affect the result if it can furnish the current of 355.4 amperes or more. (355.4 amperes at 600 volts equals 213 kilowatts.) Hence the voltage at the generators will not be affected provided they are flat-compounded.—P. M. B., Hudson, Ill.

The data given by J. G. M. are insufficient for a concise answer unless we take for granted certain conditions such as the following assumptions. These are: that the current is direct and not alternating; that the generators are not overcompounded; that the resistance of the rail return circuit is equal to that of the feeder circuit; that the length of the No. 4 copper wire causing the short-circuit is about 50 feet. These assumptions may not coincide with actual conditions, with the exception of the first, however, they are all such that J. G. M. can alter their values to meet with existing circumstances and thereby arrive at a correct result. It is common practice in railway work to overcompound the generator. But to allow for this would require still further data, and the error involved will not be very great. The resistance of 50 feet of No. 4 wire is negligible compared to that of the rest of the circuit, but it is taken into account so that as before J. G. M. may make such changes as he may find necessary to meet actual conditions. We have then that the resistance of the entire circuit is made up of the resistance of 70,000 feet feeder cable, or about 0.835 ohm; also 70,000 feet track return circuit, or 0.835 ohm; and 50 feet No. 4 wire, or 0.012 ohm; the total is 1.682 ohms. The current is therefore 600/1.682 = 366 amperes. This, however, would be true only if no trains were running at the time short-circuit took place, and if no booster or substation system were employed. In a line of the length specified these conditions will be almost certain to exist. In this event we would have to know the position of each train or car between substation and power house, the current consumed by each train, the distance from power house to substation and full particulars as to the booster system employed. These data are too complex to be assumed, and will have to be supplied by J. G. M. if he wishes a more definite answer to his question. If several trains are drawing current at different points on the line, the current will not be the same throughout different sections of the feeder, and due to the current already flowing on account of the short-circuit, might be high enough to cause the circuit-breakers to act and thereby close down the line.—A. J., New York, N. Y.

No. 207.—Connection of Current Transformers.—On an alternating-current, three-phase 2,200-volt switchboard with indicating wattmeter that has two potential and two current transformers, (A) does it make any difference in the reading of the wattmeter, if both the secondaries of the current transformers are reversed on their own transformers? If so, why? (B) does reversing the secondaries of one current transformer change the wattmeter reading? If so, why?—T. J. O. K., Atlanta, Ga.

Current transformers connected to wattmeters can have one or both of their secondaries reversed, provided that the potential coils on that same phase are reversed also. When either one current coil or one potential coil is reversed, and if the circuit is perfectly balanced, then the meter will read zero, or the sum of equal positive and negative values. When both the current coils or both potential coils are reversed then the entire reading is negative. This is best explained by saying that any meter or motor will change its direction by reversing either the shunt or the field coil, while by reversing both the shunt and the field the direction will stay the same.—C. E. R., Menominee, Mich.

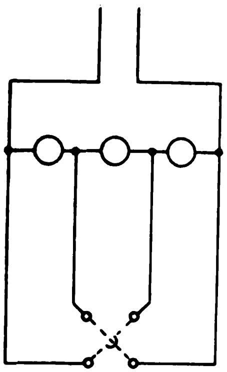
No. 208.—Motor Trouble.—I have a 40-kilowatt machine which was formerly run without trouble as a generator; now it is used as a motor, and on starting or stopping a heavy flashing occurs around the commutator, although the motor runs fine on full speed. What is the cause of this?—J. M., Kearney, N. J.

It is very evident that J. M. has not reversed the series windings in changing his generator to a motor. When he is starting up this machine as a motor, the two fields are opposing each other, and the field strength is thereby weakened, causing the flashing. This machine is likely not loaded or there would be more trouble when at full speed. Reversing the series winding will cause his motor to start without trouble and give the ability to start with more or less overloads.—W. M. P., Seattle, Wash.

As the machine ran good as a generator and still runs fine at full speed, I believe that your starting device is connected up wrong. If in starting or stopping the field is disconnected or short-circuited with the full voltage impressed across the armature, the consequent field distortion may cause high potention surges in the armature as well as the field. These surges are the cause of the flashing.—H. E. W., Chicago, Ill.

No. 209.—Series-Parallel Lamp Control.—How can I arrange a circuit to throw three lamps from a parallel to series connection and vice versa? Can this be done with only one switch?—B. T. O., Chicago, Ill.

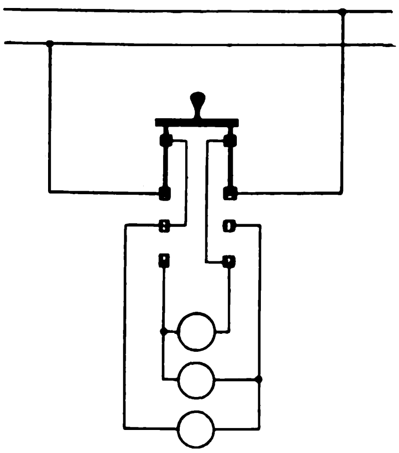
This can easily be done by using a standard double-pole rotary snap switch, as shown in the sketch (Fig. 1), which is self-explanatory. When the switch is open the lamps are in series; when switch is closed, they are in parallel. A single-pole switch in the main line can be used to cut the lamps off entirely; this is not shown in sketch.—J. D. H., Yonkers, N. Y.



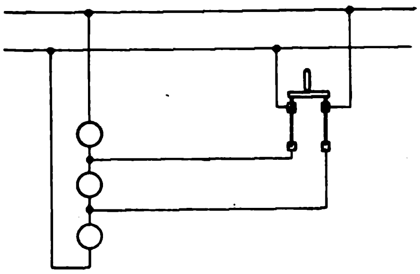
No. 209.—Fig. 1.

[Similar answers from F. W. B., Chicago, Ill.; C. E. R., Menominee, Mich.; R. W. E., Chillocothe, O.—Ed.]

Use a double-pole, double-throw knife switch with an extra set of contacts between the hinges and the regular bottom clips, as shown in Fig. 2. When the switch is in the upper position the three lamps are in series; when in the lower position the lamps are in parallel; when the switch is in "off" position the lamps are not lighted.—L. B. G., Chicago, Ill.



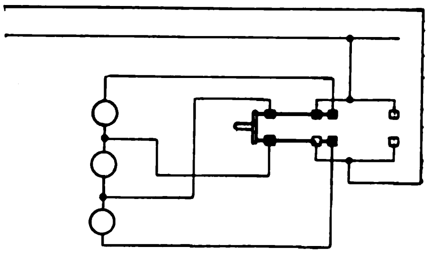
No. 209.—Fig. 2.



No. 209.—Fig. 3.

[Similar answers from J. D., Cleveland, O.; F. B., Chicago, Ill.—Ed.]

The first of the two diagrams submitted herewith, Fig. 3, shows one method of meeting the requirements of B. T. O. With the double-pole knife switch closed, as represented, the three lamps will be connected in parallel to the supply circuit. With the switch open they will be in series. This method, however, would make it necessary to use another switch if it were desired to extinguish the lamps. On this account the arrangement indicated in Fig. 4 is preferable. A double-pole double-throw switch is used; closed to the right it will put the lamps in circuit in series; closed to the left, as here represented, it will put them in parallel; when the switch is open the lamps are entirely disconnected from the circuit and even the blades of the knife switch are dead.—H. E. W., Chicago, Ill.

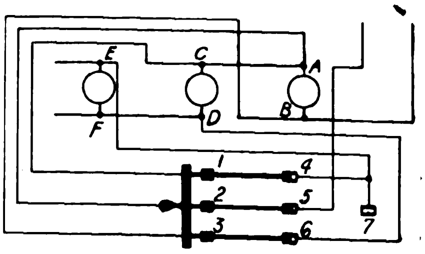


No. 209.—Fig. 4.

[Solutions similar to that shown in Fig. 3, from H. W. P., New York, N. Y.; J. H. M., San Francisco, Cal.; L. M. K., San Diego, Cal.; A. J., New York, N. Y. —Ed.]

By using a double-throw triple-pole switch as shown in Fig. 5, the change from parallel to series connection can be readily accomplished. When the switch is thrown to the left the three gaps are closed and the lamps connected in parallel. On throwing it clear over to the right the lamps are connected in series. Reversing the switch again puts them in parallel.—P. B. W., West Lynn, Mass.

[Similar answers from A. J., New York, N. Y.; P. M. B., Hudson, Ill.—Ed.]



No. 209.—Fig. 5.

MINNESOTA ELECTRICAL ASSOCIATION.

Seventh Annual Convention, Minneapolis, March 18, 19 and 20.

In accordance with its usual custom of holding its meetings alternately between St. Paul and Minneapolis, the seventh annual convention of the Minnesota Electrical Association was held at the Hotel Radisson in the latter city March 18, 19 and 20. Special commendation is due the officers of this Association for the manner in which the convention was held despite a severe handicap in the form of the resignation of Eugene Holcomb who found it necessary to retire from the presidency just prior to the time when arrangements had to be made for the annual meeting. T. P. Glidden, manager of the Consumers Power Company, St. Paul, was elected to fill the unexpired term of Mr. Holcomb and carried out the duties in an aggressive and painstaking manner.

Practically the entire morning of Wednesday, March 18, was taken up with the details of registration, the total for the morning being in excess of any previous registration. Mr. Glidden called the meeting to order shortly after 12 o'clock and explained that although he had not prepared a formal address because of his unfamiliarity with the work of the Association during the past year, he wanted to urge upon members the benefits that could be derived from the Association if all confusing problems relative to central-station practice were taken up with the Association through the office of the secretary. He thought that much work of benefit to the industry could be performed during the forthcoming year if sufficient numbers of standing committees were appointed, and if the proper care was exercised in the selection of members for these committees. Mr. Glidden then mentioned the International Electrical Congress which will be held in San Francisco in 1915, and called attention to some literature which was available in this connection.

The report of the secretary-treasurer, F. A. Otto, of the St. Paul Gas Light Company, St. Paul, was then presented and the affairs of the Association shown to be in a sound condition, both with regard to membership and finances.

At the afternoon session C. W. Drake, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., presented a very interesting illustrated lecture entitled "Motor Applications" which dealt principally with the industries predominating in the state of Minnesota. In his introductory remarks Mr. Drake pointed out that the goal of every central station should be to obtain a load-factor of 100 per cent, and, in this connection, the power business, particularly the business having off-peak characteristics, was essential. Referring to local conditions, Mr. Drake pointed out that the last census figures showed that there was approximately 300,000 primary horsepower used in the industries of the state. In view of the rate of increase in the previous years it was safe to assume that this figure has reached about 400,000 horsepower now. Of this, Mr. Drake said that about 10 per cent was served by central-station companies in 1913 and the estimate for 1914 places the figure at 26 per cent.

In point of importance the industries which predominate are flour mills, lumber mills, paper mills and creameries. A large number of lantern slides, showing typical and unusual applications of electric motors in these industries, were displayed.

In connection with the acquisition of power business, Mr. Drake mentioned the fact that rates are not and should not be the deciding factor, as frequently, when considered on a comparative cost basis, central-station power is somewhat in excess of the cost of isolated-plant power but when increased profits are realized, without increased investment, due to the increased and uniform speed of electric motors, etc., the question of cost becomes secondary. Referring to characteristics of motors for industrial applications, Mr. Drake pointed out that practically 90 per cent of the drives commonly employed could best be met by the squirrel-cage induction motors. For the driving of machine tools, however, where variable speed is essential, direct-current motors are preferable and are gaining in favor in spite of the efforts to displace them.

At this point Hon. Wallace G. Nye, Mayor of Minneapolis, appeared at the convention and was introduced by President Glidden. Mayor Nye welcomed the delegates to the city in a very cordial manner and commented upon the strength and benefits of organizations such as the Minnesota Electrical Association. He said that organization was a great force and was only objectionable when used for selfish purposes.

R. F. Pack, general manager of the Minneapolis General Electric Company, then presented a paper entitled "Public and Public Service Corporations." Mr. Pack thought that one of the most important factors in the successful operation of a public utility was absolute frankness with the people on the part of the company. He urged strongly that in controversies of all kinds, particularly those of a political nature, the company appeal to the public for justice, explaining the facts in the case.

Mr. Pack briefly reviewed the conditions that led up to the antagonistic feeling which the public, until recently, has held toward utility corporations, and enumerated some of the present-day policies which tend to create good will.

He strongly advocated private ownership of utilities and absolute monopoly, although regulation either local or state, is essential and central stations should publicly take a stand in favor of regulation. Speaking of taxation Mr. Pack thought that taxing utilities on the valuation of the property retards development and he advocated a tax dependent on the rate of return based upon a valuation. In conclusion Mr. Pack enumerated some of the items which he considered most important to the success of a utility company. These were good service, fair rates, no discrimination, extensions where necessary, sound financial management and no participation in politics.

Prof. W. T. Ryan of the University of Minnesota Extension Lecture Bureau then delivered an address dealing with the work of the University of Minnesota. Prof. Ryan stated that the University was going out after men who did not find it possible to take the regular courses. The manner in which this was being done was to organize classes wherever a sufficient number of students could be enrolled and send instructors to these localities to give the prescribed courses of instruction.

In connection with the work of the University in assisting central stations, Prof. Ryan called attention to the lecture bureau which is available to any company in the state at a very nominal cost. Four lectures, illustrated, have been prepared on electrical subjects which are all intended to stimulate the use of electricity and to familarize the public with some of the simpler details of central-station practice. One of the lectures which has just been completed and is now ready for use deals with the rate situation, and explains in detail the various methods of charging at present employed by central stations. The necessity for this lecture, Prof. Ryan stated, arose from the fact that the majority of customers cannot understand the methods of charging and hence assume that there is something wrong. With this in view the lecture deals, in a very comprehensive manner, with the fundamental principles of rate making. It is further simplified by the use of various charts.

Prof. Shepardson of the University added to the address of Prof. Ryan by calling attention to the relationship between the central stations of the state and the University. The University is ready and anxious to assist the utility companies through its laboratories, through the Extension Bureau in the manner mentioned by Prof. Ryan, and through co-operating in educational work in general, and, on the other hand, the University desires the co-operation of the central stations in using the graduates in the state and in making known to the people of the state the value of the University—particularly the electrical department—to the industry.

The first business taken up at the session on Thursday morning was the appointment of a Nominating Committee composed of R. E. Brown, Mankato, B. W. Cowperthwait, Faribault, and E. W. Erick, Canby.

S. E. Doane of the National Lamp Works then presented a very interesting paper entitled "High Efficiency Lamps," a considerable portion of which, however, dealt with the results of an extended trip in Europe, in connection with an investigation of central-station practice in foreign countries. In connection with the new high-efficiency lamp, Mr. Doane briefly described the theory upon which they are manufactured and the chemical action resulting from the use of nitrogen gas in the bulb. A feature of this latest development is tungsten wire coiled into a small area to reduce connection loss when operated under gas pressure to reduce evaporation. The candlepower of the new lamp is practically the same in all directions, and therefore the advance in efficiency in greater than the figures indicate. Commercially these lamps will, of course, modify central-station practice to some extent and will undoubtedly find most favor in connection with series street-lighting installations. One of the most significant developments looked for, however, is the lighting of public highways between towns served by central-station lines. It will be possible, by employing these lamps, to provide illumination at a very low figure.

Referring to conditions found in Europe, Mr. Doane said that central-station practice there has been more extreme than in this country, although there is less interchange of ideas and practice and less discussion between central stations than here. Interesting statistics were presented covering an European city of about 650,000 inhabitants where a privately owned plant was in competition with a municipal plant. The former had about 40,000 meter customers and about 25,000 customers on limiting devices. The city plant had about 24,000 customers on limiting devices, making a total for the city of over 90,000 customers. The average connected load of the 25,000 customers of the private plant is 21.7 watts. The rates cover everything from a single 10-watt lamp upwards. This single 10-watt lamp is supplied for 16 cents per month, including wiring rental, etc.

Mr. Doane referred to the ingenuous methods employed for billing and collecting consisting of making out a card with a number of coupons attached once a year, and handling this card with the coupons attached to the collector and billing the collector at each period for the total amount charged to his account. 12 of the coupons are attached if collection is to be made once a month, four if to be made once a quarter, etc. At the period named the collector exchanges a coupon for the cash. The collector in many cases are employees of beer gardens, grocery stores, etc., and work without commission.

Very inexpensive wiring devices and fixtures are used and a customer's account is carried over a long period of years. In some cases it requires only about an hour to install the wiring necessary to furnish service.

Mr. Doane stated that one of the most important features of the small customer business is the fact that as the number of customers increase there is less chance for politicians to work hardships against the utility, as it has been proved that customers of a company always take sides with it in a controversy.

Prof. Shepardson opened the discussion on this paper, pointing out that in this country the flat rate with limiting device was an excellent method for securing small customers using parts of offices, etc., but for residences the flat rate has a tendency to limit the use of heating devices and other appliances.

Mr. Doane explained that in Europe the flat rate with limiting device was used simply to obtain the very small customer and in most cases simply was considered as an opening wedge for meter business. As a matter of fact it was found there that flat irons and electric stoves were the only revenue producers for the central station, although the advertising value of the other appliances could not be ignored.

T. D. Crocker of St. Paul inquired as to the average consumption of the small customer in Europe, and also as to the possibility of obtaining inexpensive limiting devices in this country. Mr. Doane explained that he had no figures as to the average consumption, but the average price obtained per kilowatt-hour approximated seven cents. He added that the General Electric Company was at the present time developing a limiting device that will compare favorably with those used in Europe.

R. E. Brown of Mankato stated that the development of inexpensive house-wiring devices in this country would give great impetus to the securing of the small customer business, as the first cost is now the greatest obstacle to be overcome. Speaking on this subject, Mr. Doane said that the central stations have an elaborate plan for financing such installations by spreading the first cost over a period of many years, in some cases as many as ten. In this way the payments are very small in spite of the fact that the central station earns a very good rate on the money. In connection with wiring devices, Mr. Doane said that it was common practice to use a single-strand wire with copper sheath for the return circuit.

W. E. Dickerson brought out the point that central stations must strive to improve their load-factor, and it would seem that this would not be accomplished by the acquisition of a large number of small residence lighting customers. He also thought that if a very low flat rate was made to secure this business efforts would be made to reduce the meter rate by meter customers.

T. P. Glidden stated that it was apparent that the foreign companies were looking to the returns per kilowatt year and this should be the tendency in this country.

W. C. Beckforth of the St. Paul Gas Light Company then presented a paper entitled "Electrical Co-operation" by M. J. Wolf of Chicago who was unable to be present.

In this paper Mr. Wolf showed that under modern conditions of industry the old adage that "competition is the life of trade" is no longer strictly true. Under present-day conditions co-operation tends toward greater efficiency. In the electrical industry the central station must be regarded as the basis on which all other departments are to build. No one department of the industry nor one individual in it is independent of the others.

The fact that the company or individual, when purchasing, wants unrestricted competition, but, when selling, wants restricted competition, is an elementary condition, but co-operation will improve this situation and make for constructive rather than destructive competition.

Following this paper a Committee on Resolutions was appointed consisting of Messrs. Flemming, Aspnes and Bang.

The paper by F. C. Hoffman of the St. Paul Gas Light Company entitled "Accounting" was taken up at the opening of the session on Friday morning. This paper presents many very excellent suggestions for a proper system of accounting and points out the importance of uniform methods. The fundamental of any accounting system is to show the condition of the business as it really exists. It has not been long since it was thought that the central-station business could run itself and only income and disbursement accounts were kept. The wonderful development of the business, however, has led to a realization that an accounting system for central stations should not only be comprehensive but should be accurate and uniform because of the necessity for comparing conditions in various localities, and also because of the growth of regulation and the rulings of the various state commissions in this respect.

Following this paper John T. Gardiner, assistant commissioner of the State Bureau of Labor, delivered an address on safety and safety measures. Mr. Gardiner reviewed the work of the Bureau during the past few years and pointed out that its importance was emphasized by the fact that during the first two years of its existence 10,729 written orders were issued providing for various safeguards. During the past year there has been a reduction in accidents of over 28 per cent. This has been accomplished through the co-operation of both the employers and the employees, although greater co-operation is hoped for. One of the difficulties of the Bureau is to get the employees to keep in place and maintain safeguards that are provided.

One of the pleasing features of the Minnesota situation is the fact that there have been very few prosecutions because of refusal to comply with the orders of the Bureau, which shows that the industries of the state are co-operating to reduce accidents. In this connection, Mr. Gardiner thought that the standardization of safeguarding apparatus very important, as employees are frequently moving from city to city and from state to state, and frequently have to work under unfamiliar conditions. Several reports of accidents were read and Mr. Gardiner pointed out how these could have been prevented if the proper measure were employed. Among the most dangerous devices in industrial plants, which should be given special consideration, are emery wheels, set screws and protruding nails in boards.

The report of the Nominating Committee was then presented and the secretary was instructed to cast the ballot of the Association for the following candidates who were declared duly elected:

President, R. E. Brown, Mankato.

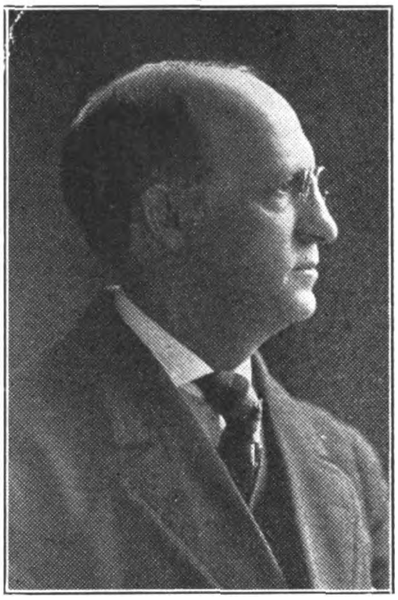
First vice-president, B. W. Lynch, Minneapolis.

Second vice-president, Alfred Horn.

Secretary-Treasurer, F. A. Otto, St. Paul.

Executive Committee, P. T. Glidden, St. Paul; F. C. Strong, Chasca; and R. F. Pack, Minneapolis.

R. E. Brown was called to the chair and the report of the Committee on Resolutions presented by E. A. Aspnes of Montevideo. This report extended resolutions of thanks to the various speakers, to the University of Minnesota and to the manufacturers who co-operated to make the convention a success.



R. E. Brown.

Mr. Brown, the president-elect of the Minnesota Electrical Association, is one of its charter members and has served as a member of the Executive Committee continuously since its inception. He has long been identified with the central-station industry in Minnesota, having been manager and part owner of the local gas and electric company in Mankato from 1887 to 1910. In 1910 H. M. Byllesby & Company, of Chicago, purchased the Mankato property, making it a part of the Consumers Power Company, of Minnesota, and Mr. Brown was continued as general manager, which position he still occupies. He is a member of the National Electric Light Association, American Gas Association and president of the Mankato Automobile Association, which is the second largest motor organization in the State.

A. G. Munson of St. Paul spoke of the necessity for a Legal Committee for the Association to suggest legislation favorable to utility companies and particularly to suggest legislation that will enable central stations to successfully prevent theft of current. It was subsequently moved that such a committee be appointed and also a standing Committee on Meters.

The entertainment features comprised a Rejuvenation of the Jovian Order at the St. Paul Hotel, St. Paul, on Monday evening at which a class of 18 candidates was initiated into the order. At the dinner which preceded the ceremonies Mayor Keller of St. Paul acted as toastmaster and several brief addresses were delivered. At 2:30 on Thursday an inspection trip was made to the University of Minnesota and the power plant, laboratories and shops of the electrical and mechanical departments visited. The feature of this trip was the opportunity to observe the destruction of a 50-foot stack belonging to an old power house which had been replaced by a new power-plant building. The foundation had been taken out and heavy timbers substituted which were set on fire and timed so that it would release the stack when the visitors arrived.

On Thursday evening the annual banquet was held at the Hotel Radisson at which C. D. Wilkinson acted as toastmaster. R. M. Laird read a paper on the "Society for Electrical Development," following which a very pleasing vaudeville entertainment was provided. The decorations for this banquet were especially interesting representing in miniature the ornamental street-lighting system employed in Minneapolis, with a miniature central station plant at the head table. The committee having this banquet in charge, to whom special credit is due, was composed of C. D. Wilkinson, J. L. Barnard, Leo Cooper and R. M. Laird.

Several manufacturers and supply men maintained headquarters at the Hotel Radisson during the convention at which various apparatus and appliances were demonstrated. Among the companies so represented were the Adams-Bangall Electric Company, Electrical Engineering Company, General Electric Company, M. J. Grady Fixture Manufacturing Company, Detroit Fuse & Manufacturing Company, Tungsten Maintenance Company, Western Electric Company, Holophane Works of General Electric Company, St. Paul Electric Company, Northwestern Electric Equipment Company, Julius Andrae & Sons Company, Duncan Electric Manufacturing Company, Sterling Electric Company, Federal Sign System (Electric), Page & Hill Company, Wagner Electric Manufacturing Company and Westinghouse Electric & Manufacturing Company.

* * *

The wireless telegraph service of the Lackawanna Railroad proved so valuable during the recent severe storms in the East, when practically all telegraph and telephone lines were down, that it has been decided to install three new wireless stations between Hoboken, N. J., and Buffalo, N. Y. These will supplement the stations at Scranton, Pa., and Binghamton, N. Y.

Joint Meeting of Technical Societies in Wisconsin.

The second joint meeting of the technical societies of Wisconsin was held in the Auditorium, Milwaukee, on March 21. The following societies and sections of national societies participated: Milwaukee Section of the American Chemical Society, Milwaukee Company Section of the American Electric Railway Association, Wisconsin Chapter of the American Institute of Architects, Madison Section of the American Institute of Electrical Engineers, Madison Section of the American Society of Mechanical Engineers, Milwaukee Section of the American Institute of Electrical Engineers, Milwaukee Section of the American Society of Mechanical Engineers, Engineers' Society of Milwaukee, Engineers' Society of Wisconsin, Chicago Section of the Illuminating Engineering Society, Milwaukee Electrical League, Milwaukee Oto-ophthalmic Club, Milwaukee Company Section of the National Electric Light Association, Jovian Order, Verein Deutscher Ingenieure, and Wisconsin Gas Association. The registration at the meeting was 375, but there were a large number present who did not register and the total attendance could not have been less than 600.

Louis E. Bogen, chairman of the Milwaukee Section of the American Institute of Electrical Engineers, presided at the meeting. The morning session was opened by an address by George C. Bruce, secretary of the Merchants' and Manufacturers' Association. The first paper to be presented was one by Alfred O. Crozier, entitled "Cement and Clay Products Contrasted."

This was followed by a paper by R. C. Disque entitled "The Historical Significance of the 1907 Wisconsin Law for the Regulation of Public Utilities."

After pointing out the principal provisions of the Public Utilities Law, Professor Disque gave a sketch of the historical development of the idea of regulation and the evolution of the utility law. The basis of such regulation is to be found in a tract by Lord Hale regarding wharfage, which was published in England in 1787, although there were many examples of regulation of prices and wages in England before that time, as well as in the American colonies. The principal justification for such regulation was found in the necessity for it. The state interfered whenever competition or other natural causes failed to properly govern prices. Regulation does not depend upon the existence of a franchise for the operating corporation, but only upon the public nature and interest in the use of the property. A virtual monopoly is just as sufficient a basis for regulation as a legal monopoly. This was illustrated by a grain-elevator case in Illinois, where the limitation of charges was upheld by the United States Supreme Court. He pointed out that regulation was in part a legislative and in part a judicial function. Courts will decide whether a rate is reasonable but will not fix a reasonable rate. This must be done by a legislative body. Where such bodies, like city councils, are not well informed upon the subject, any attempt to regulate is likely to be unsatisfactory and it has usually been the case that the courts have had to pass upon the matter. While laws were passed in Massachusetts in 1885 and in New York in 1907 along the same lines, the Wisconsin law was the first to fully protect the interests of both sides and thereby thoroughly regulate the operation of the public utilities, although it made no change in the rights or duties of utilities, as previously recognized.

The discussion was opened by J. G. D. Mack, who pointed out that the present order of society rests on court decisions. Fortunately the judiciary of Wisconsin is not involved in politics, largely owing to separate elections having been specified in the state constitution. The ideas represented by the formation of the Railroad Commission in Wisconsin are not new, as they were largely covered by three special commissioners appointed in 1873 to report upon this subject. He considered the two strongest points of the law to be the method of appeal to the courts and the fact that the commissioners were appointive and not elective.

Messrs. Cadby, Steinberg and Schmidley, of the Railroad Commission, told something of their work, Mr. Cadby giving some figures upon the cost of the engineering work of the Commission. It was pointed out that there was no longer the antagonism toward the activities of the Commission which had at first been evident.

Edward Haase of the Milwaukee Gas Company said that the corporations were pleased with the kind of a law which existed in Wisconsin and with the kind of a commission which they have. He gave some instances from the history of the company bearing on the question of regulation.

W. B. Voth of the Sheboygan Railway and Electric Company stated that regulation had been satisfactory to the electric corporations. It was to be noted that politicians usually clamored for lower rates regardless of service; whereas the Commission has paid more attention to the quality of service and has also done a great deal in the way of education, especially with respect to metering.

Edward Bennet and M. G. Lloyd also contributed to the discussion.

Professor Disque in closing stated that regulation might well be extended beyond the field of the public utilities. The time had passed when it was regarded that the less the activities of the government the better and with the greater activity of the government we must look for greater efficiency in government processes. While it is possible to overdo government by experts, this is never so bad as government by ignorance. In either case the office holders must be watched by the agency which is the source of government.

J. C. Wilson then presented a paper entitled "The Measurement of Gases in Large Quantities." This was illustrated by lantern slides. Mr. Wilson first pointed out the need of such measurements, illustrated methods formerly in use, and then gave a description of the Thomas method, which is based upon electrical means. The Thomas meter was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, March 4, 1911.

Dinner was served at the Republican House, at the close of which an address was made by A. A. Gray, managing editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

The afternoon session convened at 3 o'clock, and was opened with some motion pictures of the control apparatus of the Panama Canal locks. These films were provided by E. M. Hewlett and C. H. Hill, who were to have read a paper upon this subject, but were unable to be present.

Street Lighting.

Arthur J. Sweet then presented a paper by himself and F. A. Vaughn, entitled "Principles of Street Lighting." The importance of street lighting was first pointed out and its relation to crime, accidents and general convenience emphasized. We are entering upon a new era in the public attitude towards street lighting, and the old standards are no longer found satisfactory. The purposes of street lighting were classified under the heads (1) safety and convenience; (2) advertising value and (3) esthetic value.

It was pointed out that discernment of objects at night was effected in four different ways: (1) by the silhouette effect of an illuminated background; (2) by the illumination of the object itself; (3) by the glint or specular reflection of the light from surfaces such as water puddles; (4) by shadows. Illumination is needed on both horizontal and vertical surfaces and the relation of the uniformity of illumination to the spacing and mounting height of the lighting units was discussed. The ratio of spacing distance to height of mounting was shown to be the important quantity affecting uniformity of illumination, and that uniformity was not altered by changing these two distances proportionately. With a ratio as high as 12, it is practically impossible to get uniform illumination, which in fact can be realized only for values of this ratio as low as 4. It can be achieved without excessive operating cost but the installation cost would be greater than is now usual. It is not, however, necessary to have perfect uniformity of illumination in street lighting. This condition is, however, being approached in the large cities by increasing the height of mounting the lamps. Lantern-slide curves were exhibited, showing the candlepower distribution necessary to secure uniformity of illumination on both horizontal and vertical planes with different ratios of spacing distance to mounting height. The importance of glare was emphasized and curves given showing its quantitative effect upon the ability to see.

The next paper was one by John H. Smith entitled "Principles of Illumination." The author pointed out the great adaptability of the eye to the different intensities of illumination. A full moon gives about 0.028 foot-candle. This is sufficient to see fairly well, but the visual acuity is only one-quarter as great as in bright daylight. Acuity is not increased, however, by raising the intensities above 0.1 foot-candle. The importance of diffused light was pointed out and it was stated that the judgment of the user was more important in determining its value than any computations which can be made from distribution curves. Glare is often excessive from tungsten clusters in street lighting. Glare is most objectionable when it occurs in the lower half of the field of vision, since the eye has become more adapted to glare from the sky.

G. F. Ahlbrandt then presented a paper entitled "Manufacture of Pure Iron Products," which was illustrated by lantern slides. The author mentioned the various operations in the production of ingot iron and illustrated the process, which is carried out in an open-hearth furnace, but differs from the open-hearth steel process in being continued longer. The molten mass is puddled for three or four hours in order to burn out the impurities. Results of tests were given showing that the resulting ingot iron withstands exposure to the atmosphere, to fumes of gas, to salt water and other corroding influences much better than ordinary iron or steel. The importance of the lifting magnet in handling material was pointed out, the cost of loading cars having been decreased from ten cents to two cents per ton by this means.

An illustrated paper entitled "Special Operations on Machine Tools" was then presented by Mr. Wood, of the Lodge & Shipley Machine Tool Company, Cincinnati, O. This was followed by a paper by A. G. Christie entitled "Developments in American Power-Plant Machinery," also illustrated by lantern slides. Professor Christie pointed out the effect of the introduction of the steam turbine upon condenser design and operation and upon the efficiency of operation in the boiler room. This has been found not to depend so much upon boiler construction as upon draft, furnace construction, etc. He paid considerable attention to steam turbines, prophesying that the vertical turbines would soon be entirely eliminated. The General Electric Company is now turning out horizontal turbines for the large sizes, in which a combination of the Curtis and Rateau principles are combined, the latter being used for low pressure. The Allis-Chalmers Company is now putting out turbines in sizes up to 1,000 kilowatts for exhaust heating. Recent forms of Westinghouse turbines were also illustrated. Of the smaller types of turbine, the De Laval and the Kerr are based upon the Rateau principle and the Terry turbines are tending that way. He also pointed out the tendency toward motor drive for the auxiliary equipment of power houses. The locomobile, as well as the adaptation of the same idea to stationary plants, was discussed at some length. Such plants are made in sizes up to 500 kilowatts in this country and 1,000 kilowatts in Germany and are desirable where space is limited. The entire elimination of piping between the boiler and engine results in good efficiency. He closed with reference to the use of mercury as a heat agent in turbines, as recently proposed by W. L. R. Emmet.

Mr. Emmett proposes to use mercury vapor at a little above atmospheric pressure in a turbine, exhausting into a condenser with high vacuum. The condenser would be cooled by water which would be vaporized by the heat extracted from the mercury and would consequently serve as a steam boiler supplying a steam turbine. From this steam boiler or condenser the mercury would flow back into the mercury boiler by gravity. The furnace gases after leaving the mercury boiler would be utilized for heating the mercury feed, for superheating the steam and for heating the feed water for the steam boiler.

Mercury has the following advantages as a thermodynamic fluid. Its boiling point is at a desirable temperature; its high specific gravity makes possible the use of gravity feed, sealing of valve stems, etc. It is chemically neutral to air, water, iron, etc. It carries nothing in solution which would deteriorate or clog the heating surfaces. Its vapor density is high, it does not wet the blade surface nor erode it, and its volume at the condensing temperature is low, all of which are favorable in turbine design. The condenser is small compared with steam. It is estimated that by adding such a mercury boiler and turbine to an exhausting steam plant, an increase of 66 per cent in power can be delivered by an increase of 15 per cent in fuel. The output per pound of fuel would be increased about 45 per cent. About $10 worth of mercury would be required per kilowatt output of the mercury turbine.

After supper at the Republican House an evening session was held, at which Herbert N. McCoy gave an illustrated lecture on **"Radium."**

GOVERNMENT OWNERSHIP AND OPERATION OF THE TELEPHONE AND THE TELEGRAPH.

Some Illuminating Comment by President Theodore N. Vail of the American Telephone & Telegraph Company.

In the annual report of the directors of the American Telephone & Telegraph Company to the stockholders for the year ending December 31, 1913, published on March 16, there appears some illuminating information relating to the subject of the ownership and operation of telephones and telegraphs by the Government.

So much has been published respecting Government ownership and operation of the telephone and telegraph, particularly from the viewpoint of those favoring the idea, that the statement now made by Theodore N. Vail, president of the American Telephone & Telegraph Company, is of particular interest.

After reviewing the demonstrated policy of the company in "working this problem out on the broad lines of the greatest benefit to the public," Mr. Vail declares that:

> "Our opposition to Government operation and ownership is not based on pecuniary or personal reasons. It is because of our interest in the upbuilding of a great public utility and its preservation. * * * * We feel our obligation to the general public as strongly as to our investing public or to our own personal interests. We believe that the efficient operation of every utility is necessary to the public, and we do not believe that any service efficient, progressive and permanent can be given by companies not making fair profits. No community can afford to be served by unprofitable or bankrupt companies which are bound to give inefficient, unprogressive service. Prosperity follows trade and trade follows the line of least resistance. Efficient facilities have more to do with serving trade than any other single factor."

That the property, if ever taken by the Government, will be found in the best possible condition, and at any valuation, that will stand, will yield much more than the present market value of the shares, is declared to be a fact. Government ownership is also opposed because it is known that no government owned telephone in the world is giving as cheap and efficient service as the American public is getting from its telephone companies, and it is not believed that our Government would be any exception to the rule.

Mr. Vail corrects a common impression that there has been submitted to Congress any report by the Postmaster-General advocating and recommending the acquisition by the Government of the wire systems of the United States. The Postmaster-General has made no such report or recommendation. A special committee of Post Office officials, designated by the Postmaster-General has gathered certain material, and these findings have been forwarded by the Postmaster-General without comment. These findings, however, because of errors in compilation and failure to take into account materially dissimilar conditions affecting comparisons, Mr. Vail declares, are of little real value.

Declaring again the impregnable position of the company's physical property in guaranteeing to its proprietors full value in the event of purchase, Mr. Vail dismisses the idea as an utter impossibility of the Government taking over the telephone toll and long-distance lines and equipping them for a destructive competition with the telegraphs. This, he says, is so at variance with any possible standard of public or private or commercial honor that it would seem as if the very suggestion would be repudiated.

Discussing the right of property owners to claim and expect just compensation based upon a fair valuation, and commenting upon this point Mr. Vail says:

"It is neither contention nor resistance to defend the properties against mistaken assertions, freely made, 'that the plants are rubbish and the securities represent little value.' Values are not to be determined that way, such assertions cannot change cold facts. Sixteen millions of miles of wire, mostly copper, on poles or in cables and underground ducts, with the station and central-office equipment of nearly five and one-half millions of telephone exchange stations, all in good physical condition, are not rubbish and do represent value. The addition of over 460,000 telephone stations during the past year could not have been made without expenditure, and represents legitimate increase, not inflation of capital."

Mr. Vail raises the question as to the relative status of government-owned and privately-owned systems. If the power of the Government to own and operate be exercised, it becomes of the greatest importance that a right decision, based on an exhaustive study and a thorough understanding of facts, conditions and possible results, be reached. Continuing, he says:

Government-Operated Telephone and Telegraph Systems.

A thorough study of all available reports and official information on the operations of government-owned and operated telephones and telegraphs shows that while in some countries the post office proper pays a revenue, the combined telegraph and telephone are without exception operated at a deficit. Every telephone system in the world adopts the Bell System as a standard, use the Bell operating methods and either uses the Bell apparatus or copies it; yet there is not one that gives an approximation to the facilities that the Bell System gives the public, or gives as good or as cheap service on the same basis of accounting, franchise conditions, and wages paid.

"In England where the Post Office pays a very handsome net revenue, its telegraphs show a relatively much larger deficit, while the revenues and ordinary expenses of the telephone operations show a small balance, excluding, however, depreciation and obsolescence which have not yet become fully determined but which cannot be ignored.

"These deficits are not the result of a definite policy to give a cheap service to individuals at the cost of all, but are due to errors in management such as under-estimates of values and cost of new construction; disregard of maintenance, depreciation and particularly of obsolescence; impossible theories of operation, and a mistaken policy founded on promises, prophecies and assertions exactly the same in character as those now being used to bring about government ownership in this country, and upon a failure to understand and appreciate the advantages of private as distinguished from government organization. The fallacies urged in Parliament to induce the government acquisition of the British telegraph systems years ago are the arguments used by the advocates of government ownership and operation today.

Functions of Government.

"The functions of government and the causes of its being are 'Control' and 'Regulation'—control of the individual proper function of the government either to provide it or to see that it is so provided as to bring it within the reach of every individual member of society; even to provide it for all at the cost of the general revenue.

"To the extent that anything of a utilitarian nature is adopted by or assimilated into the habits of the public and contributes to their comfort, convenience, or even generally to their profit, it should become an object of sufficient government regulation to prevent the public convenience being made the cause of private exaction; the distinction between what should be furnished in whole or in part by the government and what should be regulated by the government being whether the necessity is absolute and the thing indispensable to the life, health and well-being of the individual and consequently of the community, or whether it be something contributing to or even important, but not indispensable, to the comfort, convenience and profit of the community or of the individual.

"A sufficient supply of potable water available to all is a necessity. The street-car, the electric light, the telephone or telegraph are conveniences of the highest importance but are not necessities in the foregoing sense. * * * *

Government Operation vs. Government Regulation.

"The step from government control and regulation to government ownership and operation is radical and fundamental; one which absolutely changes the character of government organization and functions. In this country there is no organization or function of the government that in any sense approaches ownership or operation in the real, large way.

"There are no sound reasons given or real advantages promised for government ownership and operation which do not apply to or cannot be secured by government regulation. Most of the 'advantages' promised and arguments used are purely hypothetical, theoretical and uncertain; they are not vindicated by the experience either of this or of any other country. * * * *

"There is, however, no reason for government ownership and operation where private initiative and enterprise are not only competent to develop, but have actually developed, these utilities to the fullest extent. * * * *

"The general stock arguments put forth for government ownership and operation are:

"Extension of benefits to a larger public;

"Abolition of selfish exploitation;

"Control of monopoly;

"Pecuniary advantages to the public through lower cost and consequently lower charges;

"Greater efficiency;

"Saving to general public rewards of private initiative.

Selfish Exploitation.

"Private enterprise is rightly said to be based on personal interest. There is no doubt as to this, but incentive to achievement along individual lines could not be suppressed without great detriment to the community at large. What would be the result if government restrictions reduced the reward or profit on initiative and enterprise to that of certain and secure business ventures? Where would be the incentive to assume risk and uncertainty, or the larger profit necessary to recoup the individual and the community for the unsuccessful ventures?

"The pecuniary reward to those who take the initiative and the risks of new enterprises must correspond to the labor and to the risk, but this reward cannot exceed the advantage to the public using the service, for the user must get in service, in some way at least, the equivalent of its cost to him. Private initiative, invention, enterprise, risk, spurred on by the incentive of reward, have changed the face of the world, and the resulting unearned increment largely constitutes the wealth of nations; without it many of the great scientific industrial developments would have remained scientific curiosities, even if they had been evolved at all.

Monopoly.

"The general tendency in this country is to the 'one system' idea of public utilities under regulation. Everyone knows the evil of duplication, no one wants two gas, water or electric lighting systems, and there is a general acquiescence in the 'single system' in each community. In no one of the utilities except the telephone, and the street cars to a slight degree but for a very different cause, does the fact whether A, B or C residing in the same community is on the same or different 'systems' make the slightest difference as to service, nor does it matter whether systems in different communities are connected or not.

"With the telephone exchange the question of those connected is vital; your service depends upon one system connecting all telephone subscribers in the same community and upon all communities being connected with each other.

"A telegraph system reaching all telegraphic points avoids physical transfers from one system to another, with the incidental delays and obstructions to good service.

"Telephone and telegraph systems operated under common control can avoid duplication by making use of the same wires.

"For practicability of management, economy of operation or efficiency of service there should be one combined telephone and telegraph system. This has been the Bell contention and this is the conclusion reached by the Post Office committee and by Congressional advocates of government ownership, who say in substance that the telephone and telegraph should constitute one system and that a monopoly.

"Government regulation can effectually curb 'monopoly' and 'selfish exploitation' and make them useful without destroying them, by subordinating them to the public for the public advantage. Government ownership and operation would destroy individual initiative; they would create monopoly and increase and strengthen its evils by placing it in the control of officials and servants, responsible only to themselves as a political party, and parts of the organization which made or unmade the chief executives.

Operation and Regulation.

"Operation, economical and efficient, requires high organization continuously maintained, superior methods and efficient service. There must be supervision by able executives assisted by experts, all of long experience as executives as well as in the particular industry. They must have large discretionary powers, assume responsibility, and have undisputed directive authority over subordinates. It is purely administrative and executive in its nature.

"There is a very narrow margin between efficient, economical operation and waste. It is possible to have efficiency accompanied by waste, but never possible to have efficiency without responsible organization and the individual initiative, watchfulness and continuing interest which only accompany permanency and expectation of reward.

"Regulation is in the nature of a review, consideration, determination. It is judicial and advisory, not administrative or executive; a commission of regulation is analagous to a board of direction representing the public as well as the corporation, having no other object than the conservation and protection of the interests of all.

"Operation is a methodical action upon lines of a determined policy, requiring expert knowledge, experience, training, and individual interest.

"Regulation is common-sense, intelligent review and decision, based on presentation and examination of facts and conditions.

Government Operation and Efficiency.

"Theoretically there may be no reason why government operation should not be as economical and efficient as private operation, but actual constructive performance runs up against actual conditions and tangible difficulties which only experience shows how, and responsibility develops the ability, to deal with.

"Departmental officers taken from walks of life affording neither experience nor knowledge of the duties and responsibilities they are to assume, are expected to perform the various duties of their departments and also to incidentally look after their political obligations. As a rule their training better fits them for advocates than for executives, for judicial positions or as commissioners of regulation than directors of operation.

"Every new head of a department is of necessity a reformer; his average incumbency is less than four years; there is seldom any continuity of departmental policy, and never any continuity of departmental staff. The important assistants come and go with the head. A review of the operations of his department show much that could be changed to advantage; to eliminate all that is unsatisfactory and bring about effective results under the conditions and in the time available is impossible for the ablest. He starts in finding an incomplete attempt at accomplishment along a certain line of policy, and goes out leaving an uncompleted attempt along a different line of policy. The inevitable tendency is towards promise, not performance.

"The departments are run by the minor officials and the clerical force who under ordinary conditions are permanent. The officials have no responsibility in the selection of and little directive control over their subordinates. There is a premium on that finished mediocrity which leaves much to be desired and furnishes nothing upon which to base effective reprimand, enforce discipline, or cause for removal. Lack of responsibility is a handicap in the development of men; lack of accountability is a handicap on thorough efficiency; lack of opportunity is a handicap on initiative and enterprise.

"A full average of the minor heads and clerks would normally have capacity, initiative, enterprise and ambition. If any one of them develops extraordinary efficiency initiative or enterprise, he is either elbowed out of the way as disturbing the quiet, complacent habitude of the organization, or if sufficiently masterful, develops to a point where he can go no farther, and is soon taken up by outside organizations. The higher positions, honorable as they may be, are not sufficiently compensated and do not afford the permanent and remunerative positions to be had in private enterprises for similar occupations and ability."

Comparisons Between the United States and European Telephone and Telegraph Situation.

"The government-owned European telephone plants, notwithstanding the low price of foreign labor, are carried at a much higher cost than those of the Bell System and yet every one of them uses the Bell System as a model. The book value of the plant of the Bell System per station is less than 60 per cent that of Belgium; less than 75 per cent that of Austria; about 85 per cent that of Germany, Great Britain and Switzerland; and all of them government-owned.

"The capital account of the Post Office telegraph system of Great Britain, upon which interest is charged against telegraph revenue, is about $54,000,000. The amount admitted to have been spent in the plant is about $85,000,000. The admitted cost of the Post Office telegraph, including deficits in operation but without interest on such deficits, is about $150,000,000.

"The mileage of telegraph wires is a little under 320,000 miles. Based on interest-paying capital, the cost per mile of wire is $167; on actual cost of the plant, $267. The Western Union carries its plant at $98 per mile of wire. The telegraph plants of the world, mostly government-owned and operated except in the United States and Canada, are estimated at $130 per mile of wire. * * *

"There are higher individual rates for larger individual service in the United States than in other countries, but there are relatively much larger individual users of the service. There are also rates as low as or lower than in other countries. There is every economic reason why large users of the telephone in their own business and for their own profit should pay for service according to use. If this policy is to be abandoned, low rates cannot be made for the small user.

"The soundness of any policy, the 'efficiency' and 'sufficiency' and the reasonableness of charges for the use of any utility, are ultimately determined by the degree of its adoption by the public. In the United States there are 9.7 stations to each 100 population, more than double that of any other country, nearly six times that of Great Britain, over 13 times that of France, more than four times that of Switzerland. There are nearly 2,500,000 telephones in rural habitations in the United States, nearly one to every two strictly rural habitations. It is probable that more houses are connected by telephone in the United States than are reached by rural delivery. The telephone goes to the house; the rural free delivery only to the nearest crossroads for a good proportion of the houses. * * *

"The average wages paid to the Bell operators are double the lowest and about equal to the highest rates paid by those in Europe."

Growth of the Bell System.

During the past year subscribers' telephone stations have increased until now there are 8,133,017, a gain of 676,943. These stations reach 70,000 localities or 10,000 more than the number of post offices. The total wire mileage is 16,111,011, of which 92 per cent is copper.

More than half the wire mileage is underground, the total underground plant representing a cost of $181,500,000.

The number of daily telephone connections showed a growth of nearly two million, reaching an average of 27,237,000 a day. Europe has only two-fifths of the telephone traffic of the United States.

The extension of the telephone plant during the year amounted to $54,871,856, making a total for fourteen years of $646,915,200. According to present estimates the construction for the current year will cost in the neighborhood of $56,000,000, of which the local resources of the companies will supply $25,000,000.

Large reserves have been made for maintenance, reconstruction and depreciation, and a steady improvement of service has been achieved.

The report says:

"The gross revenue in 1913 of the Bell System—not including the connected independent companies—was $215,600,000; an increase of over $16,000,000 over last year. Of this, operation consumed $75,400,000; taxes $11,300,000 or one and one-half per cent on the outstanding capital obligations; current maintenance, $32,500,000; and provision for depreciation, $37,700,000.

"The surplus available for charges, etc., was $58,700,000, of which $16,700,000 was paid in interest and over $30,300,000 was paid in dividends.

"The total capitalization, including inter-company items and duplications but excluding reacquired securities of the companies of the Bell System, is $1,390,242,470. Of this $620,127,086 is owned and in the treasury of the companies of the Bell System. The capital stock, bonds and notes payable outstanding in the hands of the public at the close of the year were $770,115,384. If to this be added the current accounts payable, $26,471,681, the total outstanding obligations of every kind were $796,587,065, as against which there were liquid assets, cash and current accounts receivable, of $72,237,885, leaving $724,349,180 as the net permanent capital obligations of the whole system outstanding in the hands of the public."

"We believe," continues the report, "that the valuation by the Interstate Commerce Commission when completed will confirm our repeated statements that the true value of our telephone plants is much greater than the book value."

In the case of the associated companies, excluding the American Telephone & Telegraph Company, particular attention is called to the per cent of net earnings and of dividend and interest disbursements to total plant and other assets:

Net earnings to plant and other assets	5.69%
Dividends and interest to plant and other assets	4.92%

In other words, the property employed earned less than 6 per cent per annum, and the dividends and interest paid were less than 5 per cent upon the value of the property, which could not be considered unreasonable.

Taken by itself the American Telephone & Telegraph Company shows net earnings of $40,576,746.19, an increase of $2,669,101.93 over 1912. The total outstanding capital stock and bonds were $504,207,300, which represent payments into the treasury of over $24,500,000 more than the par value of the capital obligations.

The number of shareholders, 55,983, showed an increase of 5,686 during the year.

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London Traffic.

The gross earnings of the various tube and other electric railways, motor-omnibus services, and tramways, controlled by the Underground Electric Railways Company, of London, England, amounted last year to $31,940,000. The total pay roll amounted to over $11,750,000. Eleven hundred million passengers were carried at an average of 1-4 pence. The motor-omnibuses carried 580 millions and their earnings were $16,000,000.

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Underground Telephone Communication Between Boston and Washington.

On February 17, 1914, Mr. Vail, president of the American Telephone and Telegraph Company, talked to Mr. Carty, chief engineer, over the through underground cable from Boston to New York. On February 25 Mr. Vail talked over a through underground circuit from Boston to Washington. On February 26 the through underground circuits between Boston and Washington were placed in commercial service.

These underground circuits were ordered by President Vail as a result of the isolation of Washington during the snowstorm when President Taft was inaugurated in 1909.

THE BOUNDARIES AND DIVISIONS OF STANDARDIZATION.

By Francis B. Crocker.

An experience of many years in the Standards Committee of the American Institute of Electrical Engineers and the fact that the writer has recently become president of the Electric Power Club, which has done much work in the standardization of electrical machinery, have caused him to consider the proper jurisdiction of the various organizations interested in the subject.

Fundamentally there are three broad divisions of standardization: (1) scientific; (2) technical; and (3) industrial. As true examples of scientific standards, we have the resistivity and temperature coefficient of copper. A proper matter for technical standardization is the safe temperature limits of the various kinds of insulating material. As clear cases of industrial standardization may be cited the shaft diameters and speeds of different types and sizes of electric motors. A scientific problem should be handled by the United States Bureau of Standards or the American Physical Society. A technical electrical matter should be decided by the American Institute of Electrical Engineers, and an industrial electrical question properly belongs to the National Electric Light Association or Electric Power Club.

The best way to solve the problems of standardization is not by conferences between a number of bodies acting jointly on the various subjects. Of course, co-operation is very desirable in some cases, but in dealing with many matters it is unnecessary. Standardization should be carried on in accordance with the following general scheme. First, each organization should have definite jurisdiction, within which it has full authority. Second, each organization should as far as possible confine its action within its own jurisdiction. Third, when questions arise that are on the border, or when the authority and interest of two or more organizations overlap, then conference between the interested parties should be held.

In order to determine jurisdiction, the following plan of procedure may be adopted. When any organization considers it desirable that something should be standardized, its secretary communicates that fact to the secretaries of the other bodies likely to be interested in the same subject. Communications between the standards committee is not sufficient because there may be several in one society and they may change from year to year. In most cases from the nature of the particular matter involved, it is clear that it properly belongs to a certain organization, and the others will accordingly acquiesce. In other instances, it is evident that a question is on the boundary between two bodies and they will therefore agree to co-operate in acting upon it. Of course, failure to answer such a communication within a reasonable time would be tantamount to an abandonment of any claim to the matter involved. When there is doubt or difference of opinion as to jurisdiction that cannot be settled by correspondence between parties interested, then the case may be referred to an arbitrator, for example, the director of the Bureau of Standards, or the president of one of the national engineering societies not interested. The arbitrator merely decides which body or bodies shall have jurisdiction over that subject. The actual standards are determined by said body or bodies.

The first standardization of electrical apparatus and methods was the work of the American Institute of Electrical Engineers several years before anything of the kind was done in other countries. In fact it was the first comprehensive scheme of standardization generally adopted in any branch of science, technology or industry. At first the Institute was the only body competent or willing to undertake such work and the standards were so general that they were important to almost all branches of electrical engineering. Hence there was no question of jurisdiction at that time. Now there is such specialization, with many organizations to cover the various branches. For example, the Electrochemical Society and the Illuminating Engineering Society are strong and active in their respective fields, which are more or less included in electrical engineering. These are technical bodies of the same general character as the American Institute of Electrical Engineers, and there are also organizations largely industrial, such as the National Electric Light Association and the Electric Power Club, composed of manufacturers of electrical machinery, which covers much of the same ground as the American Institute of Electrical Engineers but from a different standpoint.

On account of the very rapid differentiating and specializing in electrical science, technology and industry it would seem that some general plan is needed for present and future standardization. In some cases it is quite evident that a certain body should have sole authority over a certain subject. For example, the electrochemists as a body should certainly determine all standardization in that branch in spite of the fact that hundreds of members of the American Institute of Electrical Engineers are also interested in it. An organization of men who devote themselves to a particular subject should be able to determine standards for it more correctly and more quickly than the American Institute of Electrical Engineers. This is true even though a committee or sub-committee is selected for its special knowledge of the subject, because the Institute as a whole is not qualified or interested to act upon the report of such a committee, however good it may be. Special subjects should be dealt with by those who live with them, so to speak, devoting their thoughts and efforts to them.

In all matters affecting standards it is of the utmost importance to give them very careful consideration. It is much better to have no standard than to have an ill advised one or to have different standards for the same thing. It is hard to rectify mistakes of this kind. In looking back over the history of electrical and other standardization, we see that the tendency has been to standardize too quickly, too often and too much. There have been dozens of wire gauges, for example. Electrical books in the English language may use the American, Birmingham or the Standard British gauges, each materially different from the other two. Many superfluous technical terms have also been introduced. Experience, therefore, indicates that we should be conservative in establishing standards. This is another reason why each organization should limit its action to those matters which it best understands. Thus fewer mistakes and at the same time better progress are likely to be made. All standardization committees should be careful not to rush in where angels fear to tread!

It is surely a mistake for any organization to reach out and attempt to standardize in any field that does not clearly belong to it. Each organization already has far more that is unquestionably within its province than it can possibly cover and new ground is being rapidly opened up. The Standards Committee and subcommittees of the American Institute of Electrical Engineers, for example, have been working very hard for two years on a revision of its Standardization Rules. The general scope is not much greater than that of the former rules, but the new ones will be much more correct and complete. Nevertheless, there are many points that it would be desirable to cover more definitely and a number of branches of the subject could advantageously be extended and important new matter added. Certainly the duty of the Institute is to cover its own particular field thoroughly before it seeks out or wanders into other fields to which its title is even questionable.

The Electric Power Club has one general Standards Committee and there are eight sub-committees, each devoted to a particular class of electrical machinery, for example, one of electrical alternating-current generators, another for large direct-current generators, etc. A great deal has been and will be accomplished, but there is much more ground than it is possible to cover properly even though the work is strictly confined as it should be to the sizes of shaft and pulley, speeds, nomenclatures, rating for different service and other matters that are industrial in contradiction to the technical or scientific.

A great deal of trouble is caused to manufacturers and users of machine tools owing to the varying types, sizes, and speeds of electric motors employed to drive them. Hence, the standardizing of motor dimensions for machine-tool drive is very desirable. It is solely an industrial matter that should be dealt with by the Electric Power Club and the National Tool Builders Association acting jointly. Neither the American Institute of Electrical Engineers nor the American Society of Mechanical Engineers should have anything to do with it, because it is clearly outside of their jurisdiction. As a matter of fact, it has been considered by committees of both of these bodies. Little has been accomplished, however, because it was thought necessary to consult all four organizations, and everybody's business is nobody's business.

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Indiana Jovians Hold Rejuvenation.

The Indianapolis chapter of Jovians initiated more than 130 new members at a rejuvenation held on March 20 at the Hotel Severin.

Included in the class were Governor Ralston and Mayor Bell.

The gathering also officially launched the boom of Thomas A. Wynne, statesman for Indiana and vice-president and treasurer of the Indianapolis Light and Heat Company, for Supreme Jupiter of the Jovian Order.

In the after-dinner speeches each orator paid particular praise to Statesman Wynne. He was lauded in turn by Supreme Jupiter Matthews, Sam Hobson, Mayor Bell, John B. Cockrum, Governor Ralston and Ell C. Bennett.

There were numerous visiting Jovians on hand. They came from Chicago, Milwaukee, St. Louis, Cincinnati, Louisville, Lexington and other cities. Indiana was represented by delegations from several towns outside of Indianapolis. More than 250 remained to attend the banquet.

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Jovian Rejuvenation at Dayton.

On the evening of March 21, the second rejuvenation of the Dayton Jovian League was held at Dayton, O. Following a buffet luncheon, 60 candidates were initiated into the Jovian Order.

Alternate Statesman Bybee had charge of the initiation ceremonies as Jupiter of the degree team which was composed of the following other members. Neptune, L. K. Funkhouser; Pluto, Arthur Gibbons; Vulcan, W. W. Wollaston; Mercury, C. A. Kuebler; Hercules, E. S. Breidenback; Mars, C. B. Frankel; Apollo, A. B. Weinfeld; Avrenim, G. B. Sayer; Pluto's Imps, James A. Attwood, H. E. Long, R. R. Pleasant and John Martin.

Following the rejuvenation the candidates, together with the Dayton Jovians and visiting Jovians numbering about 120 in all, sat down to a banquet.

Statesman Thomas F. Kelly called the meeting to order and requested F. M. Tait, president and general manager of the Dayton Power and Light Company, to act as toastmaster.

Short talks were given by the following Jovians:

Past Jupiter Sam A. Hobson, E. P. Matthews, Director of Public Service Barlow, C. W. Chryst, Statesman W. W. Mumma, V. G. Apple, D. B. Howland, Arthur Gibbons.

In bringing the joviation to a close, Statesman Kelly mentioned the many benefits to be secured through membership in the order and predicted that at the next rejuvenation, to be held in the early part of May, another class of between 50 and 75 candidates would be initiated.

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Section of Electric Vehicle Association Organized in Washington.

At a meeting held in Washington, D. C., on March 12 to bring together the electric-vehicle interests of that city there was a good attendance of electrical men anxious to boost this type of vehicle. As the result of the enthusiastic meeting a Washington Section of the Electric Vehicle Association of America was organized.

Frank W. Smith, president of the Electric Vehicle Association of America, made the chief address at the meeting in which he pointed out the origin, standing and work of the Association. He called attention to its various activities and particularly to the co-operative work it is undertaking with other associations. He spoke enthusiastically of the prospects of the electric vehicle and urged an active campaign in Washington to stimulate the use of electric cars. He showed the peculiarly favorable conditions existing in that city and referred incidentally to the work being done by a committee to urge the postal authorities to make use of electric vehicles in the parcel-post service.

The organization of the new section was completed by the election of officers, as follows: chairman, E. S. Marlow, manager of the commercial department, Potomac Electric Power Company; vice-chairman, R. B. Emerson; secretary-treasurer, C. J. Marsh, Potomac Electric Power Company, Washington, D. C.

Michigan Section Plans Convention-Cruise for June.

The Michigan Section, National Electric Light Association, proposes to hold its convention aboard ship this year, the date of the meeting being June 17 to 20. The plans provide for leaving Detroit at 5:00 p. m. June 17 on a Detroit and Buffalo steamer, arriving at Buffalo at 9:00 a. m. June 18. Niagara Falls will be visited and the party will embark at 3:30 p. m. on the steamer *City of Rochester* from Youngstown on June 18. A trip through the 1,000 islands on the St. Lawrence River is planned, the party reaching Toronto, on the return trip, on June 20. A special train over the Canadian Pacific Railway will convey the party to Detroit, arriving at 3:30 p. m.

The above itinerary is subject to slight change in time, but will remain substantially the same as to route. The price of tickets will be $30 per person, which will cover all traveling expenses, except meals on board Detroit and Buffalo steamer, at Niagara Falls and on train from Toronto to Detroit. The cost of the additional meals will be about $4.00.

This trip will be the finest within reach of the Michigan Section and a large attendance is expected. Herbert Silvester, 18 Washington Boulevard, Detroit, Mich., is secretary of the Section.

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Proceedings of Joint National Committee on Electrolysis.

At the first meeting of the Joint National Committee on Electrolysis, held in New York City on May 27, 1913, it was decided, owing to the fact that certain national associations had not at that time appointed representatives, to have a temporary organization only, and await the meeting of the full committee before perfecting a permanent organization. At this meeting B. J. Arnold was appointed temporary chairman, and he was requested to confer with the national organizations not at that time represented on the committee.

The second regular meeting of the committee was held in the rooms of the American Institute of Electrical Engineers, New York City, on Wednesday, February 25, 1914. There were present: Messrs. B. J. Arnold, temporary chairman, C. Townley, E. B. Katte, H. S. Warren, D. W. Roper, F. N. Waterman, A. F. Ganz, W. J. Broder, A. S. Richey, P. Torchio, L. L. Elden, F. Towle, and P. Winsor. At this meeting B. J. Arnold was appointed permanent chairman of the committee.

In order that the work of the committee could be laid out, and a definite plan of action be decided upon, it was voted to confirm the appointment of the following members of a plan and scope committee, whose duty it would be to prepare a tentative plan to be submitted to the Joint Committee the following day for consideration: Messrs. C. Townley, chairman, representing the American Electric Railway Association; E. B. Katte, representing the American Railway Engineering Association; H. S. Warren, representing the American Telephone & Telegraph Company; D. W. Roper, representing the National Electric Light Association; F. N. Waterman, representing the American Institute of Electrical Engineers; A. F. Ganz, representing the American Gas Institute; W. J. Broder, representing the Natural Gas Association of America. Mr. Townley gave the following outline of the general scope of the committee, for the benefit of those representatives who had been recently appointed.

Electrolytic controversies have in the past given rise to unnecessary and acrimonious disputes, and not infrequently have resulted in litigation between the corporations concerned. The usual procedure in disputes of this kind has been for each side to employ one or more electrical experts who generally disagree as to the cause of the trouble and the remedies therefor. The dispute sometimes gets into the newspapers, occasioning unpleasant notoriety, and resulting in more or less drastic municipal action by the city government concerned. Much of this could be avoided if a body such as this committee could be created which would consider broadly the questions covered by the controversy, without attempting to pass upon the questions at issue, but to report back to their respective organizations so that in time the committee would come to be recognized as a neutral body whose decisions would be authoritative, the same as the Standards Committee of the American Institute of Electrical Engineers in connection with matters of definition and standardization. With that end in view the institute initiated the movement to organize a national body to consider the general subject, and agree upon any basic principles or methods of procedure to be followed in the case of electrolytic disputes.

The third regular meeting of the Joint National Committee on Electrolysis was held in the rooms of the American Electric Railway Association, New York City, on February 26. At this meeting the chairman reported that the invitation extended to the Bureau of Standards to participate in the work of the joint committee had been accepted, and it was voted that the bureau's representative, Dr. E. B. Rosa, be appointed secretary of the committee, and a member of the Plan and Scope Committee.

The Subcommittee on Plan and Scope presented a preliminary report, and after discussion, the following resolution was adopted:

RESOLVED, That the chairman be authorized to appoint committees as informally recommended by the Plan and Scope Committee, to collect information as outlined in the report, and that the committee on Plan and Scope be continued and requested to report further at the next meeting of the joint committee.

Chairman Arnold thereupon announced the appointment of the following committees: Principles and Definitions, E. B. Rosa, chairman; Methods and Analyses of Surveys, J. D. Van Maur, chairman; Foreign Practice, P. Torchio, chairman; and Domestic Practice, F. N. Waterman, chairman.

The following associations are represented in the Joint National Committee on Electrolysis: American Electric Railway Association, American Railway Engineering Association, National Electric Light Association, American Telephone & Telegraph Company, American Institute of Electrical Engineers, National Bureau of Standards, Natural Gas Association, American Gas Institute.

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Chicago Jovian Meeting.

At the meeting of the Jovian League of Chicago, held on March 23, the resolutions previously presented, which provide for the assessment of annual dues of $2.00 for Jovians and non-Jovians desiring to join the League, were unanimously adopted.

Homer E. Niesz, statesman for Illinois and president of the League, announced that the next Chicago rejuvenation would be held on May 25.

S. A. Hobson called attention to rejuvenations which have recently been held at Dayton, O., and Indianapolis, Ind.

The meeting was then turned over to C. R. Kreider, who introduced Ernest Freeman, president of the National Electrical Contractors' Association, who spoke on "The National Association." Mr. Freeman stated that the curtailing of credit extended to contractors has helped the contracting industry by making the contractor adopt more modern and aggressive business policies. Mention was made of the bookkeeping system inaugurated by the Association and sold to the members as another of the factors contributing to the success of the business.

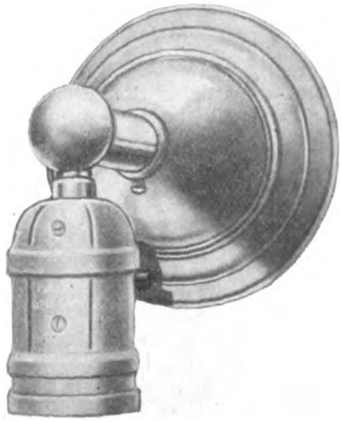
Mr. Freeman spoke of the hearty cooperation which the central stations are extending and the benefits that are being derived from this co-operation. One of the principal things occupying the attention of the Association at present is the encouragement of the enactment of state and city license laws. In conclusion Mr. Freeman stated that there were approximately 35,000 legitimate contractors and that the goal of the Association is to secure a membership of 25,000.

New Electrical and Mechanical Appliances

A New Porcelain Fixture Socket of 600 Watts Capacity.

The accompanying illustration shows a new push-button porcelain fixture socket that has been recently marketed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This new socket is of neat and attractive appearance and is well suited for use in bath rooms, laundries, and also for rooms having cement floors. It has the high rating of 660 watts, 250 volts, and is approved by the Underwriters' Laboratories. The same quick make-and-break mechanism used in C-H switches has been adopted for this socket.

A new and distinct feature is the locking ring which replaces the iron set-screw which has been used for securing sockets to fixtures for over 30 years. This new locking ring makes it possible to firmly attach C-H sockets to fixtures regardless of the varying diameters of fixture nozzle outlets and locking it in position. This new locking arrangement allows turning the socket to bring the buttons to the location desired. The porcelain casing is glazed in three standard finishes, gray, white and brown.



Push-Button Fixture Socket.

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Alternating-Current Buzzer.

An alternating-current buzzer of unique construction has been placed on the market by J. G. Clemens & Company, Incorporated, 1048 Jefferson Street, Buffalo, N. Y. This buzzer is intended to be used with any suitable bell-ringing transformer and can thus be connected through it to any alternating-current lighting circuit. The distinctive feature of this buzzer is that it has no make-and-break contacts or complicated adjustments.

The essential parts of the outfit are a coil with core and an easily adjusted vibratory disk or diaphragm directly opposite the end of the core. The disk is held at the edge of a sounding cylinder which magnifies the sound and which can by a slight turn be caused to vary the sound at will. In principle the construction somewhat resembles that of a telephone receiver, but the disk actually strikes the core at each vibration, producing a loud rap in doing so.

Since the construction is so simple and is entirely devoid of electrical contacts, the life of the buzzer is believed to be indefinite. The outfit is made of cold-rolled steel with oxidized finish. It is very compact and neat in appearance. The buzzer can be used to great advantage in any place where a buzzer is needed and which is accessible to an alternating-current circuit of any frequency. The current consumption is trivial.

COMMONSENSE
TIME SWITCH

Time Switch in Steel Cabinet.

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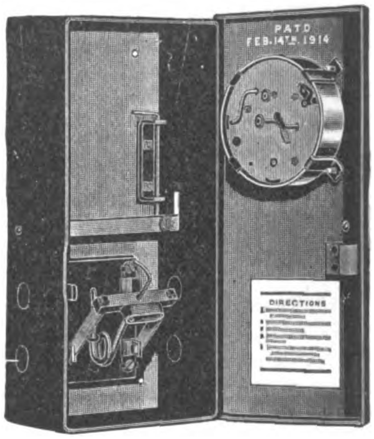
A New Time Switch.

A new type of time switch, recently patented, has been placed on the market, and on account of some of the unique features that it possesses it has been called the "Commonsense" time switch. The outfit consists of a high-grade clock movement especially made for this purpose; all its wheels are of heavy brass and its spindles work on steel bearings. This clock is the only thing that requires attention in the entire outfit, periodic winding being, of course, necessary. The switch is entirely independent of the clock, except at the moment when it is set for release. The switch is entirely automatic in action and does not release until the time set; however, an arrangement is included by means of which the switch can be thrown manually without opening the box. The lever and catch pin are each made of cold-drawn steel. The switch is easily pushed in and catches automatically. It is said to have a very powerful throw and to be absolutely reliable in its operation. The rating of the switch is 30 amperes and 250 volts, thus making it suitable for a great variety of circuits, including not only signs, window displays and outline lighting, but also battery charging and other purposes.

Aside from simplicity of construction and operation, probably the most important feature of this switch is that it is inclosed in a standard steel cabinet with half-inch knockouts on both sides and on the bottom. This makes this switch very convenient to install in connection with rigid iron conduit as well as flexible steel, fiber or other conduit; by using appropriate bushings it can also be connected directly with rubber-covered wire. None of the connections require to be taped with any of these installations. The dimensions of the cabinet shown in the illustration are height, 13 inches; width, 6 inches, depth, 4 inches.



Cabinet and Switch Open.

The switch has been placed on the market by the Kennedy-Webster Company, 536 South Clark Street, Chicago.

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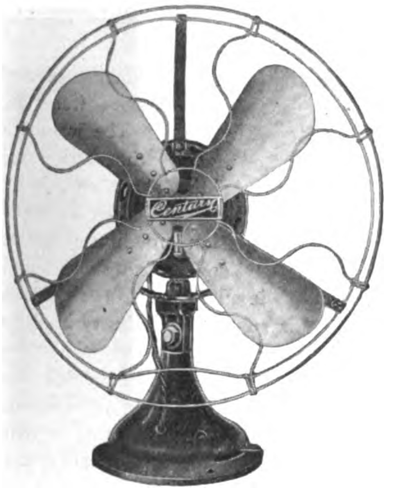
Century Alternating-Current Fans.

The fan motors manufactured by the Century Electric Company, St. Louis, Mo., and illustrated herewith, are of the alternating-current type and possess some features which in the opinion of the manufacturer are unique and noteworthy. The two illustrations show the desk and bracket type of fans which are constructed for all frequencies between 25 and 140 cycles and for various voltages between 100 and 250 volts.

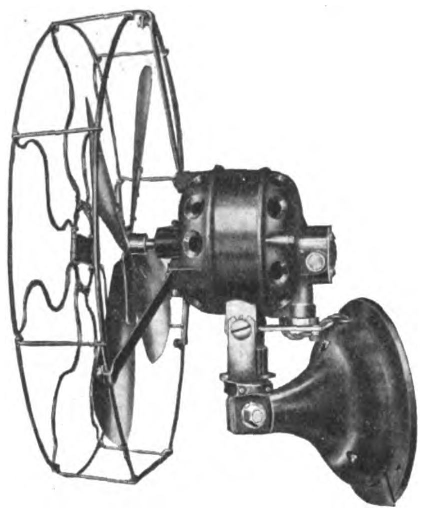
The fan motors are of the split-phase type. No moving coils are used in their operation. With the exception of the fans arranged for 133 cycles and higher frequencies, these fans require no cutout and the starting coils remain in circuit while the fan is in operation. The rotor is of the squirrel-cage type with bare copper bars located in closed slots; these bars are securely fastened mechanically and then soldered to copper end rings. The rotor core is built of high-grade sheet-steel laminations. The rotor is mounted on a shaft ground in every part to accurate dimensions, so as to produce exceptionally low friction losses and long life for the bearings. The latter are made of the highest grade of phosphor bronze and are lubricated by wick oil cups.



Nonoscillating Desk and Bracket Fan.

The base of the fan is of drawn steel, giving a very graceful outline, great strength and at the same time a minimum weight. On the bottom of the base is a pressed-steel plate with felt surface; this supports and protects the switch. Both the nonoscillating and the oscillating fans are provided with a swivel trunnion, by means of which they can be readily converted from a desk or table fan into a bracket fan without using extra parts; it is necessary merely to loosen the cap screw and turn the fan body at right angles to the base. By means of a positive lock on the trunnion the fan can be held in any position to which it may be tilted. The guard is held by a three-part support, one side of which grasps the top, where the fan is usually lifted. The standard finish is black enamel for the base and body, and dipped lacquered brass for the blades, guards and trimmings; special finishes can be provided.

The oscillating fan motors embody the same general features as are to be found in those of the nonoscillating type, but they also include an exceptionally reliable operating mechanism of the double worm-gear type. The steel worm and the phosphor bronze gear are of very substantial construction. They are inclosed in a grease case containing sufficient lubricant for the requirements of several years. By means of a simple device the oscillating mechanism can be thrown into or out of gear. The oscillation for a 60-cycle four-pole fan when running at full speed is at the rate of about four times per minute, which gives the best results in most cases. The range of oscillation can be varied up to about 100 degrees by shifting a crank pin to different holes located in the crank disk. By turning the fan on the swivel stud a change in the direction of oscillation can be made without further adjustment. Ball bearings carry the weight of the fan body and reduce the friction of oscillation to a minimum, even when the fan is operated at a considerable angle of deviation from the horizontal.



Oscillating Bracket and Desk Fan.

All these fans are made with great care from most carefully selected stock. All parts are made to fit standard jigs and gauges. Each fan receives a rigid operating test and a record is kept of its performances.

Both types of fan described are built with a maximum speed of from 1,100 to 1,600 revolutions in the 12 and 16-inch sizes, depending on the frequency; each of these fans has five speed adjustments. The fans for 133 cycles and thereabouts operate at only one speed, viz., 1,800 revolutions per minute. The power consumption of all these fans is very low and their operation is quiet.

Silver Medal Awarded for Ironclad Entrance Switches.

At the first International Exposition of Safety and Sanitation, recently held in New York City, a silver medal was awarded to the Detroit Fuse & Manufacturing Company, Detroit, Mich., for its exhibit of its line of ironclad fused entrance switches. These switches were described in this department in the issue of December 20, 1913. Their construction is distinctively along the lines of the "Safety First" movement. The company has also constructed a switchboard using these switches and embodying the ironclad principle of construction to even the minutest detail. It is expected to have this board on exhibition at the American Museum of Safety in New York City.

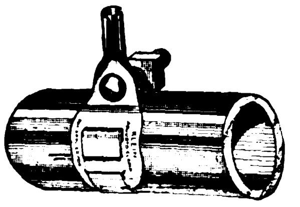
NOW LET US HUMAN
CONSERVE LIFE
FIRST INTERNATIONAL EXPOSITION OF SAFETY AND SANITATION
NEW YORK CITY
1913
COMMEMORATIVE MEDAL
AWARDED TO
Detroit Fuse & Mfg. Co.
DETROIT

Silver Medal Awarded at Safety Exposition.

In the two accompanying illustrations are shown obverse and reverse views of the silver medal alluded to above. This award was the highest given for this line of devices exhibited.

Klein Adjusto Clamp.

The increasing requirements for grounding the neutrals and secondaries of distributing circuits has called for more attention to methods of establishing a good ground connection. A number of ground clamp devices have therefore been placed on the market, of which the one illustrated herewith has some features which are claimed by its manufacturer to constitute a marked improvement over other devices of this type. This clamp is designed for use in grounding to pipe systems or pipe grounds. It is made of solid copper, is of good construction and very easily installed.



Grounding Clamp.

The method of using this clamp is first to place it around the pipe and to adjust the bolt; the free end of the slide is then pulled through the slot until it just grips the pipe snugly; the surplus end of the slide is then bent back and the clamp securely tightened by means of the take-up screw.

This clamp is made in three sizes to take pipes up to 1, 2 and 3 inches respectively. However, any of these sizes may be used with any smaller size pipe within its range and it may also be used with armored cable or metal molding, the convenient adjustable feature making this possible. This clamp has been placed on the market by S. Robert Schwartz & Brother, 624 Broadway, New York City.

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Engine-Driven Direct-Current Generators of the Commutating-Pole Type.

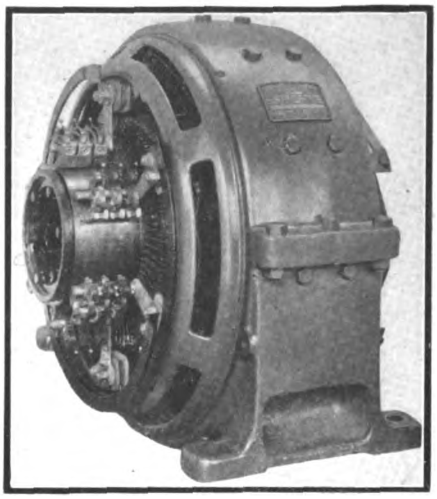
A new line of engine-type, commutating-pole, direct-current generators has been recently placed on the market by the General Electric Company. These machines embody all the advanced refinements in the electrical and mechanical design of this class of apparatus, which enable them to meet the most exacting service requirements modern applications demand. The generators are offered in the usual complete line of standard sizes ranging from 25 to 400 kilowatts, inclusive. They are manufactured in both the two-wire and three-wire types, with either shunt or compound field windings and with armatures wound to deliver the rated output at any voltage from 115 to 125 volts or 230 to 250 volts. Larger sizes of both types and wound for 250 volts only are built on specification.

The speeds of these generators are in conformity with modern engine practice, and were selected after a careful consideration of the recommendations and requirements of leading engine builders. Compound-wound machines, automatically compensating for line drop in the distribution system, are built for any desired degree of compounding from no load to full load, although four to five per cent is usually sufficient for average conditions and standard field windings provide for this amount. The frame is designed for installing on the engine bedplate or masonry foundations, and the armature is bored for mounting on the engine shaft.

The utilization of commutating poles in these generators is one of the distinctive features of the new design, and permits operation over an extremely wide range of load and voltage with fixed brush position and sparkless commutation and with a consequent increased life of the commutator and brushes.

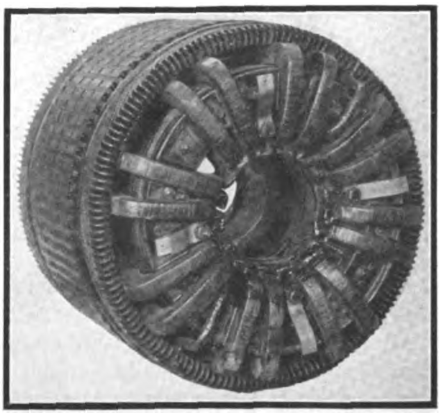
A new and very important feature of this line of generators is the development of the three-wire machines with a special type of revolving compensator. The advantages of the three-wire system for the distribution of electrical energy at low voltages are well understood.

The adoption of the revolving compensator with one collector ring for obtaining the neutral connection for three-wire operation is somewhat of a radical departure from previous designs. This design supersedes the familiar separate stationary compensator and two-collector-ring arrangement. The revolving compensator consists of a circular magnetic core upon which are mounted suitable exciting coils, the core with its coils being assembled on a cast bracket bolted directly to the back end of the armature spider. The compensator fits under the overhanging end windings of the armature, projecting but a short distance beyond the main winding, and requires no additional allowance in floor space.



Engine-Type Two-Wire Generator.

The compensator windings are connected to the main armature winding at proper points, and the neutral connection is taken through the armature spider to a single collector ring mounted on the outer end of the commutator shell. The neutral brushes bearing on this ring are supported by and insulated from the main brush-holder studs. The simplicity of this design, which is self-contained with the armature, eliminates floor space taken by the stationary compensator, requires fewer collector rings and brushes, and reduces the number of cable leads to the switchboard.



Armature with Compensator for Three-Wire Generator.

Revolving compensators may be applied and connected to standard two-wire armatures. Aside from the armature construction, the only important difference between a two-wire and a three-wire generator is in the field connections. In the three-wire generator the series and commutating fields are equally divided between the two sides (positive and negative) of the armature, insuring exact compounding for all load conditions whether balanced or unbalanced. Three-wire generators are designed to carry an unbalanced current of 25 per cent of the rated full-load current in the neutral.

Particular attention has been given to the ventilation of these machines. Armature cores, windings, spiders and flanges, commutator shells and all field coils are of open construction, allowing a free circulation of air through and around all component parts, which assures low temperatures, good efficiency and durability of the insulation. The magnet frame is of cast steel and is split horizontally above the center line, so that the generator can be taken apart for cleaning, inspection or repair without removing any of the field poles.

The main poles are of laminated steel, punched to suit the finished frame and held in place by bolts. The main field is constructed with the series coil mounted outside the shunt coil, and is separated a sufficient distance to permit thorough ventilation and insure easy access to either coil. The shunt coil is thoroughly insulated on a sheet-metal body and is supported by heavy insulating collars. The commutating poles are of rolled steel, held in place by bolts and carry a helical winding of edgewise-wound copper strip, insuring effective radiation of heat. Both the main or commutating poles with their coils can be readily removed without interfering with the magnet frame or brush rigging.

The armature windings, either multiple or series as best suits the design, are formed from bar stock in coils of the endless type, without joints or clips on the back ends, and the design of the coil is such that an exceptionally free circulation of air is obtained around and through the end windings. An improved wrapped type of insulation supersedes the trough type used on previous designs. The windings are held in the slots by hardwood wedges dovetailed in the punchings, and on the ends by binding bands, which do not, however, extend over the core.

All the end connections are supported by flanges bolted to the armature spider. Suitable equalizer connections are provided on all multiple-wound armatures to prevent any difference in voltage due to variation in the air gap, and also to equalize the magnetic pull on the shaft.

The commutator segments are made of liberal depth, from hard-drawn copper, insulated from the shell and from one another by mica gauged to uniform thickness and of such hardness as to wear evenly with the copper. On the smaller sizes the back clamping rings are cast integral with the commutator shell, the outer clamp ring being a separate casting. On the larger sizes both clamping rings are separate castings. The commutator segments are of sufficient length to permit staggering the brushes and insure even wear of the entire commutator surface. The commutator is supported independently of the shaft, being mounted on an extension of the armature spider. The segments are connected to the armature winding by copper strips soldered into the segments and to the armature conductors.

The armature core is built up of thin laminations thoroughly annealed, assembled and keyed to a finished seat on the armature spider. Through bolts hold the assembled core in place between two cast-iron flanges, one of which is cast integral with the spider. These bolts are located within the inner periphery of the core and do not pass through it.

The brush rigging is of an improved mechanical design, the yoke fitting closely in a groove turned in the magnet frame. The brush-holder brackets are firmly attached to the yoke and are made adjustable to allow for natural wear of the commutator. The brush-holder studs are riveted in the brackets and are supplied with a liberal number of brush-holders. No shifting device is furnished nor required. After the brushes are once adjusted in their proper position, the yoke is locked in place and no further brush shift is necessary. The design of the brush-holder embodies distinctive features. The brush-holder body is a single brass casting bored for the stud fit, while the broached box offers a long bearing surface that eliminates grooving of the brush. The punched-steel lever is rigid and maintains its relation to the brush irrespective of wear. Tension is obtained by a steel wire spring, the design allowing a wide range of adjustment for brush pressure. A metal cap riveted to the brush avoids wear at the point of contact with the spring lever. A flexible copper connection with ample contact surface is supplied for carrying the current to avoid deterioration of the brush-holder spring.

Connection blocks are bolted to the under side of the magnet frame. To these are fastened the machine leads, which are fitted with suitable terminals for receiving the line cables.

While commutating-pole generators are superior to ordinary generators for any character of service, these machines with their many additional improvements in design will operate in a thoroughly satisfactory and reliable manner under the most severe service conditions where fluctuating motor loads frequently predominate.

A Unique Battery and Switchboard Equipment for Low-Voltage Rural Lighting Plants.

In rural communities, farms and country homes the demand for electric lighting is rapidly increasing. Since many of these places are not accessible to central-station lines there is needed a simple isolated plant for generating the current on the spot. However much each farmer or country citizen may desire the benefits of electric lighting and power, the amount he can afford to spend for his plant is usually limited, consequently both the first cost of the apparatus and its cost of installation must be low.

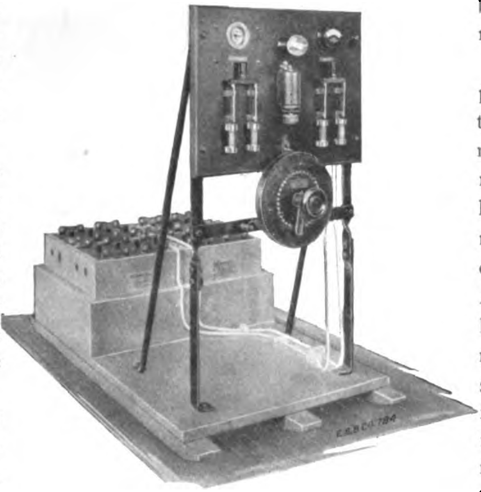


Fig. 1.—Battery and Switchboard Ready for Service.

To meet the evident need for a simple equipment and one that could be shipped and installed easily, the Electric Storage Battery Company, of Philadelphia, Pa., has placed on the market the equipment illustrated in Fig. 1. This consists of a 16-cell Hyray-Exide storage battery and type E switchboard. These are mounted on a single skid platform, with a space between the switchboard and battery box to permit the placing of a generator of appropriate size. This generator is not furnished with the present equipment, but when installed and when the generator is connected to an engine of suitable type for this service the entire electrical plant is complete and ready for operation.

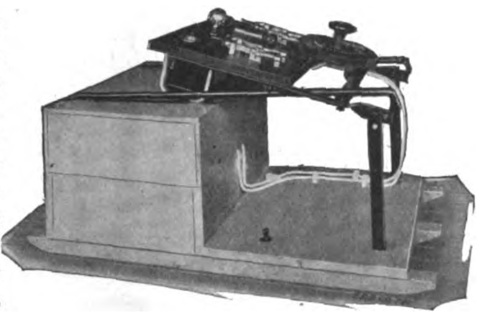


Fig. 2.—Equipment Folded for Shipment.

The battery for this equipment consists of 16 cells divided into four sets of four cells in separate trays. These cells are of the thin-plate type used for vehicle service, and therefore make a compact and relatively light-weight battery. The cells are inclosed in rubber jars and all bolt connections are made on top so that it is not necessary to assemble the battery, all the cells being already assembled and connected in the battery box. A ventilated box cover is provided for the battery. which completely incloses and protects it from dirt and dust; while the battery is being charged this cover may be removed.

The switchboard is mounted on a supporting frame with hinged legs, permitting the board to be folded down for shipment without disturbing the electrical connections. The board has in the upper left-hand corner an ampere-hour meter, by means of which accurate record of the charge and discharge can readily be kept. Adjoining this in the center is a pilot lamp and at the upper right corner is an ammeter with zero center, so as to be able to read both charging and discharging currents. At the left is a two-pole generator switch and at the right is a similar battery switch; each of these switches is of the fused type. Between the switches is an electromagnetic switch for automatically closing the circuit when the generator voltage rises to the proper value and again opening the battery circuit if a small reverse current should pass during charging from failure of the generator voltage. At the middle beneath the switchboard panel space is reserved for a rheostat, which can be furnished to suit the generator provided in connection with the equipment.

As already suggested above, one of the most unique features of this equipment lies in its being already assembled and connected and also in being readily folded up for shipment. Fig. 2 shows the equipment in the latter condition. All that it is necessary to do then is to crate the outfit, when it is ready to be shipped. The entire outfit is of such compact size that it can readily be placed on an ordinary farmer's wagon and taken to the point of installation with minimum difficulty.

These equipments are furnished in three sizes, the battery in the first having a capacity of 44 ampere-hours; in the second, 78 ampere-hours and in the largest size, 117 ampere-hours. The approximate gross shipping weight of the latter equipment is 775 pounds.

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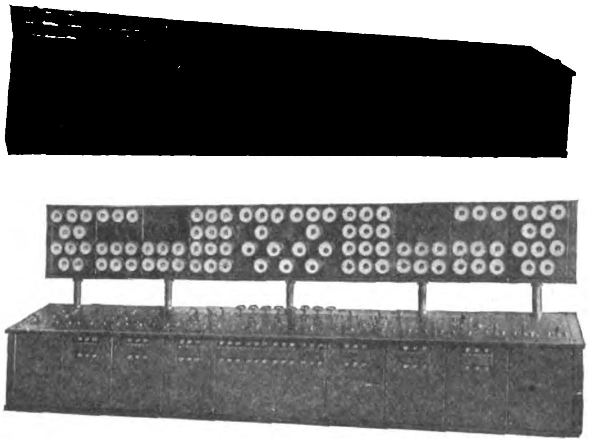
Control Desks of the Sectional Type.

Under conditions where space economy is an important consideration, a control desk may often be used to advantage for the mounting of control apparatus. Standard control desks are sectional in form, each section being a unit in itself corre-



Figs. 1 and 2.—Two Types of Control Desks.

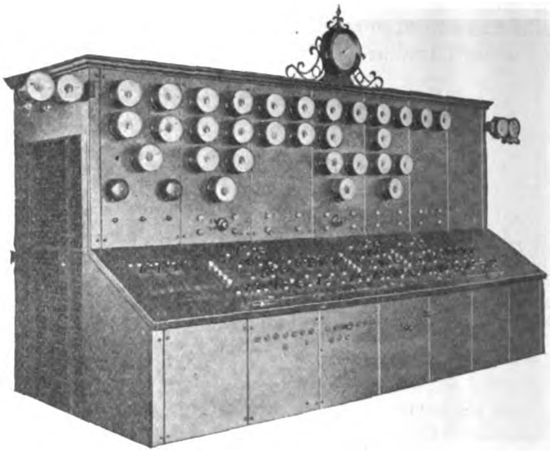


Fig. 3.—Control Desk and Instrument Board with Rear Inclosure.

sponding to the panels of a switchboard.

The desks are built up on a pipe framework having a channel-iron base. The design is such that sections can be easily added to an existing desk by moving one or both end sections and without disturbing apparatus already installed. The top sections are of slate and the sides of steel. Black marine finish is standard for both top and sides to correspond with standard finish of controlling devices and indicators. Access to the desk for wiring is afforded either from the rear or sides by means of cover plates which are easily removable.

These desks can be supplied in three standard types to suit varying conditions. The three types are as follows:

The first type is a plain desk, having no provision for instruments. The desk may be located at any convenient place in the station and still permit an uninterrupted view. Instruments are generally mounted on a supplementary panel switchboard or on instrument posts or frames to suit local conditions. This desk is illustrated in Fig. 1.

The second type of desk includes an instrument frame mounted on posts, as shown in Fig. 2. The frame is supported at such a height as to permit of a view of the station floor. The instrument frame is also of pipe construction with slate panel sections of width to correspond with those of the desk top. The posts supporting the frame are hollow, instrument leads being brought up through them from the desk below.

The third type of desk, illustrated in Fig. 3, has an instrument section extending upwards from the rear edge of desk top, without intervening space. Each section of desk includes the corresponding instrument section. This type of desk is commonly combined with a panel switchboard.

These desks are manufactured by the Westinghouse Electric & Manufacturing Company.

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New Universal Electric Grinders and Drills.

The Standard Electric Tool Company, Cincinnati, O., has developed and is now placing on the market a new line of universal portable electric tool-post grinders. These operate on both direct current and alternating current from 0 to 60 cycles, being developed particularly to meet the demand for grinders that will operate equally well on 25, 30 and 40-cycle circuits.

These grinders are provided with ball bearings of the highest grade, which are incased in dustproof chambers packed in grease. This eliminates oiling and prevents flooding with thin oil and damaging the motor windings; it also precludes the possibility of trouble from improper bearing adjustment. These tools are manufactured in one-sixth and one-fourth-horsepower sizes, and they have a speed of approximately 6,000 revolutions per minute, which makes them very effective for internal grinding.

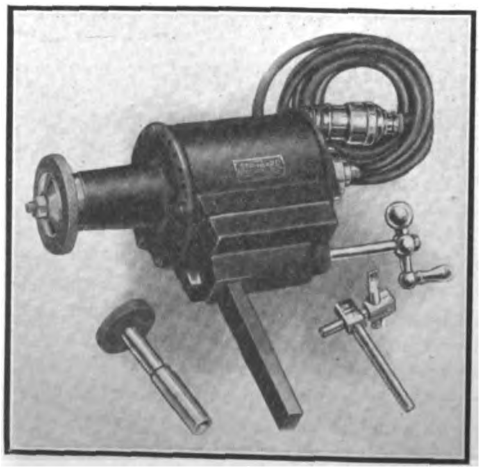
In addition to the above grinders the company is now placing on the market two new sizes of universal drills of five-eighth-inch and one-inch capacity. These are in addition to the seven sizes of universal drills that have been on the market for some time and which were illustrated and described in these columns at an earlier date.

The drills operate on both direct current and alternating current 0 to 60 cycles and, as with the grinders, are especially adapted for 25, 30 and 40-cycle circuits. These drills are ball bearing throughout. The five-eighths-inch size is fitted with a No. 2 Morse taper socket or with a chuck, and the one-inch size with a No. 3 Morse taper socket. All gears are generated from a special grade of steel and are case-hardened and run incased in grease.

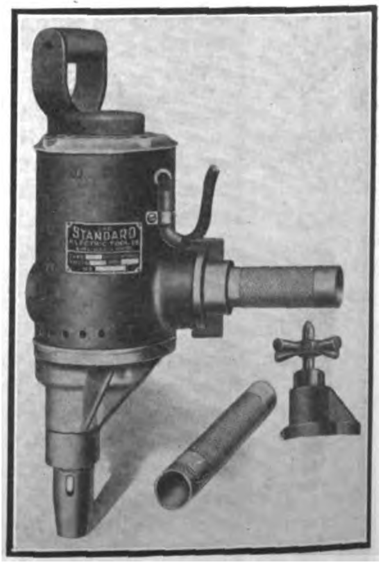
The motors in both grinders and drills are form-wound and are impregnated in Bakelite, which method of winding and insulation prevents grounds, short-circuits and other troubles incident to high-speed apparatus if constructed according to slow-speed motor practice. All tools are air-cooled by means of a high-power fan. These motors develop high power and are capable of severe overload without damage.

The principle of simple, rigid construction has been followed throughout, although weight has been kept down to the minimum. Both drills and grinders are built on the unit plan which makes them very easily dismembered; all electrical connections are made in the frame unit.

The two new sizes of drills have also been added to the line of universal drills for direct current only, as well as that for two and three-phase alternating current.



Universal Electric Grinder.



Universal Electric Drill.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

CAMBRIDGE CITY, IND.—A cluster-light system will be established. Address the city clerk

NEW IBERIA, LA.—The city will extend the electric-light system. Address the city clerk.

EVELETH, MINN.—A municipal electric light plant will be established here. Address the city clerk.

BUFFALO, IOWA.—The Council is planning to erect a municipal lighting plant. Address the city clerk.

HOMER CITY, PA.—The City is planning to establish a municipal electric light plant. Address S. C. Steel, chairman.

MOOREHEAD, MINN.—The Council is planning to purchase $20,000 worth of electric equipment. Address the city clerk.

HECTOR, MINN.—The Renville County Electric Company has been granted a franchise for electric lights and power.

WILKES-BARRE, PA. — Reilly & Schroeder, architects, have plans for a convent to be equipped with modern electric appliances. N.

DONOVAN, ILL.—The question of establishing a municipal plant is under consideration. Address J. W. Nelson, president of the Board.

GLASGOW, MONT.—The Council proposes to install a new lighting system at an estimated cost of $21,398. E. E. Crawford is city clerk. C.

HIGH POINT, N. C.—The City appointed a committee to investigate purchasing an arc-light system, to cost $25,000. Address F. N. Tate, mayor.

LOUISVILLE, KY.—Two electric elevators will be purchased by the Fiscal Court of Jefferson County for installation in the court house here.

WHITESBURG, KY.—Henry Day, Samuel Collins, Stephen Combs and others have organized a $5,000 stock company to build an electric light plant here.

ALEXANDRIA, LA.—The Alexandria Electric Street Railway Company will construct a power plant at the mill of Bayou Rapids Lumber Company.

HEBRON, O.—This village has voted in favor of a $2,500 bond issue, to provide funds for wiring for commercial and municipal electric lighting and power service. J.

BROWERVILLE, MINN.—The Browerville Electric Light & Power Company was incorporated by H. E. Hart, Thomas Heid, and others with a capital stock of **$10,000.**

WARSAW, N. C.—The Duplin Power Company will build an electric light plant to develop 125 horsepower. Address C. W. Petty, engineer, 848 North Street, Greensboro.

DANVILLE, KY. — A new hotel will be built to replace the Gilcher Hotel, recently destroyed by fire, by Malcolm Weisiger, and electric elevators will be required. G.

CLINTON, IND. — Superintendent C. M. Poor, of the Clinton Electric Light & Power Company, will purchase a 500-kilowatt generator set for the use of the company. G.

KANSAS CITY, KANS.—The Kansas City, Kaw Valley & Western Electric Railway will spend $25,000 for the installation of transformers at the municipal power plant here. M.

PHILADELPHIA, PA. — Messrs. George & Borst are taking estimates for the erection of a new electric power plant for the Counties Gas & Electric Company at Norristown, Pa. A.

WOONSOCKET, S. D.—Plans are being made for establishing a central station here and furnishing light and power to Wessington Springs, Alpena, Lane, Forestburg and Artesian. C.

HOLT, MO.—The Town Board has a proposition before it from the Kansas City promoters, looking to the establishment of an electric-lighting system for the town. Address the county clerk.

ALLENTOWN, PA.—There will be quite an electrical contract involved in the completing of the new court house to be erected here. R. S. Rathburn, Hunsicker Building, is the architect.

CHICKAMAUGA, GA.—The Council has granted a franchise to a company for lighting the town with electricity. The plant, it is said, will be installed within the next six months. Address the mayor.

FT. WAYNE, IND.—Improvements to the extent of $75,000 will be made in the municipal electric plant, including the installation of a new generator and the construction of 40 miles of new lines. G.

BEAUMONT, TEX.—The Stone & Webster Engineering Corporation will expend $100,000 in improvements, including the local power plant. Local officials have been authorized to make the expenditure.

NASHVILLE, TENN.—The Nashville Traction Company will erect a plant to generate power for operating the traction system and for commercial purposes. Address W. E. Steger, counsel, for further particulars.

DREWSEY, ORE.—John E. Johnson & Sons have filed on a power site above the Ott sawmill, with a view of constructing a power plant and transmitting electric current to a number of near-by towns.

LOUISVILLE, KY.—This city will grant a franchise for an electric-light plant for street and domestic lighting. Bids will be received May 1. Address J. A. Hagan, mayor, 3830 Grand Boulevard, Louisville.

JERSEY CITY, N. J.—The Paulinskill Water Power Company has been incorporated with a capital of $100,000 to operate water-power plants. C. M. Pihl, A. D. Lord and A. B. Cheadle are the incorporators. A.

HALLS, TENN.—This town will issue bonds to the amount of $5,000, the greater part of the proceeds of which will be used for an electric light plant for the town. B. M. Archer is in charge of the matter. G.

NEWARK, O.—The Ohio Light & Power Company is securing right of way for a high-tension line between this city and Shawnee. The company operates large plants both at Newark and at Parkersburg, W. Va. J.

EVANSVILLE, IND.—The Evansville Public Service Company will furnish current to Ft. Branch, Ind., through a substation, and the plant of the Electric Light Company of the latter place will be dismantled. G.

PRINCESS ANNE, MD.—The city will install a street-lighting system. Specifications require 65 to 80 candle-power lamps to burn all night. Bids will be received on April 3. Address J. Douglass Wallop, commissioner.

JERSEY CITY, N. J.—Paulinskill Water Power Company has been incorporated to operate water-power plants. The capital stock is $100,000 and the incorporators are C. M. P. Pihl, A. D. Lord and A. B. Cheadle.

INDIANAPOLIS, IND.—A 12-story hotel and coliseum to seat 7,000 people will be built here by Robert S. Fletcher, and it is probable that an electric plant will be built in connection. Electric elevators will be used.

BUTLER, GA. — J. M. Harrison, Montezuma, Ga., is planning to utilize the water power at McCants Mill for furnishing current for electric lights in Butler. A stock company is being organized to undertake the development.

SAN FRANCISCO, CAL.—Business men and property owners along Mission Street have agreed to pay $15,000 for the installation of ornamental arches for the better lighting of that street between Sixteenth and Twenty-fourth Streets.

CLIFTON FORGE, VA.—The Virginia Western Electric Company will construct about 30 miles of 44,000-volt transmission line and several substations, and will purchase six 44,000-volt transformers from 15 kilowatts to 200 kilowatts.

GREENVILLE, S. C.—The Buncombe Road Electric Light Company has been incorporated with a capital stock of $500 to construct and operate an electric-light line. The incorporators are R. K. Taylor, R. A. League and others.

TYLERTOWN, MISS.—T. C. Simmons and W. A. Boyd, business men, have purchased the Tylertown Light & Power Company's plant, formerly operated by C. H. Stevens. The new proprietors expect to materially enlarge and improve the plant.

TOPEKA, KANS.—The Elmhurst Investment Company is contemplating the construction of an electric power plant at Garden City and a power line down the river through Charleston, Ingalls and Cimarron. N. B. Burge is president of the Company. M.

ROCKFORD, ILL.—The Rockford Electric Company is planning to double its extension work for 1914. In previous years the extension work has been about ten miles of wire, while this year it will exceed 20 miles. Address Adam Gschwindt, manager.

OKOLONA, MISS.—The Mississippi Electric Company has been organized with a capital stock of $5,000,000 and plans the construction of an electric line from Okolona to Aliceville, a distance of 70 miles. Address A. L. Jagoe, of Okolona, for information.

LAWRENCEBURG, IND.—The J. R. Stevens Company, of Cincinnati, O., will build a concrete-and-brick distillery and grain elevator here for the W. P. Squibb Distilling Company. Light and power will be furnished by electricity, and considerable equipment will be required. G.

INDIANAPOLIS, IND.—The Board of Park Commissioners has under consideration the substitution of an electric-lighting system for the gas and gasoline lighting system now used in the city parks, and the proposed new system may also be extended to the boulevards. Address B. J. T. Jeup, city engineer.

PARKVILLE, MICH.—Although this little St. Joseph County hamlet is located away from any railway and miles from any city, the residents have decided to put in a complete lighting system. The place is not incorporated and therefore cannot bond, so the money to build the lighting plant has been raised by popular subscription.

NORTH PLATTE, NEB.—The North Platte Gas & Electric Company has been reorganized under the name of the North Platte Electric Company, and will be operated by the Union Company, of Omaha, Neb. The plant will be rebuilt and new equipment will be installed. Address Willis Todd, engineer, for further information.

EDMONTON, ALTA.—Representatives of Smith, Kerry and Chase, Toronto, Ont., recently investigated a water-power site on the Athabasca River at Grand Rapids, and from good authority comes the information that a $5,000,000 power plant will be erected at this point. For further information, address the company named at Toronto. O.

KELSO, WASH.—F. M. Housh, construction engineer in the employ of the Washington-Oregon Corporation, recently announced that work of constructing a new power line, costing about $15,000, between Winlock and Toledo, a distance of seven miles, will begin in the immediate future, and will be rushed to completion as rapidly as possible. O.

BOONE, N. C.—The Appaladrian Training School, of Boone, N. C., is having prepared plans and specifications for a 200-horsepower hydroelectric development on New River. D. R. Shearer, consulting engineer, Knoxville, Tenn., is in charge of the design and will receive bids for the construction work as soon as the plans are completed.

LONDON, O.—The expert employed to go over the lighting system of the city estimates that it will require from $10,000 to $15,000 to put the local power plant in good condition. He recommends that the city make this outlay, instead of purchasing power from the Ohio Electric Railway Company, as has been advocated by part of the Council. J.

LEXINGTON, KY.—The Kentucky Utilities Company, which controls the Kentucky Public Service Company, of Frankfort, Ky., is planning to furnish current to the latter town from its Lexington plant, and will dismantle the Frankfort plant, at least partially. The Lexington plant may be enlarged for this purpose, and will also require transmission equipment for the proposed line. G.

JOLIET, ILL.—Bids will be received by the Board of Prison Industries of the State of Illinois, Springfield, Ill., on April 6, for furnishing additional equipment for stone-crusher plant, such equipment to include electric motors of sufficient power to drive same at full capacity, also switch engine and steam shovel fully equipped. Address Board of Prison Industries, Ralph R. Tilton, secretary, Danville, Ill.

ALBANY, ORE.—A municipal electric light and power plant project for this city has been launched with the Commercial Club, and a committee has been appointed to investigate the feasibility of such a proposition, with instructions to report back to the Club at an early date. The proposed plan is to have the city construct, equip and maintain a municipal light, power and water system. For information address A. H. Hammer, Commercial Club. O.

LEXINGTON, KY.—The Kentucky Utilities Company, whose general offices are here and which operates a plant at Hopkinsville, Ky., as well as in other Kentucky towns, has purchased for $114 a franchise giving it the right to construct and operate electric light and power lines in Christian County. It is understood that the franchise was sold for the purpose of enabling the company to construct a transmission line to Pembroke, a near-by town, to which it will furnish current. G.

CHELAN, WASH.—The City Council of this city and Lakeside, near here, have decided to co-operate in the installation of a municipal light and water plant to serve both cities. F. C. Humphery, of Spokane, representing the Fairbanks-Morse Company, has made a proposition to the Councils, offering to install the systems, but this offer has not been accepted to date. In all likelihood, competitve bids covering the system will be asked for. For information, address Mayor Emerson, of Chelan, or Councilman H. E. Ward, of Lakeside. O.

PORTLAND, ORE.—Acting Secretary of Agriculture B. T. Galloway recently issued a permit to James Lindsay, of this city, for the construction and operation of a power plant on Mill Creek, Douglas County. The promoter intends to transmit the power obtained from this hydroelectric plant to this city, a distance of 18 miles. Three 1,150-horse power horizontal Francis type turbines, acting under a head of 263 feet, will be direct-connected to three 750-kilowatt three-phase, alternating-current generators. The current is to be transmitted at 22,000 volts from the plant to the town. The power house is to be constructed with a concrete foundation.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

RAVENNA, NEB.—The Ravenna Telephone Company plans to rebuild all its lines.

BANGOR, WIS.—Bangor Telephone Company has been incorporated with a capital of $25,000.

LOS ANGELES, CAL.—$250,000 will be expended for a new fire alarm. Address the city electrician.

MT. CARMEL, ILL.—The Mt. Carmel Telephone Company will establish a new system at Mt. Carmel. Address H. J. Leach, manager.

PINE ISLAND, MINN.—The Pine Island Telephone Company has been incorporated by John Clemens, James P. Kane and others.

QUITMAN, GA. — Concord Telephone Company has been incorporated with a capital stock of $175 by J. B. Shiver, and others.

WISEMAN, KY.—The Licking River Telephone Company has been incorporated with a capital stock of $645 by Jasper Holbrook and others.

MINOT, N. D.—The South Prairie Farmers Telephone Company has been incorporated with a capital stock of $10,000 by C. M. Christiansen and others.

BALDWIN, ILL.—The Baldwin Telephone Company, has been incorporated with a capital stock of $2,000 by Henry Lucht, W. R. Preston and others.

DELL RAPIDS, S. D.—The Highland Rural Telephone Company has been incorporated with a capital stock of $2,000 by Peter A. Anderson, G. T. Bras and others.

LOS ANGELES, CAL.—Arrangements have been made by the Pacific Telephone & Telegraph Company for the expenditure of $16,700 for immediate improvements to the local telephone system. T.

EAST CHATHAM, N. Y.—New Concord Telephone Company, Incorporated, has been granted articles of incorporation, with a capital stock of $500. The incorporators are Edward J. Colbert, J. Edwin Brown and John C. Daley, all of East Chatham.

KELLEYS ISLAND, O.—With the proceeds of the sale of an additional $6,700 of capital stock, the Kelley's Island & Sandusky Cable Company, will string a new cable between Kelley's Island and Marblehead. The company is desirous of handling telegraphic and telephone communication at the same time.

SWEENY, TEX.—The Sweeny Co-operative Telephone Company has been organized at this place. The following officers were elected to serve for the ensuing year, L. A. Riley, president; L. Schadler, vice-president; L. W. Engsberg, secretary; Dr. M. H. Eades, W. H. Clark, John Bagley, directors; H. Draper, business manager. Work on actual construction will begin at an early date and pushed to completion.

WATERVILLE, WASH.—D. M. Russell, of Appledale, and associates, recently incorporated the Moses-Coulee Telephone Company, and have announced their intention of constructing a line from the Columbia River to the large orchards in the Coulee Valley. The company has asked the Farmers Independent Telephone Company here to extend its line from Alstown to Palisades, thus connecting the line with the county seat. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

BLAINE, WASH. — The Blaine Lynden Electric Railway Company has been incorporated with a capital of $250,000 by John Pinckney, Lester Livingstone, and J. A. Willison.

FENTON, MICH.—Harry Hoever has begun a campaign for an electric line between Fenton and Howell to be owned by Ludington County. Mr. Hoever says the line can be built for $20,000 per mile or $120,000 for the entire distance.

ADRIAN, MICH.—Persistent rumors are current here to the effect that an extension of the Toledo & Western electric railway will be made soon from Adrian to Jackson, by way of Rome Center, Manitoy Beach, Wild Water Beach, Devil's Lake Station, Addison and thence on to Jackson. Address C. W. Laskey, 607 Nashby Building., Toledo, O., for further information.

SAN FRANCISCO, CAL.—A new electric company, to be known as the San Francisco & Northern Railway Company, is being formed here, to reorganize the Petaluma & Santa Rosa Railroad Company and to provide direct service between San Francisco and Healdsburg. Its steamship connection with this city will be by way of Petaluma. Expenditures of $10,000,000 will be involved.

NEW YORK, N. Y.—Westinghouse, Church, Kerr & Company, of Montreal and New York, have been retained by the Canadian Pacific Railway as engineers to investigate the matter of the proposed electrification of the new double-track Selkirk Tunnel in British Columbia. The investigations will cover in general the type of system to be installed, the relative economies of steam and water power and the effect of the electrification upon operating conditions.

OLATHE, KANS.—The Olathe, Winfield & Arkansas City Railway Company has been incorporated with a capitalization of $1,000,000 to construct an electric road 175 miles in length between Olathe, Kans., and Arkansas City, Ark. The incorporators are J. W. Gettel, W. A. Powell and F. A. Nickel, of Enid, Okla.; P. E. Wiles, Lamont, Okla.; J. E. Jones, Atlanta, Kans.; P. H. Guy, P. H. Albright, W. H. Perry, and C. M. Wallace, of Winfield, Kans. M.

ARDMORE, OKLA.—The Ardmore Electric Railway Company has been chartered to construct seven miles of street car lines in Ardmore. The estimated cost of the lines is $150,000 and the capital stock of the company is $110,000. The incorporators are George S. Craven, James C. Mort and John F. Easley, Ardmore; Asa B. Hale and William Craven, Milton, Iowa. All preliminary arrangements have been made and it is understood that construction work will start soon. P.

EVANSVILLE, IND.—It has been announced here that the suits against the Evansville, Chrisney & Lynnville Traction Company to prevent the collection of subsidy taxes in certain townships in Warrick County will be dismissed at once, and work on the building of the two lines will be started and pushed to completion. Bonds will be issued. The company will build a traction line from Boonville to Chrisney and another from Boonville to Lynnville. Both lines have been surveyed. It is believed that construction work on both roads can be finished by the first of next year.

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Custom-house, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 76-78 Appraisers' Stores Building, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 12,561. TRAIN LIGHTING SYSTEMS.—On a railway line between two foreign cities two trains are now running, fitted with experimental electric generators and accumulators for lighting purposes. The tests have been going on for some time, and it is not yet known whether either will be adopted or other systems will be invited to make experiments. An American consular officer furnishes the name of the railway in question and states that correspondence in regard to other systems of lighting should be addressed in Spanish.

NO. 12,718. ELECTRIC STOVES AND APPLIANCES.—An American consul reports that the residents of his district are beginning to equip their kitchens with electric cooking stoves, as two companies are supplying current at rates that easily compete with fuel. Manufacturers of electric stoves and allied appliances should furnish the consul with catalogs in English or Spanish. Price lists giving all discounts should accompany the catalogs.

NO. 12,719. WIRELESS TELEGRAPH STATIONS.—The American consul at Madrid reports that bids are requested for supplying and installing two wireless telegraph stations in Spain. Bids must be submitted through a local agent.

NEW INCORPORATIONS.

AUSTWELL, TEX.—The Austwell Utilities Company has been incorporated with a capital stock of $25,000 by P. R. Austin, D. S. Emison and W. H. Dunson.

McCALLEN, TEX.—The McAllen Ice, Light & Water Company has been incorporated with a capital of $10,000 by F. E. Osborne, R. E. Hoen, and J. T. Cardwell.

NEW YORK, N. Y.—South Electric Manufacturing Company, Incorporated, has been incorporated, capitalized at $25,000, by Lewis C. Randolph, William D. Ligon and Charles R. Peddle, all of New York City.

EAST ST. LOUIS, ILL.—American Carbon & Battery Company has been incorporated with a capital stock of $250,000 to manufacture and deal in carbon products. The incorporators are William C. Schramm, Joseph O'Neil and Frank H. Sullivan.

NEW YORK, N. Y.—Progressive Electric Welding Company, Incorporated, has been granted articles of incorporation, capitalized at $30,000, by Ernst Von Der Heyde, Eugene Wollesky, of New York City, and Charles L. White, of Passaic, N. J.

CLEVELAND, O.—Electric Products Company has been incorporated for the purpose of manufacturing and dealing in electrical supplies. The capital stock is $1,000 and the incorporators are William Rodewell, Joseph F. Meyer, George B. Myers, V. C. Birchall and T. H. Ball.

WILMINGTON, DEL.—A Delaware charter has been secured by the Polyacousticon Company. Incorporated. The promoters propose to erect wireless stations along the Atlantic Coast and to maintain, besides, the usual message service, a system of aerogram press service. Charles B. Bishop of Wilmington, Del., is the officer of record. Eastern capitalists are said to be backing the venture. N.

PROPOSALS.

ELECTRIC-LIGHT CABLE. — On March 26 bids will be received by F. T. Bowler, secretary, Detroit, Mich., for furnishing lead-covered electric-light cable and oil-break switches.

WHITE WAY LIGHTING SYSTEM.—Bids will be received March 31 for furnishing all material for the construction of a "White Way" lighting system. Address A. R. Watkins, city auditor, Fargo, N. D.

ELECTRICAL EQUIPMENT. — Bids will be received on April 6th for 25 electric meters; 1,000 electric lamps; 500 pounds of insulated wire; 500 pounds of copper wire; 100 cross-arms; 400 pins. Address H. S. Ely, city clerk, Winterset, Iowa.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 7 for furnishing 275 cross-arms for electric-light poles and three single-phase transformers, as per Schedule 6537, for delivery at the Navy Yard, Norfolk, Va.

EXTENSION TO POWER HOUSE.—April 15 bids will be received for labor and material necessary for the construction of an addition to the power house, extension of steam, water and electric lines, additional machinery, telephone system, signal system, etc., in accordance with plans and specifications prepared by Architects C. C. & A. L. Thayer, of Newcastle, Pa. Work to be done at the District Tuberculosis Hospital, Springfield Lake. Address F. L. Allen, secretary.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 21 for supplying the following electrical equipment to be delivered to the Navy Yard named in each case, all as per Schedule 6434; one six-drop watertight annunciator, miscellaneous electric fixtures, six portable voltmeters, 100 portable hooks, Brooklyn, N. Y.; miscellaneous nonwatertight bells and buzzers, Brooklyn and Philadelphia; miscellaneous branch boxes, junction boxes, etc., Norfolk and Mare Island; four 250-volt 25-ampere circuit breakers, 175 pounds hard sheet rubber, Mare Island; 1,975 portable nonwatertight guards, 31 120-volt electric flat irons, East; 12 120-volt electric disk heaters, Philadelphia and Mare Island; miscellaneous shadeholders, Brooklyn and Norfolk; 120 keyless sockets, catalog 59,954, Puget Sound; 45,000 two-hole wire terminals, Boston and Norfolk; miscellaneous terminal and stuffing tubes, Norfolk; 300 nonwatertight push buttons, Brooklyn and Mare Island; miscellaneous sheet and rod fiber, interior fittings, interior fittings for switches, 85,000 three-ampere glass-tube fuses, miscellaneous cartridge-type inclosed fuses, link and plug fuses, renewable fuses and elements for same, 3,200 hard-rubber bushings, miscellaneous pear-shaped push buttons, miscellaneous insulators, electric soldering irons, mica and pressed mica plate, nonwatertight attachment plugs, 20 portable ventilating sets and miscellaneous wire magnet, for Navy Yards East and West.

FINANCIAL NOTES.

Chicago City Railway will issue $3,000,000 first-mortgage rehabilitation bonds for 1914 needs.

The Pacific Gas & Electric Company, it is stated, will shortly issue $12,000,00 six-per-cent preferred stock, ranking with the present issue of preferred. The new securities, it is said, will be offered to preferred stockholders at 80, on a basis of six shares of new stock for five shares of old.

Stockholders of the Cities Service Company, at the next annual meeting of the company, to be held at Dover, Del., April 7, will be asked to approve an increase in the capitalization of the company from $20,000,000 common and $30,000,000 six-per-cent preferred to $25,000,000 common and $40,000,000 six-per-cent preferred, respectively. The new stock will not be issued promptly, but is to allow the company the right to do future financing.

Sales of the Idaho-Oregon Light & Power Company, which was to be made on March 16 under order of the court in the receivership proceedings, was deferred, and no date set for future sale. The property will continue to be operated by the receiver, and the court will be asked to authorize the issue of receiver's certificates for approximately $250,000, the proceeds of which will be used to install about 4,000 horsepower at the Ox Bow hydroelectric development. The company will then be able to provide all its own current, and purchases from other companies may be discontinued.

The Board of Directors of the North American Company at its organization meeting elected James Campbell chairman. Mr. Campbell had resigned as president. James D. Mortimer, vice-president, was elected to succeed him, and George R. Sheldon was elected vice-president to succeed Mr. Mortimer. James F. Fogarty, Edwin Gruhl and William T. Graham have been elected directors during the last year to fill the vacancies. Retiring officers were re-elected at the annual meetings of the West Kentucky Coal Company, Milwaukee Railway and Electric Light Company, Milwaukee Light, Heat and Traction Company and the Wisconsin Edison Company.

Under the reorganization plan, the American Water Works & Guarantee Company will be known as the American Water Works & Electric Company. Each depositor of preferred stock will be entitled, upon subscription and payment of $35 a share, to receive $40 par value in first preferred and $100 par value in participating preferred stock of the new company. Each depositor of preferred stock, who does not make any subscription and payment, will be entitled to receive for each share of preferred $50 par value in participating preferred stock on payment of an assessment of $5 each on the shares of the old company.

Dividends.

American Public Utilities; quarterly, of 1.5 per cent on preferred, payable April 1 to stock of record March 16, and 0.75 per cent on common, payable April 2 to stock of record March 16.

American Telephone & Telegraph Company; quarterly of two per cent, payable April 15 to stock of record March 20.

California Electric Generating Company; a quarterly preferred dividend of 1.5 per cent, payable April 1 to stock of record March 20.

California Railway & Power Company; a quarterly preferred dividend of 1.75 per cent, payable April 1 to stock of record March 21.

Capital Traction Company; a quarterly dividend of 1.5 per cent, payable April 1 to stock of record March 14.

Cincinnati Suburban Bell Telephone Company; quarterly of 2.5 per cent, payable April 1.

Cincinnati, Hamilton & Dayton Traction Company; a quarterly common dividend of one per cent, and a preferred dividend of 1.25 per cent, both payable April 1 to stock of record March 20.

Cities Service Company; monthly of 0.5 per cent on preferred and 0.5 per cent on common, both payable May 1 to stock of record April 15.

Columbus, Newark & Zanesville Electric Railway Company; a quarterly preferred dividend of 1.5 per cent, payable April 1 to stock of record March 25.

Detroit Edison Company; quarterly of 1.75 per cent, payable April 15 to stock of record April 1.

Eastern Michigan Edison Company; quarterly of one per cent, payable April 15 to stock of record April 1.

Electric Securities Corporation; a quarterly common dividend of two per cent, and a quarterly preferred dividend of 1.25 per cent; the former payable April 1 and the latter May 1.

Houghton County Traction Company; semi-annual of $2.50 on common and $3 on preferred, both payable April 1 to stock of record March 21.

Kansas Gas & Electric Company; quarterly of 1.75 per cent on preferred, payable April 1 to stock of record March 25.

Lowell Electric Light Corporation; quarterly of $2 a share, payable May 1 to stock of record April 15.

Massachusetts Lighting Company; quarterly of $1.75 a share on old common, $1.50 a share on new preferred, and 25 cents a share on new common, payable April 15 to stock of record March 25.

National Carbon Company; quarterly of 1.5 per cent on common, payable April 15 to stock of record April 4.

New England Telephone & Telegraph Company; quarterly of 1.75 per cent, payable March 31 to stock of record March 18.

New Orleans Railway & Light Company; quarterly of 0.5 per cent on common and 1.25 per cent on preferred, payable March 31.

Niagara Falls Power Company; a quarterly dividend of $2 per share, payable April 15 to stock of record March 31.

Philadelphia Company; quarterly of 1.75 per cent on common and semi-annual of three per cent on preferred, both payable May 1 to stock of record April 1.

Public Service Corporation of New Jersey; a quarterly dividend of 1.5 per cent, payable March 31 to stock of record March 27.

Republic Railway & Light Company; quarterly of 1.5 per cent on preferred, payable April 15 to stock of record March 31.

Trinidad Electric Company; quarterly of 1.25 per cent, payable April 10 to stock of record March 31.

United Utilities Company; quarterly of 1.75 per cent on preferred, payable April 1 to stock of record March 21.

Winnipeg Electric Railway Company; quarterly of three per cent, payable April 1 to stock of record March 20.

Reports of Earnings.

UTAH SECURITIES CORPORATION.

(Utah Power & Light and Subsidiaries.)

	1914	1913
January gross	$ 158,400	$ 140,575
Net after taxes	95,306	80,201
Six months' gross	936,145	754,076
Net after taxes	560,069	412,785
12 months' gross	1,773,286	1,485,989
Net after taxes	1,062,869	806,609

CENTRAL STATES ELECTRIC.

The Cleveland Electric Illuminating Company operating subsidiary of Central States Electric Corporation reports:

	1914.	1913.
January gross	$ 409,468	$ 361,975
Net after taxes	209,909	186,211
Surplus after charges and preferred dividends	174,305	149,856
Twelve months' gross	4,056,268	3,261,457
Net after taxes	1,958,308	1,506,155
Surplus after charges and preferred dividends	1,546,227	1,121,575

NORTHERN STATES POWER.

The consolidated earnings of the companies embraced in the Northern States Power Company and the Consumers Power Company, for the twelve months ended December 31, 1913, compare as follows:

	1913	1912
Gross	$3,887,408	$2,821,402
Net	1,956,934	1,374,743
Surplus after charges	752,309	531,130
Preferred dividend	571,513	423,163
Surplus	180,796	107,967

CONSUMERS' POWER COMPANY.

The Consumers' Power Company of Maine and its constituent companies report for January and 12 months as follows:

	January	12 Months
Gross earnings	$318,067	$3,174,732
Operating expenses	119,939	1,440,043
Net earnings	$198,127	$1,734,688
Fixed charges	92,639	1,021,456
Net profits	$105,488	$713,232
Div. preferred stock	27,500	323,500
Balance	$77,988	$389,732

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 23	March 16
American Tel. & Tel. (New York)	122	122⅜
Commonwealth Edison (Chicago)	139	138
Edison Electric Illuminating (Boston)	260	260½
Electric Storage Battery common (Philadelphia)	54¼	53½
Electric Storage Battery preferred (Philadelphia)	54¼	53½
General Electric (New York)	147½	147½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1⅛
Massachusetts Electric common (Boston)	11	11½
Massachusetts Electric preferred (Boston)	61½	62
National Carbon common (Chicago)	109	105½
National Carbon preferred (Chicago)	117	117
New England Telephone (Boston)	138	138
Philadelphia Electric (Philadelphia)	26¾	26⅞
Postal Telegraph and Cables common (New York)	83½	84½
Postal Telegraph and Cables preferred (New York)	64¾	64¾
Western Union (New York)	63¼	63½
Westinghouse common (New York)	77¼	75¼
Westinghouse preferred (New York)	118	116¾

PERSONAL MENTION.

MR. MILES F. STEEL, Pacific Coast representative of the Benjamin Electric & Manufacturing Company, was in Salt Lake City last week on his regular trip over the territory.

MR. VICTOR L. CRAWFORD, who for nine years has been in continuous service with the firm of W. N. Matthews & Brother, St. Louis, Mo., has tendered his resignation, effective April 1.

MR. W. H. TRASK, formerly commercial agent of the Idaho Railway, Light & Power Company, has taken a position in the commercial department of the Utah Power & Light Company at Salt Lake City.

MR. C. B. HAWLEY, manager of the Intermountain Electric Company, Salt Lake City, has returned from Pocatello, Idaho, where he spent a week in connection with his company's business in that territory.

MR. A. L. POWELL, of the Edison Lamp Company, Newark, N. J., tendered an address on the illumination of streets, homes, public buildings and factories, before the Clinton Hill Improvement Association, Berkeley Hall, Newark, on March 9.

MR. PRESS H. BAILEY, formerly of Fremont, O., where he was manager of the Fremont Gas, Electric Light & Power Company, has been doing excellent work in his new location at Louisville, Ky., where he is industrial engineer of the Louisville Gas & Electric Company.

MR. J. C. RENNARD, real-estate manager of the New York Telephone Company, delivered an address entitled "The Real Estate of a Telephone Company" at the 151st meeting of the Telephone Society of New York, held at the United Engineers' Building, New York City, on March 23.

MR. CHARLES S. GLEED, chairman of the Board of Directors of the Southwestern Telephone System, spoke on the subject of "Public Service Corporations" at the luncheon meeting of the St. Louis League of Electrical Interests, Jovian Chapter, held at the American Hotel Annex, St. Louis, Mo., on March 24.

PROF. WARWICK ANDERSON, who occupies the chair of physics in the University of Louisville, Louisville, Ky., addressed a recent meeting of the Engineers' and Architects' Club of that city on the subject "A Recent Electric Theory." The theory referred to was to the effect that electric forces are the basis of all matter.

MR. J. GLEASON, traveling representative for the Western Conduit Company, subsidiary to the Youngstown Sheet Tube Company, Youngstown, O., has been appointed manager of the Philadelphia (Pa.) office of the same company, with offices at 1733 Land Title Building. Mr. Gleason assumes his new duties immediately.

MR. WILLIAM P. BEAR, formerly with the Westinghouse Electric & Manufacturing Company and with the General Electric Company, has been appointed traveling representative of The Trumbull Electric Manufacturing Company, Chicago, Ill., with headquarters in that city. Mr. Bear will cover the states in that territory east of the Mississippi River, also Iowa, Missouri, Arkansas and the Southern states south of the Virginia line, relieving MR. W. P. NASER, who will now devote his attention to the Northern and Western territory, also with headquarters in Chicago.

MR. O. G. DRAPER has resigned as business secretary of the Electric Motor Car Club of Boston, Mass., and the New England Section, Electric Vehicle Association of America, and has become identified with the Buffalo Electric Vehicle Company, Buffalo, N.. Y., devoting his activities to the New England field. MR. CHARLES H. MILES, in charge of electric vehicle work for the Edison Electric Illuminating Company, of Boston, will carry on the duties connected with the above organization.

MR. R. J. McCLELLAND, chief engineer of the Electric Bond & Share Company, of New York City, accompanied by MR. LOUIS ELLIOTT, New York engineer for the same company, for the Utah, Idaho and Colorado district; MR. H. H. DEWEY, engineer for the General Electric Company in the power and mining department, handling matters in the same territory; and MR. F. C. GREEN, engineer of the transformer department at the Pittsfield Works of the General Electric Company, have been in Salt Lake City during the past week going over the system of the Utah Power & Light Company, particularly with reference to the 110,000-volt transmission system which that company proposes to place in operation in the near future.

OBITUARY.

MR. EDWIN N. CORYELL, consulting engineer of New York City, died of heart failure in his office on March 23. He had been for 30 years consulting engineer for the Cameron Steam Pump Works, owned by the Ingersoll-Rand Company.

MR. WALTER L. ISAACS, an electrical expert, died of pneumonia at his home in Brooklyn, N. Y., on March 8 at the age of 50. He was formerly in business on the Isthmus of Panama and was a Past Master of a Masonic lodge of the city of Panama. He leaves a wife, four sons and three daughters.

MR. BYRON LAFLIN SMITH died in Chicago, Ill., on March 21, of heart failure. Mr. Smith was president and founder of the Northern Trust Company, of Chicago, a director of the Chicago & Northwestern Railroad Company, the Atchison, Topeka & Santa Fe Railroad Company, and of the Commonwealth Edison Company.

MR. CHARLES E. Du VAL, head of the accounting department of the Edison Electric Illuminating Company, died of general debility at his home in Brooklyn, N. Y., on March 9. Mr. Du Val was 60 years of age and had been connected with the Edison company for more than 30 years, and was at one time associated with Mr. Thomas A. Edison. He was a member of the Veterans' Association of the Twenty-third Regiment. He is survived by two sons and two daughters.

MR. JAMES SHELDON CUMMINS, one of the original partners of H. M. Byllesby & Company, died at his residence, the Bryson Hotel, Chicago, Ill., on March 23, after an illness of two weeks. Mr. Cummins was born in 1857 in Pennsylvania, the son of James R. and Sarah Bishop Cummins, and was educated at Swarthmore College. He was admitted to the Pennsylvania bar in 1882 and practiced law at Media, Pa., where he was married in 1889 to Alice Charlotte Byllesby, daughter of the Rev. DeWitt Clinton Byllesby. In 1891 Mr. Cummins came to Chicago and was counsel for the Thomson-Houston Electric Company until the company was consolidated with the General Electric Company in 1893, after which date he served the latter company in a similar capacity. The deceased was the senior member of the law firm of Cummins, Stearns & Milkewitch, and vice-president, director, senior counsel and one of the founders of H. M. Byllesby & Company, whose offices were closed on March 25 as a mark of respect.

NEW PUBLICATIONS.

VALUATION FOR RATE-MAKING.—The article by Robert H. Whitten entitled "Fair Value for Rate Purposes" has been reprinted from the *Harvard Law Review,* Vol. XXVII, No. 5.

GOVERNMENT OWNERSHIP.—The report of the committee of the Post Office Department on "Government Ownership of Electrical Means of Communication" has been printed as Senate Document No. 399, and is now available for distribution.

CANADIAN ELECTRICAL RULES.—The Hydro-Electric Power Commission of Ontario has issued a second edition of the "Rules and Regulations for Interior Electrical Work, Signaling Systems, Wireless Telegraph Apparatus, Electric Railway Work," etc.

DATES AHEAD.

Society of Efficiency, New York, N. Y., April 4-11. Secretary, W. H. Tallis, 41 Park Row, New York City.

American Institute of Electrical Engineers. Pittsburgh, Pa. April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Federal Sign System (Electric), will remove its New York office to the United States Rubber Building, 1790 Broadway, New York City, on March 30.

The Delta-Star Electric Company, Chicago, Ill., is distributing bulletin No. 3, devoted to high-tension line and outdoor substation equipments. About 105 illustrations are shown, many of which are of installations in operation.

The Connecticut Telephone & Electric Company, Meriden, Conn., manufacturer of the well known Connecticut ignition products, has appointed Chas. E. Stahl, of Chicago, sales manager.

The Bristol Company, Waterbury, Conn., has issued bulletin No. 801 devoted to the Bristo patented safety setscrews. This bulletin points out the advantages of this type of hollow setscrew, describes their construction and gives full data respecting them.

Cooper Hewitt Electric Company announces that the steady increase in its business has necessitated the removal of its Chicago office to 506 Fisher Building. The new quarters provide more room for this office and in every way afford better facilities for the prompt conduct of the business.

The Import Sales Company, New York City, announces that the Diamond line of flashlights is increasing in popularity. Full information, including special circulars, catalogs and leaflets are available for distribution. The company has moved into new quarters and has now available more than twice the floor space that was used last year.

The Holt Electric Company, Milwaukee, Wis., has issued a booklet describing its electric starters for automobiles. These starters are designed to start any engine used in pleasure automobiles on the market today. The starter, which is of simple four-unit construction, is operated by a six-volt battery, which is charged from a lighting dynamo.

The Terry Steam Turbine Company, Hartford, Conn., announces that it has concluded arrangements with Fraser & Chalmers, Limited, 3 London Wall Buildings, London, England, whereby this firm will handle Terry steam turbines in England and all British colonies, excepting Canada. This arrangement does not include marine forced-draft sets, which as before are being handled by Yarrow & Company, Glasgow, Scotland.

U. S. Electrical Manufacturing Company, Los Angeles, Cal., has issued bulletin No. "A," describing its type "FR," constant-speed, riveted-frame, polyphase induction motors. These motors supersede type "C," and embody all the desirable features of the older type. The motors are made for two and three-phase operation, in capacities up to 15 horsepower. A supplement to this bulletin gives diagrams showing the general construction and ventilation of the motors.

The Robbins & Myers Company, Springfield, O., manufacturer of the famous "Standard" line of small motors and fans for ceiling, desk, bracket, etc., has accepted an invitation to membership in the Rice Leaders of the World Association. The membership of this association is composed of leading manufacturers, each representing a different line of industry. The object of the association is co-operatively to exercise the united prestige of members towards the development of their interests individually.

Mohawk Electric Manufacturing Company, Newark, N. J., has issued a pamphlet describing the Mohawk electrolytic rectifier for use in charging storage batteries from alternating-current circuits. This equipment consists of an aluminum-cell rectifier together with switchboard, transformer and all necessary instruments, switches, etc. The pamphlet describes the equipment in detail and shows how easily its operation can be carried on. Storage batteries suitable for fire alarm, telephone, telegraph and similar service are also described.

The Dana Manufacturing Company, Cincinnati, O., has issued a large well illustrated folder describing the electric general power machine and ice-cream freezer manufactured by the company. This compact equipment is composed of a motor arranged for driving an ice-cream freezer, an ice crusher and an auxiliary shaft on which may be mounted an emery wheel, buffer or other device, or which may be connected to a washing machine, ironer or other household appliance. The outfit, therefore, is suitable for general utility in households, boarding houses, hotels, clubs, ice-cream parlors, etc.

Safety Insulated Wire & Cable Company, 114 Liberty Street, New York, N. Y., has issued a little folder entitled, "How One Town Solved Its Lighting Problem." This folder explains how Forest Park, Ill., was able to obtain an underground lighting system with limited means. "Safety" steel-taped cable was laid in shallow trenches dug along the curb, the dirt thrown in and the bricks replaced. In this way an underground system to replace unsightly poles and wires was completed in the shortest time, and at an extremely low cost. The cable is waterproof, heat-proof and practically accident-proof.

Elmer P. Morris Iron Works, Incorporated, 136 Liberty Street, New York, will hereafter act as selling agent for the lamp-post and electrical accessory department of the Central Foundry Company, of New York. The latter company has taken over all designs, patterns, patents and good will of the Elmer P. Morris Iron Works. For the present the manufacturing of this line will be carried on at the Central Foundry Company's plant at Baltimore, Md., and as soon as duplicate patterns and equipment can be secured additional manufacturing will be done at other plants of the Central Foundry Company, namely, at Newark, N. J.; Medinah, N. Y.; Vincennes, Ind.; Holt, Bessemer and Anniston, Ala.

The Barber-Dwinnell Electric & Manufacturing Company, Kansas City, Kans., has published a very interesting and practicable net-price sheet on electrical material. This book has been prepared for the busy electrical contractor and central-station manager who often have to figure prices on apparatus and have not the time necessary to figure a string of fractional discounts and then get the freight rate from some distant city in order to arrive at cost. All discounts have been figured, excepting those for cash, and the prices given are all net prices to the trade. In every case possible prices are also listed F. O. B., cars Kansas City. The company is doing a fine business and announces that the prospects in general are brighter this spring than they have been for many years. The installation of a three-phase plant at Burwell, Neb., and a storage-battery lighting plant at Milligan, Neb., have just been completed.

The General Electric Company, Schenectady, N. Y., has issued bulletin No. A4200, which illustrates and describes strain insulators and strain clamps, suitable for insulating and supporting power-house wiring and overhead distributing cables and wires. Catalog numbers and prices of the various articles are given. Bulletin No. 44590 describes the type ML governor, the function of which is to automatically control the operation of either stationary or railway motor-driven air compressors in order to maintain air pressure in a storage reservoir between predetermined limits. Bulletin No. 47400, illustrating and describing the Type F, Form K12 oil switches has recently been issued. This supersedes a previous bulletin on this subject, and contains up-to-date information on this important piece of apparatus. The company has also issued bulletin No. 45601, entitled "Aluminum Lightning Arresters for Alternating-Current Circuits," which supersedes bulletin No. A4042 on the same subject. The bulletin consists of thirty-two pages, filled with detailed information relative to these arresters and choke coils for use with them, with notes on the charging operation, installation and ground connections. There are also diagrams and tables of dimensions of both arrester and choke coils. Another recent bulletin is one, No. 45,600, which describes vacuum-tube lightning arresters for use in connection with railway signal circuits. It supersedes the company's previous bulletin on the same subject.

Record of Electrical Patents.

Issued by the United States Patent Office, March 17, 1914.

1,090,154. Electrolier. J. H. Jones, Leavenworth, Kans. An extensible fixture having a spool with special contacts and brush to permit lowering of the body of the fixture.

1,090,159. Brush-Holder. J. C. Lincoln, Cleveland, O. A special adjustable spring construction.

1,090,170. Safety Appliance for Elevator Cars. C. Schenck, assignor to Elevator Supply & Repair Co., Chicago, Ill. Includes electromagnetically controlled locks for the shaft doors interconnected with the circuit of the elevator motor.

1,090,190. Electrically Connecting Device. R. James Bell, Harvey, Ill. A J-shaped bolt grasps the base of a rail and carries a sleeved head to receive the end of an electric wire.

1,090,201. Charging-Switch for Storage Batteries. C. W. Coleman, deceased, by K. Coleman, administratrix, Westfield, N. J., assignor to Hall Switch & Signal Co., New York, N. Y. A rotatable switch to connect two batteries alternately to the charging and discharging circuits.

1,090,213. High-Speed Railway. T. L. Johnson, Cleveland, O.; M. J. Johnson, administratrix of said T. L. Johnson, deceased. An electric traction system in which the truck carries an electromagnet to both lift and propel itself along the track.

1,090,215. Mechanism for Electrically Controlling and Operating Fare-Registers and Other Devices. E. J. Kennedy, New York, N. Y. An automatic repeating switch controlled by a push-button.

1,090,217. Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Provides means for transmitting Morse messages by a series of impulses of alternating polarity.

1,090,234. Insulating and Supporting Mechanism. J. W. Rogers, Woodbury, N. J., assignor of one-half to N. Shute. For mounting a third rail in an insulating trough and a guard above the rail.

1,090,237. Automatic Valve-Alarm System. F. V. Sackett, assignor to General Fire Extinguisher Co., Providence, R. I. A spring motor closes the alarm circuit when the pressure is varied.

1,090,238. Electric Curler and the Like. E. Schwartz, assignor to Wm. E. Slaughter Co., Chicago, Ill. Relates to the terminal arrangement.

1,090,254. Lamp-Shade Holder. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. Has rotatable disks to engage a flanged lamp socket.

1,090,301. Control of Signal Lamps. L. A. Hawkins, assignor to Union Switch & Signal Co. Special control for railway lamps supplied through transformers.

1,090,302. Vehicle Signal. J. B. Hawks and H. R. Kennedy, Los Angeles, Cal. An electrically lighted rotatable direction indicator.

1,090,309. Electric Railway Signal. J. B. Howell, Leavenworth, Kans. A two-armed switch lever is mounted above the trolley wire so as to be actuated by the trolley wheel.

1,090,328. Single-Phase Motor. C. B. Mills, assignor to Westinghouse Electric & Mfg. Co. Comprises a commutator, a ring with a garter spring located in its groove and a relatively low-resistance short-circuiting shunt comprising a braided tubular member within the garter spring.

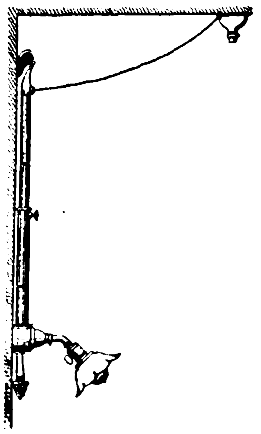
1,090,339. Electrically Heated Stove. T. S. Perkins and E. E. Rose, assignors to Westinghouse Electric & Mfg. Co. A disk stove with gear-operated switch controlled from the side.

1,090,354. Socket for Incandescent Electric Lamps. W. C. Tregoning, assignor to Tregoning Electric Mfg. Co., Cleveland, O. Covers details of the key switch.

1,090,357. Electric Signal System for Railways. H. J. Warthen, Washington, D. C. Block system with control of locomotive cab signals through ramp rails along the track sections.

1,090,358. System for Controlling the Operation of Railroad Trains. H. J. Warthen. Electrical control of the air brakes through track circuits with ramps.

1,090,359. Electric Train-Control System for Railroads. H. J. Warthen. Relates to the track circuits and ramps.



1,090,374.—Portable Bracket Fixture.

1,090,360. Electric Signal for Railroads. H. J. Warthen. A special contact shoe on the train engages a track ramp and actuates a solenoid.

1,090,361. Apparatus for Controlling the Speed of Railroad Trains. H. J. Warthen. The spindle of a flyball governor belted to the axle electrically controls an air-brake valve.

1,090,362. Electric Signal for Railways. H. J. Warthen. An automatic block signaling system.

1,090,363. Trolley for Electric Signals for Railways. H. J. Warthen. For engaging an inverted third rail.

1,090,365. Printing Telegraph. J. E. Wright, Pittsburgh, Pa. Includes electrically controlled stops for limiting the rotation of a spindle.

1,090,366. Keyboard for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co., New York, N. Y. Includes key-controlled circuit selectors and means controlled by the transmitting sunflower for connecting the selected circuits with their corresponding sunflower segments.

1,090,367. Translator for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co. Includes special electromagnetic control.

1,090,368. Transmitter for Printing-Telegraph Systems. J. E. Wright, assignor to Wright Telegraphic Typewriter Co. Includes two normally locked sunflower instruments having corresponding contact segments and located at opposite ends of the line.

1,090,369. Insulating Sleeve or Tube Machine. F. Wunderlich, assignor to Westinghouse Electric & Mfg. Co. Comprises a rotary shaft, resilient means for wrapping a flexible sleeve about the shaft, means for preventing turning of the sleeve with the shaft and a chute for feeding insulating strips into the sleeve.

1,090,372. Dry Battery. J. A. E. Achenbach, Hamburg, Germany. Comprises a central positive electrode, surrounded by a negative electrode consisting of several layers of corrugated finely perforated zinc, and a semisolid electrolyte.

1,090,374. Portable Electrolier. G. H. Barnhart, Ouray, Colo. A bracket arranged for vertical telescopic adjustment and adapted to be suspended from a picture molding. (See cut.)

1,090,378. Railway-Signal-Operating Mechanism. J. Blackburn, Kirkwood, Mo. An electric motor-operated semaphore.

1,090,388. Automatic Labeling-Machine. T. M. Foote, assignor to National Binding Machine Co., New York, N. Y. Includes an electrically actuated knife.

1,090,391. Apparatus for Manufacturing Nitrogen Compounds. T. Fujiyama, Tokyo, Japan. Has an electric heater in the chamber.

1,090,394. Coil-Insulating Machine. E. Haefely, assignor to Westinghouse Electric & Mfg. Co. Comprises a rotary hollow member having a pair of internal pivoted arms and pressure members at the extremities thereof.

1,090,412. Circuits for Automatic Fire-Indicators. O. Rennert, Munich, Germany. Comprises a pair of normally closed circuits and a number of thermal circuit-closers interposed in parallel between one side of each of the circuits.

1,090,413. Apparatus for Producing Photographic Time Records of Meter Readings. S. G. Rhodes, assignor to T. E. Murray, New York, N. Y. Includes an electric meter and clock, a continuous sensitized record strip, means for projecting an image of the dials upon the strip, a motor for actuating the strip and a clock-controlled electromagnet governing the motor and in circuit with the meter.

1,090,419. Calibrating Device. S. D. Sprong, Brooklyn, N. Y. For checking a D'Arsonval instrument.

1,090,427 and 1,090,428. Electric Zinc-Furnace with Integral Condenser. J. Thomson, New York, N. Y. Has a carbon-bed resistor.

1,090,429. Universal Electric Furnace, Combined with Means for Condensing Zinc. J. Thomson. Has a resistor resting on an open table.

1,090,435. Harmonic Signaling System. H. G. Webster, Chicago, Ill. Telephone ringing system with sources of alternating current producing frequencies of 33.3, 50 and 66.7 cycles.

1,090,436. Call Bell. H. G. Webster. A telephone bell with a tuned electromagnetic reed striker.

1,090,445. Cartridge Fuse. L. D. Blackman, Battle Creek, Mich. Has special terminal construction.

1,090,455. Railway Signaling Apparatus. W. J. Cook, assignor to Cook Railway Signal Co., Denver, Colo. A ramp adjacent the track actuates an electrically operated alarm on the train.

1,090,456. Process of Forming Joints. W. A. Darrah, Brooklyn, N. Y. The end of an insulating tube is rendered conducting and a metal is then electrodeposited thereon.

1,090,465. Adjustable Lamp-Shade. F. Evans, assignor to Patented Devices Co., New York, N. Y. A circular screen held by fingers projecting perpendicularly thereto engages the lamp bulb.

1,090,481. Fan. F. Lambert, Brooklyn, N. Y. An oscillating fan motor.

1,090,489. Meter-Testing Cutout. T. E. Murray, New York, N. Y. An electric cutout having contact clips, fuses and a testing plug.

1,090,497. Sprinkler Supervisory System. C. F. Patterson, New York, N. Y. Includes a number of contact devices actuating an electric signal system for indicating pressure and movement of water in the riser.

1,090,516. Apparatus for Magnetizing Desulfurized Ores. G. S. Brooks, assignor to Mineral Point Zinc Co., Depue, Ill. Has means for increasing the magnetic gap between the constituents of the dead roasted ore.

1,090,527. Cap and Shell Fastening for Lamp-Socket Casings. E. H. Freeman, Trenton, N. J. Has a locking tongue with external operating means.

1,090,528. Electrical Border-Light Receptacle. E. H. Freeman, assignor to E. H. Freeman Electric Co., Trenton, N. J. Has an L-shaped body with a socket and a wiring base projecting at right angles to the socket. (See cut.)

1,090,557. Transmitter. R. S. M. Mitchell, assignor to Talking Moving Picture Co., Syracuse, N. Y. A three-way telephone transmitter.

1,090,568. Means for Collectively Actuating and Controlling Alternating-Current Motors. J. L. Routin, Paris, France. Means for furnishing stators of induction motors with single-phase and polyphase current and of transmitting current generated in the rotors for the purpose of producing synchronous rotation of other motors.

1,090,579. Electric Hair-Drier. J. T. Stapleton, Jersey City, N. J., assignor of one-half to V. H. Skinner. Includes use of electric heating coils.

1,090,580. Apparatus for Starting Multiple-Cylinder Internal-Combustion Motors. H. Stöcker, assignor to Weckerlein & Stöcker, Nuremberg, Germany. Includes use of main and auxiliary magnetos.

1,090,600. Starting Device for Internal-Combustion Engines. D. E. Crouse, assignor to Auto Air Appliance Co., Baltimore, Md. Includes electromagnetic control gear.

1,090,618. Process and Machine for Making Switch Parts. W. F. Hosford, assignor to Western Electric Co. An electric welding process involving the use of a transformer.

1,090,619. Process and Machine for Forming and Affixing Switch-Contacts. W. F. Hosford, assignor to Western Electric Co. A modification of the foregoing.

1,090,622. Picture-Projecting Device. C. F. Jenkins, Washington, D. C. Has a special arc and controlling rheostat therefor.

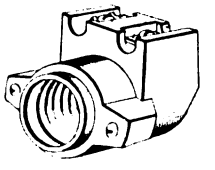
1,090,624. Casing for Electric Cells. I. Kaempfer, New York, N. Y. A sealed paper carton with a contact at each end.

1,090,627. Signaling Device for Party-Line Telephones. T. Kernan, East St. Cloud, Minn. Includes a motor for operating the signaling device.

1,090,629. Electric Socket. G. C. Knauff, Chicago, Ill. A keyless socket associated with a plug connector.

1,090,630. Socket for Electric Lamps. G. C. Knauff. Covers details of the foregoing.

1,090,657. Trolley. H. Shaffert, East Pittsburgh, Pa. A trolley harp of box-like construction.



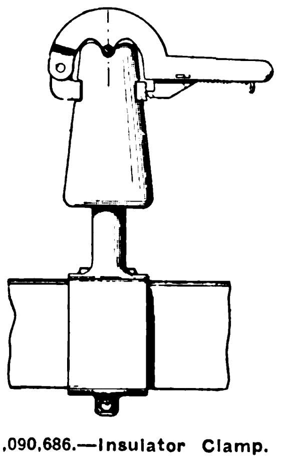
1,090,528.—Border-Light Receptacle.

1,090,672. Electric Curling-Iron Heater. C. H. Austin, Palmyra, N. Y. A heater with a socket-connecting plug at one end is arranged for receiving the curling iron.

1,090,682. Electric Shoe. K. H. Brown, Chicago, Ill. Has an electric cell in the heel and electrodes at the ankle.

1,090,686. Insulator Clamp. W. A. Cook, Shinnston, W. Va. Has special means for clamping the wire. (See cut.)

1,090,726. Carbon-Holder for Electric-Arc Lamps. B. B. Lacy, Houston, Tex., assignor to H. E. Elrod. Special clutch construction.



1,090,686.—Insulator Clamp.

1,090,763. Electric-Battery Cell. H. A. Thomas, Springfield, Ill. The anode contains zinc, bismuth, mercury and platinum.

1,090,794. Automatic Circuit-Closing Device for Elevators. C. W. Sauer, Jr., Elizabeth, N. J. Associated with elevator doors.

1,090,795. Lighting Fixture. F. P. Schoenhardt, assignor to Edward Miller & Co., Meriden, Conn. An indirect fixture having translucent top and side openings.

1,090,805. Junction Box. J. F. Wagner, assignor to Arnold-Wagner Electric Co., South Bend, Ind. An integral box with special lugs at the side and rear.

1,090,806. Automatic Air-Brake Control for Railways. H. J. Warthen, Washington, D. C. Includes electromagnetic means for controlling air-brake valves.

1,090,815. Spark Plug. F. E. Harter, Olympia, Wash. Covers details.

1,090,816. Signaling Device. C. Henschel, assignor to Chas. Cory & Son, New York, N. Y. Has a toothed disk and a number of circuit-control switches.

1,090,821. Telephone System. F. R. Parker, Chicago, Ill. Includes a special signaling system.

1,090,825. Railway Signaling System. M. H. Collins, West Hoboken, N. J. An alternating-current block signal system.

Patents Expired.

The following United States electrical patents expired March 23, 1914.

579,161. Electric Arc Lamp. J. A. Mosher, Chicago, Ill.

579,169. Sand-Box for Electric Cars. M. M. Nash, Lowell, Mass.

579,169. Telegraph Call-Bell. J. N. Newsom, St. Louis, Mo.

579,170. Electrically Operated Signal or Semaphore. J. N. Newsom.

579,211. Electrical Amalgamator. W. Wright, New York, N. Y.

579,213. Device for House-Wiring. H. R. Young, Lakeport, N. H.

579,221. Signal-Recording Mechanism. A. E. Colgate, New York, N. Y.

579,227. Electric Incandescent Lamp. F. L. Fowler, Philadelphia, Pa.

579,239. Telephone Spring-Jack. W. O. Meissner, Chicago, Ill.

579,249. Electrical Gas-Cock. F. W. Ackerman, Corning, N. Y.

579,267. Carbon-Holder. C. E. Harthan, Lynn, Mass.

579,268. Arc-Light Cutout. C. E. Harthan.

579,273. Zinc for Electric Batteries. F. A. Lane, Torrington, Conn.

579,283. Alternating-Current Dynamo-Electric Machine. C. P. Steinmetz, Schenectady, N. Y.

579,300. Electric Railway. E. Lachmann, Hamburg, Germany.

579,299. Telephone-Exchange System. J. E. Kerlyn, Chicago, Ill.

579,324. Electric Furnace. W. S. Hadaway, Jr., New York, N. Y.

579,344. Electrical Measuring Instrument. E. J. Houston and A. E. Kennelly, Philadelphia, Pa.

579,361. Method of Manufacturing Electrodes for Secondary Batteries. L. Epstein, London, England.

579,366. Circuit-Breaker. F. C. Robertson, Toronto, Canada.

579,380. Trolley Support for Electric-Railway Cars. J. F. S. Branth, New York, N. Y.

579,393. Electric Sunshine-Annunciator. L. Hunt, St. Louis, Mo.

579,395. Electrical Transformer. F. H. Jeannin, Arcadia, Fla.

579,431. Automatic Electromagnetic Circuit-Breaker. W. E. Harrington, Philadelphia, Pa.

579,459. Electric Heater. G. H. Whittingham, Baltimore, Md.

579,473. Electric Time Check and Recorder. A. Davidson, New York, N. Y.

579,482. Telephonic Messenger Service. J. D. Hobbs, New York, N. Y.

579,511. Electrically Operated Sewing Machine. J. S. Biggar, Chicago, Ill.

579,525. System of Circuit and Apparatus for Electric Railways. G. Westinghouse, Jr., Pittsburgh, Pa.

579,526. Electropneumatic Locomotive. G. Westinghouse, Jr.

579,527. Electric-Railway System. G. Westinghouse, Jr.

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ELECTRICS IN ENGLAND.

Mr. F. Ayton, borough electrical engineer of Ipswich, Eng., and secretary of the Electrical Vehicle Committee that has been formed in England for popularizing the electric battery vehicle, believes that the story of electric-vehicle progress in Great Britain —"a story of splendid progress, a record of fine achievement"—will constitute a complete rebuke to present-day skeptics. In introducing the subject of electric vehicles for discussion at a special meeting of the Institution of Electrical Engineers in London, on March 19, he explained how this could only be brought about by the central stations working hand in hand with the manufacturers and carrying on an active propaganda for advertising the electric vehicle. Both the general public and those in charge of garages have to be educated, and the idea that because a vehicle is electric, therefore it is complicated, must be dispelled. Existing automobile dealers and agencies and garage proprietors cannot be expected to help, for they do not want their present business connections and profits to be interfered with; they may have doubts as to the utility of electrics; and are profoundly ignorant as to electric mechanism, merits and economy. They will only awaken to the possibilities when they see a created business around them and find a reduction in sales of gasoline vehicles. It is for such reasons as this that active advertising propaganda is essential.

Another point mentioned by Mr. Ayton was the necessity for making the charging operation as simple as possible—indeed practically automatic—and electric companies and manufacturers must see that reliable automatic apparatus is provided. It should be so constructed that when the correct terminal voltage for the whole battery (which is a good approximate indication of the battery's condition) has been reached, the charging is automatically discontinued.

Judging from some of Mr. Ayton's remarks, there appear to be too many skeptics in England who are ready to judge the present-day electric vehicle in the light of unfortunate experiences with battery vehicles in years gone by. Remembering these past records, they go so far as to openly express doubts as to the possibility of battery-driven trucks ever proving commercially successful. This is an attitude of mind that English electrical engineers recognize they must change, and they are out to do it. They have even to educate their engineering friends in this aspect of the matter, as they have the general public and the garage suppliers and dealers on other aspects. The past few years in the general world of automobile design and practical engineering have produced many improvements for which electric-vehicle men are grateful, and skeptics are being shown that the position of electrics is altogether different today from what it was a few years ago, by reason of the great advances made in storage-battery construction, the improvement in design of motors for electric vehicles, the bringing to a high pitch of perfection of ball and roller bearings, the lightening of chassis construction and the improved efficiency of rubber tires.

The congested state of public thoroughness in all big cities imperatively demands the removal of the horse therefrom. Mr. Ayton argued that it was in the displacement of that faithful animal that the real economic future of the electric vehicle lies, and he said that upon the basis of operating costs, the electric vehicle was the only type of power-driven vehicle that could take its place.

DISPLAY LIGHTING ON MOTOR VEHICLES.

The purchase by a tobacco manufacturer of national reputation of a number of gasoline and electric motor trucks which are to be equipped with animated display lighting marks a new development in a branch of electrical service of immense possibilities. Several of these machines are now in service in the East, and the attention which they are attracting from the public on the streets through which they are operated is little short of remarkable. Just as the moving electric sign appeals with greater force to the city dweller or visitor than the stationary display of equal size, so the portable animated lighting outfit draws the attention of a clientele accustomed perhaps to the extensive use of electricity in publicity, but none the less arrested by the appeal of the migratory display.

This class of advertising is peculiarly the province of the electric vehicle on account of the nominal speed requirements and consequent long mileages obtainable per charge. Whether the installation be made on a gasoline or an electrically operated truck, however, the use of a separate battery for lighting the display and running the flasher motor is considered desirable. With such equipment the brilliancy of the lamps is independent of the condition of the main battery, and the attractiveness of the display is not affected by low voltage. A better separation of running costs can be made, also. Considering the results that a few tungsten lamps can be made to produce in this field, it is safe to predict that within the next year or two, display lighting on motor vehicles will become one of the most popular methods of publicity in the country, and if the designs are kept free from glare, it is unlikely that restrictive ordinances will be passed to limit this interesting and important development.

THE ELECTRICAL OPTIMIST.

The electrical engineer is pre-eminently an optimist. Sometimes by very practical people he is termed a visionary. But his optimism is not that of a sensationalist or an obsessed inventor; nor can he in many instances be regarded as having a predilection for castle-building in the air. He has very good reason for the faith that is in him, and his unconquerable hope for the future may be said to rest upon the sure foundation formed by a score of years of remarkable achievement.

The writer for the magazine may carry his reader with him fascinated with the story of discoveries that we hope to hear of as actual facts before long, things that are already perhaps upon the horizon, and the said reader may contemplate with wonder the age in which he is privileged to have existence. But the confidence of the electrical man of experience is very differently based; he has a knowledge which the lay reader does not possess, and looking backward can trace in detail the sure and certain way along which electrical achievement has come in so many departments. The newspaper writer and reader may lack that specialized knowledge and may occasionally be led to accept as gospel the statement of some inventor or interested financier respecting some startling discovery or apparatus. Sometimes in this way the lay reader is in his information far in advance of the electrical man who judges more from achievement than from prophecy.

But your electrical observer is none the less an optimist because he does not accept everything without question. He has learnt by experience that it is not always safe to accept inventors' or financiers' own valuations; occasionally at least he has found full justification for his caution and skepticism as the years have passed. He is an optimist because he, knowing the past so well, is able to read with greater accuracy the sign posts leading to the future. He can conceive of few fields in which electricity is not going to be supreme.

It is generally safe to follow the leading of your electrical man of vision if he be engaged in practical affairs. He is less likely to be a mere dreamer. Dr. Ferranti's vision of the All-Electric Age told to the Institution of Electrical Engineers several years ago made no appeal to the man in the street—it was hardly more than passingly referred to in the British newspapers. But to electrical men it was one of those great visions of the future which are justified by the co-ordination of a number of reasonable probabilities. Now we have another vision—a reverie he termed it—from a very prominent leader in British electrical manufacturing affairs—Mr. Hugo Hirst, chairman of the General Electric Company, Limited. He at any rate will be free from the least suspicion of being a visionary! Yet falling under the spell of electricity, he let his fancy play around the future as it will be under electrical influence. Very cheap communication by cable or by wireless with the farthest corner of the world. Journeys from the West of Ireland to Labrador in two and one-half days, and Quebec within three and one-half days at the outside. The expression "distant" would disappear. No particular new invention is required; only a little more perfection in what we already know, combined with a larger population at the other end, and the distances would shrink by at least 50 per cent. Within the next 30 or 40 years, if not before, Dr. Ferranti's prophecy of the "All-Electric Age" will be near fulfilment. Then the electric supply of Great Britain will be provided by less than 20 central stations, through the introduction of large and efficient units of production, and with cheap units at their disposal the price of electric current will be reduced to one-fourth of a cent per kilowatt-hour.

Mr. Hirst touched other points of a like kind in his speech, hinting at the time when electrical engineers would, if there were any of them left by then, not have to worry whether their annual conventions took place in Manchester, Sheffield or Brighton, as they would be given the option of Calcutta, London or Montreal. All of which only goes to show that though the speaker is a practical manufacturer and an electrical optimist, he is an after-dinner speaker as well. He admitted that his thoughts were merely the expression of a quiet reverie, but he had since found no reason why such a condition of affairs as he had indicated should not come to pass very soon if everybody electrical did his share of the work.

The hopes or dreams of the optimist have their valuable place to fill in our efforts to appeal to the public mind in favor of electrical service, and in these days an electrical man who is not optimistic is, when found, to be pitied,—we were going to say cast out!

STUDY THE CODE.

In order to do his work properly every contractor and wireman should be familiar with the regulations which govern that work. Just as ignorance of the law is no excuse, so ignorance of the proper manner of doing his work is no excuse for the inefficient workman. Especially in electrical construction, where defective work may result in hazards to life and property, should every worker be familiar with the recognized standards of installation.

The National Electrical Code is the general standard for electrical construction work in this country, and in many large cities this is supplemented by additional requirements which are considered necessary for acceptable installations in congested districts. In a few other places there are entire codes which have been drawn up independently, and in such places what is said here regarding the National Code would apply to such local codes. With the broadening of the personnel of the Committee which conducts the bi-annual revision of the Code, there is less occasion for these independent local codes, and as a matter of fact they are growing less in number each year.

Even where entire municipal codes are in existence or where there are additional restrictions, the provisions of the National Code are usually enforced, and every electrical contractor and wireman, in whatever part of the country he may be located, should be familiar with these provisions. Possession of a copy of the National Code is easily acquired, since the National Board of Fire Underwriters will furnish one free of charge to any person engaged in electrical work.

That all of those connected with electrical work are not familiar with these rules is evidenced by the frequency with which questions are sent to us upon points which are fully covered by the Code rules and which would never be asked by one who was familiar with them. Other indications are seen in the many instances where inspectors are compelled to order changes in wiring work. There is but one remedy for this condition, and that is for every man connected with electrical installation to study the Code.

STUDYING COMMISSION WORK.

Much as the central-station manager may regret the time required to attend to public relations in these days of multiform regulation, legislation and inquiry, he cannot afford to overlook the trend of practice in this field if he aims to operate his property on the higher planes of efficiency. It is in recognition of the far reaching significance of commission regulatory methods that the special department under Mr. Norton has been established by this journal, and it is scarcely necessary to say that it is our intention by this program to put the really significant features of commission work at the disposal of our readers in a thoroughly finished and practical form, so that those having cases of various kinds in hand will be able to glean helpful information and suggestions from the flood of new material which is pouring out of the state capitols each week.

It will not do to forget that a simple expression of an opinion by a commission on the Pacific Coast, when seized upon for local application in a somewhat similar case in Pennsylvania, may mean real money to the eastern company; and again, it is just as important to study precedents of this kind from the standpoint of dividends as it is to hunt down abrasions in feed-water-main covering or loose connections at the switchboard and meter. The subject of regulation has grown important enough to lead to the establishment of journals devoted exclusively to that branch of public service economics, and the thorough student of the subject should refer to these, but through the special department above mentioned we hope to cover the important features of the work sufficiently to keep our readers posted on all the essential phases of this interesting and significant subject.

The case in the First District of New York, which was appealed to the courts by the Kings County Lighting Company, and recently decided by the New York Court of Appeals, will be considered in detail next week. It presents several interesting and important points.

Electric Sign Manufacturers Organize Permanent Association at Chicago Meeting.

In accordance with a call issued by a committee of sign manufacturers appointed at a preliminary meeting held in Chicago on December 1, about 25 representatives of sign and accessory manufacturers met at the Hotel Planters, Chicago, March 30 and 31, and organized what will be known as the National Association of Electric Sign Manufacturers.

At the opening meeting on Monday morning George R. Hall, of the National Electric Sign Company, Jersey City, N. J., was elected temporary chairman.

At the afternoon session Chairman Hall presented a draft of the constitution and by-laws, which the committee previously appointed had prepared. A detailed discussion of this constitution was entered into and with the exception of a few minor points was adopted substantially as read. The by-laws provide for an annual meeting to be held during the summer at a time and place to be decided upon by the Executive Committee. The membership fee for active members is $50.00 and the initiation fee after May 30, $50.00, except in such cases where companies applying for membership have an annual gross business of less than $15,000. In this case the membership fee is $25.00 and initiation fee, $25.00. The constitution provides for an associate membership comprising accessory manufacturers, technical journals, etc., the dues for which are $25.00 per year and an initiation fee of $25.00 for those joining after May 30, 1914.

Membership requirements for active members stipulate that the applicant must have been in business for a period not less than one year and that the signs manufactured be of quality approved by the Underwriters.

Officers were elected as follows:

President; George R. Hall, National Electric Sign Company, Jersey City, N. J.

First vice-president; F. A. Kehl, Brilliant Sign Company, St. Louis, Mo.

Second vice-president; Norman B. Hickox, Greenwood Advertising Company, Knoxville, Tenn.

Third vice-president; T. J. Macey, Macey Sign Company, Toronto, Canada.

Treasurer; C. M. Davis, American Sign Company, Kalamazoo, Mich.

According to the constitution a permanent secretary will be appointed who will direct the affairs of the Association from an office to be engaged for the purpose.

A Membership Committee was appointed comprising Norman B. Hickox, Knoxville, Tenn.; H. I. Markham, of the Federal Sign System (Electric), Chicago; J. H. Betts, of Betts & Betts, New York; C. J. Willberscheid, The Western Display Company, St. Paul; and C. A. Wiley, The Flexlume Sign Company, Buffalo, N. Y.

Other information concerning this meeting will be found on page 669 of this issue.

Illuminating Engineers to Meet With Signal Men.

The Railway Signal Association and the Chicago Section of the Illuminating Engineering Society will hold a joint meeting on the evening of April 10, in the auditorium of the Western Society of Engineers, Monadnock Block, Chicago, Ill.

The following program has been arranged: "Fundamentals of Illumination," by W. A. Durgin; "Illumination of Railway Signals," by Thomas S. Stevens, signal engineer of the Santa Fe Railway, Topeka, Kans.; "Signal Lenses," by William Churchill, of the Corning Glass Works, Corning, N. Y.; "The Physiology of the Eye and Its Relation to Signal Affairs," by Dr. Nelson M. Black, of Milwaukee.

There will be an informal dinner at the Grand Pacific Hotel, at 6:00 p. m., and the meeting will begin promptly at 8 o'clock.

Meeting of Utah Company Section.

The regular monthly meeting of the Utah Light and Railway Company Section of the National Electric Light Association was held at the Consolidated Music Hall, Salt Lake City, on Wednesday, March 25. This was the first session held in this hall, arrangements having been made by the company to hire it for the regular meetings of the section.

The paper of the evening was presented by William M. Scott, superintendent of electric lines and service entitled, "The Relation Between the Company and Its Employees." Mr. Scott's paper was one of the most valuable which has been presented before the section. His wide experience during the past twenty years of his employment with the company has admirably fitted him to handle this subject. The Section will hold an outing at Pine Crest in June.

Convention of Steel Engineers to be Held in Cleveland.

The annual convention of the Association of Iron and Steel Electrical Engineers will be held in Cleveland, O., September 14 to 19. The secretary of the Association is W. T. Snyder, McKeesport, Pa.

Water Power on Public Lands.

Senator W. L. Jones, of Washington, in speaking before the senate on March 5, upon his bill to regulate water power on public lands, showed in a rather detailed manner the effects of present laws upon the subject and pointed out the conditions which should be remedied.

Some idea of the abundance of water-power opportunity may be obtained from his statement that the total available horsepower for water-power developments in the United States is conservatively estimated at 200,000,000, of which amount only about 6,000,000 horsepower is at present developed. Despite the overwhelming necessity for water-power development, the laws of the United States have made it difficult to finance the development of this power.

Senator Jones states that the United States imported during the year 1913 over $41,000,000 worth of nitrogenous products, all of which could be made in this country if we possessed a national water-power policy; yet the country is in great need of nitrogenous compounds for use in intensive farming and, also, in the manufacture of explosives.

Extensive hydroelectric developments for irrigation purposes in the west, he says, are practically impossible under present laws, in that either the power developed must be devoted solely for irrigation purposes thus forcing a plant to shut down six or eight months during the year, or the development must be made under a revocable permit which makes it difficult to finance the project owing to the uncertainty of the investment, and which necessitates a high rate for electric power.

Moreover, water-power developments can never be financed if the Government requires the forced amortization of the property in order that it might be turned over to the government free of cost at the end of 50 or 60 years, because the farmer could not stand the cost of irrigation water and the price of nitrogenous products produced by electrical means would be prohibited. What is needed, he claims, is a law by which the grantee can build his plant and operate it for fifty years or more, paying the United States annually five per cent of the fair market value of the land, but that after fifty years the right to use such lands should be capable of being terminated and the property taken over by the United States, the State, or a municipal subdivision thereof, upon the payment of the fair value of the property, excluding the value of the right to use such Government land.

Philadelphia Electrical Conference Discusses the Mercury-Arc Rectifier.

The March meeting of the Electrical Conference was held Thursday evening, March 26, 1914, at the Meter Department Building of The Philadelphia Electric Company, 226 South Eleventh Street. Chairman, Washington Devereux, presided, and introduced the speaker of the evening, D. Brookfield Wilson of the General Electric Company, who gave an illustrated talk on the "Mercury-Arc Rectifier". The various economies to be effected by an intelligent investigation of the proposed installation, together with the installation of the proper number and size of rectifiers were demonstrated by Mr. Wilson. He also brought out the fact that if central-station service was available this was invariably the most economical source of energy. The advantage of the rectifier as an advertising medium, when placed in the lobby of moving-picture theaters, was also dwelt upon by the speaker, as well as the fact that this apparatus was the source of the best current for moving picture projection when direct-current was not available except by means of this device.

Samuel Seata, chairman of the "Committee on Fittings and Devices," spoke of the failure of some fittings after use in the field and about 12 fittings were shown that had failed in service. Among the number were porcelain pull-chain sockets, porcelain tubes, snap switches, molding fittings, etc. This talk and the discussion following brought out the fact that the contractor should consider well the character of material supplied by the manufacturer and jobber, as the loss due to defective material usually fell upon the contractor.

A. H. Lilly, chairman of the "Question Box Committee," read the questions that had been turned in since last meeting and also gave the answers as arrived at by the committee.

Louis Grossman, chairman of the "Organization Committee," gave a short talk on the hopes and aims of his committee and asked for the co-operation of the members in this work.

That the Electrical Conference is attaining more than local fame was attested when Chairman Devereux read a telegram from Messrs. Robertson and Kingsbury, of Baltimore, regretting their inability to be present as they had requested that they be invited to attend these meetings. The discussion was participated in by Messrs. Messner, Seata, Grossman, Marley, Stern, Barry, Goldman and others.

The next meeting of the Conference will be held April 23, 1914 at 226 South Eleventh Street. The speaker will be R. Maitland Nesbitt, of the Philadelphia Fire Underwriters' Association and the subject is "Iron Conduit, its Manufacture and Use."

◆

New Austrian Municipal Electric Plants Proposed.

The municipalities of Bielitz and Biala propose jointly to erect an electric central station to illuminate the twin cities. The estimated cost is $124,000. Construction will be begun this year. Inquiries should be addressed in German to the Stadtgemeinde, Bielitz, Silesia, Austria.

The municipality of Sniatyn plans construction of a central electric station for lighting the city. More detailed information may be obtained by addressing in German Magistrat, Sniatyn, Galicia, Austria.

The municipality of St. Ulrich in Groden has electrical works under consideration, estimated cost $80,000. Inquiries should be addressed in German to the Magistrat, St. Ulrich in Groden, Tyrol, Austria.

◆

Chicago Electric Club.

An illustrated lecture on the "Beauties of Chicago" was delivered before the Electric Club of Chicago, on March 26, by Jen. Jensen, noted landscape architect.

Historical Dynamo Exhibited.

Included in the exhibits at the third annual display of the Missouri Valley Historical Society at Kansas City, Mo., recently was one of the first dynamos built by Edison in 1880. The first incandescent electric lights in Kansas City were run from this dynamo in the Santa Fe station of the Kawsmouth, now the Kansas City Electric Light Company.

◆

Census Report on Electric Railways.

Preliminary figures of the forthcoming quinquennial report of the electric railways of continental United States have been given out by Director W. J. Harris of the Bureau of Census, Department of Commerce. They were prepared under the supervision of W. M. Steuart, chief statistician for manufactures.

The statistics relate to the years ended December 31 for 1912 and 1907, and June 30 for 1902. The totals include electric light plants operated in connection with electric railways and not separable therefrom, but do not include reports of mixed steam and electric railroads nor railways under construction during the census year which had not begun operations.

The figures are shown in detail in the accompanying table:

	1912.	1907.	1902.	Per Cent of increase:[1] 1902-1912.
Number of companies	1,260	1,236	987	27.7
Operating	975	945	817	19.3
Lessor	285	291	170	67.6
Miles of line	30,437.86	25,547.19	16,645.34	82.9
Miles of single track[2]	41,064.82	34,381.51	22,576.99	81.9
Cars, number	94,016	83,641	66,784	40.8
Passenger	76,162	70,016	60,290	26.3
All others	17,854	13,625	6,494	174.9
Electric locomotives	277	117	3	.....
Persons employed	282,461	[3] 221,429	[3] 140,769	100.7
Salaried employees	23,271	11,700	7,128	226.5
Wage earners (average number)	[4] 259,190	209,729	133,641	93.9
Power:				
Horsepower, total	3,665,051	2,476,479	1,349,211	171.6
Steam and gas engines (including turbines)—				
Number	2,312	2,552	2,351	—1.7
Horsepower	3,193,744	2,384,518	1,300,058	145.7
Water wheels—				
Number	383	228	159	140.9
Horsepower	471,307	91,961	49,153	858.9
Kilowatt capacity of dynamos	2,508,066	1,723,416	898,362	179.2
Output of stations, kilowatt-hours	6,052,699,008	4,759,130,100	2,261,484,397	167.6
Current purchased, kilowatt-hours	2,967,318,781	(5)	(5)	.....
Passengers carried	12,135,341,716	9,533,080,766	5,836,615,296	107.9
Revenue	9,545,554,667	7,441,114,508	4,774,211,904	99.9
Transfer	2,423,918,024	1,995,658,101	1,062,403,392	128.1
Free	165,869,025	96,308,157	(5)	.....
Car mileage (passenger, express, freight, etc.)	1,921,620,074	1,617,731,300	1,144,430,466	67.9
Condensed income account of operating companies:				
Gross income	$585,930,517	[6]$429,744,254	[6]$250,504,627	133.9
Operating revenues	$567,511,704	$418,187,858	$247,553,999	129.2
Transportation revenues	$520,184,773	$390,276,347	$235,997,005	120.4
Nontransportation revenues[7]	$47,326,931	$27,911,511	$11,556,994	309.5
Income from other sources	$18,418,813	$11,556,396	$2,950,628	524.2
Operating expenses	$332,896,356	$251,309,252	$142,312,597	133.9
Gross income less operating expenses	253,034,161	$178,435,002	$108,192,030	133.9
Deductions from income (taxes and fixed charges)	$191,123,408	$138,094,716	$77,595,053	146.3
Net income	$61,910,753	$40,340,286	$30,596,977	102.3
Dividends (operating companies)	$51,650,117	$26,454,732	$15,882,110	225.2
Surplus	$10,260,636	$13,885,554	$14,714,867	—30.3

[1] A minus sign (—) denotes decrease.

[2] Includes track lying outside the United States, namely, 1912, 31.91 miles; 1907, 27.52 miles; and 1902, 4.20 miles and exclusive of track not operated.

[3] For 939 companies in 1907 and 797 companies in 1902.

[4] Number employed September 16, 1912.

[5] Figures not available.

[6] For 939 companies in 1907 and 799 companies in 1902.

[7] Income from sale of current included. In 1912, $36,500,030; in 1907, $20,093,302; and in 1902, $7,703,574.

Speed Control of Alternating-Current Motors.

At a meeting of the Pittsburgh Section of the American Institute of Electrical Engineers on March 10, G. E. Stoltz presented the details of a practical scheme for controlling the speed of alternating-current rolling-mill motors.

Rheostatic control is satisfactory for use in conjunction with a flywheel, for moderate speed reductions, where the load is constant, but when the load momentarily goes off, the speed rises to near synchronism.

Multi-speed motors, having two separate windings on both stator and rotor, are satisfactory where two speeds are sufficient.

For more than two speeds this scheme is both expensive and inefficient.

The use of two motors connected in cascade provides four different synchronous speeds. This scheme is expensive, and not very efficient, and the control is complicated.

The polyphase commutator motor is but little used in this country. Its characteristics are similar to the direct-current motor, but the additional reactance voltage, due to the pulsating current, which is not present in the direct-current motor, introduces commutation difficulties. The inherent characteristics are such that good commutation is obtained at the expense of poor power-factor, and vice versa.

An installation has recently been made which provides exact speed control over a wide range, with the speed at any setting constant, irrespective of the load on the mill. Unlike rheostatic control it is economical, and consists of standard apparatus throughout, presenting no complications in operation or repair.

This apparatus consists essentially of a standard wound-secondary mill motor, connected to the mill directly, or by means of a gear, rope or belt drive. The secondary slip rings are connected electrically to the slip rings of a rotary converter with the same number of phases as the secondary of the mill motor. Its frequency and rating must be consistent with that obtained from the secondary of the large motor under operation. The maximum speed reduction in this installation is 30 per cent, which on a 60-cycle system is equivalent to 18 cycles on the secondary. As the locked secondary voltage of the main motor is 552 volts, the secondary voltage corresponding to 18 cycles is 166, corresponding to 272 volts on the direct-current end of the three-phase rotary converter. The direct-current terminals are connected to the direct-current machine of a motor-generator set, the alternating-current machine, a standard squirrel-cage motor, being connected directly to the three-phase line. Each of these machines has a capacity equal to 30 per cent of that of the main mill motor.

In operation, the converter takes current from the secondary of the mill motor, and returns it, through the motor-generator set, to the line, the squirrel-cage machine acting as an asynchronous generator when running above synchronous speed. The synchronous speed of the mill motor under these conditions is equal to 60 cycles minus the frequency of the converter, which depends on its speed, which, in turn, with constant field excitation, depends on the voltage impressed across its direct-current terminals. This voltage, and hence the speed of the converter, and the speed reduction of the mill motor, depends on the excitation of the direct-current machine of the motor-generator set. At maximum excitation the mill motor speed is reduced to 30 per cent. At zero excitation, the speed of the mill motor is the same as if its secondary was short-circuited. With the fields reversed, and full excitation applied, the mill motor will run approximately 30 per cent above synchronous speed. In this case, the speed of the motor-generator set drops below synchronism and the squirrel-cage machine draws power from the line, feeding it through the rotary converter into the mill motor, which thus receives power at both its primary and secondary terminals. The speed characteristics of the outfit can be designed to give the mill motor practically constant speed, regardless of load, or to provide sufficient speed drop to take advantage of a flywheel. The complete outfit has a full-load efficiency of 84 per cent, with a speed reduction of 30 per cent.

In the discussion, in which Messrs. Dudley, Lincoln, Crosby, Swoboda, Wood, Sykes, and Stoltz participated, the following points were brought out.

In Germany, a very similar application is made, except that the direct-current motor, instead of being part of a motor-generator set, is coupled or geared directly to the mill shaft.

The power-factor of the combined set can be made unity or better, on account of the high excitation of the rotary converter. The scheme is not new, but represents simply a practical application of standard apparatus. Its principal features are reliability, and reasonable efficiency. The fact that it involves only well known apparatus, makes it easily cared for, and if a change in operation occurs later, the apparatus can all be readily used for other purposes.

The Sherbius, or polyphase commutator-motor scheme, while new in this country, has been in use in Europe without very great success. It requires high-grade operators, and is clumsy and complicated.

Connecting the direct-current motor to the mill shaft instead of to an alternating-current generator is quite satisfactory where constant horsepower output is desired. Usually constant torque is the requisite, in which case it is more efficient to return the energy to the line. Moreover, a slow-speed motor is required to help drive the shaft, which might easily be more expensive than a high-speed motor-generator set.

Wireless Lecture by Dr. Thomson.

At a meeting of the Commercial Club held in Boston, Mass., on March 23, Elihu Thomson, of Swampscott, Mass., dwelt upon the possibility of wireless transmission and expressed the belief that soon a microphone transmitter would make it possible to control 100 horsepower. It will be only a few years before wireless telephony will be in practical effect across the Atlantic, he said.

Dr. Thomson began experimenting in wireless transmission in 1875, when he was an instructor in chemistry in a Philadelphia high school, working in conjunction with the late Prof. E. J. Houston.

Salt Lake City Commissioners Decide on Liability Insurance for Electric Signs.

The proposition made by the Utah Light and Railway Company to the commissioners of Salt Lake City to furnish a blanket bond for electric signs to protect the city in case damage results from the signs falling or otherwise, has been rejected by the Commission. They have decided instead to take out liability insurance on electric signs and charge the cost of the insurance against the sign owners. The Commission reached this decision after carefully investigating the matter.

Coal Miners Demand Use of Electric Power.

A conference was recently held in the Betz Building, Philadelphia, Pa., between certain operators and miners of bituminous coal. The miners demanded that the cars that move in and out of the collieries should be operated by electric power instead of by the men. The operators refused to grant this demand on the ground that it would increase the cost of the production from 7 to 14 cents per ton. The cost of an electric power plant would be approximately $150,000.

Electricity in Coal Mining.

This article treats particularly of the application of central-station power to the coal mining districts of the Middle Western States. The advantages of motor drive are discussed and data presented on the cost of mining using central-station power and isolated-plant service.

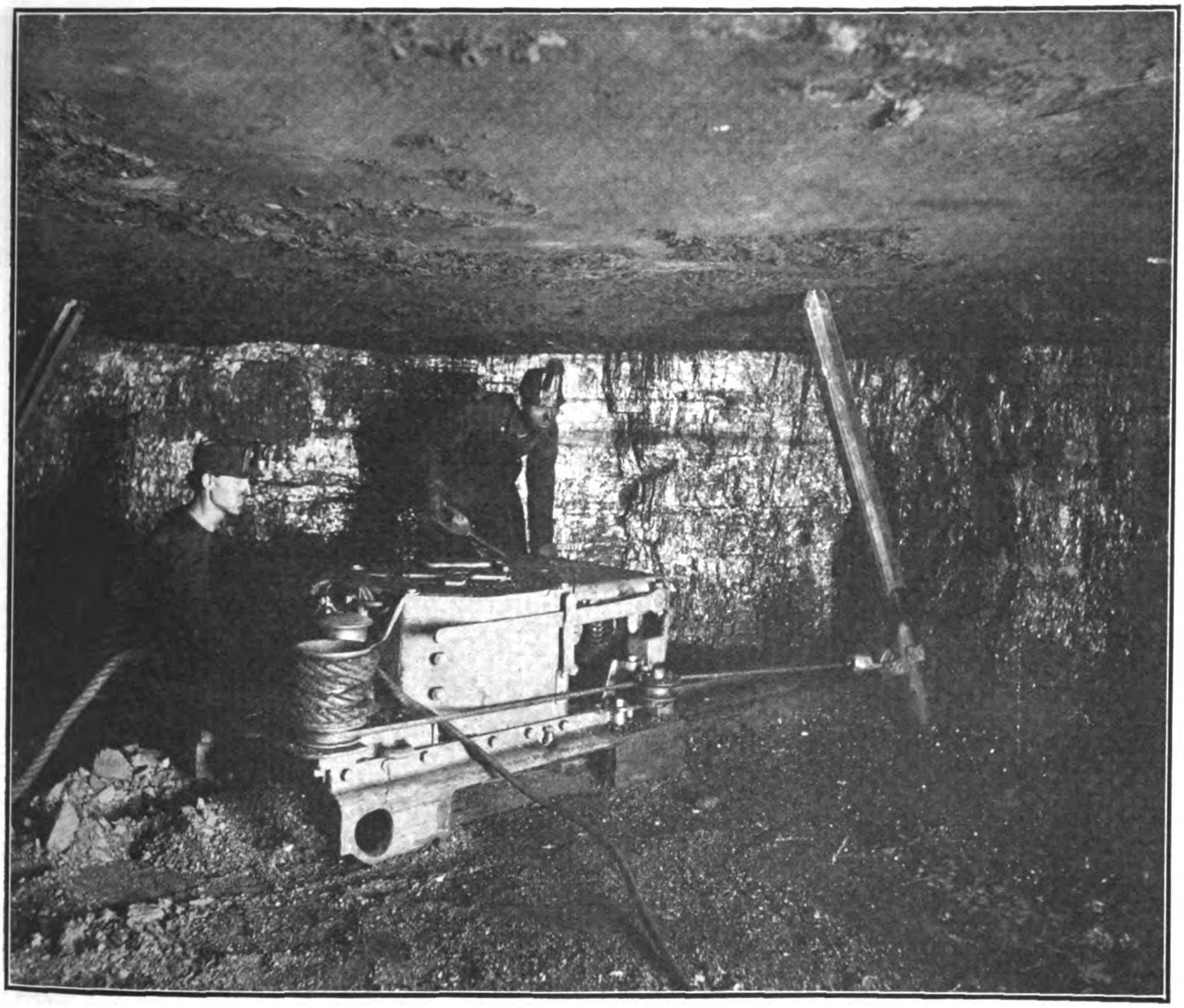
The use of electricity in coal mining is not new, as it has been employed to a limited extent for many years. Recently, however, rapid advances have been made in completely electrifying coal mines and it is now generally conceded that electrical apparatus will supersede steam equipment as rapidly as the change can be made.

A few years ago it would have seemed almost ridiculous to have intimated that central-station service could successfully compete with isolated-plant service for the operation of coal mines. Today, however, many mines, of all types and sizes, are purchasing power and the results being achieved indicate that within the next five years a majority of the coal mines will be operated by central-station power. The significance of this will be realized when it is learned that the 1911 census figures placed the total output of coal of the United States for that year at 500,000,000 net tons. The figures for 1913, it is claimed, will show an increase of fully 20 per cent.

In view of these figures it is evident that the power requirements of this industry represent an annual outlay of such proportions as to justify the most careful scrutiny of all factors entering into the cost of producing and applying the energy required for the numerous mechanical aids which have become indispensabe to modern coal mining.

Perhaps the most important advantage of electricity is its economy. The necessity for long lines of steam or air piping, which are expensive to install and maintain is entirely eliminated by the use of electric power, which at once renders possible the application of a single form of power to all classes of machinery, both on the surface and in the mine itself.

Electricity substitutes a simple and thoroughly flexible system of transmitting power by means of conductors which can be easily run and rapidly extended to meet changes, involved in progress of development, and which are not affected by temperature variation and are not liable to mechanical injury or to breakage due to floods or shifting ground. They can be safely used in places where steam lines would introduce an element of danger, and finally, they can in many instances be run in shafts or bore holes already in



Electrical Coal-Cutting Machine at Work in Coal Mine.

use for other purposes without occupying room that could be otherwise utilized.

Notwithstanding the remarkable efficiencies which have been obtained by the engineers of some mining companies in the operation of carefully constructed steam lines, the investment and operating expense of this method has been so heavy that resort to the alternative of separate boiler plants even in comparatively closely grouped developments has often been found necessary.

In the application of electric motors to the various machines the characteristics of modern types of both alternating and direct-current motors are such that in a majority of cases they can be direct-connected or direct-geared to the driving shaft, thereby eliminating a large percentage of the friction losses and repair charges, as well as the first cost of the belting and countershafts.

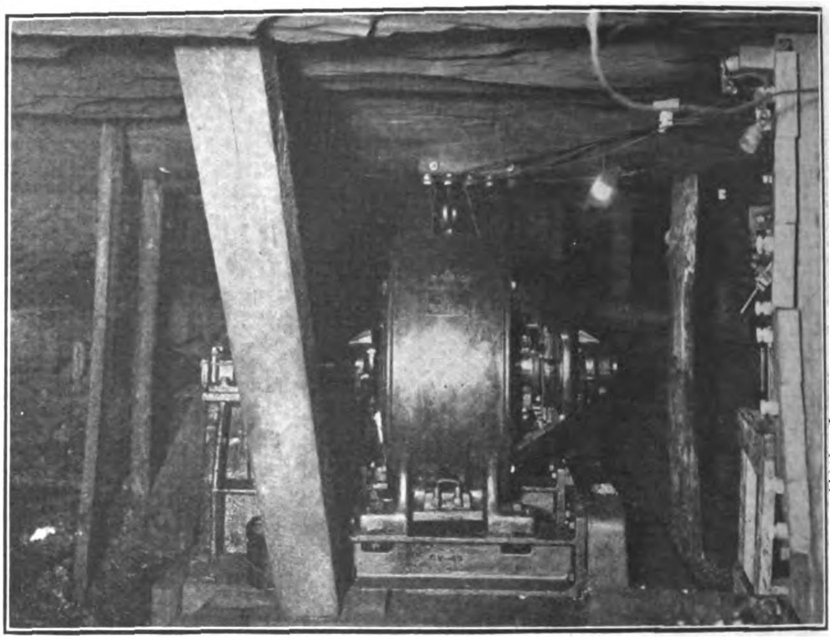
It is also possible to further reduce the power losses by substituting individual drive in the sections of long conveyor or scraper lines, and for the different units in breakers and tipples, thereby effecting a considerable saving in power over that required by the older method of group operating by means of engines. In the case of motor-driven breakers, the saving effected in belting alone is a very considerable item, but due to the design of some of the breakers and tipples, the retention of some belts and countershafts is still necessary. For the driving of coal crushers the interposition of belting is not usually considered in modern equipments as the motors are capable of carrying heavy overloads for the short periods during which they are liable to occur in this particular service.

The flexibility of motor drive renders possible the use of portable machinery, and additions to or changes in the location of existing machines can easily be arranged for without interfering in any way with the operation of the remainder of the equipment.

The benefits of electric lighting, both in the mine and for night operations on the surface and for signaling, are universally acknowledged, and electric current is used for these purposes even in mines which have not as yet adopted electric power service.

In a previous article in this journal treating of the use of electricity in coal mines (March 1, 1913, page 435) particular attention was given to the practices of the Eastern coal states, principally Pennsylvania, Virginia and West Virginia. However, the conditions found to obtain in the middle Western states do not differ materially as regards the application of central-station power and electric motors.

Contrary to the situation encountered in Eastern coal mines, the mines in Illinois are fairly dry and practically devoid of dangerous gases. Faults in the structure of the earth are prevalent, however, and the shafts are lined with concrete to prevent slides. The interest on the investment for constructing such shoring and benching in the different levels counterbalances the cost of pumping in wet mines.



Typical Mine Motor-Generator Set.

Electric Gathering Locomotive in Mine Shaft.

The primary operations involved in the production of coal are undercutting, transporting, and hoisting. The secondary operations, as far as power requirements are concerned, are ventilation, drainage or pumping, operation of tipple and other outside machinery.

In connection with cutting, it is interesting to note that the electric coal cutter is estimated as reducing the cost of production of coal from 10 to 12 cents per ton. This operation is one offering a very good load for power as it is fairly continuous throughout the day hours up to 3 or 4 o'clock in the afternoon.

The combined problems of cutting and hauling form the nucleus around which an electric installation can be made, and while it is proposed to discuss the question of installation costs a little later, it should be noted that

TABLE OF COMPARATIVE COSTS BETWEEN PURCHASED POWER AND ISOLATED-PLANT SERVICE.

Items Included in Cost.		Total Present Cost	Amt. Saved with Purchased Power
Three engineers at $85.00		$255.00	$110.00
Two firemen at $75.00		150.00	150.00
One helper at $50.00		50.00	50.00
500 tons of coal at 50c per ton		250.00	250.00
Oil, waste and packing		50.00	40.00
Boilers:			
Cost, including stack	$4,000.00		
Feed pumps	200.00		
Setting and foundation	800.00		
Feed water heater	400.00		
	$5,400.00		
Interest at 5 per cent		22.50	22.50
Depreciation 7 per cent		31.50	31.50
Repairs and upkeep		50.00	50.00
Insurance		10.00	10.00
Boiler Building:			
Cost $2,000.00			
Interest at 5 per cent		8.35	8.35
Depreciation at 5 per cent		5.00	5.00
Upkeep and repairs		5.00	5.00
Engines:			
Cost two generator engines	$3,000.00		
Hoist engine	1,500.00		
Fan engine	600.00		
Elevator engine	200.00		
Screen engine	150.00		
Conveyor engine	100.00		
Pumps	400.00		
Machine shop engine	150.00		
	$6,100.00		
Interest at 5 per cent		25.40	25.40
Depreciation at 6 per cent		30.50	30.50
Upkeep and repairs		30.00	30.00
Building:			
Cost $2,500.00			
Interest at 5 per cent		10.40	
Depreciation at 5 per cent		10.40	
Upkeep and repairs		5.00	
Piping:			
Cost $1,500.00.			
Interest at 5 per cent		6.25	6.25
Depreciation at 7 per cent		8.75	8.75
Upkeep and repairs		15.00	15.00
Generator, switchboard and wiring:			
Cost $2,640.00.			
Interest at 5 per cent		11.00	11.00
Depreciation at 5 per cent		11.00	11.00
Upkeep and repairs		15.00	15.00
Superintendence		25.00	
Taxes at 1 per cent of valuation (assessment 90 per cent)		15.00	7.50
Liability insurance at $1.33 per $100.00		6.05	4.15
Overhead		50.00	
Total cost		$1,165.45	$900.25
Fixed charges		284.40	
Operating expenses		881.05	

these two problems are usually considered at one time in determining upon such improvements. A number of factors enter into the question of such improvements and where the older mines are not equipped with mechanical haulage, it is necessary in most cases to relay the track with heavier rails to stand the weight of the locomotive, which must necessarily be heavier than the cars in order to offer sufficient draw-bar pull to permit of bunching cars into trains and cut down the labor attendant upon the old system.

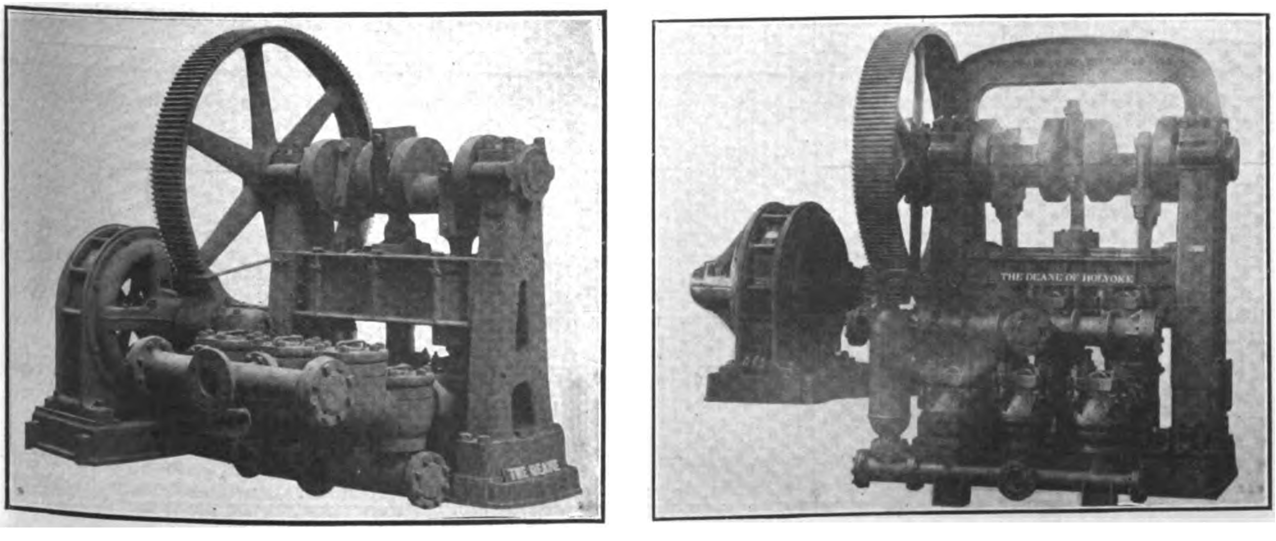
After a mine has assumed commercial proportions with any considerable development away from the entry or shaft, it is seldom difficult to demonstrate the possible savings in the use of suitable and well designed electric haulage equipment.

The relative importance of the pumping equipment in different coal mines is dependent upon the geological conditions encountered. In many mines the service required constitutes a comparatively negligible demand on the power station, owing to the possession of natural drainage facilities, with a resulting limitation of the pumping units to those required for fire protection and a few dip pumps operating at low heads.

On the other hand, a large percentage of the mines situated below local water levels are absolutely dependent for continuous operation on the efficacy of their pumps or water hoists, and the cost of their operation has a vital influence on the obtainable margin of profit. The importance of this factor can be fully apppreciated when it is realized that in many mines more than ten tons of water have to be elevated to the surface for every ton of coal mined. In addition to this the pumping outfit must ordinarily have sufficient reserve capacity to cope with excessive demands due to floods having their source either on the surface or in water bearing ground which is likely to be encountered in extending the workings.

As in the applications already referred to, the electrical operation of pumps renders possible increased economies and efficiencies otherwise unobtainable, and the benefits derived as compared with either steam or air power service increase in direct proportion to the diversity of the applications and the distances over which the power has to be transmitted.

The motor-driven hoist is the simplest and most compact form, inasmuch as the motor can usually be mounted on a common base with the hoisting drum and arranged to drive it directly through gears, thereby form-



Two Typical Mine Pumping Units with Motors Geared Direct to Pumps.

Coal Mining Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Coal mine, having an average production of 10,700 tons per month.

Total connected horsepower, 455. Total number of motors installed, 5. Average kilowatt-hours per month, 37,655.

Kilowatt-hour consumption for 9 months:

Month	Kilowatt-hours	Tons Coal	Month	Kilowatt-hours	Tons Coal	Month	Kilowatt-hours	Tons Coal
April	26,900	11,571	July	37,800	11,585	October ...	57,700	12,102
May	29,000	9,262	August	43,800	12,258	November .	43,200	9,407
June	29,500	8,742	September .	41,400	11,050	December .	29,600	10,752

Load-factor, 15 per cent.

The average energy consumption per ton of coal mined is 3.4 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	300	900	Direct-connected to one 200-kilowatt, 250-volt, direct-current generator for supplying energy to the following: one 12-ton haulage locomotive; one 10-ton haulage locomotive; two four-ton gathering locomotives; three 30-horsepower cutting machines; and one 15-ton Larry motor.
1	100	720	Slip-ring motor belted to shafting driving one automatic feeder; three sets of shaker screens; two jigs; one pump; two drag lines, 100 and 50 feet respectively; four elevators, 330 feet; one crusher; and one 60-foot picking table.
2	20	720	Each belted direct to a 16-foot Crawford & McCrimon fan.
1	15	900	Geared direct to deep-well pump.

Coal mine, having an average monthly production of 22,000 tons. This mine uses no cutting machine inasmuch as the coal formation is such that it is not necessary. There is still some steam haulage equipment that has not as yet been changed over.

Total connected horsepower, 325. Total number of motors installed, 3. Average kilowatt-hours per month, 17,300.

Kilowatt-hour consumption for 9 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
June	16,000	September	18,500	December	16,100
July	16,500	October...........	20,500	January	16,000
August	17,000	November	17,300	February	17,300

Load-factor, 9.7 per cent.

The average electrical energy consumption per ton of coal mined is 0.78 kilowatt-hour.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	225	900	Direct-connected to a 150-kilowatt, 250-volt, direct-current generator supplying energy to the following: one 12-ton haulage locomotive; one 10-ton haulage locomotive; one five-ton gathering locomotive; and one 15-horsepower motor, 900 revolutions per minute direct-connected to pump.
1	40	840	Belted direct to a 16-inch Cappell fan, speed 98 revolutions per minute.
1	40	570	Slip-ring motor, operating tipple.

Coal mine, having an average monthly production of 20,000 tons. Some steam equipment is still temporarily retained.

Total connected horsepower, 225. One motor. Average kilowatt-hours per month, 10,926.

Kilowatt-hour consumption for five months: August, 10,550; September, 7,560; October, 10,390; November, 11,300; December, 14,833.

Load-factor, 8.9 per cent.

The average electrical energy consumption per ton of coal mined is 0.54 kilowatt-hour.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	225	900	Direct-connected to one 150-kilowatt, 250-volt, direct-current generator supplying energy for the following direct-current equipment: one 10-ton haulage locomotive; one six-ton gathering locomotive; one 15-horsepower motor direct-connected to 12-foot fan; one 15-horsepower motor belted direct to 14-foot fan; one short-wall mining machine; and one five-horsepower motor geared to pump.

ing an entirely self-contained unit and effecting an economy in weight and in the amount of space required for its installation, which is often of appreciable importance when the hoists are located in the mine. Owing to the superior speed contact of the electric type it has a great flexibility in operation and its extreme simplicity not only minimizes the cost of repairs, but obviates the necessity for the service of an engineer in running it, as the average worker is competent to receive the limited amount of instruction necessary and can be safely entrusted with its operation. Emergency demands on the ability of the operator are, as a rule, reduced by providing safety devices in the form of signal lamps, bells, or automatic cutouts, and for conditions such as those imposed by the use of motors for driving the type of water hoist commonly found in the anthracite fields, the hoisting equipment can be made entirely automatic in operation.

The power losses involved in the operation of an engine-driven breaker are unavoidably great, due to the complex mechanical transmission of the energy through numerous shafts, pulleys, sprockets, sheaves, belts, ropes and chains interposed between the prime mover and the machinery actually performing useful work, and which, in addition to consuming a large proportion of the available energy occupy a very considerable amount of space and serve to complicate the internal arrangement of the breaker. Owing to the severe service conditions the belt renewals and general repair work constitute a continuous and heavy expense and very little saving in the primary power required is possible when the breaker is operating on partial loads.

A realization of the efficiency of engine drive has led some of the coal operators to equip breakers of modern construction with individual motor drive, which, by eliminating a large percentage of the shafting, belting, etc., effects a great reduction in the power losses and maintenance charges, and by rendering it possible to run the various portions of the machinery independently, makes the power cost, when only part of the equipment is used, directly proportional to the amount of productive work.

The earliest attempt at individual motor drive was made with direct-current inclosed motors, and was only partially successful, as the intense vibration inseparable from breaker operation tended to cause commutator troubles.

In those breakers where induction motors were used, the simplicity of the rotor and the absence of moving electrical contacts resulted in a practically complete immunity from motor troubles, and the breakers were supplied with current from a central generating station; no local reserve power plant being required.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tipple is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

When long conveyor or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections.

The accompanying table which is taken from a paper presented by Graham Bright before the American Institute of Electrical Engineers gives specific information relative to the economics that can be effected by the use of purchased power in the operation of mines.

Commercial Practice
Management, Rates, New Business

High Peak Loads on Boston Dark Days.

The extraordinary weather conditions prevailing in Boston, Mass., March 18 and 23 produced abnormally high peak loads on the generating station of the Edison Electric Illuminating Company. During the morning hours of March 18 a dense black cloud enshrouded the city and suburbs, later resulting in rain. The darkest time was about 10 o'clock, when all the stores and many residences were lighted as at night. At 10:15 a. m. the load reached 54,456 kilowatts, or within 16 per cent of the greatest peak for the year 1913.

The following table shows the rapid increase from hour to hour:

7 a. m.	12,293	kilowatts.
8 a. m.	25,388	kilowatts.
9 a. m.	35,993	kilowatts.
10 a. m.	54,456	kilowatts.

The dark period of March 23 occurred in the latter part of the afternoon. At about 3 o'clock heavy clouds accompanied by violent snow squalls enveloped the territory in gloom. Most of the 50,000 customers of the Edison Company turned on their lights, and the City of Boston called for street lighting out of schedule the first time in ten years and only once before since the "yellow day" of 1881. By 3:55 p. m. the demand caused an increase in load at the L Street station at the rate of 1,000 kilowatts per minute. The normal demand at 4 p. m. at this season is about 33,000 kilowatts. The load on this day showed a maximum soon after four o'clock, of 56,835 kilowatts, or within 11 per cent of the greatest peak for the year 1913—63,131 kilowatts. The following was the recorded load during the dark hours of the afternoon of March 23.

2 p. m.	32,512	kilowatts.
3 p. m.	33,763	kilowatts.
4 p. m.	51,837	kilowatts.
4.15 p. m.	56,835	kilowatts.

Utah Light and Railway Company Demonstrates Heating and Cooking Devices.

Upon the invitation of the Home Economic Section of the Ladies' Literary Club, the Utah Light and Railway Company gave a practical demonstration of the operation of electric cooking and heating appliances before this section at the Club's new home, on East South Temple, Salt Lake City. Miss Helen L. Bartlett, teacher of cooking in the Salt Lake High School, read a paper entitled, "Electricity, and Its Application to Household Efficiency." Mrs. Olive Huppert, demonstrator for the Utah Light and Railway Company, gave a practical demonstration of the various electric cooking appliances available, and served a dainty electrically cooked luncheon at the close of the session to more than 100 ladies present.

Miss Bartlett's paper provoked a most interesting discussion.

Kansas City Central Station Has Luncheons for Department Heads.

The Kansas City Electric Light Company, Kansas City, Mo., has inaugurated a system of monthly luncheons for the heads of the various departments of that company and of others which are affiliated with it, including the Standard Electric Light Company, of Kansas City, Kan., and the Metropolitan Street Railway Company. The luncheons will be held on the first Saturday of each month at the Mid-Day Club, in the Commerce Building. While the social features alone are regarded as thoroughly worth while, the chief benefit is expected to result from the discussions between the department heads. It is planned to give each manager of a department as much insight into the workings of other departments as possible, the result being maximum efficiency in all.

Telephone Rules of New York Edison Company.

Believing that its customers can be best served and the company's business facilitated by the adoption of a universal method of answering the telephone, the management of The New York Edison Company has compiled a set of telephone rules which have been distributed to every one of the four hundred odd members of the contract and inspection department of the lighting company.

Four different cards have been circulated in all, two going to each individual employee, and one, a larger card, going to the department managers and bureau heads. These last are put in a conspicuous place in each office, in an effort to keep the idea of good telephone service constantly before the employees. The fourth card was an advertising novelty in the form of a large tag to be hung above the employees' desks.

The first card sent to the employees contained the following information:

"Please answer your telephone with the name of your bureau and your own name, instead of 'Hello'—as, 'Special Service Bureau, Mr. Brown speaking.'

"In calling individuals, if their bureau answers, give your name or bureau at once, as 'Mr. Jones, please, Mr. Brown speaking,' or 'Mr. Jones, please, Follow-up Bureau speaking.'"

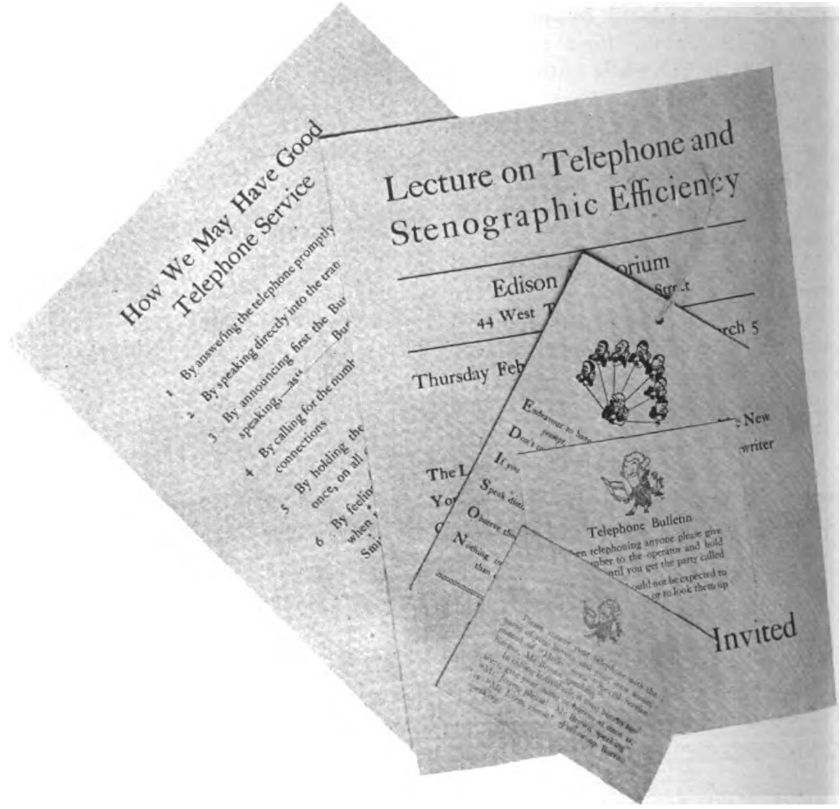
The second card, which followed soon after the first, gave brief instructions to employees when calling outside numbers, as follows:

"When telephoning any one please give the number to the operator and hold the wire until you get the party called. The operator should not be expected to remember numbers or to look them up.

The following general rules, under the heading "How We May Have Good Telephone Service," were printed on a large card and sent to the heads of the different bureaus with instructions to display them prominently on the office bulletin board: (1) By answering the telephone promptly and pleasantly. (2) By speaking directly into the transmitter . (3) By announcing first the bureau, then the person calling. (4) By calling for the number, not the name, on outside communications. (5) By holding the line and being ready to speak at once on all connections. (6) By feeling responsible for a neighbor's telephone. And so, complete information and courteous treatment will convince our customers that we are always at their service."

All four cards are arranged with great care typographically, the always courteous Edison Man being conspicuous.

Following the circulation of these rules, arrangements were made with officials of the Edison Company's commercial school for a special lecture for telephone operators and stenographers at the Edison Auditorium, in Twenty-seventh Street. W. I. Oldaker, of the New York Telephone Company, was invited to deliver an address on "Seven Rules of Telephone Service." This lecture, with another lecture delivered at the same meeting, was subsequently published in the Edison Weekly, the lighting company's employees' journal.



How We May Have Good Telephone Service

Lecture on Telephone and Stenographic Efficiency

Telephone Bulletin

Invited

Literature Published by New York Edison Company to Improve Its Telephone Service to Customers.

Voluntary Reduction in Boston Street-Lighting Rates.

As the result of conferences between the commissioner of public works of Boston, Louis K. Rourke, and officials of the Edison Electric Illuminating Company, a rate of $87.53 per lamp per year has been agreed upon at which the Edison Company will supply energy to the city's arc lamps used in street lighting. The lamps are of 6.6-ampere capacity, and number about 5,000. The contract runs for 10 years, and if accepted by the City Council after hearing will go into effect April 1.

The rate prevailing under the five-year contract between the Edison Company and the city, which expires on April 1, has been $103 per lamp. Under the terms of this contract the city should have notified the company a year ago that a revision of the terms was to be sought. No such notice having been served, the company was privileged to continue the present rate for another five-year period. The Edison officials, however, waived their right to this extension and agreed to the rate mentioned, which represents a saving of $77,350 per year to the city.

The Boston Consolidated Gas Company agrees to furnish gas lights at $20.60 per year. However, Mayor Curley is working to secure a rate of $20, and states that if this rate is not granted, the project of replacing gas lamps with electric lights will be taken up.

New-Business Activities in Louisville.

The Louisville (Ky.) Gas & Electric Company has recently completed the installation of a variety of electrical equipment for the Kentucky & Indiana Bridge & Terminal Railway Company, including a 10-horsepower motor which operates car-icing equipment by means of which a refrigerator car is iced in two minutes, yard-lighting equipment and a Mazda series-lighting system for the company's new bridge across the Ohio River.

The reorganized commercial department of the company secured contracts for 6,479 horsepower of new electrical business in the six months ended February 1, 1914. New electrical customers numbered 2,159. The new lighting business contracted for aggregated 3,034 horsepower, and the additional power business 3,433 horsepower. Contracts for natural gas for industrial purposes call for an estimated annual consumption of 221,640,000 cubic feet, and these were taken at the rate of 35 cents per thousand cubic feet.

Lighting of New Offices of New York Edison Company.

Facade Lighting of New York Edison Company's New Office Building.

One of the most studied and carefully worked out examples of the exterior illumination of a large building is to be found in the new home of The New York Edison Company at Irving Place and Fifteenth Street. The present artistic scheme of decorative lighting was evolved after months of experimenting and testing by the company's illuminating engineers. Lamps of various candlepower were tried at different distances apart and at numerous points and angles, the results being carefully observed several blocks away. There are 4,000 Mazda lamps used on the outside of the building alone, ranging from 10 watts to 500 watts and aggregating 128,000 candlepower. This is approximately as much illumination as glows from a battery of the most powerful searchlights now used in the navy, or as is used to light a mile of Fifth Avenue, or to dispel the darkness in Central Park.

The brilliancy of the illumination is accentuated by the gilt trimmings of the building. The coping may be said to resemble a golden crown of light. In design this coping appears to consist of large and small spreading fans set alternately a short distance apart. The decorative surface of these fans is covered with gilt, the large fans being 8 feet high. The illumination is at the foot as the footlights of the stage. From a distance this surmounting feature takes on the appearance of a delicate tracery of gold lace.

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Strenuous House-Wiring Campaign in Columbus, O.

A second campaign on a still more popular plan than that of a few months ago, is just being launched by the Columbus Railway, Light & Power Company, to increase the number of customers for its residence service. It is a co-operative arrangement between the company and six of the leading electrical contractors of the city. By the terms of the contract the consumer may have eight rooms wired complete, with first-class fixtures, equipped with handy pull-chain sockets, suitable glassware and 40-watt Mazda lamps, for the sum of $49.75, on easy payments. Superintendent Wolls, of the new business division has been at work upon the plan for some weeks, and believes that contract to be the most simple and the most liberal that has ever been put in force anywhere. Attached to the contract signed by the customer are illustrations of all fixtures to be used. The fixtures are furnished and installed by a high-class house. A force of ten salesmen has been put to work, with the view of covering the entire city. They are provided with information which will permit of prompt estimate being made on extra features. The contractors co-operating in the campaign will carry deferred payments.

The company expects that not less than 1,000 new customers will be added to its residence service through this popular effort.

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Central-Station Power for Excavating River Bed.

The J. H. Cahill Company, which is doing a good deal of rock and earth excavating in Louisville, Ky., in connection with its job of concreting the bed of Beargrass Creek, has installed a battery of four drills, driven by compressed air. A 60-horsepower Westinghouse motor drives a 350-cubic feet Ingersoll-Rand compressor, and this equipment has supplanted the steam drills which were at first used on the job. The Louisville Gas & Electric Company has built a temporary line to the point at which the work is being carried on. This class of business forms a very profitable central-station load.

New England Central Stations Find Means for Protection from Accident Suits.

As a means for protecting themselves from possible suits for damages, two hydroelectric companies in New England require a contract from visitors to their generating stations which stipulates that the visitor assumes all risks to person and property while on the premises.

The Bar Harbor & Union River Power Company, which operates a 2,250-kilowatt hydroelectric plant at Ellsworth, Me., has a contract to the above effect which is printed on a long sheet of strong paper and attached to the station wall near the entrance. Visitors to the station sign this paper before inspecting the plant.

The Connecticut River Transmission Company and the Connecticut River Power Company, which operate the widely known generating plant at Vernon, Vt., on the Connecticut River, issue a pass to applicants for admission to the power house or substations. This pass is in the form of a card, on the back of which are printed the following conditions which constitute a contract with the user:

"In consideration of its receipt and use, any person entering the power house or substations under this ticket voluntarily assumes all risks of accident, and it is expressly agreed that the Company shall not be liable under any circumstances, whether by negligence of itself, its agent, or otherwise, for any injury to the person, or for any loss or injury to the property of anyone so using it."

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Another Use for Edison Current.

The Forbes water sterilizer, which was installed in the Forty-second Street Building of the New York Edison Company last spring, has just completed its first six months of service. During that time it has supplied drinking water for the Delancey Street, the Harlem, the Broadway, and the Forty-second Street offices. Some interesting figures have been worked out as to the cost of operation of such a machine compared with the seemingly simpler method of buying water. In the first place the machine is of an automatic type and required no extra help to take care of it. The cost of the current used at ten cents per kilowatt-hour would have been $53.84, which marks the total expenditure. During the six months 979 five-gallon bottles of water were sterilized and used; these at fifty cents per bottle would have cost $489.50, making the total saving for the six months $435.66. It is interesting to note that from May through July the number of bottles used monthly steadily increased until 186 were consumed in the latter month. Then, as the weather became cooler, the number fell off, 127 being the October figure.

The cost of the outfit was $1,065, the machine itself being $650, and the bottles and coolers $415. As compared with the investment the saving of $435 in six months' time is an enormous amount. This saving could be made even greater, however, for in the case of a concern large enough to use the amount of water the machine is capable of producing, current could be supplied at wholesale rates considerably under ten cents per kilowatt-hour.

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Review of Philadelphia Electric Company's Business.

The Philadelphia Electric Company in a special bulletin covering the work of the year of 1913, announces that in that year its net increase, in connected load, was equivalent to 627,572 50-watt lamps. Before the end of the present year it will have more than the equivalent of 4,000,000 50-watt lamps connected to its circuits, an increase of 100 per cent in five years. During the year of 1913 a number of important power contracts were closed, including one for 2,000 horsepower in motors for the new Girard Point elevator of the Pennsylvania Railroad.

The earnings of the Philadelphia Electric Company were much larger during 1913 than any year previous. The annual report covering operations for the year, ending December 31, was submitted to the directors at their recent meeting. It was unofficially reported that the gross earnings were approximately $7,700,000, or an increase of about 10 per cent over the preceding year, when they were $7,051,497. The net earnings are said to be about $2,000,000 which would be equivalent to 8⅞ per cent on $22,500,000 paid in capital of the company. In 1912 they were $1,666,190, or about 9.5 per cent on $17,500,000 capital. The exact figures of the report will be made public at the annual meeting of the stock holders to be held in Camden on April 8.

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Special Toaster Campaign in Boston.

The Edison Electric Illuminating Company of Boston is offering electric toasters of the Landers, Frary & Clark Thermax manufacture at $2.95 for a limited time. The use of this appliance is demonstrated in the company's show window, the process being conducted in the presence of an interested multitude outside, to whom the crisp toasted bread resulting looks inviting. The Edison Company is advertising the use of this little breakfast-table accessory as "the modern way to start the day", and enumerates some 50 supply dealers in all parts of its territory who will give information and demonstrate the advantages of the toaster.

Boston Employees' Campaign to Increase Load to 200,000 Kilowatts.

In order to stimulate the volume of sales and the general growth of the business, the Edison Electric Illuminating Company of Boston is conducting a campaign among its employees looking to the securing of a connected load of over 4,000,000 50-watt equivalents before July 1.

The campaign began about the first of February, when the company's load was 3,764,000 equivalents, and interest has been aroused and stimulated by means of a letter from Superintendent W. H. Atkins to every employee in which he urged every person in the company's service to join in this campaign; the company publication, *Edison Life*, carried forward the project through advertisements and editorially calling upon the employees to work toward the desired end. Placards posted throughout the company's offices, call attention to the same thing, and a "thermometer" indicates the progress of the campaign. Every letter passing between the various departments bears the following slogan, stamped upon it:

4 MILLION
OR MORE
JULY FIRST
OR BEFORE

On March 27 the company's total connected load was 3,814,852 equivalents. The average of 1,900 equivalents per day are needed to reach the goal, and it is the belief of the employees that the end will be accomplished. Every employee of the 2,000 in the Edison Company's service is interested to work among his friends and neighbors. The total of 4,000,000 equivalents is to be net, with service discontinued deducted.

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Central-Station Power for Cotton Mills in Georgia.

The recent completion of the big hydroelectric development at Stevens Creek, on the Savannah River, near Augusta, Ga., is being followed by the use of the electricity for power by many manufacturing plants in that section. This waterpower plant is owned by the Georgia-Carolina Power Company of Augusta and will transmit 30,000 electrical horsepower. The Graniteville Manufacturing Company, with mills at Graniteville, S. C., is one of the cotton manufacturing plants that will adopt the electric drive. Two other companies that will use the Stevens Creek electricity are the Aiken Manufacturing Company and the Seminole Manufacturing Company, with mills at Bath and Clearwater, S. C. These companies have contracted for 1,600 electrical horsepower.

Electric Sign Data

Convention of Sign Manufacturers in Chicago.

As mentioned on another page of this issue a representative gathering of the electric sign and accessory manufacturers of the United States gathered in Chicago on March 30 and 31 for a two-day meeting for the purpose of organizing a permanent association. Preliminary action in this respect was taken at the initial meeting held in Chicago on December 1, at which an Organization Committee was appointed to perfect plans for a permanent association. This committee was composed of George R. Hall, H. I. Markham and Norman B. Hickox.

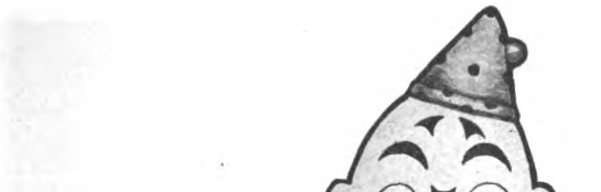
The need of an association of sign manufacturers was generally conceded by those actually present and by expressions from a large number of companies who found it impossible to be represented at the Chicago meeting. The misapplication of sketches by sign manufacturers and central-station salesmen seems to be one of the annoying conditions in the industry. Improvement of the quality of sign construction also seems to be the aim of those manufacturers represented and in the Constitution and by-laws adopted at the meeting strict requirements in this respect were made for membership.

At the session on Monday afternoon James Betts, of Betts & Betts, New York, read a communication from Dana Pierce, of the Underwriters' Laboratories, in which he pointed out the many ways in which the proposed association of sign manufacturers could cooperate with the Underwriters in reducing both the fire and accident hazard. There was also a great opportunity to obtain uniform inspection laws in different localities through organized effort.

A. R. Small, of the Underwriters' Laboratories, Chicago, delivered a brief address in which he called attention to the National Electrical Code and pointed out that the sign manufacturers either as an association or as individuals have the opportunity to modify or amplify the Code as respects the manufacture or installation of electric signs. He stated that in a great many instances particularly in smaller towns and cities the municipal electrical inspection departments use the Code as their standard for inspection and if the sign manufacturers could see that the proper requirements are embodied in the Code the standard of sign construction would be improved and no inspection difficulties would be encountered. In conclusion he referred to the label system as applied to sign manufacturing and enumerated the benefits to be derived therefrom.

J. E. Latta, also of the Underwriters' Laboratories, stated that letters had recently been sent to 150 municipal electrical inspection departments asking whether or not Rule 83 of the Code was applied in sign inspection. So far 54 replies had been received from 28 states and in only a few cases are changes or additions to this rule made.

Practically the entire time of the convention was taken up with a detailed consideration of the constitution and by-laws for the association, compiled by the committee previously referred to. Among the important committees provided for are the Grievance Committee, which will investigate and report on all differences between companies, particularly in connection with the misapplication of sketches; Manufacturing Standards Committee, which will seek to standardize manufacturing methods in sign factories; and the Underwriters' Standardization Committee, which will co-operate with the Underwriters' Laboratories.



Sign sketch submitted by the Greenwood Advertising Company, Knoxville, Tenn. This is a double face sign admirably suited for vaudeville and motion-picture theaters.

Sign measures 11 feet by 9.5 feet. There are 406 receptacles, 12 and 16-inch grooved, fancy block letters being used. The background is imported glass smalt and any desired colors can be furnished.

The clown's head is constructed under the Greenwood shadow-picture patents making several different expressions, among which are sleeping, winking eyes, smile, etc.

Electrical Construction

ELECTRICAL INSPECTION IN ONTARIO.[1]

By H. F. Strickland.

In a limited time it is impossible to go thoroughly into all the details of such an extensive question as electrical inspection of a province the size of Ontario. I will therefore confine my remarks to a short, comprehensive outline of the plan of inspection and the probable method of enforcing it.

We all know that it is necessary to first of all formulate proper laws and ones which can be regarded by those who know as just and practical, and then when the law is passed it is of little or no use unless it is enforced. In the case of the old inspection there is not very much the matter with the rules, or what we might term the old law. The chief weakness with these old rules is the fact that they do not specifically cover the life hazard. The old rules were made almost entirely under the supervision of the fire underwriters and kindred associations, whose one interest is the prevention of loss from fire, and I think that we can safely say that the National Electrical Code has been a familiar figure in the electrical field over this entire continent and that there was little wanting in it so far as was required to get a pretty satisfactory job, if carried out to the letter. So much for the departed friend. We always like to speak well of those who have gone before, and I think I am not going too far when I say that the book of regulations now produced by the Hydro-Electric Power Commission will be the recognized standard of electrical installation work in this province for a good many years to come, with of course such amendments and additions as may be necessary from time to time owing to fluctuations in the conditions. At this point it would be well to remark that the National Code when it first appeared was not anything like what it is at the present time. The Hydro-Electric Power Commission's Rules as they stand today have adopted a good deal of the matter originally in the National Code, for the simple reason that after having made a most exhaustive inquiry the Commission decided that there was nothing which would suit local conditions better than the main substance of this code. The text of the Code was carefully read through and re-edited, making considerable change in the phraseology of certain rules, eliminating a great many repetitions, adding a number of other rules and deleting a few unnecessary ones, and finally the whole substance of the book was reclassified and put in much simpler and practical order. The National Code was written in the form of a suggestion throughout, owing to the fact that the fire underwriters have had no legal power of enforcing their requirements other than by an increase of insurance rates, which often were detrimental to the interest of the companies bidding for insurance business.

As the Hydro-Electric Power Commission's Rules have become a law in the province, it was necessary that the book be re-edited in such a way as to make all requirements positive, clear and concise, which I think is conceded by most people who have studied it carefully to be the case. The question of enforcement is now the next problem to deal with. The law requires that municipalities must appoint electrical inspectors, and also has vested the Commission with power to approve of the selection which any municipality may make. I am not at the present time at liberty to make any statements as to what the Commission may do or what further legislation it may ask for, but I have reason to believe that as time goes on it will continue to add such amendments to the Act as to obtain the best results. In the meantime the municipalities have been notified throughout this province that they are expected to pass the by-law giving their municipality the power to regulate electric wiring and the use of electric current within their boundaries. The Commission has prepared a uniform by-law which has been printed and is sent to all municipalities, which they can copy and pass, thereby relieving them of much loss of time, expense and worry in drawing up a varied assortment of by-laws throughout the province, some of which might be useful and others perhaps useless. The Commission has power to amend this by-law, add to it or change it, as the commissioners may consider advisable.

In a great many of the important cities in Ontario the by-law has been passed and electrical inspectors appointed, and results are already forthcoming, so that it is likely before the end of the year there will be in the neighborhood of 100 municipalities from Ottawa to Fort William carrying on a municipal system of electrical inspection. The work of the different inspectors throughout the province is subject to the supervision of the Hydro-Electric Power Commission, that part of the work directly connected with electrical inspection being handled by what is known as the Rules and Regulation Department, but, like all other departments in the Commission, is subject to the authority of the chief engineer of the Hydro-Electric Power Commission. The result of this system should ultimately be very satisfactory to all parties concerned, inasmuch as the system of inspection, the enforcement of rules, the general interpretation thereof and the final settlement of all disputes will be uniform, as they must ultimately resolve back to the Hydro-Electric Power Commission for adjustment. One of the chief difficulties experienced in the country to the south of us is that while they have many municipal inspection bureaus, the interpretation and enforcement of the rules is largely affected by the idiosyncrasies of individual inspectors, resulting often in confusion and a duplication of devices to suit the whims and peculiarities of any particular inspector who may fancy that he is divinely inspired to enforce the rules just a little differently than somebody else. In the province of Ontario, however, the chief inspector does not make any claims to any superior inspiration, but will carry out the orders of his employers to the effect that the rules be enforced in their full broad meaning, that everybody get an absolutely fair and unprejudiced decision and that cheap substitutes for approved material and workmanship be not tolerated. In a word, the entire system of inspection is therefore under the control of one final authority, namely, the Hydro-Electric Power Commission, resulting in a uniform and legal administration of electrical inspection laws. Now in anticipation, this condition is ideal, and I hope before long that the realization of it will be all that can be expected.

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[1] Address at a local meeting of Jovians in Toronto, Canada.

We all appreciate the difficulties which confront the electrical contracting interests, which are, that people who are endeavoring to carry on a first-class business and handle only approved material are confronted with competition from irresponsible amateurs who under the present dispensation are able to do anything they like. This fact is well known to all people engaged in the electrical business as either contractor or jobber, without any further elaboration. Already old-Code rubber-covered wire is becoming a drug on the market, and in several municipalities connection has been refused to installations by local inspectors where old-Code wire had been used. This may seem a trifle hard at the first, but the contractors had been fairly warned that new-Code wire only would be accepted, and if they choose to play with fire they will get their fingers burned.

The new regulations of the Power Commission, in addition to the rules pertaining to the fire hazard, contain also sufficient extra safeguards to prevent, as far as reasonable, electric shocks or danger to the unskilled person who is inadvertently brought in contact with electrical apparatus or fittings. Voluminous productions have been produced and many hours of thought expended on fuses, and the fusing of circuits, so that they cannot be improperly or over-fused. The result of all this deliberation has been the production of cartridge fuses with different types of holders, with the object of making them non-interchangeable, but after all is said and done there is no rule heretofore to prevent anyone from fusing up his main cutouts with gas pipe or overfusing it beyond the melting point of the wires they are intended to protect, regardless of the consequences. Under the Hydro-Commission regulations, all main fuses must be inclosed in a sealed-up metal inclosure and proper warning placed on the box that if these main fuses are tampered with or the seal broken the offending parties will be prosecuted. I think I am pretty safe in saying they will be prosecuted. This at least insures that the installation will be protected so far as the main fuses are concerned, and if amateurs or others choose to overfuse their branch circuits they can only go so far and no further. There is nothing in the rules to prevent the consumer from having an auxiliary main fuse if he desires it, but he will soon learn to know that once he goes past the safety point he will blow his main fuses, and it will likely cost him something to have it replaced.

There is one point in connection with the whole of the electrical inspection methods which is of the utmost importance and one which I wish at this juncture to emphasize very strongly, and that is the prevailing notion among a great many electrical contractors, and also an impression which a great many of these people give their customers, and that is that the new regulations will greatly increase the cost of electric wiring. I wish to bring out this point very strongly, because it is one of great importance to central-station operators. In answer to this I would quote the statement of one of our best known central-station operators in Canada, who in writing to us recently used the remark that "even should proper regulations somewhat increase the cost of electric wiring, I am firmly of the opinion that it should be safe at any cost." When this statement is thoroughly digested the force of it becomes more and more apparent. When one is called upon to enter the home of some unfortunate family whose husband and father has been suddenly carried out from their very midst in the prime of life through an unfortunate accident owing to defective electrical installation, the truth of this statement is brought home in a most forcible and grievous manner. I have now been in three homes during the past twelve months where just such an accident has occurred, and in each case the electric wiring was defective and could have been originally installed properly for practically nothing more in the way of expense than was expended in doing work in the way in which I found it.

The object of the wiring rules and regulations is to ensure to the unskilled and untrained people of the community a reasonable protection against shock and fire and also to encourage skilled and *bona fide* electrical workers to give an estimate on doing work in accordance with the specifications laid down in the Hydro Rules and Regulations, knowing their trade will not be interfered with by the work of unskilled people who in the absence of any proper system of inspection are at liberty to do pretty much as they like. I want to say also at this juncture that wiring contractors who make the cry to their customers that the wiring regulations are greatly increasing the cost of wiring are only admitting that they have heretofore been giving their customers small measure for value received. To prove this statement it is only necessary to mention that there is little or nothing in our regulations requiring any greater expenditure of time and material than was originally suggested in the rules of the National Electrical Code. The chief difficulty is that in one case our regulations will require that the work be done in accordance with the letter, whereas before there was no way of enforcing the requirements except in a few centers where there was some inspection by the fire underwriters.

As a further illustration of this argument we will take the case of a moderate-sized home, say a ten-room house. To wire a house of this size with knob-and-tube wiring with an ordinary outfit of switches and the number of outlets which would be ordinarily found in a moderate-sized home would cost between $60 and $85, varying somewhat according to whether the switches were flush or surface, etc. Taking $75 as a fair price, it will cost just about 75 cents more to do this job in accordance with our Rules and Regulations as against the National Code requirements. Is there any man among you who would grudge 75 cents to save his wife from shock, fire or even injury? Yet in the face of these facts we have already had some contractors, where electrical inspection is being rigidly enforced, raising the cry that it is greatly increasing the cost of wiring. Their chief object in view seems to have no other motive than to make the system of inspection unpopular and to get back at the inspector. There is an element of inconsistency through all this. On every hand the cry goes up amongst the electrical contractors for good inspection. I therefore say to all those engaged in the business, chiefly in the outlying towns, now that we are giving you this inspection, do not encourage such talk, and let the municipal councils of your municipalities feel that the institution of a system of electrical inspection is for the welfare of the citizens at large.

Laws for Licensing Electrical Contractors.

The Committee on Legislation of the National Electrical Contractors' Association, of which P. H. Jaehnig is chairman, has made a report covering the laws and city ordinances now in effect in the United States, which affect the licensing or registration of electrical contractors. From this report the following paragraphs are taken.

Not all existing laws and ordinances are working out satisfactorily, due partly to defects in the law, and partly to laxity in its enforcement. There remains much to be done to secure ideal legislation. Each new law or ordinance proposed approaches more nearly the ideal, by eliminating such clauses as experience has proven to be unsatisfactory, retaining those which are beneficial, and adding new clauses which tend to place the business on a higher plane, or perhaps meet local conditions.

In introducing new legislation, the committee suggests the co-operation of all the electrical interests, principally the lighting company, the labor organizations, the municipal and underwriters' inspection bureaus, manufacturers, jobbers, electrical engineers, architects and in fact all who are directly or indirectly interested in safe electrical work.

The law should be drawn so that it is a protection to life and property. It should not create a monopoly for the electrical contractor, or restrict the freedom of those who wish to engage in the business.

Make sure that it is constitutional.

Make the license fee small, and provide for a competent examining board.

Make violations of the law a misdemeanor. Educate the public and legislators as to the necessity and justice of the law, and the protection it affords.

Dignify the business by having it legally recognized, and the term "electrical contractor" will carry with it the prestige it deserves to carry.

Do not provide for a bond in the law; the penalty is enough to safeguard the public.

Provide that the license shall be revocable after repeated violations.

Do not license the workmen; the responsibility should rest entirely with the master electrician.

The licensing of electrical contractors is at present receiving much attention throughout our country, as it seems to be the only solution of certain abuses and weaknesses in the trade. One of the chief difficulties in obtaining uniformly good results in electrical construction work, is the irresponsible contractor, one who has just sufficient knowledge of the business to be dangerous. He, through lack of knowledge of correct principles, the use of inferior material and poor workmanship, tends to create a life and fire hazard, instead of a safe installation.

This has a tendency to discredit the business in general, and more particularly the legitimate and well qualified contractor, who strives always to install his work in accordance with correct principles, and the most modern practice, and produce a safe and creditable installation.

A license in itself would not be an assurance of safe or honest work but merely that the licensee is in a degree competent to engage in the work.

It would prevent those from engaging in the business who do not possess the requisite knowledge of the correct principles and their practical application.

The authority to issue a license carries with it the power to revoke it for improper practices, and violations of its provisions, and herein lies its power.

The cancellation of a license, for cause, would be more effective than the fear of a suit under a bond.

Licensing tends to dignify the business, give it official recognition, and place it on a higher plane in the minds of the public. It tends to fix responsibility, and guarantee a compliance with National Electrical Code requirements.

There are at present license laws in Tennessee, Louisiana, Maryland, Minnesota, Ohio and the District of Columbia.

In general these laws provide for a license to do electrical work, which can be secured by passing an examination before an examining board, the payment of a license fee and yearly renewal fee. In three of the states named a bond is required, the amount of the bond being $1,000 in Maryland and $2,500 in both Tennessee and Louisiana.

License laws are now before the legislatures of the States of Oregon, California, Indiana and Massachusetts, and electrical contractors in these states are very actively engaged in securing their passage.

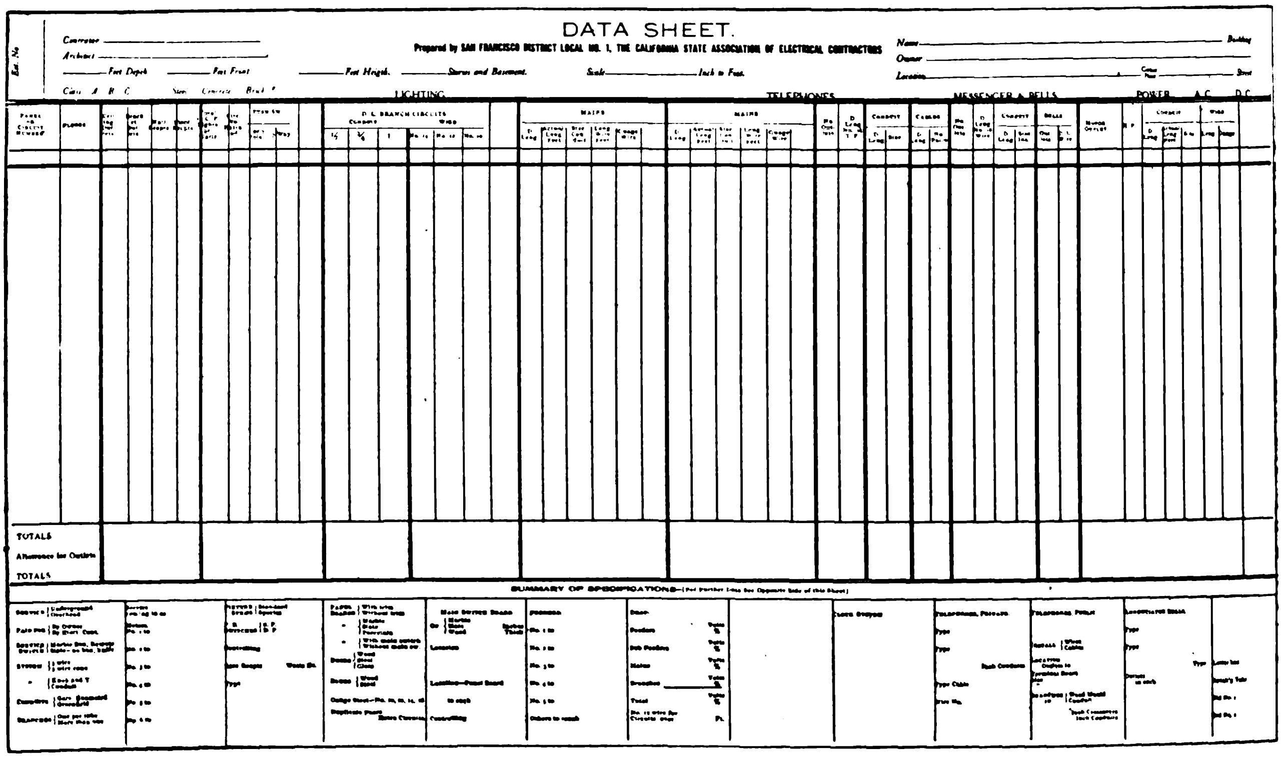
The Ohio law, recently enacted, has a rather unique history. For the past eight years the Ohio electrical contractors have tried to have a law enacted licensing them, but without success. Last year a bill was presented licensing house movers, plumbers, sewer tappers and vault cleaners, and at the eleventh hour the contractors slipped in a rider in the form of the term "electrical contractor," so they were included in the license bill.

While perhaps this law did not give the Ohio contractors all they had hoped for, it is at least a step in the right direction, a legal recognition of the business of electrical contracting.

The Louisiana law was declared unconstitutional on the ground that it discriminated in favor of the public service companies, or was class legislation.

The Maryland law is not entirely satisfactory, due principally to lack of proper application and enforcement.

In the cities of the United States there are ordinances governing the installation of electrical work as follows:



DATA SHEET.

Prepared by San Francisco District Local No. 1, The California State Association of Electrical Contractors

LIGHTING
TELEPHONES
MESSENGER & BELLS
POWER A.C. D.C.
TOTALS
Allowance for Outlets
TOTALS
SUMMARY OF SPECIFICATIONS

Fig. 1.—Data Sheet Prepared by San Francisco Contractors.

Moline, Rock Island, Peoria and Chicago, Ill.; Newark and Camden, N. J.; Kansas City, Mo.; San Francisco and San Diego, Cal.; Toledo, O.; Minneapolis, Minn.; Louisville, Ky.; Denver, Colo.; Medford, Mass.; Madison, Wis.; Indianapolis, Ind.; New Haven, Conn.; Jamestown, N. Y.; Sioux City, Iowa; Memphis, Tenn., and Little Rock, Ark.

Proposed ordinances are being considered in the cities of Gary, Ind.; Watertown and Buffalo, N. Y.; New Orleans, La., and Newark, N. J.

The recent Chicago ordinance is not satisfactory as it does not provide for an examination, and anyone can secure a license by paying the required fee, and being vouched for by two citizens. Under this ordinance they have issued licenses to sign manufacturers, real-estate dealers, piano manufacturers, hardware dealers, plumbers, etc.

Sioux City reports that its ordinance is working nicely. Jamestown reports the ordinance and its provisions satisfactory, but its enforcement weak. Peoria reports the ordinance satisfactory. Denver has a very complete ordinance which is working out satisfactorily, although there is trouble in enforcing all of its provisions.

Kansas City reports the ordinance not working to suit the contractor. It does not provide for an examining board, hence anyone can secure a license by paying the fees. The fees are too high.

Camden and Newark report their ordinances are working out satisfactorily, although experience has shown where improvements can be made.

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Searching for a Malicious "Inspector."

Electrical contractors of Kansas City, Mo., are co-operating with the police in searching for a bogus contractor who, it is alleged, has been cutting wires on one visit and repairing them on the next, thus creating profitable activity for himself. The initial visit is made, it is said, under the representation that he is an inspector.

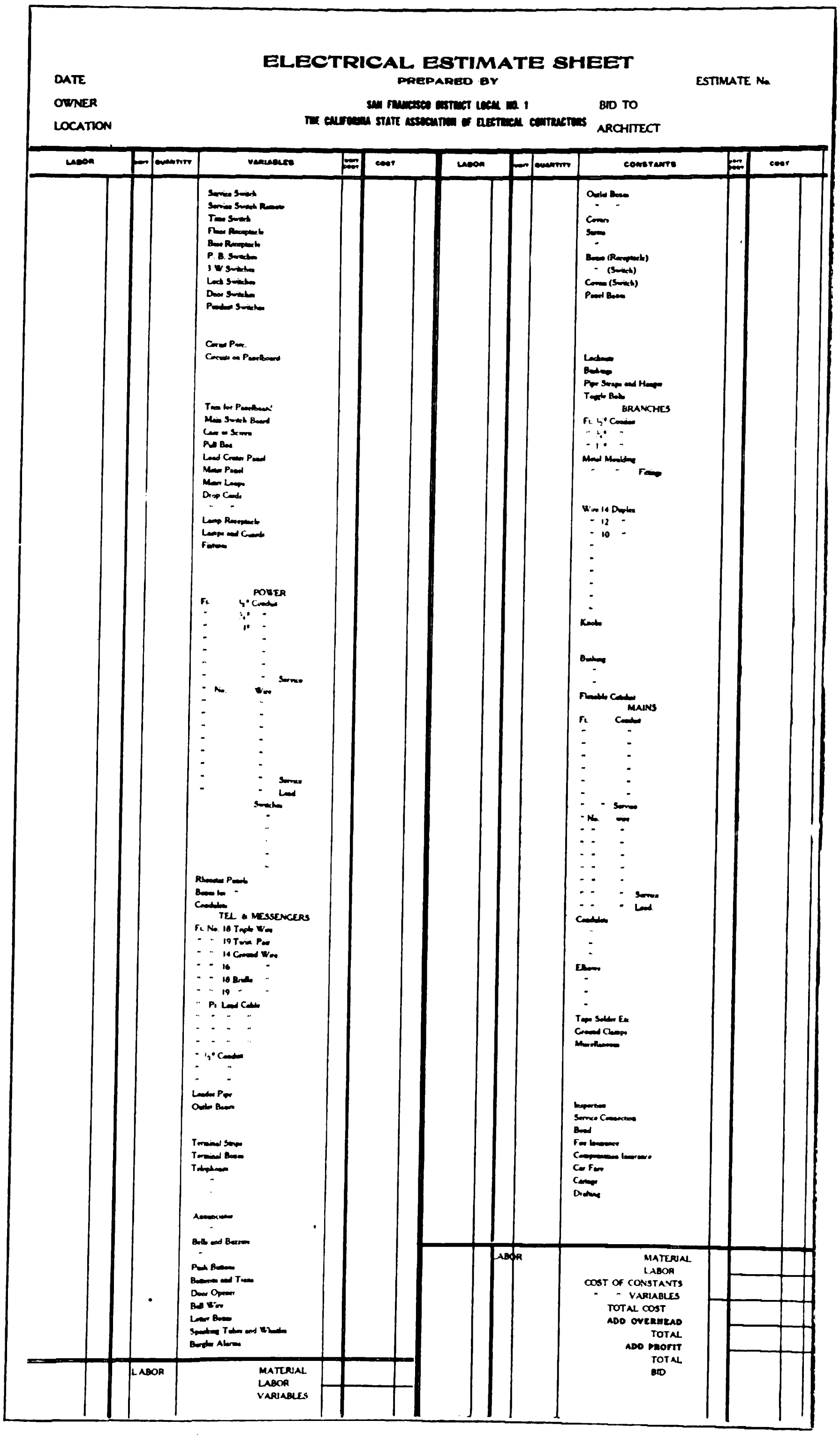
◆

Data and Estimate Sheets.

Printed blanks for facilitating the work of making estimates upon jobs of electrical contracting have been prepared and published by San Francisco District Local No. 1 of the California State Association of Electrical Contractors. These sheets are reproduced in the accompanying illustrations, Figs. 1 and 2. Each sheet measures 18.75 by 10.25 inches.

Fig. 1 is a data sheet which is filled out by reference to plans and specifications which are supplied to the bidder. Spaces are provided for each circuit involved and for all of the material to be used in connection therewith, and for showing the kind and quantity of this material. After this information has been taken from the plans and specifications the estimate sheet shown in Fig. 2 is filled out. This is arranged so that the quantity and cost of material of all kinds can be filled in and also an estimate of the labor involved in this work and cost for same. There is also a place for incidental expenses connected with the work such as inspection, insurance, drafting, etc. After summing up the cost for material and labor, there are blanks which remind the bidder to make provision for overhead expenses and profit.

It will be noted that these forms are very complete and they are being found very useful by the California contractors. They may be obtained from W. S. Hanbridge, secretary of the Association, Rialto Building, San Francisco, Cal. They are supplied in sets of 100 sheets of each kind for $2.50.



ELECTRICAL ESTIMATE SHEET

DATE

PREPARED BY

ESTIMATE No.

OWNER

SAN FRANCISCO DISTRICT LOCAL NO. 1

BID TO

LOCATION

THE CALIFORNIA STATE ASSOCIATION OF ELECTRICAL CONTRACTORS

ARCHITECT

LABOR	UNIT	QUANTITY	VARIABLES	UNIT COST	COST	LABOR	UNIT	QUANTITY	CONSTANTS	UNIT COST	COST

Service Switch
Service Switch Remote
Time Switch
Floor Receptacle
Base Receptacle
P. B. Switches
3 W Switches
Lock Switches
Door Switches
Pendant Switches
Circuit Panel.
Circuits on Panelboard
Trim for Panelboard
Main Switch Board
Case or Screen
Pull Box
Load Center Panel
Meter Panel
Meter Loops
Drop Cords
Lamp Receptacle
Lamps and Guards
Fixtures
POWER
Ft. ½" Conduit
" ¾" "
" 1" "
" " Service
" No. Wire
" " Service
" " Load
Switches
Rheostat Panels
Boxes for "
Condulets
TEL. & MESSENGERS
Ft. No. 18 Triple Wire
" " 19 Twist. Pair
" " 14 Ground Wire
" " 16 "
" " 18 Bridle "
" " 19 " "
" Pr. Lead Cable
" ½" Conduit
Leader Pipe
Outlet Boxes
Terminal Strips
Terminal Boxes
Telephones
Annunciator
Bells and Buzzers
Push Buttons
Batteries and Trans.
Door Opener
Bell Wire
Letter Boxes
Speaking Tubes and Whistles
Burglar Alarms

LABOR
MATERIAL
LABOR
VARIABLES

Outlet Boxes
Covers
Stems
Boxes (Receptacle)
" (Switch)
Covers (Switch)
Panel Boxes
Locknuts
Bushings
Pipe Straps and Hangers
Toggle Bolts
BRANCHES
Ft. ½" Conduit
" ¾" "
" 1" "
Metal Moulding
" " Fittings
Wire 14 Duplex
" 12 "
" 10 "
Knobs
Bushing
Flexible Conduit
MAINS
Ft. Conduit
" " Service
" No. wire
" " " Service
" " " Load
Condulets
Elbows
Tape Solder Etc.
Ground Clamps
Miscellaneous
Inspection
Service Connection
Bond
Fire Insurance
Compensation Insurance
Car Fare
Cartage
Drafting

LABOR
MATERIAL
LABOR
COST OF CONSTANTS
" " VARIABLES
TOTAL COST
ADD OVERHEAD
TOTAL
ADD PROFIT
TOTAL
BID

Fig. 2.—Estimate Sheet.

LETTER TO THE EDITOR.

Keeping Costs for the Electrical Contractor.

To the Editor:

The term "electrical contractor" may be taken to mean anything from a man who keeps a small supply of wire and porcelain for doing small house jobs to one who installs entire lighting plants and extensive equipments. The former calls himself such so as to appear of more consequence. While much has been said about the "curbstoner" he seems to have made a place for himself in the industry. He can do work and bring modern conveniences within the means of people who would not otherwise be able to enjoy them at the prices the legitimate contractor has to charge, with his larger expense, and we must recognize the smaller fellow; and if the industry as a whole is going to expand, must have the co-operation of everyone in it. The records of the supply dealers will show that a large percentage of their business is with just these small wiremen, and instead of trying to wipe out this little fellow we should try and help him build up a bigger business and instill a few business principles into his mind so that he will realize that he must get a profit from his work if he is going to stay at the trade. As a matter of fact, if we were to go back and see the beginning we would find that many of the present big contractors, the "old-timers," started at one time with a small stock of goods and more ambition and nerve than capital. So, then, we must educate these men, who in many cases are excellent workmen, but who have no idea of what profit means and to whom everything over their cost appears as profit. It is true that they have not the expense the larger contractor has, but considering the smaller volume of business done they must get a correspondingly larger profit. They should also take into consideration the lost time, for as a rule they have not enough work to keep going steady, and often must spend some time soliciting work and also on figuring jobs which they do not always get, which is an item of expense. It will pay any small contractor to spend some time on his books and with a small business, keeping cost is a comparatively simple matter as there is not the great volume of this to do and if every contractor small or large would spend a little time each day on figuring out his cost on work done, there would be fewer "electrical firms" listed in the failures of the commercial reports.

Prices for wiring are strictly governed by competitive conditions. The customer has no idea of value pertaining to our goods except by comparison and when he gets one price from one man and another from another man it naturally leaves him to suppose that the higher-priced man is making more profit, while in fact they may both be losing money should either get the job, and the customer is not slow to recognize the ease with which he can "jockey" two bidders by telling each one he is high man and thus get one cut after another until the price of the job is down where no one could do it and hope to come out. If the bidders would just stop and consider what they are doing, they might better sell out and start a grocery store. Price cutting not only is demoralizing at the time it is done, but sets a precedent from which the one who gets the job at that time, or the next bidder, must suffer, as the customer thus gets a line on prices which he expects will hold good for future jobs. The writer gets up against just this proposition every day, where the prospective customer will cite other cases where a job was done so much cheaper and it is always hard to explain and at the best leaves the customer in a doubtful state of mind.

There are two ways of meeting competition; one is to get the job no matter what the consequences are and in due time have the sheriff put a padlock on your door; another is to get your price or leave the job to the other fellow and while he is busy trying to "come out" on a bunch of this class of work, you can be doing a lot of "time and material" jobs for your regular customers and get a profit from your work and I'll gamble that inside of a year you will be riding around on your jobs with an automobile while your competitor will be sitting up nights figuring out a new scheme for raising money to pay his bills with, if he has not "stung" his dealers he buys from already by this time.

The first essential thing necessary to attain success in any venture is to ever keep in mind what the deal is going to net you. You may need some advertising but you had better get that in some commercial form and not by taking a job below cost, which is the most expensive kind of advertising I know of, and remember that in handling work taken without profit you lose both ways; you are spending your time, which might otherwise be devoted to profitable work, on work which is causing you loss, besides the loss on the job itself. By keeping a careful and accurate record of your costs you can determine your future policy and then make up your mind not to take any job that you know will not net you a profit. If you only do one-half the amount of work, better lay off and go fishing and get some enjoyment out of life than to be overworking yourself on unprofitable work. I have heard the argument that it is impossible to keep an accurate record of costs and thus it is useless to try to keep any at all. Reasoning along these same lines, we are wasting our time trying to get along with artificial light as we cannot light the earth with it and thus might as well not have any at all. The argument is about as logical, if you cannot keep accurate records, keep them as accurate as you can and get a rough idea of your cost until you can formulate some plan to do better. We have changed from one plan to another in our shop for keeping various records and will change any time we find a better way than we are using at present. Only by improving your methods of handling your business and your jobs to keep pace with the times can you hope for success. Do not make the mistake of thinking you are independent of your competitor for you are not and never will be so long as you are not alone in your line of work and must stand or fall with him under the conditions outlined above.

E. M. Raetz.

Rochester, Minn., March 23, 1914.

Electric Clearing House of Louisville.

A number of Louisville, Ky., electrical contractors and other members of the electrical trades have organized the Electric Clearing House of Louisville. C. C. Childers, of the Childers & Waters Company, is president, and E. C. Knoop, one of the electrical inspectors of the Kentucky Actuarial Bureau, is secretary. An interesting feature of the meetings of the organization will be informal talks by and discussions with the electrical inspectors of the underwriting agencies, who will point out better methods of handling work with reference to fire protection.

Double Lighting Systems Proposed for Kansas City.

An Ordinance is pending in the City Council of Kansas City, Mo., providing for the installation of double lighting systems in all theaters, apartments more than two stories high, and other buildings more than two stories high used for business, to which people are invited, or in which 30 or more persons are employed. One set of lights shall be kept burning when natural light in sufficient quantities is not available, and the other shall be kept ready for instant use.

Los Angeles Electrical Department Enlarged.

The bureau of Fire Alarm and Police Telegraph has been incorporated in the Department of Electricity of Los Angeles, Cal.

National Association of Electrical Inspectors.

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H. S. WYNKOOP, Vice-President,
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Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association,
11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

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A. A. Moffitt
R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary has received word that the New York Section has chosen its officers as follows: president, J. C. Forsyth, chief inspector of the Electrical Department, Bureau of Surveys, New York Board of Fire Underwriters, 123 William Street; vice-president, A. L. Holt, 19 West Eighty-fourth Street; secretary and treasurer, C. A. Hannan, Little Neck, Long Island; delegates on the Executive Committee, National Association Electrical Inspectors, C. A. Hannan and O. E. Smith, Box 180, Edgewater, N. J.

Members will please observe that by error, the Secretary gave Mr. Hannan's name wrongly as Harman both in his recent circular to the Executive Committee and to the printer for the heading of this page in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

C. B. Roulet, who is a past president of the Association (1905), has removed from Dallas, Tex., and is now employed in the Special Risks Department of the National Fire Insurance Company, his home address being 138 Whitney Street, Hartford, Conn.

The Secretary desires to say a few words in regard to his message which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of March 21, especially as it has been called to his attention that some persons inferred there was a difference of opinion between him and the President on the subject there discussed.

In the first place the Secretary intended that the matter there printed should appear over his personal signature, and not as a message in order to prevent any idea that he was stating the views of the Association, and not his own personally. If anything is to be printed as the Association's views it must be formally presented to the Executive Committee and acted upon; and unless announcement that this has been done is made in print, the matter printed is invariably to be understood as personal with the author. I should be sorry indeed if anyone understood anything else as regards my article of March 21.

My purpose in writing it was first to express my emphatic belief in the correctness of President Day's position of "Let the Code Decide"; and second, my absolute adherence to his policy of ruling out of order any and all attempts to get the Association on record *publicly* regarding the Code or related matters, except when the proposal for such changes has been placed before us by the Secretary of the Electrical Committee in proper form in order that after discussion we may, if it seems best, *instruct* our representative upon the Committee.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

This does not mean that the Association does not propose to take an active and legitimate part in the revision of the Code. Thus, four matters at least have recently come up from sections and other sources in which we have thought it worth while to take action. These matters were simply presented in writing to Representative Cole by the Secretary with the request he present them to the Electrical Committee at its meeting in Boston this month, and have them referred to the proper subcommittees and presented in proper form for public discussion and action at the meeting for revision in New York next year.

It does mean, I believe, that in every jurisdiction, insurance, public service or municipal, when a Code has been adopted by the proper tribunal in that jurisdiction, it is to be the final authority for the action of each of our members. In all cases it should be interpreted equitably and reasonably by both parties and in case of controversy, the points at issue should be promptly referred to the proper superior arbiter in case no agreement can be reached after a cool study of the Code.

I presume the idea of disagreement arose from my attempt to elucidate the different position of the several types of inspection departments and their relations to the community under the law.

We all know that there is a difference. The inspector for the insurance company derives all his rights and powers under the *contractual relation* existing between his company and the policy holder and the moment he steps beyond that, he is without power to enforce a demand because he can only do so through the policy,—by suspension of insurance, by nonpayment in case of loss, or for similar reasons, which if they come to a Court, appeal can only be maintained by the aid of the contracts and mutual agreements between the two parties. The municipal inspector derives his rights and powers from the statutory law and municipal bylaws consonant therewith, under the police power of the commonwealth which is a totally different thing. Moreover he is required implicitly, if not explicitly, in every case to consider life and health not only as each citizen's acts affects himself, but also as they affect his cocitizens.

We observe the influence of the appreciation of this point in the Code which Wisconsin is considering at this very time.

It is probable that in the large majority of moderate-size communities, the National Electrical Code as it stands is entirely sufficient to guard the people from bodily ill as completely as from property loss. But it is a fact that as the community increases in size, so does the complexity of the interrelations between the several individual parts, and it cannot be expected that the above statement will hold *without limit*. It may well be our ideal to develop a Code which shall be so comprehensive and flexible as to protect without change the city of a million and the hamlet of five hundred, not only on the fire side, but on that of health and life as well. But I must confess that it seems to me that if such a Code *could* be worked out it would necessarily be so full of special provisions, exemptions, and additional requirements, that we should be just as badly off, if not worse than with a simpler Code modified in a small number of points (and if necessary printed like New York's, showing the Code reading and the change) to suit the comparatively moderate number of localities where change is really desirable and necessary.

Let me illustrate with just one case. Take the former Code, with its permissive secondary grounding. Suppose I had let the Code stand that way and that the supply company had chosen not to ground. A citizen meets with an accident through disturbance of his house system and someone tells him that if it had been grounded it would not have happened. He sues the supply company and the municipality and me as its duly authorized agent for permitting the company to continue its practice. It would be out of the question for me to testify that the Code I had adopted permitted the alternative, the plaintiff's attorney would observe that the law made me, in the municipality, the sole judge of safe wiring (as it does) and gave me the use of its weapons to enforce my ruling; he would instantly ask on cross-examination if I believed the practice I permitted was the best available in the present state of the art to protect his client. I should either answer, "Yes," in which case the way would be open for him to discredit me by expert authority, or, "No." In either case the result would probably be that the court would order a verdict immediately, or take some action toward the same end according to the rules of procedure. The municipality would lose, and personally I should much prefer to have modified the Code in that point (as I did by changing "may" to "must") than to have to face the Board of Selectmen at their next meeting.

It seems to me, and please understand that I am expressing *my personal views* throughout, that we must either develop a Code as full and effective to protect against risk to life and health as against risk to property by fire, by the joint harmonious action of all parties at interest; or we must be prepared to see a life and health Code developed by the states (of which the Wisconsin plan will be merely the germ) which I fear, like so many other laws, would differ in the different states.

It may be better that two Codes should grow up side by side in harmony, and that we should develop something interstate (like the Negotiable Instrument Law) and have the states adopt it together with a purely fire protective code.

It does not seem as though this is necessary however, and I do not personally feel that it would be wise or justifiable.

The National Electrical Code is at present about as perfect a fire-protective Code as it is humanly possible to draw up, considering the state of the art and the rapid spread of the use of electricity from day to day. Moreover, it is a fact that the things which protect against fire are usually protective to life as well. It only requires a very moderate amount of work to make such rules equally as good for a life Code. I believe we should all aim toward that end and feel confident that we shall reach, if not the ideal of a Code absolutely without need of modification, at least as near that result as common sense appreciation of the complexity of modern society should lead us to anticipate, and human endeavor permit.

Grounding of Secondary Systems.

Question 259. Under the present Code rule for grounding secondary systems, is it permissible to ground at the transformer when the transformer feeds a number of services or must each individual service be grounded?

Answer 1 (U). Either at transformer or individual services as provided in rule 15*b*.

Answer 2 (W). The rule gives alternative permission, individual service grounding is preferable.

Answer 3 (A). The rule is alternative. But if transformers are overhead, each service should be grounded; if underground work is under discussion, ground at the transformer.

Answer 4 (H). I should say where a single transformer feeds a number of services distributed at any great distance from the transformer, each service should be grounded.

Answer 5 (P). Rule 15 permits the ground at the transformer; but it should be noted that if the secondary system is over 500 feet long, its neutral must be grounded every 500 feet.

Answer 6 (O). Grounding secondaries at the transformer is not only permissible, but is required if the secondaries are not grounded at the individual services, and in addition the neutral must be grounded every 500 feet.

The option provided is apt to prove valuable to the inspection department in case the lighting company refuses to ground its secondaries at the transformers. The inspector frequently has no jurisdiction over the wires in the street, but may insist that each building connected to the secondary shall have a ground on its service.

Answer 7 (E). This question is definitely answered in rule 15*b3*. The ground connection may be at the transformer or on the individual service, but when the transformers feed systems with a neutral, the neutral must also be grounded at least every 500 feet. If the line be not 500 feet long in a three-wire system, then the ground at the transformer would be sufficient.

Answer 8 (Q). It is alternative. Ground connection ought to be at the transformer. When transformer supplies a number of services, neutral wire must be grounded every 500 feet.

Answer 9 (T). Yes, certainly following the requirements of rule 15*b3* and *c* to *g* inclusive.

Answer 10 (J). The ground connection must be at the transformer or on the individual service, rule 15*b3*. Either is permissible and there is no distinction as to whether the transformer supplies only one service or several. Note, however, that the neutral wire must be grounded every 500 feet.

Answer 11 (D). Rule 15 for grounding, requires same to be done at transformers and every 500 feet along the line.

Answer 12 (S). By Rule 15*b3* either method is allowed and acceptable.

Answer 13 (B). As may be seen by paragraph *3* section *b* of rule 15 relating to the grounding of low potential circuits, the ground connection may be made at the transformer or on the individual service as provided in sections *c* to *g*. Where system is an overhead one, the neutral wire should also be grounded at least every 500 feet. In this city, while the method as above outlined would be permissible, each and every service entering a building is grounded to the service side of the water shut-off on water service entering the building.

Answer 14 (M). Rule 15*b3* states that the ground must be at the transformer *or* on the individual service. No limit is placed on the number of these which may be connected to one transformer, so each service need not be grounded if the transformer is grounded properly.

Answer 15 (F). Yes.

Answer 16 (L). By rule 15*b3* (also *c* to *g*) a choice of methods is permitted, and this choice is perfectly clear.

Answer 17 (Y). Yes.

Answer 18 (N). Yes it is permissible. In this municipality transformers are grounded and also the neutral at *every alternate pole* (that is, every 200 to 250 feet). Further if a two-wire service feeds a number of farm buildings in the outskirts, one side of the service is similarly grounded. The water service cannot be used because there are some sections of the old cement-lined pipe laid in the 1870's still in use, which renders it ineffective as a whole. At the same time ground water is usually found not over 10 feet below surface even in dry seasons, nevertheless there are a number of localities where ledge, clay ridges, etc., intervene and at several of these points ground wires are carried over to maintain continuity.

Position of Signal Wires on Pole Lines.

Question 260. In a pole line of joint occupancy, carrying telephone, telegraph, electric-light and power, and fire-alarm wires upon it, which is the proper position for the fire-alarm wires —on the top or on a lower cross arm?

Answer 1 (U). All signal wires such as fire alarm should be on lower cross arm.

Answer 2 (W). Rule 85*b*, fine print note, says on lower or bottom cross arm.

Answer 3 (A). The old method of running municipal wires for fire-alarm and police service was at the top of the pole. This was before power wires were in use. At the present time, I believe the proper place for these wires is on the first cross arm from the ground.

Answer 4 (H). The practice varies in different places and possibly neither can be claimed as invariably the correct solution. If the fire-alarm and similar wires are at the top of the pole, inconvenience may be occasioned by the presence of heavier wires below it, should it become necessary to go over them to reach the alarm system. Further the fire-alarm wires being smaller are likely to breakage in severe weather and to injure the system by contact with higher potential wires below them. Still in this city the fire-alarm system still occupies the top of the pole and no difficulty is experienced.

Answer 5 (P). You will probably recall that many of the earlier electric-light franchises contained a stipulation which reserved the top arm for the use of the fire-alarm telegraph and other city wires. Formerly the controlling thought was that these wires should be placed as far as possible out of the reach of any disturbance due to the operations of other linemen. Later on, after a number of experiences with sleet storms, opinion changed and it was believed to be better engineering practice to install the lighter wires, which break the more readily, beneath the heavier or electric-light wires, which less seldom part under the weight of the sleet. Having arrived at the general conclusion that the signal wires should be placed below the electric-light wires, there was no objection to retaining the original practice of placing fire-alarm wires above other signal wires in order to minimize the chances of disturbance due to the operations of other linemen. Therefore, the upper one of the several signal cross arms seems to be the proper one to reserve for the fire-alarm telegraph. This is coming to be the general practice throughout the country, as in this way the wires will suffer as little disturbance as possible.

Answer 6 (O). This point is merely suggested under rule 85*b* of the Code, but see also rule 1*d*, National Board of Fire Underwriters Rules for Signaling Systems; also rule 3*c*, National Board of Fire Underwriters Rules for Municipal Fire-Alarm Systems. The signaling wires being smaller and more apt to break than the electric-light or power wires should be placed underneath. Following out this idea, I should judge that the best location would be under the electric-light wires and above the other signaling wires.

Answer 7 (E). The last sentence of rule 13*c* bears on this question where any part of the occupancy exceeds 5,000 volts. "If carried on the same pole with other wires the high pressure wires must be at least three feet above the other wires." Also rule 85*a* provides "and must not be placed on the same cross arm with electric light or power wires."

Answer 8 (Q). Lower cross arm.

Answer 9 (T). Lower arm, rule 85*b*, fine print clause.

Answer 10 (J). This question does not fall under the jurisdiction of this department.

Answer 11 (D). I think these wires are preferably installed on the top arm.

Answer 12 (S). On the lower cross arm. Rule 85*b*. I should consider the fire-alarm wires of the greatest importance and so should have the preference as to location.

Answer 13 (M). This condition should be avoided if possible. Rules for fire-alarm systems state that fire-alarm wires should preferably be run under the others. But to prevent injury by linemen working on poles, they are frequently run over the others. We consider this frequently "the lesser of the two evils."

Answer 14 (F). Bottom.

Answer 15 (N). The National Code (outside of rule 13*c* which merely touches the question by implication) contains merely the suggestion of the fine print note to rule 85*b*. According to the first paragraph of the page headed, "General Suggestions," such notes are "in no case to be considered by the inspection department as mandatory." This clearly indicates that Electrical Committee in March, 1913, was not prepared to say that the lower cross arm was invariably the better location and make suggestions accordingly a part of the Code. It is true that in the Rules for Signaling Systems, we find a rule reading, "Must be supported at least every 150 feet and as far as possible run under electric light and power wires." This is a part of the rule not a note, but two things should be noted, first that we are here concerned *only* with the National Electrical Code, and second that even the quotation above contains the intimation that sometimes an alternative may be necessary.

As a general thing, however, the fire alarm should be below the light and power wires, but above the telephone lines, etc.

One reason for this, which is not to be neglected in country towns with lines running long distances along the roads, is that the wires above exert a powerful and valuable screening action to protect the fire-alarm wires from the effects of lightening during the thunder-storm season; while at the same time the lines below shield them to some extent from the various missiles frequently thrown carelessly and sometimes wantonly at the lines by passers by.

Answer 16 (L). This is practically covered by rule 85*b*, fine print note.

Answer 17 (Y). This is to some extent a matter of opinion. In this territory the municipality uses the top arm.

Answer 18 (B). The subject matter of this question is particularly of great importance in connection with life hazard. It would be desirable from the standpoint of increased safety, both to life and property, if signaling wires, to which class fire-alarm, police-signal, telephone and telegraph wires belong, and the wires for electric-light, heat and power purposes were on separate lines of poles; wires of one class being on one side of the street and wires of the other class being on the other side.

This, however, is impracticable to enforce in the majority of cases, it being necessary in many cases to attach both classes of wires to the same poles, particularly in cities, etc., where it is often *difficult* to get pole rights for one line of poles and *impossible* to get rights for two lines on the same street.

Under conditions where city and other signaling wires occupy the upper portion of poles, and the light and power wires are attached to cross arms beneath, it is necessary for the linemen who work on signaling wires to pass up between the wires carrying currents dangerous to life, which in my judgment subjects them to is an unnecessary hazard.

Furthermore, the relative strength of the two classes of wires is such that under the stress of severe storms the wires of the signaling class are more liable to break than those of the other class, and, falling, often come in contact with light and power wires attached to cross arms beneath, thereby becoming charged with currents dangerous to both life and property.

Our records show that the majority of accidents to persons on poles, and of fires due to crosses between signaling and high-potential overhead wires, have been mainly due to the unfortunate custom in the past of placing wires of the signaling class above the wires of the light and power systems.

Previous to 1910, the ordinances of this city reserved the upper cross arm and top of pole for the fire-alarm and other signaling wires of the city. Believing in the light of experience that this condition was wrong from every point of view, except possibly the point of view that wires at the top of the pole were not liable to injury when other wires were being attached below, the matter was taken up, by this department and its views presented in detail to the other departments of the city government with the result that the ordinances were changed so that at present it is the lower cross arm on pole which is reserved for city wires.

In such cases as where the telephone company desires to attach a cable to a joint pole, it is permitted by joint agreement, as the cases come up, that the cable may be attached to the lower cross arm, the city signaling wires taking the cross arm immediately above. This is permitted on account of the telephone company's running cables or ring construction which has a tendency to sag between poles, and which if placed immediately above the city wires, might in places sag down so as to come between city wires, with possible chances of trouble in times of storms.

We also insist in all cases of joint occupancy of poles, that the two classes of wires shall be distinctively separated by at least 40 inches between same.

Public Service Commissions

ARIZONA.

Court Decision. The federal court has handed down a decision enjoining the operation of the three-cent fare law in Arizona. The decision is based upon the opinion of the Supreme Court of Arizona in the Tuscon Gas and Electric Company case, wherein that court held that the sole power to fix rates for public service corporations, under the constitution, lay with the Corporation Commission of the State of Arizona and that the Legislature did not have concurrent power to establish such rates.

The Yuma Water & Electric Company applied to the Corporation Commission for authority to change its rates so as to provide a material reduction for small consumers and an increase for several of its large consumers.

CALIFORNIA.

Compensation for Taking of Utility's Property. The Railroad Commission fixed the value of the Eureka Water Company in condemnation proceedings. This is the first decision of the Commission under the amendment to the public utilities act empowering it to fix, on application of towns, cities, counties or municipal districts, the value of the public utility properties which the public seeks to acquire. The Commission states in this decision the elements to be considered in making such valuations.

INDIANA.

Proposed Merger. An application for authority to consolidate practically all the utilities at West Baden and French Lick under the name of the West Baden Water, Heat, Light & Power Company is under consideration by the Commission. The interested parties expect that the Commission will grant authority to merge, provided the companies surrender their franchises and take in lieu thereof an indeterminate permit. This the companies have agreed to do.

ILLINOIS.

General Order. The Commission has issued the following general conference ruling. "This Commission holds that any changes made by public utility in its rates, charges, and classifications for service since July 1, 1913, whereby the rates and charges exceed those in effect on said date, are illegal unless the same have been consented to by this Commission. If any change of rates and charges are deemed necessary application should be made to this Commission for its consent to make such change. And in case any public utility has made a change of its rates and charges whereby the same exceed those in force on July 1, 1913, such public utilities are ordered and directed to return to the rates and charges as of July 1, 1913, and to continue the same in force until this Commission has given its consent to change the same." An application for change in rates is to show the existing schedule and the schedule of proposed rates and charges. "Where the rates and charges of a public utility in effect on July 1, 1913, are discriminatory, such public utility must forthwith apply to this Commission for consent to change its schedule of rates and charges so as to comply with the law against discrimination in rates and charges."

The Mt. Auburn Telephone Company applied for authority to put in effect a new rate schedule providing higher rates for practically all classes of service. The applicant submitted a statement showing the purchase price paid by the present owner and the revenues and expenses of the plant. The decision states that the income derived from the proposed schedule "to take care of depreciation and dividends would not exceed 14.8 per cent of the original cost, and therefore could not be held excessive." The Commission further points out that the plant is very economically run. "An example of this is shown by the president's salary, which is $50 every three months. Surely, if the officers and managers are willing to donate their services, the stockholders of the company are entitled to that donation as against the subscribers." The Commission approved the increase and the new rates are as follows: business—private line, per year $18.00, party line, per year $15.00; city residence—private line per year $15, party line per year $12.00; rural—per year $15.00 (discount of 20 per cent if paid quarterly in advance); and mutuals—switching $6.00.

Transmission Line Near Galesburg. The newly constructed transmission line of the Galesburg Railway & Light Company runs above and parallel to the trolley line of the Rock Island Southern Railroad Company and both lines cross the wires of the Bell Telephone Company. Upon complaint of the Rock Island Company, the Commission made an investigation and found that the rules of the Commission for the construction of such lines had not been complied with. The Galesburg Company was ordered to rebuild its line and the Rock Island Company was ordered to make certain changes in its line in accordance with the specifications contained in the order.

Springfield Gas & Electric Company. The Commission has approved the plans for the construction of the company's transmission line which crosses the tracks of the Wabash Railroad Company at Tenth Street in the City of Springfield and granted the company permission to maintain and operate such transmission line.

Free Service. In a recent decision the Commission has held that it is not against public policy to allow railroads and railways to issue free transportation to policemen of a city or village and United States mail carriers, to be used in the performance of their official duties.

Stockton Electric Company. The commission issued an order granting permission to the Stockton Electric Company to construct a power transmission line across the tracks of the Chicago Great Western Railroad Company at Stockton, Ill. The order gives directions as to the construction of the crossing.

MARYLAND.

The Consolidated Gas, Electric Light & Power Company has applied for permission to issue $1,106,800 of five-per-cent debenture stock, the proceeds to be used for construction purposes.

Proposed Legislation. The Maryland Commission asks that it be given the power to declare forfeit the charters of those public service corporations which refuse to obey the Commission's orders to render adequate service.

MASSACHUSETTS.

The Worcester Suburban Electric Company was authorized by the Gas and Electric Light Commission to issue 2,000 shares of new capital stock at $125 per share. The proceeds of 1,280 shares are to be applied to the payment of notes outstanding December 31, and 720 shares to the payment of the cost of additions made after that date.

Proposed Change in Commissions. Governor Walsh advocates the reduction of the Public Service Commission from five to three members, with salaries of $8,000 each, and the enlargement of the functions of the Gas and Electric Light Commissioners so as to include supervision of telegraph and telephone, water supply and water power companies, members of this board to have a salary of $8,000 each.

NEW JERSEY.

Extension of Service. The Board has rendered a decision in a case brought by residents of South Bound Brook to compel the Public Service Gas Company to extend its system along Canal Street, holding that an order to such effect cannot be granted unless the petitioners guarantee the company a return upon the necessary investment of eight per cent. Such return, estimated at $108.89, is to cover a period of income of five years.

OHIO.

The Dayton Power & Light Company has been authorized to issue $271,500 preferred cumulative stock to be sold for not less than 80 per cent of par. Before this issue can be placed on the market the company must retire $200,000 common stock.

WISCONSIN.

The Troy & Honey Creek Telephone Company was authorized to put in effect certain of the increases applied for in local and rural telephone rates. The Commission ordered a discontinuance of free service over more than one connecting line. The subscriber may choose one of four lines over which he is entitled to unlimited service and must pay an additional amount per month for unlimited service over each additional connecting line. Toll rates are provided for those not contracting for service over connecting lines. A rate tending to discourage the installation of the so-called silent phones was included in the schedule fixed by the Commission. The overloaded condition of the rural lines is to be rectified, and the increase in rates is not to be put into effect until the company installs a system of accounts approved by the Commission.

The Westboro Telephone Company was authorized to issue $2,500 of capital stock, the proceeds of which are to be used for the building of a telephone line in accordance with the provisions of a certificate of convenience and necessity issued by the Commission.

New England Central-Station Men Banqueted by General Electric Company.

At the twelfth annual banquet given by the General Electric Company to the representatives of central stations in New England, held March 27 at the Copley Plaza Hotel, Boston, E. W. Rice, of Schenectady, N. Y., president of the company, paid tribute to the memory of the late George Westinghouse, speaking of the courage and energy of the deceased.

"It may not be inappropriate," said Mr. Rice, "to speak of Mr. Westinghouse as the greatest competitor of the General Electric Company. The loss through his death is one that cannot fail to be felt with the deepest regret by the whole electrical industry."

J. W. Lieb, Jr., vice-president of the New York Edison Company, spoke on "Leonardo da Vinci, Engineer and Artist." C. B. Davis, manager of the Boston office, presided; 500 were present.

Reduction in Price of Tungsten Lamps.

Another reduction in the price of tungsten lamps was put into effect by the General Electric Company and its various lamp works on April 1, when the list price was reduced from about 10 to 15 per cent. Lamps from 10 to 60 watts, inclusive, have been cut 5 cents each; 100 and 150-watt lamps 10 cents each; 250-watt lamps were cut 20 cents. The new list prices are 30 cents for all lamps from 10 to 40 watts; 40 cents for 60 watts; 70 cents for 100 watts; $1.10 for 150 watts; $1.80 for 250 watts. These prices apply to 100 to 130-volt lamps in standard package quantities.

Proposed Reorganization of Memphis Telephone Company.

Application for a franchise for the Memphis Automatic Telephone Company has been made to the City Commission of Memphis, Tenn., by C. W. Thompson, J. B. Goodbar, T. R. Winfield, L. W. Johnson, George G. Alban and others. The company proposes to buy out the Memphis Telephone Company, reorganize under the name of the Memphis Automatic Telephone Company, with an authorized capitalization of $2,000,000, and to spend $500,000 in telephone extensions. The application asks a franchise for 30 years, at established rates to subscribers lower than the rates fixed by the city in its recent rate ordinance.

Symposium on Electrical Inspection.

At a joint meeting held in Chicago on March 26 by the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers, the subject of electrical inspection formed the topic of the evening.

Inspection of Electrical Fittings.

B. H. Glover, electrical engineer, Underwriters' Laboratories, Chicago, opened the symposium by presenting a paper in which he discussed the inspection of electrical fittings and devices. This subject, Mr. Glover said, naturally suggests consideration of the National Electrical Code; unfortunately this is still regarded in many quarters as a code developed by the insurance interests. Mr. Glover showed that, although the drafting of the Code was started by insurance men, now it is truly a national code, in the drafting and revision of which substantially every electrical interest is represented. The continual changes in conditions and the improvements in electrical conconstruction methods and in appliances necessitate more or less frequent revision of the Code from time to time. During these revisions and, in fact, at all times the Code has been subject to criticism by all parties interested in electrical work; therefore it is undoubtedly the expression of the best judgment of the electrical industry. The Code is generally accepted throughout the country and even in Canada. In some cities its requirements are added to by special rules covering conditions peculiar to the community. However, it is interesting to note that all large cities are gradually dropping most of their special rules and making their entire set of rules practically coincide with the National Electrical Code.

Mr. Glover explained the work of the Underwriters' Laboratories, showing how manufacturers of all kinds of electrical fittings submit these for test and criticism before they are placed on the market. The investigation of these fittings is entirely impartial and concerns itself only with the question of whether these fittings comply fully with the Code. If such is the case, a recommendation for approval is made; if the fitting or appliance requires some changes in its design or construction to make it accord with the Code, recommendations are made to the manufacturer and, in practically all cases, he is glad to make the changes along these lines. When a suggestion for approval is made, this is usually ordered by a council and the fitting is then placed in the published list of approved electrical fittings. This list and the Code form the two essential handbooks of approved electrical construction.

Mr. Glover showed further that the list of approved fittings is a most valuable guide in the selection of material to be used in construction work. This list is entirely unbiased and gives an array of equipment which can be depended upon. He called attention to the hazards likely to arise when fittings that have not been approved are used. He explained further how close check is kept on the manufacturers to see that the fittings they make are maintained up to the standard of the samples that have been submitted for test and approved. This is done by a number of resident and traveling inspectors and by means of the label service, which is a most reliable way to insure that the product is up to standard. Inspectors in the field frequently make suggestions as to improvements of devices. Mr. Glover also showed that the safety idea has long been actively kept in mind, citing in this connection the standardization of lamp bases and sockets made at the suggestion of the Underwriters' Laboratories.

Municipal Electrical Inspection.

V. H. Tousley, chief electrical inspector of Chicago, took up the problem from the standpoint of the municipal inspector. He described at some length the organization and the work of the Electrical Inspection Bureau of Chicago. Electrical inspection work has been carried on in the city for over 30 years and therefore has kept closely in touch with the great developments of the electrical industry. Mr. Tousley referred to the first set of electrical rules which were drafted in Chicago in 1893; out of this later grew the National Electrical Code. From its early beginning the Bureau has steadily grown until now it has 71 employees, of whom 47 are inspectors. The appropriation for the Bureau for the year 1914 is close to $124,000. Mr. Tousley gave a number of interesting figures on the work conducted during the past year to show its magnitude and varied character.

As regards the classification of the city's electrical inspectors, the largest number of them are concerned with inspection of interior installations; for this purpose the city is divided into 27 districts. An application for an electrical installation in any district is given to the inspector assigned to the district, who follows it up during its various stages until the work is completed. A new division has been created covering all outside electrical lines, both overhead and underground; three inspectors devote themselves entirely to this work, of which a considerable portion has had to deal with a study of electrolysis of underground pipe and other systems from stray railway currents. Two inspectors devote their entire time to inspecting electric signs; this work has been continued for about 12 years. All signs are inspected when first put up and afterwards from time to time to make sure that they are properly maintained electrically and so as to prevent danger of falling. There are between 7,000 and 8,000 electric signs in Chicago. One inspector devotes himself to the inspection of the larger theaters and of theatrical equipment. He makes visits to all the theaters from time to time and also makes inspections of electrical equipment of traveling show companies; this latter equipment is usually in very poor order and must be put into proper condition before it can be used in any theater in the city. One inspector devotes himself entirely to moving-picture theaters; he is constantly going the rounds among these establishments, of which there are between 700 and 800 in the city. This work has been so systematized that the electrical equipment of these places is maintained in quite satisfactory condition.

About two years ago a municipal electrical laboratory was established, chiefly to make quick tests of rubber-covered wire and also of various materials which the inspectors suspect to be not up to standard. Mr. Tousley referred to finding a considerable amount of poor rubber-covered wire still in use and called attention to the hazard resulting from this. Last year there was established a division of reinspection in which seven inspectors are now devoting their entire time to carefully going over the electrical equipment in old buildings. This inspection is intended to minimize both the fire and life hazards. Although it is the aim to cover all buildings, at present the staff for this purpose permits looking after only those old buildings in which the hazard is manifestly greatest, such as old buildings housing clothing and other hazardous industrial establishments in which many people are employed.

Formerly the attitude of owners and tenants of buildings was hostile toward all city inspectors for various reasons and every means was tried to keep these inspectors out of the premises. The standard of municipal electrical inspection, which always has been high, has been raised still more to cause a change in the attitude of the public towards its importance. The inspectors have been continually making suggestions which will minimize existing dangers and also improve the installation in other ways. Consequently it is found that building owners now readily cooperate with the inspectors and even ask their aid in various kinds of electrical work.

Another branch of the work is the investigation and recording of electrical accidents. Last year there were reported in the city 242 such accidents, of which 28 were fatal. The victims of most of the latter were minors and, in fact, many cases school boys who had climbed arc lamp posts and the poles of overhead circuits with disastrous results. There seem to be an increasing number of accidents on pole lines. Mr. Tousley dwelt on the need for inspection of electrical appliances, particularly those sold at low cost to the uninitiated public. He cited many devices sold by department stores which were not only poorly constructed and evidently made merely to sell, but were decidedly hazardous. He discussed a number of accidents from the use of electric vibrators, particularly one which a few months ago caused a great deal of investigation. This emphasized the need for inspection of such appliances before sale, authority for which is now lacking. One company has been found chronically putting out an electric heating device with 25-ampere fuses which were recommended for use on ordinary lighting circuits. At the present time the only way to fight this is to order the outfits out after they have been installed.

Inspection for Central-Station Company.

H. B. Gear, engineer of distribution, Commonwealth Edison Company, spoke of the electrical inspection work carried on by the Chicago central-station company. He called attention first to the great advance in the character of electrical installations during the last 15 or 20 years and narrated a number of incidents in connection with early conduit work. The result of the early poor construction was a multitude of mysterious fires which it was common to charge to crossed wires, in many cases with justice. This condition caused a fear of electric circuits and greatly retarded the early development of electric lighting.

Nowadays, however, electrical construction has been improved to such an extent that not only is the fear of electric lighting entirely gone but it is seldom that one can find new buildings that are not wired and in fact well wired. The requirements for this work have properly become more rigid and this has most decidedly reduced the hazards and at the same time increased the prestige of electric lighting. Of course, the cost of installation has also greatly increased, which has been especially felt in temporary work. However, the central-station company has no quarrel over this situation because it realizes that it is for the best interests of all concerned.

Taking up the inspection work of the Edison Company, Mr. Gear said that it is carried on by about 50 men and primarily concerns itself with the inspection of all of the company's stations, substations and overhead and underground lines, also of all buildings wired by the company's electricians. Another line of work looked after by the inspectors is to make careful inspection of every installation before the service is connected; this is primarily not to check on life or fire hazards, which are well looked after by the inspectors of the city and insurance companies, but for the elimination of hazards to the service. For this reason a set of special rules has been adopted by the company. For instance, it is necessary to limit the number of lamps on one side of a three-wire circuit to 24 lamps in stores and 36 in residences; otherwise serious unbalancing of the three-wire circuit would result with poor regulation thereof. A separate circuit is usually insisted on for the projecting lamps in theaters; in some cases it is possible to balance these lamps with the lamps in the auditorium of the theater. It is also required to have a separate circuit for the wireless outfits of amateurs; also for nickel-in-the-slot electric pianos. The motors of the latter and of other devices cause a severe drop in voltage when started, which becomes very annoying to the lighting circuit. Such motors are therefore frequently made 220 volts and are connected on a separate circuit. In larger installations the motors must be fed from transformers separate from the lighting transformers. In some cases, however, like grain elevators, in which perfect regulation of the lights is not very important, this is not required.

Special rules have to be enforced regarding the placing of meters so as to make them accessible and also free from conditions likely to cause errors. Mr. Gear commended the city rule on meter loops and meter closets in apartment buildings and office buildings.

Discussion.

The general discussion was then opened by F. J. Postel, who presided. He said that the Mutual Fire Prevention Bureau has two standards of construction: one complying merely with the requirements of the National Electrical Code, the other of a still higher standard so as to give the best possible construction, which is in many cases much more expensive than that in accordance with the standard requirements of the Code. Where the latter or more advanced type of construction is used it is possible to get lower insurance rates, which well warrant the additional initial cost. Many grain elevators, flour mills and similar establishments have availed themselves of this practice.

Replying to a question by Mr. Peck, it was stated by Mr. Tousley that the city inspectors cannot make regular inspection of low-voltage signaling systems, telephones, etc., because the inspection force is not large enough; moreover, it has been found that the telephone companies' inspectors look after these installations quite satisfactorily and but little trouble results.

R. S. Huey cited a case in which a vacuum cleaner caused the blowing out of a fuse every time it was started. Mr. Glover said that if on testing such an appliance is found to take over 660 watts, this is so stated on the approval card and it is left to the inspector to see that a circuit of proper size is provided.

S. J. W. Wendt asked whether the size of fuse can be limited by the size of receptacle so as to insure that a proper fuse will be used. To this Mr. Glover replied that the Code does already in a measure so limit fuse receptacles. For instance, the dimensions are specified for fuses rated between 0 and 30 amperes, 30 to 60 amperes, etc. Although these classes are not subdivided, an attempt to make a finer subdivision, particularly of the first class, is being made. Mr. Glover also stated, in reply as to whether temporary approval is issued in cases where material is liable to deteriorate, that this is not done; only one kind of approval is issued and if deterioration is liable to occur keeping track of it is up to the inspectors in the field. Mr. Huey brought up the question of refillable fuses, stating that to him it seemed necessary to use them for some motors. Mr. Glover stated that although these are not formally approved, because of Code restrictions, this matter is now being considered by a special committee.

C. W. Naylor asked why certificates of inspection are issued covering the wiring only and not the fixtures. It was his opinion that much fixture work is done by inexperienced persons and that a certificate of inspection should not be issued until all the fixtures have been installed in an approved manner. Mr. Tousley stated that many buildings are equipped before all of the fixtures have been installed. In many cases the wiring is put in but gas only is used. Evidently it is impossible in such cases to withhold the certificate until the fixtures are completely installed. He also stated that as an evidence of the improvement in the standard of electrical installation it was interesting to note that during 1894 there were 71 fires in Chicago that were ascribed to electrical causes; in 1913 there were 80 such fires, an increase of only 10 per cent in number, whereas the increase in the number of incandescent lamps connected was 1,400 per cent.

Progress In Electrical Department of Panama-Pacific International Exposition.

Working drawings are now being made of the device to be used for suspending the jewels to be used for illumination effects from the various buildings. These jewels, which are of hard flint glass, forty-seven millimeters in diameter, hand cut and polished, will be mounted in metal rings one-eighth inch wide with a second holder in back to bring a small mirror against the apex of the jewel, thus giving an estimated increase in brilliancy of 40 per cent. The jewels will be hung by a small handle in such a manner as to permit of free motion in any direction.

A new receptacle in the form of a mission bell is being developed for gala and festive lighting. More than 25,000 of these receptacles will be used in decorative lighting, special lamps being grouped so as to imitate the various forms of fruits and flowers.

Experiments are now being made to determine the extent to which it will be advisable to use electrical substitutes for fire-work displays. Imitations of waterfalls will be used which will show gold and silver showers in the day and be displayed to advantage at night by searchlights.

Complete orders have been placed for all auxiliary equipment required for the operating of the three main direct-current generating stations for the control of direct-current power for exhibitors and decorative lighting. The contract for the electrical work in the Court of Palms and the Court of Flowers has been awarded to Newberry Bendheim, while the order for 2,154 reflectors varying in size from seven to eleven inches was placed with the Wheeler Reflector Company, of Boston, Mass. The plans and specifications for the electrical work for the California building are almost completed, while the orders for the remainder of the electrical apparatus to be used in buildings and on the grounds will soon be placed.

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Examination for Electrician.

The United States Civil Service Commission has announced an open competitive examination for electrician to be held on May 6, at the usual places. Vacancies are to be filled in the Departmental Service at Washington, D. C. The usual entrance salary is $4.00 per day.

The examination will cover the writing of reports, practical questions, training and experience. Experience in the care, maintenance, repair and operation of storage batteries and in lead burning is very desirable. Applicants must be at least 20 years of age.

Chattanooga Jovians Hold Meeting.

Chattanooga, Tenn., has a Jovian league, the membership of which has recently been increased from 21 to 68 members.

On March 13, the Chattanooga league had a rejuvenation at Signal Mountain Inn, at which the regular banquet was enjoyed by all. George Herbert, of the Terrell-Hedges Company, took the part of Avrenim and appeared in the costume of a goddess, much to the delectation of the party.

The banquet was held in the café. Paul J. Kruesi, president of the Chattanooga Chamber of Commerce and treasurer and manager of the American Lava Company, presided. Among the speakers were: Byron T. Burt, general manager of the Chattanooga & Tennessee River Power Company; F. H. Cantrell, of the Terrell-Hedges Company; C. S. Steward, of the D. M. Steward Manufacturing Company; J. S. Kirkpatrick, sales manager of the Chattanooga & Tennessee River Power Company and E. D. Reed, general superintendent of the Chattanooga Railway & Light Company. F. W. Hoover, second vice-president of the Chattanooga Railway & Light Company, highest officer of the Clark interests in Chattanooga, was to be among the initiates and speakers, but was compelled to be out of town.

The initiation was presided over by Statesmen J. L. Wilheite, contract manager for the railway and light company, who is an enthusiastic Jovian. The team comprised F. H. Cantrell; P. W. Curtis, of "The Electric Shop"; R. W. Dugger; J. Dugger, city electrician; J. N. Slaughter; C. Rigdon, of the street-railway company; N. C. Blanchard; I. L. Faucette and W. J. Hill.

The Jovians meet once a week informally, lunching together at the Commercial club, Chattanooga's popular dinner club. This is not a secret meeting, the Jovians merely forming a nucleus for a jolly party of boosters. Mr. Burt has tendered the use of a building at the Brady power plant to the league, and there is a tentative plan to have a rejuvenation there in the near future.

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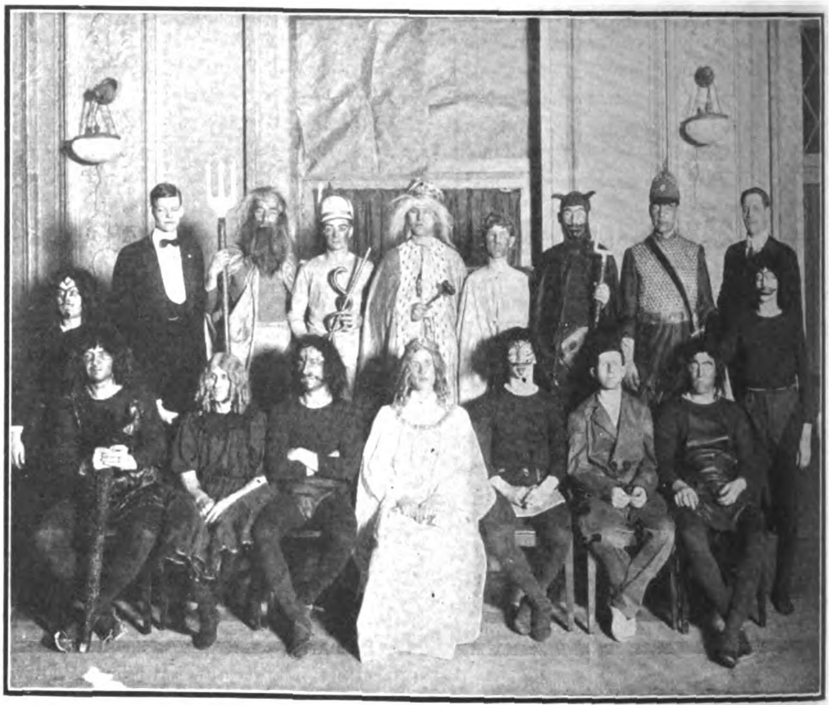
Twin City Jovian Rejuvenation.

A Jovian rejuvenation and banquet was held at the St. Paul Hotel Palm Room, St. Paul, Minn., on the evening of Wednesday, March 18. There were about 100 members present at the banquet in addition to the candidates.



Degree Team Which Conducted Rejuvenation at St. Paul on March 18.

Mayor H. P. Keller was toastmaster, and in addition to him the following were seated at the speakers' table: B. O. Horton, J. O. Corbett, O. M. Frykman, Al Frankenberger, J. M. Hannaford, A. W. Zahm, B. B. Downs, C. W. Wilkins, A. J. Anderson, T. P. Glidden, A. J. Cole, H. S. Tuthill and W. E. Keily. The rejuvenation was held during the convention of the Minnesota Electrical Association in Minneapolis and a delegation came from that city, including the Degree Team.

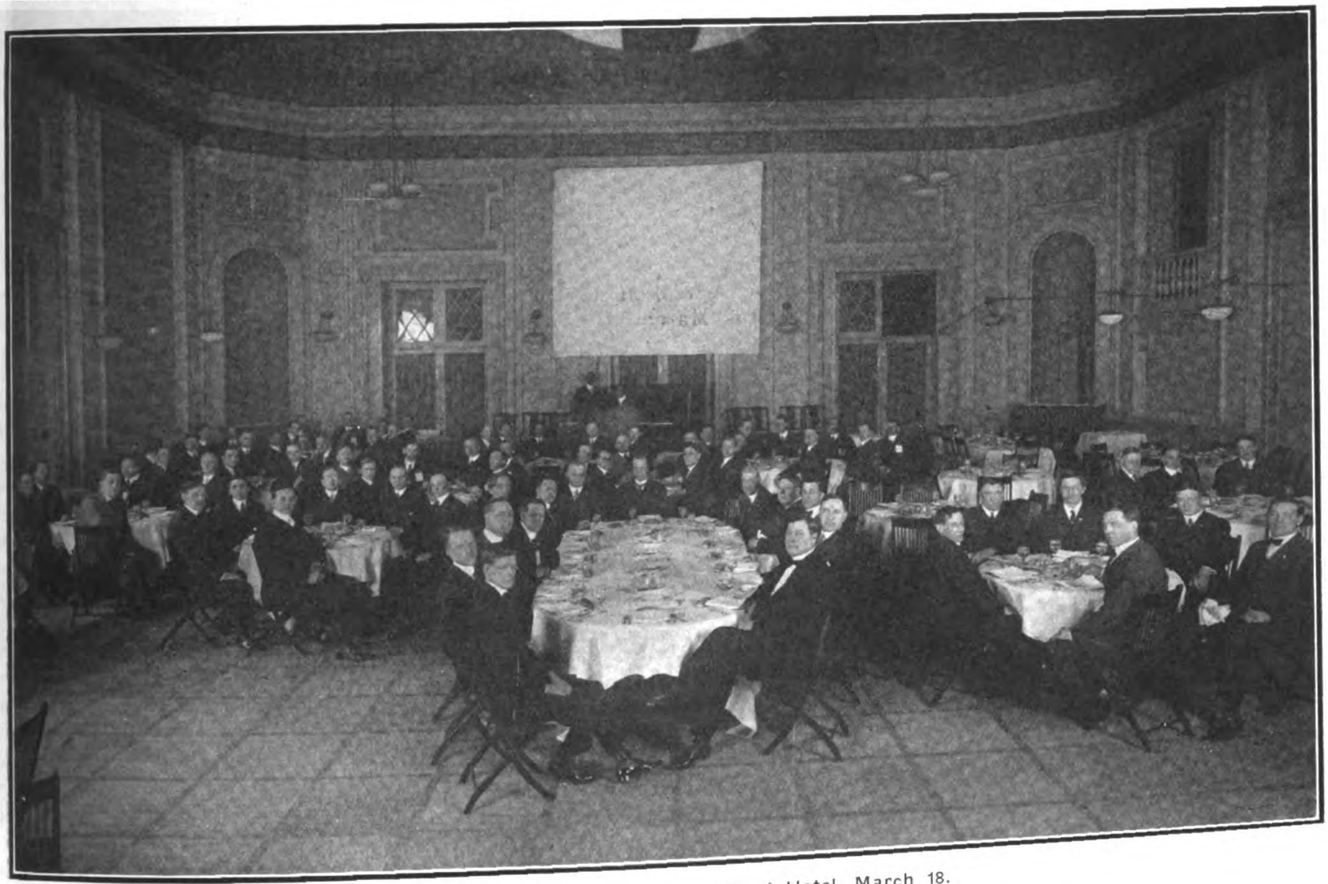
J. A. O. Preus, as representative of Governor Eberhart, made an address on the "Development of the Northwest and its Relation to Minnesota." J. O. Corbett, statesman at large, made an address upon "Electrical Development and Co-operation." During the dinner entertainment was provided in the form of music and motion pictures.

Immediately after the banquet the rejuvenation was held, the degree team being constituted as follows: Jupiter, Emil Anderson; Neptune, Frank Lang; Mercury, R. C. Rowlands; Apollo, C. L. Hotchkiss; Pluto, Roy Chase; Mars, Tom Findlay; Hercules, Fred G. Dustin; Vulcan, Guy See; Avrenim, George Bloomgren; Imps, R. H. Eddy, Leo Cooper, A. W. Ewert and Charles Hansing.

This team did excellent work.

Philadelphia Jovian League.

Dr. Thomas E. Eldridge, of the Philadelphia Aeronautical Recreation Society, delivered an address on the limited extent to which radium has proven a cure for cancer, at a recent meeting of the Jovian League, held in the Bingham Hotel. Dr. G. H. Simmerman, also a member of the Aeronautical Society, in conjunction with Dr. Eldridge, offered the use of the Society's new balloon "Greater Philadelphia" for ascensions in connection with the convention in Philadelphia, in June, of the National Electric Light Association. One ascension will be made on June 3. It is designed to utilize the new balloon in advertising Philadelphia.



Banquet of St. Paul Jovians at St. Paul Hotel, March 18.

Chicago Jovian Meeting.

Prof. Philip B. Woodworth, of Lewis Institute, spoke before the Jovian League of Chicago, on March 30, choosing for his subject "Electrical Dimensions." Professor Woodworth interestingly described Sir Oliver Lodge's theory that electricity belongs to the order of the fourth dimension. Prof. George Marsh, of Armour Institute of Techonolgy, presided.

Successful Theater Party Given by Philadelphia Jovians.

On the evening of March 19, the Jovians in Philadelphia and vicinity gave a theater party at the Forrest Theater. The play was "The Doll Girl," a musical comedy. There were about 800 to 850 Jovians and their guests in attendance. The affair was a great success, both socially and financially.

Chelsea Power Plant Extending.

It is proposed to expend $1,100,000 upon the enlargement of the Lot's Road power station which serves the London underground tube and other lines. The output of the plant, which in 1910 was 130 million kilowatt-hours, had grown in 1913 to 156 million kilowatt-hours, and railway extensions now in progress necessitate a bigger capacity. Two 15,000-kilowatt turbo-alternators are to be added, a large coal-reserve storage tank is to be provided, and injection and overflow pipes are to be run to the River Thames for cooling water for condensing.

Turners Falls Plant Under Construction.

Work on the new hydroelectric development of the Turners Falls Company, at Turners Falls, Mass., has been begun. The plans call for the construction of a canal about two miles in length and the erection of a dam and generating station to produce 27,000 horsepower of electrical energy. The work requires the excavation of about 820,000 cubic yards of earth and 120,000 yards of rock ,and the use of 18,000 cubic yards of concrete in the construction of the canal. About the same amount of concrete will be required for the station foundations. Fred T. Lay & Company, Incorporated, Springfield, Mass., is the contractor for the station and the Holbrook, Cabot & Rollins Corporation, Boston, for the canal. Immediately upon the completion of the foundation the station will be erected and generating apparatus installed. The ultimate development, through the canals under contract, will be about 47,000 horsepower.

The Turners Falls Company, through its relations with the Amherst Power Company and other transmission and distributing companies, furnishes electrical energy to a large territory along the Connecticut River in the central and western parts of Massachusetts.

United States District Court Upholds Marconi Interests.

In the litigation of the Marconi Wireless Telegraph Company of America against the National Electric Signaling Company, a decision was rendered by United States District Judge Veeder in the district court at New York, recognizing Marconi, the Italian inventor, as entitled to absolute credit for the creation of commercial wireless telegraphy.

In an opinion filed on March 17, there is given to the Marconi interests, for the present at least, what appears to be a monopoly of the wireless telegraph field.

The patents at issue were No. 11,913, issued to William Marconi on July 13, 1897; No. 609,154, issued on Aug. 16, 1898, to Sir Oliver Lodge and now owned by Marconi, and No. 763,772, issued on June 18, 1904, to William Marconi.

The latest of the three patents is regarded as the most vital of the group in present-day wireless operations. As counterparts of this patent have already been held to be valid by the courts of Great Britain and France, the decision of Judge Veeder was held by lawyers for the Marconi Company to give the company control of the international wireless situation.

While the decision established the validity of the three patents, it holds that the National Electric Signaling Company infringed only the two granted most recently, and not the original Marconi patent, which was issued before improvements made long-distance signaling possible.

Judge Veeder's decision, which goes exhaustively into the history of wireless signaling from the days of Egyptian signal fires down to the Marconi inventions, sweeps away the defendant company's assertions that others preceded Marconi as inventors of a practicable wireless system in this summary of what actually had been done:

"Maxwell, in 1863, had speculated on the possibility of the production of electric waves which would detach themselves from a source of origin; Hertz, in 1887-1888, had proved experimentally that Maxwell's theories were correct; Lodge, in 1889, had repeated Hertz's experiments; Branly, in 1890, had repeated Hertz's experiments, and had also discovered that certain substances, in addition to Hertz's ring resonator, were detectors of electric waves; Crookes, in 1892, had forecast the possibilities of wireless telegraphy by the utilization of Hertzian waves; Lodge, in 1894, had reviewed the experiments of Hertz and Branly and some of his own, touching the form which electric waves took when emanating from their source of origin, and upon substances which would detect these waves; Popoff, in 1895, in similar experiments had noted that he could detect the existence of a distant thunder storm, and expressed the hope that wireless telegraphy could be accomplished by the utilization of Hertzian waves. But no one had described and demonstrated a system of wireless telegraph apparatus adapted for the transmission and reception of definite intelligible signals by such means. This was the state of scientific knowledge and practice when in 1896 Marconi applied for his first patent.

"Accordingly, I find that the evidence established Marconi's claim that he was the first to discover and use any practical means for effective telegraphic transmission and intelligible reception of signals produced by artificially formed Hertz oscillations."

More than fifty pages of Judge Veeder's decree is given up to a discussion of the third Marconi patent, which has been held to be valid in Europe. Of the manner in which Marconi achieved his final wireless triumph with instruments made under this patent he said:

"With this apparatus Marconi communicated across the Atlantic in 1901 and claims in issue constitute the essential features of apparatus which has since made possible communication over a distance of 6,000 miles. It has been used in more than 1,000 installations by Marconi, and is admittedly an essential feature of the wireless art as at present known and practiced."

The Marconi Company was represented in the litigation by the law firm of Sheffield, Bentley & Betts, and the National Electric Signaling Company by the law firm of Clay, Ogden, Winter & Church.

Illumination Scheme for Palace of Horticulture.

W. D'A. Ryan, chief engineer of illumination of the Panama-Pacific International Exposition, has evolved a unique plan for the illumination of the various palaces at the Exposition.

The Palace of Horticulture will be constructed almost entirely of glass and will be surmounted by a dome 150 feet high and 152 feet in diameter, which will be fully covered with glass. If illuminated from the interior by ordinary methods this dome would have presented a "dead" appearance at night, instead of being one of the feature spots of the Exposition, as it will be, in fact. Sixteen 30-inch searchlight projectors will be placed in a circle about a column in the center of the building. At the top of the column are arranged a color screen with six segments, an opaque vane which will cover two segments at the same time, a lens and a diffusing plate.

The segments of the color screen are of red, green and yellow. The screen will revolve at the rate of 500 revolutions a minute and the vane at the rate of 499 revolutions a minute. This enables the screen to make one full revolution a minute more than the opaque vane.

The rays of the searchlights are focussed on the screen and diffused on the dome, the revolution of the screen and vane causing the various colors to illuminate the glass in succession.

A combination of three lenses will be used, so arranged that only one will be in position over the screens at one time. One of these will be composed of a number of tiny lenses which will have the effect of producing spots of light upon the dome. Another will be plain. The third will produce the most spectacular effect and will present the appearance of millions of tiny tadpoles squirming about the interior of the dome.

Street Lighting at Augusta, Me.

The visitor to Augusta, Maine, is struck with the admirable electric lighting of Water Street, the main thoroughfare of the city. If he arrives at night, at the Maine Central Railroad station, as he steps out onto the street he is bound to remark the exceptionally brilliant lamps, arranged in groups of four on ornamental iron poles. There are 75 such groups on Water Street, and they are spaced only 100 feet apart, on both sides of the street. The lamps are 100-watt Mazdas and are inclosed in opal globes. The wires, of single phase, are carried on brackets at the top of the poles. The lamps are operated on 110 volts, the current being furnished by the Central Maine Power Company, which has eleven hydroelectric stations on the Kennebec River and its tributaries, besides an auxiliary steam plant at tide water below Augusta. The company's high-tension system is 200 miles in extent.

The city of Waterville, about 20 miles north of Augusta, boasts 45 groups of lamps of similar type and arrangement, on Main and Silver Streets, in the business section.

Spring Meeting of Electrochemists.

The twenty-fifth general meeting of the American Electrochemical Society will be held in New York City, April 16 to 18. Technical sessions will be held on Thursday morning and afternoon at the Chemists' Building, and on Saturday morning and afternoon at Columbia University. On Friday there will be an all-day steamboat excursion. On Thursday evening there will be a smoker. On Saturday evening there will be a dinner-dance.

FRACTIONAL-HORSEPOWER MOTORS.

By Gordon Fox.

This is an era of power, man using his energy more efficiently to direct rather than to perform. It is cheaper to pay for power than to perform work by human effort. Small motors are therefore being adopted for all purposes in which human exertion can be replaced automatically. The small motor performs service out of all proportion to power cost, that cost being compared to the cost of human effort.

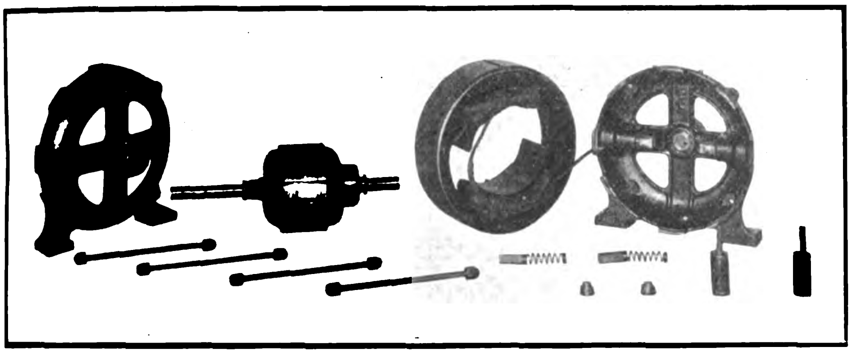


Fig. 1.—Fort Wayne Direct-Current Motor Disassembled.

At first the fractional-horsepower motor was merely a smaller brother to the regular power motor, small motors being considered as one-half horsepower and below. Growth was slow because drives were not thoroughly worked out to meet requirements and were not entirely satisfactory. Experience has taught that there is as much or more care required in designing a motor drive for a small power machine as for the larger machines. The motor manufacturers have broadened their lines, experimented to secure different characteristics and to determine the limiting features of each of their designs. The manufacturer with a new device is no longer advised to "put on a one-eighth or one-sixth horsepower motor." An expert is sent out to see the machine in action in its field, noting all conditions affecting the drive. The device is taken to the motor factory and thoroughly tested. From the data thus obtained a motor is selected or designed to fit the machine. This is found to be the only manner in which continued satisfaction can be assured.

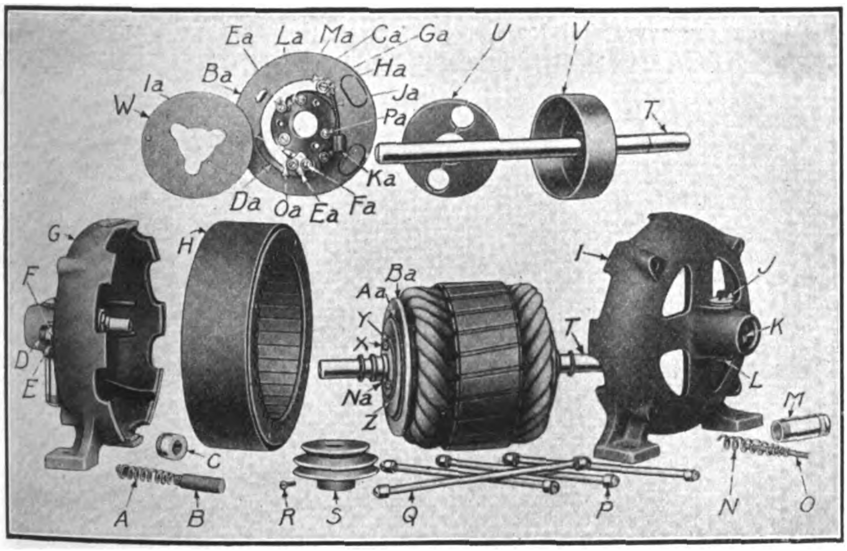


Fig. 2.—Fort Wayne Alternating-Current Motor Disassembled.

The successful small-motor application is a matter largely dependent upon careful attention to detail. First, in selection, every feature affecting the drive must be considered; second, in manufacture, constant minute scrutiny is required to insure uniformity of product. In designing the drive, limits of variation should be established for use in subsequent inspection and test.

In the large-motor field a few standard frames and ratings are commonly carried and these are adapted to their driven machines usually by building the machine to fit the motor or by addition of special parts. This is mainly because few motors are used for identical applications.

Fractional-motor applications are usually quantity propositions. Therefore the motor and driven machine are best considered as a whole and a complete design worked out requiring a minimum of machine work, maximum ease of assembling and greatest probability of uniform results. From a manufacturing viewpoint it is a matter of designing lines of standardized working parts which can be easily adapted mechanically to standard frames or can be worked in effectively as part of general designs. The aim is to provide as many ratings and as large a variety of characteristics as possible from standardized parts.

The great variety of applications imposes a corresponding variety of limiting features upon the motor. In one case weight may be all important, as for a portable device; again, freedom from noise is necessary, as in a piano motor; in some cases heavy breakdown or pull-out torque is a limiting feature, as is the case with a washing machine drive where a wringer is used. Constant speed may be very important or ability to start quickly and repeatedly. Mechanical dimensions often play an important part. A minimum diameter is often advantageous because of limited space, or the over-all length may be restricted for the same cause.

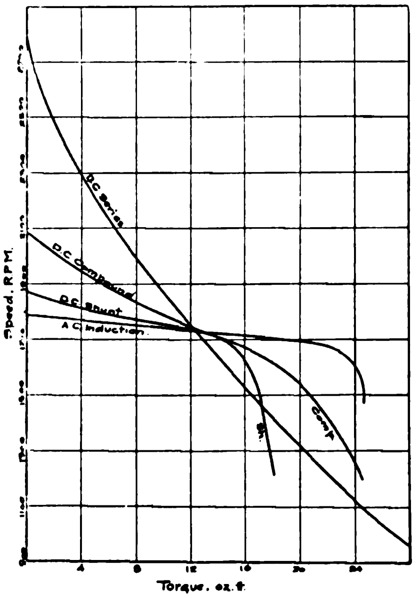


Fig. 3.—Speed-Torque Curves.

As practically all devices driven by small motors are for general sale and distribution, it is necessary to build them for all voltages and classes of current commonly encountered. In order to reduce costs of patterns, drawings and machinery; in order to stock machines and furnish the proper motor upon receipt of the order, or to change motors when the user moves or otherwise changes his power, it is very advantageous to all concerned if motors for different currents can be supplied having the same mechanical dimensions. The more progressive manufacturers are now able to meet this requirement.

As before stated, each application has its particular specifications which must be closely followed and maintained. There may be in the factory, parts for many different orders being carried through simultaneously. A tremendous amount of detail must be accurately executed to insure success. It is evident that standardization should be carried as far as possible to avoid multiplicity of specifications and to simplify inspection, as well as for reasons of economy. The fundamental purpose should therefore be, standardization of basic parts, specialization in method of assembling.

The essentials of a small motor are, the stator, the rotor, the shaft, the commutator, collector or switch, the bearings and their supports. The stator and rotor are made up of stacked punchings. Here is a point in which standard parts may be variously assembled to gain flexibility of ratings and characteristics. The same punchings may be stacked "long" or "short." A difference in the stacking length will affect the shaft and may affect the frame. If the end flanges holding the bearings in the standard motor can be arranged to fasten to the ends of the stackings then the same flanges may be used for different stacking lengths. Windings must, of course, be special. Commutator or collector parts can be made standard. It is thus possible to provide a variety of characteristics and ratings from a set of standard parts by simply furnishing three or four shaft lengths, and varying the winding designs.

The bearing flanges for alternating and direct-current motors must frequently be different for the end containing the brushes or current-carrying parts. If mechanical dimensions are similar and the flanges for the two ends of the motor are made independent, it is possible to use the same standard or special pulley-end flange for both alternating and direct-current motors. Reference to Fig. 1 may make this point more evident. This is an exploded view of a small direct-current motor. This is assembled by placing the rotor in the field, sliding the flanges over the shaft ends and holding the whole together with the through rods.

Here it will be seen that different stacking lengths affect only the windings, shaft and through rods, the same flanges being applicable. It can also be seen that the pulley-end flange to the left in the figure, can be equally well used for an alternating-current motor similarly constructed. An exploded view of such an alernating-current motor is shown in Fig. 2, the pulley-end flange in this case being to the right.

Direct-current fractional-horsepower motors are commonly wound for shunt, series and compound connections. Alternating-current motors are mostly single phase, of the induction type in the larger sizes, some sort of split-phasing arrangement being used for starting. Ordinarily a starting winding is provided which is cut out by a centrifugal switch as the motor attains its speed. The comparative characteristics of a standard line of motors are shown in Fig. 3. It will be noted that all the curves have a common point, this being the rated full load. With changes of load they all act differently. Of course, the exact characteristics can be changed according to the design of the windings.

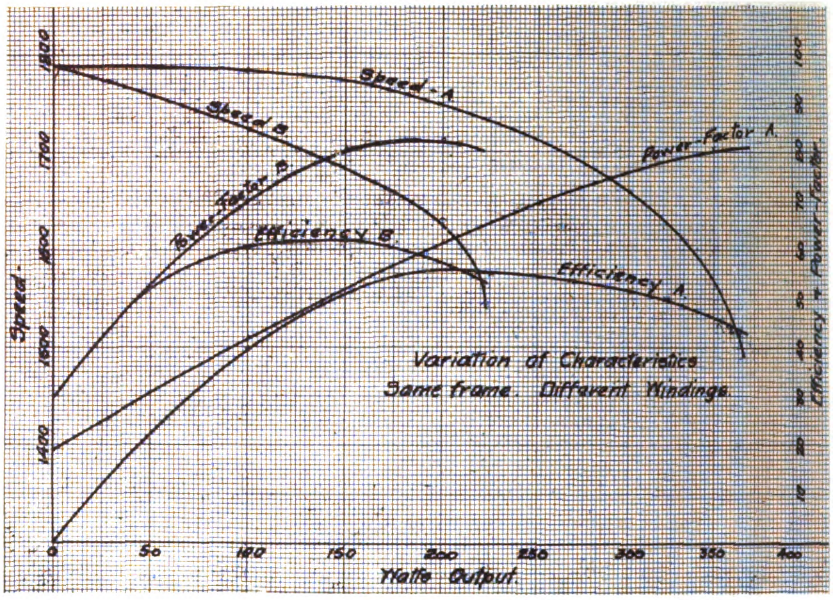


Fig. 4.—Change of Characteristics with Winding.

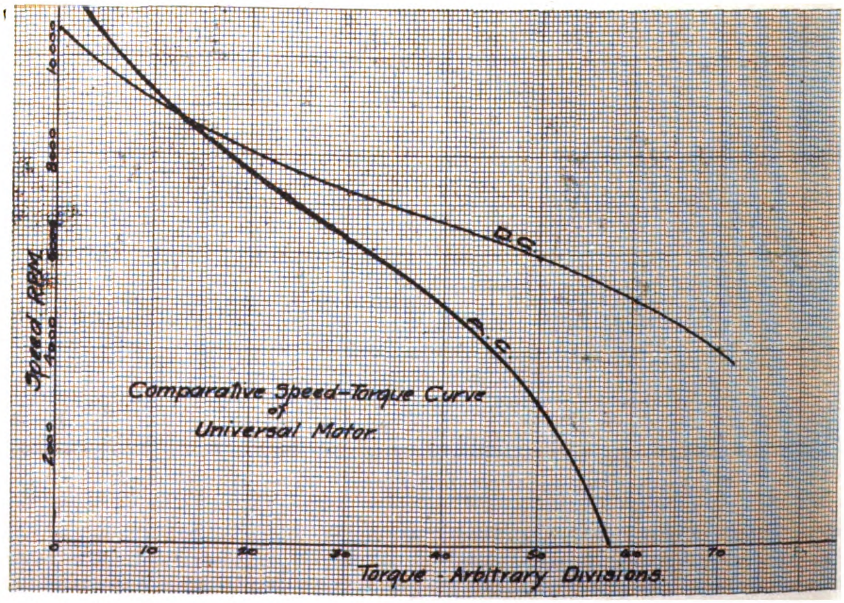


Fig. 5.—Curves for Universal Motor.

The winding design is largely a matter of compromise. Starting and pull-out torque, constancy of speed and efficiency, and power-factor, with the consequent heating effects, are the points commonly affected. Fig. 4 shows the characteristics obtained from two different windings upon the same frame of a small single-phase induction motor. It will be noted that heavy pull-out torque and constancy of speed over a wide range of load are here obtained at the sacrifice of efficiency and power-factor. Motor A would, therefore, run considerably warmer than motor B under the same load, but would be able to carry much heavier overloads for short periods. Motor A would be used for meat choppers or washing machines with wringers, whereas motor B would be used for piano work or for washing machines without wringers. This case is illustrative of the whole matter of small-motor design where compromises are made which best meet the demands of each particular drive. It is evident that it is not sufficient to specify merely the horsepower rating and speed desired, as motors acting widely different can be furnished to meet these specifications.

There are many light power devices requiring motors of very low output. Portable vacuum cleaners are a notable instance of this type of device. It is impossible to build the single-phase induction motor in these small sizes. Alternating-current motors cannot be connected in shunt because of power-factor differences of armature and field. These very small motors are commonly series-wound. The alternating and direct-current motors are built from the same parts but the windings differ in most cases. Very careful study of the load imposed by the driven device is required, since with a series motor, a slight change in load causes a material difference in speed. It is difficult to build motors of this type to give consistent results within close limits, because a minute variation in mechanical dimensions such as air gap or commutator setting causes appreciable difference in operation. A certain leeway must be allowed in the application or a percentage of motors will be returned, due to overload, heating or sparking. In many of these devices the cost of assembling and testing is a relatively large item. If the percentage of rejections be high and many machines must be disassembled, repaired or changed and retested then the unit cost is materially affected. Hence careful inspection of all parts before assembling and a little leeway in load range are desirable features.

Commercial considerations have made it very desirable that these small motors be universal, operating upon direct or alternating current interchangeably. Domestic users are constantly moving to new premises where different current is obtainable. Portable tools are often to be used at places having different kinds of power. Dealers must stock for all currents and the manufacturer also is hampered by a variety of windings. No strictly universal motors have as yet been developed. Some windings have been produced which will operate upon 60 and 25 cycles and direct current, but the characteristic curves differ. At the rated load the curves have a common point. Fig. 5 shows the variation in operation of a universal motor upon 60-cycle alternating current and direct current. These universal windings have proven satisfactory only for high rotative speeds. Low-speed motors require a stronger field, more armature turns and consequently more inductance. The low-speed motor placed on alternating current drops in speed more quickly, has little overload capacity, and sparks. Universal motors, being universal at but one point in the load curve, demand that the power required by the driven machine be accurately determined so that the universal point may occur at the corresponding output.

It is a difficult matter to provide a small series motor to operate at a moderately constant speed with load changes. Slow-speed motors are also hard to build since the large number of armature turns is productive of sparking. A special connection used to meet these requirements may be of interest. This connection is shown in Fig. 6. It will be seen that the series field is connected in series with a resistance across the line. This causes the field to be quite uniform, due to the constant current that will flow across this circuit. The armature is shunted across a part of this resistance. The armature therefore has but a low impressed voltage, with but few armature turns required. The power-factor of armature and field will be nearly the same with this arrangement and the torque is therefore good. Due to the uniform field a constant speed is obtained; due to the low armature voltage a low speed may be had with no sparking. At starting, the rush of armature current strengthens the field, giving a compounding effect with good torque and quick acceleration.

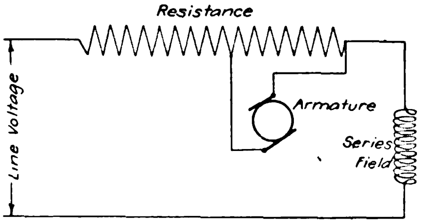


Fig. 6.

A summary of the points to be considered in planning a small motor drive may be useful. Not all of the points will apply in every case, but it is well to check against them to be sure nothing is neglected having a bearing.

The motor manufacturer should be given a description of the machine to be driven, stating its purpose, field and the number of sizes to be built. He should know the state of development to know whether special features for the motor or machine would be better or cheaper. Also the probable consumption affects this decision. He should know where the device will be installed and surrounding conditions such as moisture, dirt or gas. He should know the amount of space the motor may occupy. He should know the class of users, to estimate the care that will be given and to plan accordingly.

Next, it should be stated clearly just what the motor is to do. How will it be mounted? What means of drive will be used? If belted, the pulley dimensions, belt centers and means of adjustment are important. If coupled or geared, bearing service and thrust provisions should be considered.

What should the full-load speed be? How much leeway is permissable? Is particularly constant speed desired?

Direction of rotation, open or inclosed, rating and continuous or intermittent service are questions to be answered. If the work is not continuous an estimate should be made of the periods of work and of rest, stating whether the motor is stopped or runs light.

The load cycle should be determined as accurately as possible. The amount of load, adjustments affecting the load and their results, and features limiting the range of load all have an important bearing. Load and service data determine the heating.

The starting and working torques should be determined if possible. Many machines perform a cycle of operations requiring different torques at different periods. Some may start only at one point in the cycle, others may start at any point. If the motor may be called upon to start at the point of maximum torque, that is a limiting feature. Torque may be determined by means of a small spring balance. Measure the ounce-feet pull at the driven shaft at various points in the cycle. This may be accomplished by simply attachinch the balance to some point at a given radius and pulling until the driven shaft starts to move, noting the pull at starting and after the shaft is in motion. Multiply the speed of this driven shaft by the ounce-feet of torque and divide by the motor speed. The result is the ounce-feet of torque required of the motor. These data may also be used to check the power consumption and load. The average torque multiplied by motor speed in revolutions per minute divided by 528, gives the horsepower load. Measured torques are necessarily taken with the machine just moving slowly and may not correspond exactly to running torques. In some cases, such as fans or blowers, the starting and running torques may differ widely.

Other considerations affecting the motor selection are rapidity of acceleration required and frequency of starting. Are there any special considerations, such as noise, magnetic effect of the motor, absence of end play at the shaft, etc.?

The whole matter of small motor application, it will be seen, is one requiring careful study and attention to detail to insure satisfaction. It is hoped that this outline may be suggestive toward obtaining more successful small-motor drives for numerous purposes.

New Electrical and Mechanical Appliances

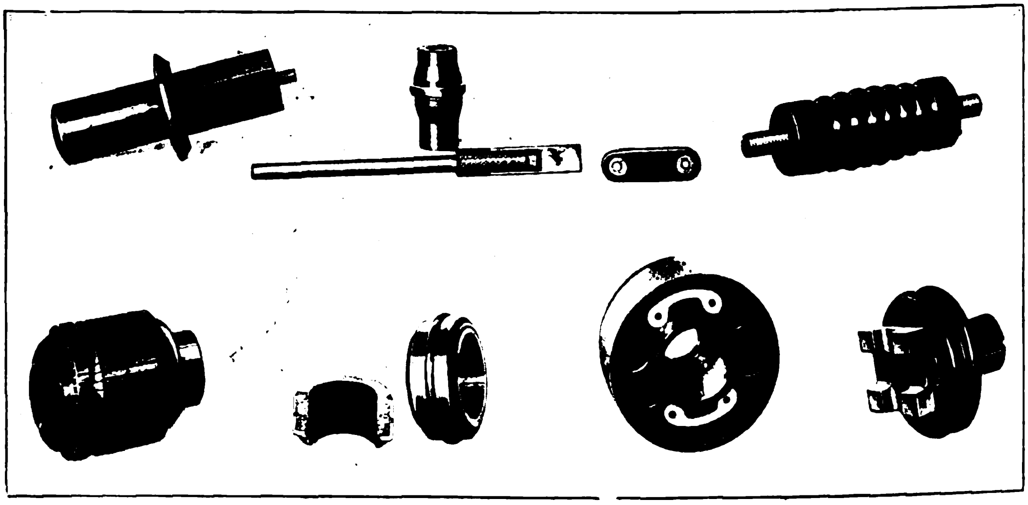
New Adaptibox Service Caps.

The Adapti Manufacturing Company, Cleveland, O., has added to its extensive array of the now well known Adaptiboxes new sizes of service caps which complete the line of service entrances for conduits ranging from one-half inch to four inches. The new sizes are suitable for one-half-inch and three-quarter-inch conduits and are believed to be the smallest fittings of this class now on the market.

These new service caps, like other Adaptibox fittings, possess valuable interchange features. The cap is interchangeable for two different sizes of outlets; thus the one-half-inch size can be adapted to three-quarter-inch conduit by simply changing the outlet. Moreover, by changing the straight or standard type of lug for an elbow lug the fitting can be readily changed from a straight to an elbow cap, as shown herewith.

ADAPTI
ADAPTI

Service Caps.



Electrical Apparatus Parts Made of or with Molded Insulation.

Since both the outlet and cover are removable it is very easy to pull the wires. The cover is made of special insulating material of exceptionally high dielectric and mechanical strength that is said to be superior to porcelain. No bushings are required. These fittings have been approved by the Underwriters' Laboratories.

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Paine Expansion Shells Withstand Severe Tests.

The expansion shells and toggle bolts manufactured by the Paine Company, Chicago, were described in our issue of January 3, 1914. Since that time the company has had a number of its three-quarter-inch expansion shells tested in the testing laboratory of Lewis Institute with exceptionally interesting results.

Two holes each one and nine-sixteenths inch in diameter were drilled about four inches apart near the center of one face of a block of stone about two feet square by one foot thick; this stone was described as oölitic limestone. One hole was 4.75 inches deep and the other 6 inches deep. A three-quarter-inch Paine expansion shell with wrought-iron rod was put into each hole and expanded as far in the hole as possible. The rods had carriage-bolt heads and were threaded for a standard three-quarter-inch rod to within five inches of the head. A clear space of about six inches was left between the face of the stone and the jaws gripping the ends of the rods.

On applying a powerful pull on the jaws by means of a testing machine, it was found that the shells held in the holes indefinitely and that the rods parted, in the shallower hole at a net pull of 16,740 pounds and in the six-inch hole at a net pull of 15,640 pounds. The tensile strength of three-fourths-inch wrought-iron rods is usually given as 15,200 pounds; thus the rods were even stronger than standard. These tests show the extraordinary holding power and dependability of the Paine expansion shells, which apparently does not depend on the depth of the hole. The tests were made by Prof. A. W. Mosely.

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Some Interesting Insulation Parts.

In the illustration below are shown a number of the different insulation parts made by the Stevenson Company, Wilkinsburg Station, Pittsburgh, Pa., from its various Bakelite molding mixtures. These parts will be particularly interesting in that they are practically all for some piece of electrical apparatus and, furthermore, show very plainly the accuracy attained by workmen of this company in molding in metal parts or inserts.

The sectional view of the pin in the top row is an excellent example of accurate molding and perfect insulation. These features are further emphasized by the sectional view of the collector ring in the bottom row of the group.

Bakelite parts mark the first real advance in the art of plastic insulation in half a century, yet the success of each piece depends largely upon skill in compounding the various mixtures and accuracy in molding. Higher dielectric and mechanical tests are claimed for the product of the Stevenson Company than for any other similar material.

Bakelite insulation has been in use but a few years and it may not be generally known to what extent these parts are used today. Besides following closely in the path of the electric motor and blanketing the electrical field, it is now molded into various parts such as collars, base blocks, spools, pinions, valve gates, meter disks, boxes, washers, thimbles, fingers, etc., etc., to take the place of hard rubber or raw hide and resinous material parts in many fields.

It can be readily drilled, tapped, machined or buffed to a very high finish. The regular molded finish, however, is suitable for nearly every purpose. Stevenson molded insulation is claimed to be high-heat resisting, non-hygroscopic, impervious to oils, moisture and most chemicals. It will not warp, soften, decay or otherwise deteriorate with age.

It can be furnished in round or square solid bars, round or square tubes, and plates of reasonable size for stock from which special parts may be machined as needed. It also comes in two or three different colors, to match different finishes.

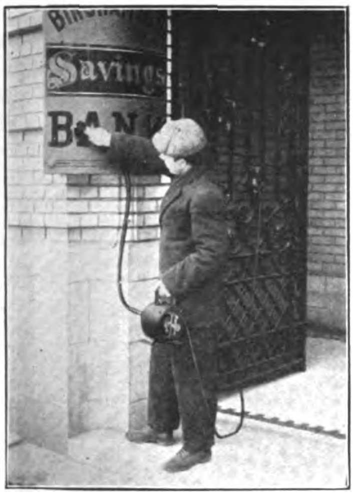

Fig. 1.—Portable Electric Buffer.

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Stow Portable Electric Tools.

The great convenience and adaptability of electric drive for small portable tools is being so well recognized that a rapidly increasing demand has been developed for such appliances in machine shops, garages and other places where speed and labor saving count. Among manufacturers making such tools is the Stow Manufacturing Company, Binghamton, N. Y. These tools are of considerable variety, some of which are illustrated herewith.

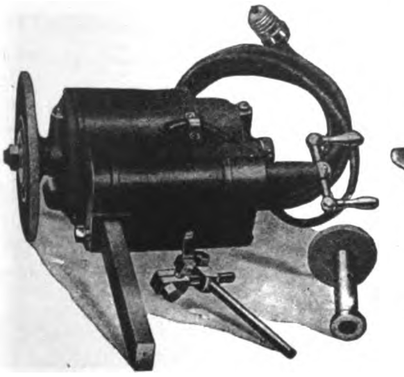


Fig. 4.—Tool-Post Grinder.

Fig. 1 shows a portable electric buffer equipped with the well-known Stow flexible shaft, which makes it a most useful appliance for polishing brass signs, the bright parts of automobiles and metal work of all kinds in office buildings, hotels, engine rooms, etc. These buffers are made in four sizes and are supplied with either direct-current or alternating-current motors. The energy consumption is small, so that the appliance can be connected to a lamp socket. A buffing wheel or emery wheel can be used on each outfit. One of these is mounted on a pedestal to permit greater freedom for the hands when the motor cannot be placed on a table or box.

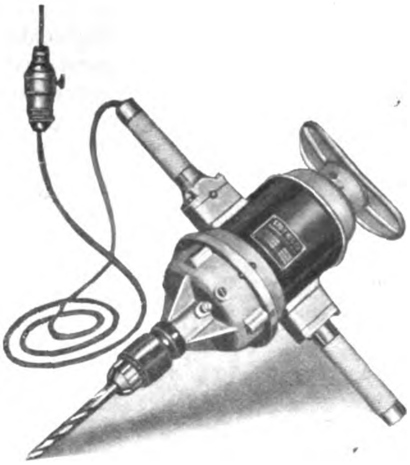


Fig. 2.—Electric Breast Drill.

In Fig. 2 is shown a new electric breast drill capable of drilling holes up to one-half inch diameter in iron or steel or up to one inch in hardwood. All parts of the drill are equally balanced, making the tool easy to handle. Power is applied at opposite points on each reduction gear. These drills are carefully constructed so as to reduce upkeep to a minimum. They are provided with 110 or 220-volt motors. The direct-current tools are 16.5 inches in total height, including chuck, and weigh 20 pounds; the alternating-current tools are slightly heavier. In each case a Pratt or Jacobs cluck is furnished as desired.

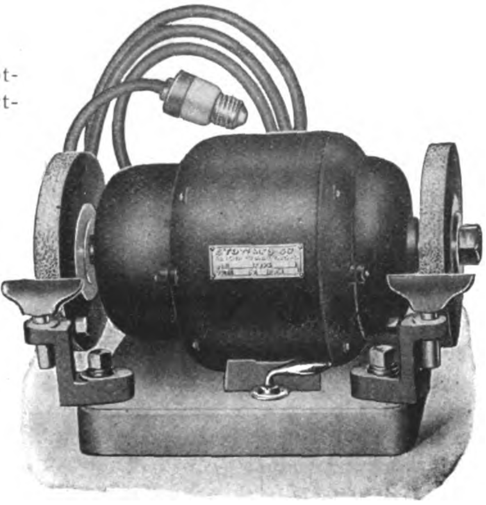


Fig. 5.—Bench Grinder.

A new form of radial flexible boring and utility machine is shown in Fig. 3. Its design is based on the similar Stow machine that is said to be in use by 70 per cent of the leading wagon and carriage manufacturers in this country, but the machine shown herewith is adapted for general shop work. It has the advantage of being easily transferred to any part of a shop accessible to a lamp socket. The machine can be used for boring, drilling, emery grinding and buffing. The motor acts as a counterbalance to the extension arm to which the flexible shaft is attached. This construction also permits of higher speed with less wear on the flexible shaft. The upright stand is telescopically adjustable and the arm can be extended when supplied with a longer belt. It can be swung in a complete circle, thus having a wide range of work.

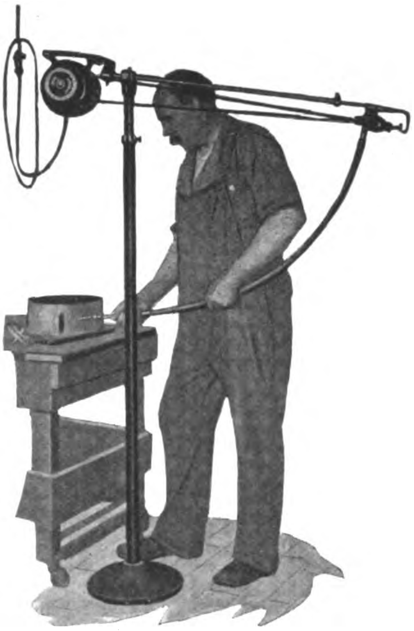


Fig. 3.—Boring and Utility Machine.

Fig. 4 shows a convenient tool-post grinder made either with hand feed, as shown, or plain. It takes a three-eighth-inch by six-inch emery wheel and is suitable for either surface or internal grinding. It is particularly serviceable for grinding dies, cutters, centers, etc.

An electric bench grinder with two emery wheels is shown in Fig. 5. This is made, like the other tools, for direct current and also for alternating current and in five sizes, ranging from 6-inch to 12-inch wheels. This is a compact and highly efficient tool.

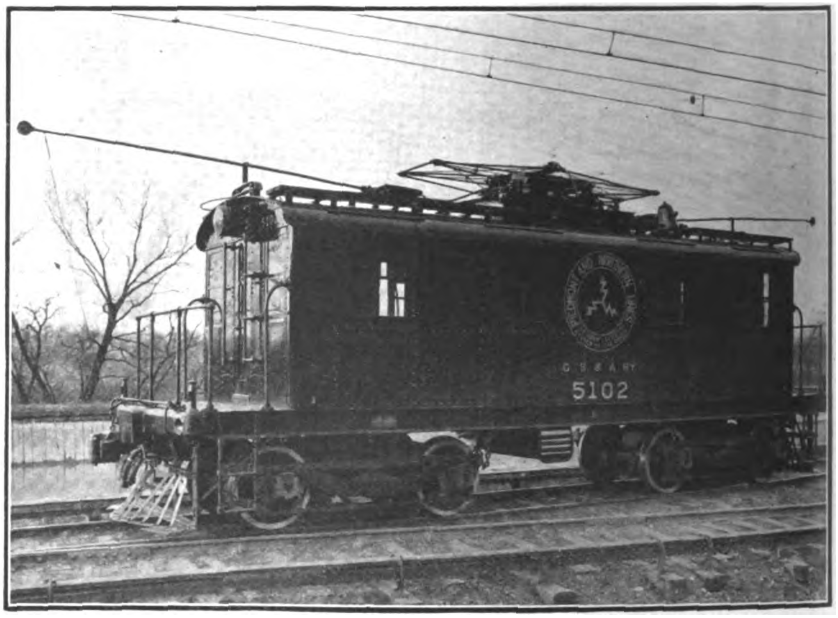
New 1,500-Volt Direct-Current Freight Locomotives for the Piedmont & Northern Lines.

The Piedmont & Northern Lines, Charlotte, N. C., are placing in commission six new 1,500-volt direct-current locomotives on the Greenville, Spartanburg & Anderson division of their system. These locomotives weigh 63.5 tons with all the weight on drivers, have the box type of cab extending nearly the entire length of the underframe and are designed for heavy freight service. At the normal rating of the four motors, with which each locomotive is equipped, operated on 1,500 volts two in series, they will develop a tractive effort of 17,500 pounds and a speed of 21 miles per hour. The locomotives will handle trains of 800 to 1,000 tons gross weight.

The Piedmont & Northern Lines comprise two main divisions, which, when entirely completed, will embrace 280 miles of track for limited and local passenger, express and heavy freight service. One division, operated by the Piedmont Traction Company, extends from Charlotte, N. C., to King's Mountain, N. C.; 23 miles of this road are in operation at the present time between Charlotte and Gastonia, but the remaining 12 miles from Gastonia to King's Mountain are yet to be constructed. The other division, operated by the Greenville, Spartanburg & Anderson Traction Company, extends from Greenwood through Greenville to Spartanburg, S. C., and joins the northern division at King's Mountain; 95 miles of this road are now in operation from Greenwood to Spartanburg, including a 10-mile spur running from Belton to Anderson. The section between Spartanburg and King's Mountain is also yet to be closed, and with the northern gap through to Gastonia leaves about 50 miles of the system yet to be built.

All these lines operate on 1,500 volts direct current. Energy is purchased from the Southern Power Company and is delivered from the transmission lines to two substations for the Piedmont Traction Company, one in Charlotte and the other in Gastonia. On the southern division of the road there are four substations, one three miles south of Spartanburg, one at Greenville, one at Belton and one at Downs, which is three miles out of Greenwood. The roads have a very heavy freight traffic and transport great quantities of cotton from shipping points to the various mills along the route, and in turn fabric from the mills to connecting stations for distribution to distant markets.

The new locomotives were designed and built by the General Electric Company. The cab is of the all-steel box type; outside platforms of suitable width are left at each end for the switchman to handle the trolley poles and are protected by side and end hand or guard rails. In the interior the cab is open throughout as far as is consistent with the apparatus located therein. While the operating mechanism is grouped in the central section, it is not located in a compartment separate from the operating cabs. Convenient passageways run along each side and connect with the operating positions in each end.



New Direct-Current 1,500-Volt Freight Locomotive.

The underframe or backbone of the locomotive consists of four 10-inch steel channels extending the entire length of the platform. These channels are tied together by heavy end-frame box-girder castings and bolster plates. The bolsters are built up of 18 by 1-inch plates, the top bolsters being carried clear across the platform and riveted to all four longitudinal sills. The two center channels are enclosed throughout with steel plates riveted to the under sills and carry the center-pin castings, which are bolted to them. The space between the center sills serves as a reservoir for distributing air from the blowers to the motors. Openings in the floor of this reservoir admit air from it through suitable intake pipes into the back end of each motor.

The drawhead castings are bolted to the center sills, which in turn are riveted to the end frames. The draft gearing consists of MCB couplers. The whole platform is floored and braced by heavy steel plates running the width of the locomotive and riveted to the longitudinal sills. In the cab this is covered with the usual wood flooring. Necessary ballast required to bring the locomotive up to its rated weight consists of steel bars running the whole length of the platform, notched over the bolster plates and bolted to the longitudinal sills. Pilots with switchman's steps are bolted to the end frames and braced to the side sills.

The two four-wheel trucks are of standard swivel type, designed for heavy freight work. The side frames are built of heavy rolled bars for top and bottom members with cast-steel pedestals. The bolster, or center transom, is bolted rigidly to the side frames, and the entire weight of the truck framing is supported on heavy semi-elliptic springs hung by links to the double side equalizer bars, which in turn rest on the journal boxes. The wheels are solid rolled steel, 36-inch diameter. The axles are forged open-hearth steel, six inches in diameter between the wheels. The air brakes are the combined straight and automatic type. The brake shoes are inside hung, and the brake rigging is proportioned for a brake-shoe pressure of 85 per cent of the weight on the drivers with 50 pounds pressure in the brake cylinders. Hand brakes are provided to hold the engine in the yard in case of loss of air pressure in the brake cylinders.

Taking up the electric equipment, the locomotive is driven by four GE-212 F, 600-1,200-volt, box-frame, commutating-pole motors, insulated for operation on 1,500 volts. Each motor is geared to an axle; all the axles are therefore driving axles. A forged pinion is mounted on each armature shaft and meshes into a corresponding solid steel gear mounted on the axle. The gear ratio is 65 to 18, making 3.61 gear reduction. The continuous capacity of each motor is 200 amperes under forced ventilation, and 269 amperes at the one-hour rating. For the complete equipment of four motors on a locomotive this is equivalent to a continuously sustained tractive effort of 11,200 pounds at the rail head.

The motor is inclosed and is designed especially for locomotive service. Through the method of forced ventilation employed, air is circulated over the armature and field coils, over and through the commutator, through longitudinal holes in the armature core, and thence exhausted through openings in the bearing head. A large volume of cool air is thus distributed effectively throughout the motor, which keeps all parts at a uniform temperature and eliminates the possibility of "hot spots."

The control equipment is Sprague-General Electric type M multiple-unit control, arranged to operate the four motors in series and series-parallel connections. The pairs of motors with their respective resistances are all connected in series on the first point of the controller. The resistance is varied through six points and finally short-circuited on the seventh or running point. The pairs of motors are then operated similarly in series- parallel and all resistance is cut out on the twelfth point, which is the full-speed running point. This provides control connections with seven steps in series and five steps in series-parallel. The transition between series and series-parallel is effected without opening the motor circuit, and there is no appreciable reduction in tractive effort during the change. This smooth transition between control points permits operating the motors close to the slipping point of the wheels throughout the entire range of acceleration without sudden fluctuations of tractive effort. Two switches are provided for cutting out either pair of motors, so that the locomotive can then be operated with one pair of motors in the usual manner.

One of the new and distinctive features for a locomotive of this type is the convenient manner in which the apparatus is arranged in the central section of the cab so as to afford ready and complete access to all parts for inspection, cleaning, adjustment or repair. The main motor rheostat boxes are mounted in banks in an inclosed sheet-steel compartment in the cab center. This compartment extends from the floor to the roof and is accessible through doors opening into the passageways on each side. The floor in the compartment is open and it is surmounted by an open monitor deck. Thus there is a continuous draught of air rushing up through the compartment while the locomotive is running, which affords exceptionally good ventilation. The rheostats are formed of the usual cast-iron grids assembled in frames and insulated with mica. This arrangement allows ample rheostat capacity for the locomotive, as there are 18 resistance units included in the group.

At each end of the rheostat compartment and suspended from the roof of the cab in laterally inclosed steel frames, accessible through lift doors at the sides, are grouped the contactors and reverser. Beneath these are installed on the floor the dynamotor, blower and one of the air reservoirs in one end, and the two air compressors and the other air reservoir in the other end. All mechanism and circuits carrying 1,500 volts are thoroughly insulated and protected from accidental contact.

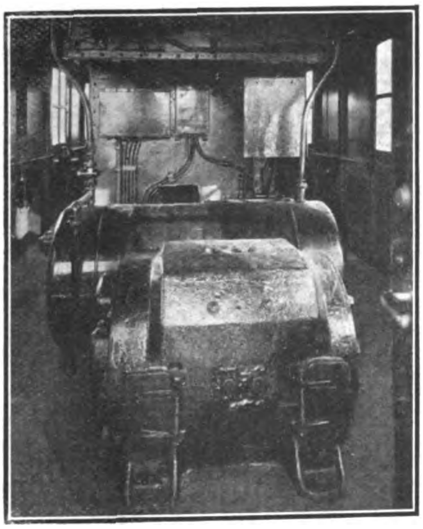
The blower set for ventilating the motors has a liberal capacity and is driven by a series-wound motor of the railway type. Air is taken from the exterior through a suction box with side louvres underneath the platform at the center. Current at 600 volts for the operation of the blower, and also the air compressors, the contactors and the lights, is furnished from a two-fifth's tap taken from the dynamotor. The contactors are of the same general design as that employed in the standard 600-volt type M control. The principal modifications are embodied in the greater insulation distances and more effective methods of insulating where the contacts and magnetic blowouts make and break on the 1,500-volt circuit.

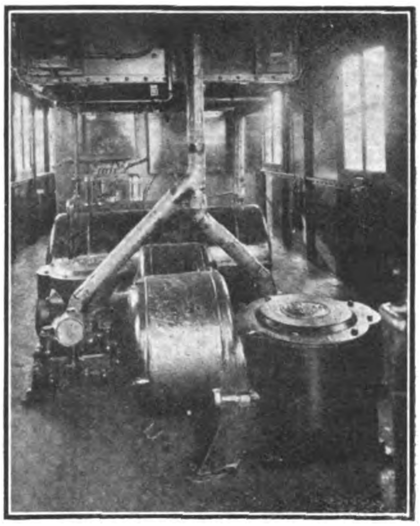
The air compressors are two-stage motor-driven machines and have a total piston displacement of 70 cubic feet per minute when pumping against a tank pressure of 90 pounds per square inch. Air is taken in from the interior of the cab through strainer screens, which prevent the entrance of injurious particles of dust, and is delivered into the two air reservoirs, each 28 by 60 inches, connected in series, thereby affording an opportunity for radiation of heat and condensation of moisture before entering the air-brake cylinders.

At the operating positions, in each end of the cab, are located the engineman's seat, controller, air-brake valves, bell and whistle ropes, ammeter, air gauges, sander valves and other parts of the control apparatus that should be within his immediate reach. A tool box with complete equipment of tools is also provided.

Current is collected by an overhead pantograph trolley, which is pneumatically controlled and can be put into service from either operating station by a manually operated valve. The trolley is arranged for a minimum operating height of 14 feet 6 inches and a maximum height of 22 feet. On some of the local lines which form

Operating Equipment at Ends of Cab.


View of Equipment Near Middle of Cab.


Another View Inside of Cab.

the system, the overhead construction is not adapted for the pantograph trolley, and in order to operate over such lines, the locomotives are equipped with pole-type trolleys and trolley wheels. Some of these local lines are operated on 600 and in some cases as low as 500 volts direct current. A change-over switch is installed for cutting out the dynamotor while the locomotive is operating on low-voltage circuits, so that in such cases the current for the auxiliary control and supply circuits is obtained direct from the trolley circuit. This change-over switch is protected by an automatic relay, which makes it impossible to connect 1,500-volt trolley current to the auxiliary circuits of the locomotive.

The main switch is provided with a powerful blowout so that heavy currents can be handled without damage. There is also furnished a complete equipment of auxiliary switches, one each for controlling the lighting, compressor and blower circuits, two each for the headlight and control circuits, two motor cutout switches already mentioned, and also two manually operated main auxiliary switches for cutting around the 1,500-600 volt automatic relay. All switches that control 1,500-volt circuits are thoroughly insulated for this higher voltage.

Protection of the locomotive against short-circuit is very complete. There is one main fuse for the trolley circuit, two fuses for protecting locally the circuits of the pairs of motors and smaller fuses for the auxiliary circuits. The main fuses are of the copper-ribbon type and are fitted with hinged covers to facilitate fuse renewals. All fuse boxes are provided with powerful magnetic blowouts, energized by current passing through the fuse to insure proper rupture of the arc. The main fuse box is located as near as possible to the overhead trolley in order to protect the wiring circuits near the source of supply. An aluminum-cell lightning arrester is also installed in the cab.

The locomotive is equipped with standard luminous arc headlights fitted with semaphore lenses. The brackets and plugs are arranged so that one headlight may be installed on each end or two on either end as desired. Trolley retrievers are used for the pole collectors, and the edge of the cab roof is provided with projecting guard rails to prevent the trolley rope from cutting on the edge or catching in the lamps. The ammeter located at each operating station indicates the current in the circuit of one pair of motors, and with the air gauges is illuminated by a gauge light connected in the headlight circuit, so that the headlight switch turns on simultaneously the headlight and gauge lights in the corresponding ends of the locomotive.

The sanders are pneumatically operated. Sand boxes of ample capacity are located alongside the door in each end of the cab, and the valves are arranged for sanding the track in front of the leading wheels at either end when running in either direction. Ladders for mounting to the roof of the cab are provided alongside the end doors together with grab railings here and at the end steps in accordance with the Safety Appliance Act. The interior of the cab is illuminated by incandescent lamps. Included among these are two portable lamps with extension cords installed at the center in the side passageways. The bell is fitted with an automatic bell-ringer and the whistle is air-operated. All wiring is drawn through conduits and carefully protected from mechanical injury. Two air signals are supplied, one in each end of the cab, to enable the switchmen to signal the engineman.

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Automatic Charging Panel for Storage-Battery Lighting Plants.

The great popularity of electric lighting and other uses for electricity has extended to country homes and farming communities, in many of which electric service from a central station cannot be obtained. A considerable number of equipments intended for operation as low-voltage isolating plants driven by gasoline or similar engines, or even by water power, have been installed, but considerable care and skill is required in their operation when provided with a storage-battery auxiliary.

To simplify this matter there has been placed on the market an automatic charging and lighting panel for use with plants of this character employing storage batteries of the lead type. One of the main features aimed at in the design of this automatic charging equipment was to give the battery what is now regarded as the ideal tapering charge, that is, starting at a heavy current which should automatically be gradually reduced to a low rate at the close of the charging period. The charge when fully completed is automatically cut off and the engine and dynamo are disconnected from the battery and stopped, while the lamp circuit is connected so as to be supplied by the battery directly.

The control equipment is so arranged that practically constant voltage can be maintained at the lighting circuit throughout the charge. Thus lamps may be used without being subjected to excess voltage at any period of the charging process. Automatic safeguards are provided for cutting out the battery, if continued discharge should be imposed on it from failure of the generating equipment to give a proper charge. Both the battery and generator are also protected against excessive currents, overspeeding of the engine and other difficulties. During these latter contingencies the lighting circuit is connected direct to the battery so that there is practically no interruption of lighting.

The equipment also provides for electric self-starting of the engine, the generator being used as a motor and operating from the battery to bring the engine up to speed; as soon as this is attained the machine becomes a generator and is ready for charging. An automatic signal and alarm is displayed and sounded when the battery approaches the end of discharge, thus calling the attention of some responsible person to this condition; automatic re-starting of the charging is intentionally not provided so as to compel periodic inspection of the engine, bearings, etc.

The equipment is designed for use with a 16-cell lead battery and with an ordinary shunt-wound generator designed for 42 volts maximum. The principle of operation is shown in Fig. 1. The switches S_1 and S_2 are two parts of a double-pole automatic switch which makes contact with the terminals C_1 and C_2 for charging, as shown, and with the contacts D_1 and D_2 for discharging. The fixed resistance R, usually of one-quarter ohm, is included in the charging circuit, this being so proportioned that with the current used it causes a gradually decreasing voltage drop across its terminals so as to maintain a constant voltage at the lamp terminals, while the voltage across the battery is gradually increasing. Thus the voltage at the terminals of a battery in a typical case, for example, rose from 36.3 volts at the start to 41 volts at the finish of the charging process, during which time, however, the voltage on the lamps varied from only 32.5 to 33 volts. When the charge is completed the automatic switch is thrown over to discharge.

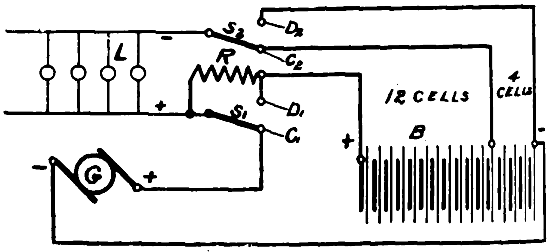

Fig. 1.—Diagram of Connections of Automatic Charging Outfit.

The panel is 18 to 24 inches in outside dimensions, and, as shown in Fig. 2, is neatly arranged with two instruments near the top, of which the one at the right is a battery ammeter with zero in the middle, thus reading both charge and discharge currents; the instrument at the left is of similar appearance but is actually a voltmeter and voltage relay with two platinum contact pins. One of these pins, on completion of the charge, makes contact with the needle and causes the automatic circuit-breaker and throw-over switch to open, stopping the discharge and at the same time breaking the ignition circuit of the engine and connecting the lamp circuit direct to the battery. Another platinum pin in this relay instrument makes contact when the battery is discharged and causes the signal and alarm to be actuated. The instrument also serves as a voltmeter, showing the battery voltage throughout the charge and discharge. In the middle of the panel is the automatic switch or circuit-breaker inclosed in an enamel iron case and operating in oil so as to prevent arcing. Pushing the button on the handle of this switch makes a connection from the battery to the dynamo for starting. Directly below the switch and connected with it is a combined overload and reverse-current relay. A push-button for the ignition circuit is also provided for use when it is desired to run the engine for other purposes without charging the battery. In the middle of the bottom of the panel is the handwheel for the field rheostat of the generator. This seldom requires adjustment. Two double-pole fused knife switches are provided, the one at the left being for the battery and the one at the right for the generator. Ordinarily these are not used, since the automatic switch in the middle takes care of practically all operations. These panels are made for batteries ranging from 30 to 250 ampere-hours capacity.

These panels are manufactured by the Roller-Smith Company, 203 Broadway, New York City.

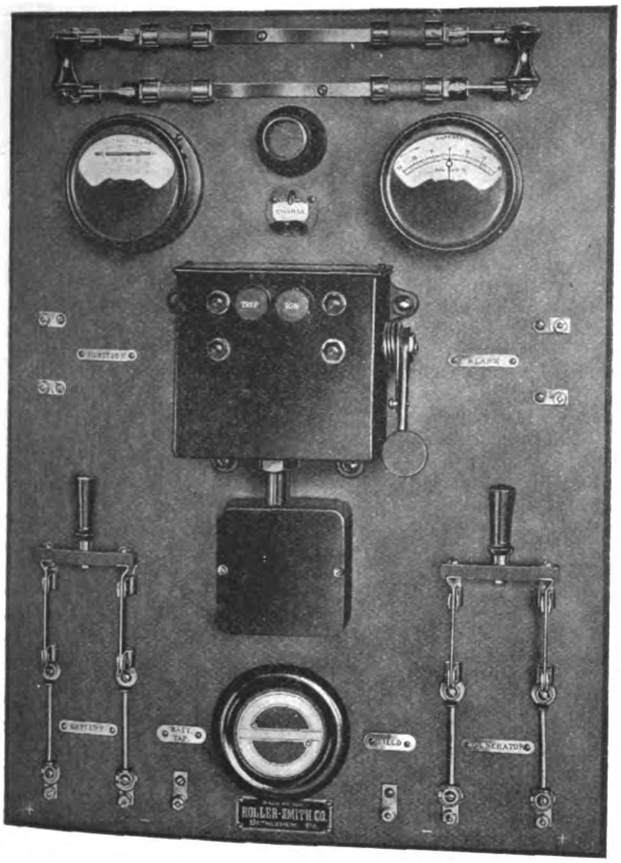

Fig. 2.—View of Automatic Battery-Charging Panel.

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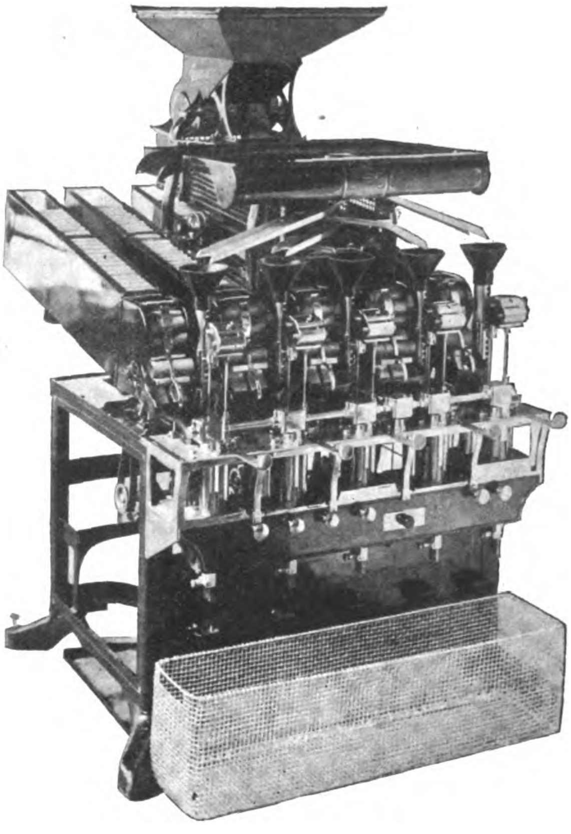
The Sattley Coin-Handling Machine.

Dump a miscellaneous lot of coins into the hopper of the machine shown in the accompanying illustration, start the electric motor that drives it, and the machine will sort out the coins into denominations, count them in dollars and cents, wrap them up into standard packages or sack them as you prefer, and also separate the mutilated coins and throw them into a separate receptacle.

Evidently this machine is going to become popular among companies that have to handle small coins in large quantities, such as street-railway companies, gas and electric companies, department stores, tax-receiving offices, water companies, banks, moving-picture theaters, etc. It cuts down the time required to handle money and reduces the cost considerably. It also eliminates errors in counting and prevents pilfering.

The machine is made by the Sattley Coin Handling Machine Company, Detroit, Mich. A Westinghouse small motor is used to drive it.



Motor-Driven Coin-Handling Machine.

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Tubular Woven Fabric Company Develops Vacuum Hose.

The Tubular Woven Fabric Company, Pawtucket, R. I., manufacturer of the well known Duraduct flexible conduit, has placed on the market a new vacuum hose which is of a different type of construction, it is stated, from any other hose now available. The hose is designed to be indestructible, inseparable and non-collapsible, the same as Duraduct, and it is also equipped with a molded rubber end. The extreme end of the section which goes over the metal tube is reinforced and so molded onto the fabric that it would appear to be impossible to rupture it in any way. The manufacturer states that the hose has been tested in every possible way and recent tests at Brown University laboratory indicate that the hose stands as nearly a perfect vacuum as it is possible to obtain.

In making the hose the company has endeavored to see how good a hose could be produced rather than making a hose to meet trade prices. The claim is made, however, that the hose is very reasonably priced. The company is already doing a nice business with the hose, which will be known by the trade name of Airoduct.

Latest Approved Fittings

ATTACHMENT PLUGS, Fused.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

"Hubbell."

Edison type, 660 watts, 250 volts; catalog Nos. 5,729, 5,754-5,756 inclusive, 5,824-5,826 inclusive, and 5,832. Separable attachment plugs, with bases designed to receive D. & W. type C baby cartridge fuses.

Approved February 24, 1914.

CABINETS.— Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved February 19, 1914.

CABINETS. — Portland Electric Maintenance Company, 121 North Fifth Street, Portland, Ore.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved February 19, 1914.

FLEXIBLE CORD, Portable. (For electric heaters.)—Driver-Harris Wire Company, Railroad Avenue and South Fourth Street, Harrison, N. J.

Double-conductor cord composed of loosely-woven wires with cotton-wind, rubber and asbestos insulations, covered with a braid and assembled as a twin or twisted pair, with and without an extra protecting braid over the whole.

Tag on coil to read: "National Electrical Code Standard."

Marking: One blue and one white thread cabled with the copper strand.

Approved February 18, 1914.

FIXTURES.—L. Erickson Electric Company, 82 Sudbury Street, Boston, Mass.

"Erickson"; for show-case and show-window use. Types for tubular lamps of standard and candelabra size.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each fixture.

Approved February 19, 1914.

LAMP ADJUSTER.—F. J. Gammache, 207 West Chestnut Street, Lancaster, Pa.

"Gam" cord adjuster.

A wooden block with grooves at each end in which reinforced cord is held by a metal spring fastened to the block.

Standard only for use with approved reinfroced flexible cord.

Approved February 7, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

PANELBOARDS.—H. Krantz Manufacturing Company, 160-166 Seventh Street, Brooklyn, N. Y.

"Krantz Safety Panel" three-wire, 125-250 volt; with an additional slate face which covers the busbars and the special branch-circuit snap switches and through which the switch handles extend. With N. E. Code cartridge-inclosed, Edison-plug or open-link fuse extensions in branch circuits.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced bear uniform labels by which they can be identified in the field.

Approved February 19, 1914.

PANELBOARDS. — Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

125, 125-250 and 250 volts.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed bv Underwriters' Laboratories, have labels attached to each panelboard.

Approved February 19, 1914.

RECEPTACLES, for Attachment Plugs.—Chelten Electric Company, 314 Armat Street, Philadelphia, Pa.

"Chelten," 10-ampere, 250-volt flush receptacle; catalog Nos. 5,561, 5,561-A.

Approved February 24, 1914.

RECEPTACLES, for Attachment Plugs.—General Electric Company, Schenectady, N. Y.

Surface receptacles: 10 amperes, 250 volts; cleat, catalog No. 49,488; concealed, 49,489; molding, catalog No. GE064.

Flush receptacles: 25 amperes, 250 volts, catalog No. GE996, with plug 59,197.

Approved February 24, 1914.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." porcelain-shell.

Keyless, 660 watts, 250 volts.

Concealed, catalog No. 490.

Approved February 25, 1914.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Sign sockets: catalog Nos. 274, 279.

Approved February 24, 1914.

RHEOSTATS.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

For starting or continuous duty on circuits of 600 volts or less. Type DE.

Approved February 24, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass shell electrolier sockets.

Keyless, 660 watts, 250 volts; short shell; catalog No. 470.

Approved February 24, 1914, for fixture use only.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S.," 660 watts, 600 volts; catalog Nos. 80, 423, 9,366, 43,310, 43,310 "Shurlock" for use with incandescent lamps in series on 600-volt circuits.

Approved February 24, 1914.

SOLDERING FLUX.—L. B. Allen Company, Incorporated, 4519 North Lincoln Street, Chicago, Ill.

"Soldering Stick."

"Soldering Paste."

"Presto Soldering Paste."

Approved February 25, 1914.

SWITCHES, Combination Cutout.—E. H. Freeman Electric Company, Trenton, N. J.

Service cutouts with porcelain base, knife switch and cartridge fuses: 30 amperes, 250 volts; catalog No. 1,804.

Porcelain base switches with Edison plug cutouts: 30 amperes, 125 volts; catalog Nos. 1,814, 1,815 and 1,816.

Approved February 24, 1914.

SWITCHES, Push-button Flush.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Single-pole, five amperes, 250 volts, 10 amperes, 125 volts.

Approved February 18, 1914.

SWITCHES, Surface Snap.—The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn.

(With porcelain covers.)

Single-pole, three amperes, 250 volts, five amperes, 125 volts; catalog Nos. 2,601-2,604 inclusive.

Double-pole, five amperes, 250 volts: catalog Nos. 2,607-2,610 inclusive.

Three-way, three amperes, 250 volts, five amperes, 125 volts, catalog Nos. 2,605 and 2,606.

Approved February 19, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

DERBY, CONN.—The Eastern Engineering & Construction Company has been incorporated, the capital stock being $50,000. W.

AUGUSTA, ME.—The Governor and Council of Maine has authorized the installation of an electrically operated elevator in the State House at Augusta, at a cost of about $4,000. to replace an elevator which is now operated by water power. W.

BOSTON, MASS.—The Clifton Electro Chemical Company has been incorporated with a capital of $40,000. Herbert S. Riley, M. Schuyler Clawson and Thomas M. Smith are the incorporators. W.

HOLYOKE, MASS.—This city is about to replace the arc street lamps on Springfield Road with tungsten incandescent lamps. It is proposed to make a general substitution on all streets of the city in a few months. W.

LEE, MASS.—This town is to install several new street lights. The annual appropriation is $3,950. W.

SPRINGFIELD, MASS.—Engineers of the R. D. Kimball Company, of Boston, will be consulted by the City Property Committee relative to the advisability and practicability of installing a plant for lighting the municipal group.

ATLANTIC CITY, N. J.—Three sets of street-lighting specifications are to be introduced by Director William H. Bartlett before the Board of Commissioners for approval, and as soon as is practicable bids will be advertised for and contracts awarded. Address City Electrician Frank Shinnen for further information.

BELLEVILLE, N. J.—The Town Council is planning for the installation of a new fire-alarm system. Christian Reinhardt is fire chief. A.

CAMDEN, N. J.—The Sterling Switchboard Company has been incorporated with a capital of $125,000 to manufacture switchboards and electrical apparatus. J. S. Low, Fred H. Humphreys, Jr., and William A. Forman, Jr., are the incorporators. A.

HOPE, N. J.—The Patrons' Telephone Company will arrange for the reconstruction of its entire system between Hope and Delaware as a result of the recent storms. A.

SOUTH ORANGE, N. J.—The Township Committee is considering the advisability of the installation of a municipal electric lighting plant. A.

TRENTON, N. J.—The Trenton & Mercer County Traction Company is planning for the extension of its system from Yardsville to Crosswicks. W. H. Hitchcock is general manager. A.

BATAVIA, N. Y.—Batavia Traction Company, Incorporated, has been granted articles of incorporation to build and operate an electric surface railroad. The capital stock is $25,000 and the incorporators are Stephen W. Brown, William F. Haitz and Michael H. Keogh, of this place.

NEW YORK, N. Y.—South Electric Manufacturing Company has been granted articles of incorporation, capitalized at $25,000. The incorporators are L. C. Randolph, C. R. Peddle and W. B. Ligou.

PHILADELPHIA, PA.—The Scofield Engineering Company, Commonwealth Trust Building, has prepared estimates for substation power and transmission for the Savannah Electric Company, at a cost of $200,000. Contracts will be let by the engineers.

PHILADELPHIA, PA.—Plans are being prepared by John T. Windrim for the transmission station to be erected at Germantown Avenue and Moreland Street for the Philadelphia Electric Company. The structure is to be 57 by 100 feet. N.

PHILADELPHIA, PA.—The Delaware & Atlantic Telegraph & Telephone Company is planning for the early erection of a new fifteen-story building on the Philadelphia Parkway, and for improvements in its underground cable system. The latter work is estimated to cost $40,000. H. L. Kinnard is manager of the company. A.

CORINTH, VT.—The Corinth & Newbury Telephone Company has filed articles of incorporation, having a capital stock of $1,500. The subscribers are R. H. Waldow and W. C. Chamberlain, of South Ryegate, and R. E. Burroughs, of Wells River.

SOUTH ATLANTIC STATES.

HOMESTEAD, FLA.—A $30,000 lighting plant will be established here under the supervision of the J. B. McCrary Company.

LEESBURG, GA.—The Albany Power & Manufacturing Company, of Albany, has been granted a 25-year franchise, and will build a transmission line to this city and furnish the street lighting.

WOODLAND, GA.—Citizens are planning to establish electric lighting here. Address the city clerk.

SNOW CAMP, N. C.—The Snow Camp Mutual Telephone Company has been incorporated with a capital stock of $5,000 by D. H. Thompson, James H. Roach and others.

YEMASSEE, S. C.—The Southern Orchard Company will operate an electric-light plant. J. W. Agey is president.

NORTH CENTRAL STATES.

CLINTON, IND.—The Clinton Electric Light & Power Company will soon purchase a 500-kilowatt 2,300-volt three-phase 60-cycle generating unit, direct connected, and a condensing outfit. Address C. M. Poor, superintendent, for further information.

INDIANAPOLIS, IND.—City Civil Engineer Jesup has made public the specifications for the street lighting, bids for which will be received by the Board of Public Works April 20. The contract will be for ten years, taking effect April 1, 1915. There will be a minimum of 2,000 arc lamps and 500 incandescent lamps. In the specifications the arcs called for are ten-ampere alternating-current inclosed flame-carbon lamps.

APPLE RIVER, ILL.—The Warren Light & Power Company has been granted the right to construct and maintain an electric line for the transmission of light, heat and power, within the village.

BLOOMFIELD, IOWA.—Bonds for $15,000 will be issued to rebuild the electric light plant. C.

LYONS, IOWA.—L. C. Moeszinger is a member of a committee to secure ways and means to establish electric lighting.

MUSCATINE, IOWA.—Bids are being asked for the construction of the power plant and for furnishing electrical power to operate the plant in drainage district No. 13. The bids will be opened on April 14. Address Muscatine County Auditor.

KANSAS CITY, KANS.—The capacity of the municipal light plant is to be trebled at once. L. H. Chapman is commissioner of water and lights. M.

WYANDOTTE, MICH.—The Village Board plans to establish a light and water system. Address the village clerk.

COLD SPRINGS, MINN.—Northwestern Telephone Company will erect rural lines to Jacobs Prairie and the Bavarian settlement. C.

ELK RIVER, MINN.—Andrew Davis and C. H. Tyler were appointed a committee to investigate electric lighting for this place. C.

KINGSTON, MO.—The Caldwell County & Southern Railway Company, which proposes to build a nine and one-half mile electric road between Hamilton and this city has been granted a charter to operate in Missouri. David Miller, of Kansas City, is the chief stockholder in the company, which is capitalized at $100,000. Others interested are S. C. Rogers, H. C. Shivley and L. F. Bowman, of Kingston. M.

HARRISON, NEB.—The Town Board has granted a franchise to the Chadron Telephone Company to establish a system in Harrison and connect with the county lines.

OMAHA, NEB.—The Baker Construction Company has filed with the State Railway Commission application to issue $13,000,000 in bonds to finance the construction of the 420 miles of road of the Niobrara, Sioux City & Omaha electric railway. It is believed that authority to issue bonds will be forthcoming. Present plans provide for an electric road between Omaha and Norfolk, by way of Elk City. A branch from Elk City to South Sioux City, from the latter to Niobrara and from Niobrara to O'Neill, also is proposed with a cross line from West Point to Decatur. C. W. Baker is president of the company. M.

ELLENDALE, N. D.—An electric light plant will be established here this summer. J. L. Tucker of Norwood, owns the franchise.

LISBON, N. D.—Farmers Success Telephone Company has been incorporated with a capital of $10,000. Carl Bliss is named among the incorporators.

CINCINNATI, O.—The management of the Lyric Theater is considering plans and specifications for installing a large electric-light plant in the basement of the theater. Address President Heuck for further information.

DEAN, O.—The residents of this place are considering ways and means to secure electric lighting. Address Theodore F. Kelly, of the Dayton Light & Power Company, Dayton.

MINERAL CITY, O.—The Industrial Power & Light Company, of this place, which has lately been incorporated with a capital of $200,000, will build and operate a large electric power plant for furnishing current to the Federal Clay Products Brick plants of Mineral City. The brick company owns two plants at this point, and two at near-by localities.

NORWOOD, O.—Bids are being asked for all the materials and appliances necessary to properly fit a private power plant for the Boss Washing Machine Company. R.

OAK HARBOR, O.—L. L. Carstensen, clerk of the village of Oak Harbor, will open bids April 15 for the material and construction of an electric-lighting system for the village. Plans on file with Vance L. Grey, electrical engineer, Toledo, O. R.

RAVENNA, O.—The Commissioners have granted this city the right to erect and maintain an electrical transmission line in the township of Rottstown.

TROY, O.—Business men of Pleasant Hill are organizing an electric lighting company to undertake the erection of an electric plant for that village. N. B. Teeter, N. W. Powell, John Myers and others are interested. R.

WYOMING, O.—The Council is planning to erect a municipal electric-light plant after February, 1915, when the franchise now held by the Union Gas & Electric Company, expires. Address the village clerk for information.

DELL RAPIDS, S. D.—The Twin Mound Rural Telephone Company has been incorporated with a capital stock of $2,500, by E. J. Zellmer, T. S. Braa, Henry Haak, Gilbert Braa and S. A. Braa.

AMERY, WIS.—The Amery River Milling Company has been organized here with a capital stock of $40,000, and will generate and sell electric power. Address E. J. Schneider for further information.

BAYFIELD, WIS.—The Municipal Light, Power & Water Company will purchase two direct-current generators; also a motor-driven pump and two switchboards.

BUTTERNUT, WIS.—W. J. Schulze is considering enlarging the electric light plant and lighting the entire city.

MADISON, WIS.—The Railroad Commission gave a permit to the Independent Telephone Company of Blue River to build a line through Grant, Richland and Crawford Counties. C.

SOUTH CENTRAL STATES.

MOBILE, ALA.—The Tidewater Securities Corporation plans to construct a combined aerial and submarine telegraph and telephone line from the mainland at Cedar Point to Dauphin Island.

BARDWELL, KY.—J. Horn and others have organized the Bardwell Home Telephone Company with a capital stock of $1,500, to build a telephone line. G.

BARBOURVILLE, KY.—The Harlan Coal Mining Company, composed of Barbourville and Louisville men, and operating some of the largest mines in Harlan County, is having plans prepared for a large central electrical plant which will probably be constructed early in the summer. Address the general manager.

LEWISBURG, KY.—J. E. Powell and others have organized the J. E. Powell Electric Light Company for the purpose of operating a plant to furnish current to the town. The capital stock of the company is $1,500. G.

LOUISVILLE, KY.—The Louisville Grocery Company will install electric elevators in a five-story building which it is fitting up for its use on Main Street.

LOUISVILLE, KY.—The Cumberland Telephone & Telegraph Company will install equipment extending from Hemlock Exchange to Rossville to cost $20,000.

MIDDLESBORO, KY.—An electric passenger elevator will be installed by Gibson Brothers, who are adding a second story to their establishment. G.

WHITESBURG, KY.—Stephen Combs and others have organized a company for the purpose of constructing an electric power plant for the town. G.

WOODBURN, KY.—The Farmers' Mutual Telephone Company has been organized by V. K. Nicoll and others to build a telephone line. The capital stock is $1,000. G.

DICKSON, TENN.—$15,000 in bonds has been voted to extend the electric and water system. Address the mayor.

BROWNWOOD, TEX.—The City Council has granted a franchise to the Brown Telephone & Telegraph Company to build an exchange here. D.

EMORY, TEX.—The Emory Electric Light & Power Company has been organized here with a capital stock of $2,000 and will erect an electric light plant. The incorporators are G. W. Alexander, J. E. Alexander and K. L. McCormick. D.

SEGUIN, TEX.—The Guadalupe Water Power Company has completed plans for the construction of a great hydroelectric project on the Guadalupe River, which will develop 100,000 horsepower of electrical energy and furnish current for towns and cities within a radius of 60 miles of Seguin, including the city of San Antonio. The project includes the construction of five dams on the Guadalupe River between Seguin and New Braunfels, the erection of a great reservoir on the upper portion of the river with a capacity of 150,000 acre-feet of water, and the hydroelectric plants to generate the power. It is estimated that fully $8,000,000 will have been expended to complete the work. This company has a capital stock of $400,000 and is backed by Dr. E. W. Brown, of Orange, who is president; W. B. Dunlap, of Beaumont, vice-president, and G. M. Abbott, secretary. It is expected to begin actual construction work at once.

WESTERN STATES.

TUCSON, ARIZ.—The dispute between the city of Tucson and the Tucson Gas, Electric Light & Power Company regarding rates and underground conduits has been settled, the company agreeing to take down all electric-light wires and poles on Congress Street, pave between the street car tracks in Congress Street and Stone Avenue, extend its car lines and increase the capacity of the lighting plant, expending about $200,000 on improvements. D.

NEWPORT BEACH, CAL.—Officials of this city have advertised for sale bonds to the amount of $25,000. These were voted in September, 1912, but on account of legal action taken at this time by C. H. L. Ghriest, owner of the only local plant, the sale of the bonds was delayed. The bonds were voted for a municipal lighting plant, but as a 40-year franchise has been entered into with the Pacific Light & Power Company, the money derived from the sale of the bonds will be used in establishing an ornamental street-lighting system. This system will consist of concrete or bronze posts and fixtures and underground conduits. Should the bonds not sell, the system will be built and the district assessed for their payment. T.

STRATHMORE, CAL.—A substation is soon to be erected here for the Mt. Whitney Power Company.

VICTORVILLE, CAL.—Officials of the Southern Sierras Power Company have informed residents of this city that within a few weeks the line which will transmit electrical energy to local people will be constructed. A distributing system will be established here and energy for both light and power will be furnished. Local residents have just been afforded telephone service with the outside world. T.

MALAD CITY, IDAHO.—The City Council has granted a franchise for an electric-lighting system to G. C. McLaughlin, who has announced his intentions of installing a power plant providing the State Utilities Commission, at Boise, will grant him the required permission. O.

BILLINGS, MONT.—The Carbon & Stillwater Electric Railway Company has been incorporated with a capital stock of $75,000 for the purpose of building an interurban trolley line between Red Lodge and Columbus, a distance of 40 miles.

JUDITH GAP, MONT.—Farmers east of the town have organized a Farmers Telephone Company, of which Samuel Riggs is president, and farmers west of town are planning on organizing a company. Mayor H. B. Mills is interested in the project.

SIDNEY, MONT.—The Water Users Electric Company is preparing to construct a telephone line to Lambert. Mr. Kemmis is president. C.

LA GRANDE, ORE.—A. Klees & Son, owners of the electric light plant at Summerville, Ore., recently re-organized as the Klees Water Power Company, and are making preparations and plans for the construction of a large central station and distributing system here, in addition to their present holdings here. A steam power plant is included in the proposed improvement. O.

MYRTLE POINT, ORE.—The Oregon Power Company is making preparations for the rebuilding of its lines in this city, and in Coquill. The telephone wires the poles now carry will be placed in cables, and the power transmission lines placed on top of the poles. The improvement is estimated to cost approximately $10,000. O.

PORTLAND, ORE.—G. B. Hegardt, engineer, Port of Portland Commission, has been authorized to advertise for bids for five electric winches, costing approximately $2,100 each; a rotary transformer costing about $2,500, and equipment for a power circuit, and other equipment necessary in preparing to use electricity in handling cargo. O.

SANDY, ORE.—The Portland Railway, Light & Power Company recently announced its intention of extending an electric transmission line from Bull Run to this city for the purpose of furnishing light. The cost will amount to about $5,000 and work will be ordered in the immediate future. O.

PROVO, UTAH.—The Utah Power & Light Company has entered into a contract with Provo City providing for the supply of fifty 6.6-ampere 510-watt luminous-arc lamps for street-lighting purposes at $5.50 each per month. U.

BELLINGHAM, WASH.—The Washington Electric Company, a subsidiary of the Stone & Webster Company, recently filed notices with the county auditor of Whatcom County of the appropriation of water power on the Baker River at six different points on the stream. It is understood the company contemplates extensive development work later, but no definite announcements have as yet been made. O.

CENTRALIA, WASH.—The Lincoln Creek Telephone Company recently filed articles of incorporation, naming Eustace Childer, E. Conley, and John Sinclair as incorporators. The new company will maintain a main office here, and will operate in Lewis County. O.

EVERETT, WASH.—The City Commissioners have under consideration the installation of a tungsten lighting system to replace the one now in use. If the new plan carries, additions and extensions to the present system will be made. Address Commissioner Thompson for further information. O.

GLAZIER, WASH.—The Washington Anthracite Coal Company, four miles south of this place, is seeking to secure an official permit to construct a new power transmission line and an expensive aerial tramway at the Lucky Strike Coal mine. Letters applying for permits have been forwarded to the office of the District United States Forester, Portland. Power will be purchased from the Puget Sound Traction, Light & Power Company. O.

SOUTH BEND, WASH.—The City Council unanimously voted to grant an electric light and power franchise to the MacKean interests, which company promises to furnish electricity at the rate of eight cents per kilowatt-hour for lighting purposes, and one cent per kilowatt-hour for domestic purposes. The franchise is combined with a franchise for furnishing the city with water for all purposes at 50 cents per month. A cash forfeit has been placed in a local bank to guarantee the commencement of work on an electric light plant within one year. The city has been guaranteed two per cent of the gross earnings of the Company. Address Frank J. MacKean, here. O.

NEW INCORPORATIONS.

DETROIT, MICH.—C. E. Clements & Son Electric Company has been incorporated with a capital of $20,000.

PITTSBURG, TEX.—The Home Light and Ice Company has been incorporated with a capital stock of $11,000 by Philip Dolinski, W. C. Hargrove and others.

WORCESTER, MASS.—Callahan-Earle Contracting Company has been incorporated with a capital of $3,000. John M. Callahan, William S. Earle and Frank C. Smith, Jr., are named as the incorporators. W.

CHICAGO, ILL.—The Railway Electric Manufacturing Company has been incorporated with a capital stock of $25,000. The incorporators include Max W. Zabel, 53 W. Jackson Boulevard, this city.

CHICAGO, ILL.—The American Burglar Alarm Company has been incorporated with a capital stock of $100,000 to manufacture and install burglar alarms, building protection, etc. The incorporators include Otto P. Ley 4045 N. Hermitage Avenue, this city.

CHICAGO, ILL.—The Palmet Equipment Company has been incorporated with a capital stock of $5,000 to purchase, sell and manufacture railway, power and electric equipment. The incorporators are Elliott S. Rice, Lawrence Palmer-Ball and Miss Effie A. Kelly.

NEW PUBLICATIONS.

CALIFORNIA REPORT.—The report of the Railroad Commission of California for the year ended June 30, 1913, has been published in a volume of 2,005 pages. It contains statistics of the utilities, complaints, orders and laws relating to utilities.

NEW YORK COMMISSION.—The New York Public Service Commission for the Second District has issued Vol. III of the sixth annual report, covering the year 1912. This contains abstracts of the reports of electrical, gas, telegraph and telephone companies.

MAINE COMMISSION.—The fifty-fifth annual report of the Railroad Commissioners of the State of Maine, covering the year ended November 30, 1913, has been issued. It includes statistical tables and petitions, decisions and rules of the Board.

CONSERVATION OF NATURAL RESOURCES.—An article by W. V. N. Powelson entitled "Conservation of Natural Resources," and dealing with the waste involved in the nondevelopment of our water powers has been printed as Senate Document No. 243.

BUREAU OF MINES REPORT.—The annual report of the Director of the Bureau of Mines, Washington, D. C., for the fiscal year ended June 30, 1913, has been issued. It refers to the investigation of the use of electricity in coal and metal mining and the dangers from such use, and to the electric smelting of ores.

ENGLISH TELEPHONE SITUATION.—The Bureau of Public Service Economics has published a pamphlet entitled "What the English People Think of Their National Telephone." It contains correspondence originally published in the *London Times* during December, 1913, dealing with complaints of the telephone service.

TERRESTRIAL MAGNETISM.—The annual report of the Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, for the year 1913, has been separately printed. It refers to the magnetic surveys of land and ocean areas which have been completed and gives plans of the new building to be erected for the department in a Washington suburb.

NEBRASKA COMMISSION REPORT.—The sixth annual report of the Nebraska State Railway Commission for the year ended November 30, 1913, has come from the press. It contains a general review of the work of the Commission, a list of complaints filed and orders issued, a list of court decisions affecting the Commission, a compilation of reports of utility companies, a tabulation of the physical valuations which have been carried out and a report on the operation of the blue-sky law.

PROPOSALS.

ELECTRICAL WORK.—Bids are being received at the Philadelphia City Hall by the Committee on Property of the Board of Public Education, for the electrical work to be done in the schools of Philadelphia.

WIRING AND ELECTRICAL EQUIPMENT.—Messrs. Baird & Huselton, Kansas City, Mo., are receiving bids for the wiring and installation of electrical equipment in the new Muehlebach Hotel, to be erected on Kansas City at a cost of several million dollars .

ELECTRICAL FITTINGS.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until April 18 for furnishing under Circular 837 cable clips, motors, etc. For further information address F. C. Boggs, Major, Corps of Engineers, U. S. Army, General Purchasing Officer.

ELECTRIC LIGHTING SYSTEM.—Frederick Fries, chairman of the Board of Chosen Freeholders, Camden, N. J., will receive bids until April 8 for the installation of an electric lighting system and power station, as well as a water system, at the tuberculosis hospital, Ancora. Thomas Stephen, Temple Building, Camden, is the architect.

ELECTRIC LIGHT AND POWER SYSTEM.—The Board of Chosen Freeholders, County Courthouse, Newark, N. J., will receive bids until April 15 for an electric lighting and power system installation in the new tuberculosis hospital to be erected at Overbrook. John F. Capen, 207 Market Street, Newark, is architect.

POWER PLANT.—Sealed proposals will be received at the United States Engineer Office, Wheeling, W. Va., for building a fireproof power house and a boiler chimney and furnishing and installing one 115-horsepower boiler, one steam-driven air compressor, two air receivers, one feed-water heater, one feed-water pump, one service pump, etc., at dam No. 12, Ohio River, near Wheeling.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until April 27 for furnishing interior lighting fixtures of a one-story building for the post office at Cadillac, Mich.; and until April 30 of a one-story building for the post office at Bryan, Tex. Drawings and specifications may be obtained from the office of the Supervising Architect or the custodians of the sites named.

FINANCIAL NOTES.

The Philadelphia Stock Exchange has listed $7,000,000 additional general mortgage five-per-cent sinking-fund fifty-year coupon bonds of the Public Service Corporation of New Jersey.

Kuhn, Loeb & Company has called for 50 per cent payment by members of Western Union syndicate, payable April 1. Something over half of the Western Union stock was subscribed for by stockholders.

James N. Wallace, president of the Central Trust Company, has been elected a director of the Westinghouse Electric & Manufacturing Company, succeeding Thomas W. Lamont, resigned, and H. H. Westinghouse has been elected a director, succeeding the late George Westinghouse.

At the annual meeting of the Guanajuato Power & Electric Company, retiring directors and officers were re-elected. The company, which operates electric properties in the State of Guanajuato, Mexico, reported gross earnings for 1913 of $677,972, an increase of $20,000 over gross for 1912.

Announcement has been made of the absorption by the Reading Transit & Light Company of the Lebanon Valley Electric Light Company interests in Lebanon County. The purchase was made from John S. Weaver, of Lebanon, Pa., who was paid $41,500 in cash and accepted $75,000 worth of common stock in the Eastern Power & Light Corporation, which is the holding company for a number of corporations, including the Reading Transit Company. The Lebanon Valley Company had a capital of $100,000 and several years ago absorbed the Swatara, Bunker Hill, North Lebanon, Palmyra, Lebanon, Hebron, West Lebanon, Myerstown, Jackson and Mill Creek Township companies.

Immediate completion of the Willamette Valley Southern Railway, from Oregon City *via* Beaver Creek, Mulino and Molalla to Mount Angel, and the actual operation of the road before the end of the present year was assured when the Portland Railway, Light & Power Company agreed to guarantee a $700,000 bond issue necessary to finance the project. In consideration for this arrangement the Willamette Valley Southern will purchase its electric power from the Portland Railway and will interchange its traffic with that road at Oregon City. The Willamette Valley Southern already has about seven miles of road completed. The remaining distance can be built with the $700,000 accruing from the sale of the bonds. Under terms of a mortgage filed at Oregon City the road can be bonded for $3,000,000, but this entire issue will not be sold. An outstanding issue of $57,000 first-mortgage bonds will be redeemed by the present issue so that the entire new issue will consist of first-lien securities. The bonds will mature in twenty-five years and pay six per cent. They will be callable at 103 on any interest date.

Dividends.

Bell Telephone Company of Pennsylvania; quarterly of 1.5 per cent, payable April 15 to stock of record April 6.

Central Mexico Light & Power Company; a quarterly preferred dividend of 1.5 per cent, payable March 31.

Chippewa Valley Railway, Light & Power Company; a quarterly common dividend of 1.75 per cent, payable April 1.

Cincinnati, Newport & Covington Light & Traction Company; quarterly of 1.125 per cent on preferred and 1.5 per cent on common, both payable April 15.

City Railway, Dayton; a quarterly dividend of 1.5 per cent on preferred, and two per cent on common, both payable March 31.

Consolidated Cities Light, Power & Traction Company; a quarterly dividend of 0.75 per cent, payable April 1.

Dayton Power & Light Company; quarterly of 1.5 per cent on preferred, payable April 15 to stock of record April 1.

Electrical Utilities Corporation; quarterly of 1.25 per cent on preferred, payable April 15 to stock of record April 1.

Illinois Northern Utilities Company; quarterly of 1.5 per cent on preferred, payable May 1 to stock of record April 20.

Manchester Traction, Light & Power Company; a quarterly dividend of two per cent, payable April 15.

Memphis Street Railway Company; a quarterly preferred dividend of 1.25 per cent, payable March 31.

Nashville Railway & Light Company; a quarterly dividend of 1.25 per cent, payable April 1.

National Gas, Electric Light & Power Company; quarterly of 1.5 per cent on preferred and one per cent on common, payable April 1.

New England Power Company; a quarterly preferred dividend of 1.5 per cent, payable April 1.

Pacific Telephone & Telegraph Company; quarterly of 1.5 per cent, payable April 15.

Western Ohio Railway Company; a quarterly dividend of 1.5 per cent on second preferred, and 1.75 per cent on first preferred, both payable April 10.

Westinghouse Electric & Manufacturing Company; quarterly of one per cent on common, payable April 30 to stock of record March 31, and 1.75 per cent on preferred, payable April 15 to stock of record March 31.

Youngstown & Ohio River Railroad Company; dividend of 0.75 per cent on preferred, payable March 31. This is a reduction of 0.25 per cent from dividend paid December 31, 1913.

Report of Earnings.

NEW ORLEANS RAILWAY & LIGHT.

The New Orleans Railway & Light Company for the year ended December 31, 1913, reports income account as follows:

	1913	1912
Gross earnings	$6,924,425	$6,652,935
Operating expenses, taxes, etc.	4,331,577	3,986,347
Net earnings	2,592,847	2,666,588
Miscellaneous deductions	89,357	101,583
Interest on underlying liens	592,612	602,276
Interest on general mortgages, 4½s	789,480	789,480
Interest on ref. liens	179,050	178,480
Interest on deb. notes.	69,588	......
Surplus	872,759	995,032

BANGOR RAILWAY & ELECTRIC.

	1914.	1913.
January gross	$ 63,687	$ 58,793
Net after taxes	32,354	29,860
Surplus after charges.	14,996	12,250
Twelve months' gross.	768,979	715,373
Net after taxes	420,068	391,590
Surplus after charges.	212,465	190,354
Balance after preferred dividends	107,465	85,354

Equivalent to 5.4 per cent on common stock.

CHATTANOOGA RAILWAY & LIGHT.

(Subsidiary Tennessee Railway, Light & Power.)

	1914.	1913.
January gross	$ 99,233	$ 95,633
Net after taxes	40,881	36,392
Surplus after charges.	13,228	11,993
Twelve months' gross.	1,208,529	1,079,302
Net after taxes	491,791	433,537
Surplus after charges.	190,456	164,378
Balance after preferred dividends	90,456	64,378

CENTRAL STATES ELECTRIC CORPORATION.

(Cleveland Electric Illuminating Co.)

	1914	1913
February gross	$ 412,903	$ 354,836
Net after taxes	211,045	181,573
Balance after interest, preferred dividends, etc.	173,803	144,560
12 months' gross	4,114,335	3,330,030
Net after taxes	1,987,780	1,559,156
Balance after interest, preferred dividends, etc.	1,575,470	1,167,619

DAYTON POWER & LIGHT.

	1914	1913
February gross	$ 84,055	$ 70,517
Operating expenses	46,367	34,977
Net earnings	37,688	35,540
Surplus after charges	12,528	12,881
Output, kilowatt-hours.	2,407,091	1,930,726

DETROIT EDISON COMPANY.

	1914	1913
February gross	$ 553,335	$ 467,417
Surplus after charges	175,720	152,923
Balance after depreciation	134,920	112,123
Two months' gross	1,156,661	967,990
Surplus after charges.	392,159	328,172
Balance after depreciation	308,009	244,002

ONTARIO POWER COMPANY.

The report of the Northern Ontario Light & Power Company, Ltd., for the year ended December 31, 1913, shows net earnings of $658,408, an increase of $285,136. The income account compares as follows:

	1913	Increase
Gross revenue	$872,510	$350,905
Operating expenses, maintenance, taxes, rentals, etc.	214,102	65,769
Net earnings	$658,408	$285,136
Interest, etc.	272,263	84,286
Balance	$386,145	$200,850
Dividends preferred	142,758	24,810
Balance	$243,387	$176,040
General reserves	50,000	50,000
Surplus	$193,387	$126,040
Previous surplus	129,652	62,122
Total surplus	$323,039	$188,162

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	March 30	March 23
American Tel. & Tel. (New York)	121¾	122
Commonwealth Edison (Chicago)	139	139
Edison Electric Illuminating (Boston)	255	260
Electric Storage Battery, common (Philadelphia)	52	54¼
Electric Storage Battery, preferred (Philadelphia)	52	54¼
General Electric (New York)	145	147½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric, common (Boston)	11	11
Massachusetts Electric, preferred stamped (Boston)	61⅝	61½
National Carbon, common (Chicago)	108½	109
National Carbon, preferred (Chicago)	117½	117
New England Telephone (Boston)	137	138
Philadelphia Electric (Philadelphia)	26½	26¾
Postal Telegraph and Cables, common (New York)	83¼	83½
Postal Telegraph and Cables, preferred (New York)	69	64¾
Western Union (New York)	62¾	63¼
Westinghouse, common (New York)	75½	77¼
Westinghouse, preferred (New York)	118	118

PERSONAL MENTION.

MR. A. L. POWELL, of the Public Service Corporation, tendered an address on "Lighting" before the City Center Merchants' Association, Jersey City, N. J., on March 26.

MR. NEWTON W. BOLEN, general superintendent of the Public Service Corporation, was a guest of honor at a testimonial dinner given by employees at Paterson, N. J., on March 24, in appreciation of business relations.

MR. DANA PIERCE has been designated by the New York Board of Fire Underwriters to serve as one of its representatives on the Advisory Board of Electrical Engineers for the Department of Water Supply, Gas and Electricity.

MR. C. W. LORING, of the sales department of the Minneapolis General Electric Company, Minneapolis, Minn., recently lectured at the Woman's Club in that city on "Electric Appliances," and has been invited to give another lecture specializing on electric-washing machines and vacuum cleaners.

PROF. MONTRAVILLE M. WOOD, who made the plans for the 500-foot model of the Panama Canal, to be on exhibition at San Francisco in 1915, delivered an illustrated lecture at the high school auditorium in Kansas City, Mo., on March 24, on the use of electricity. Mr. Wood gave a demonstration of the ultra-violet ray, writing on the wall with it in letters of fire. Professor Wood was assisted by his daughter, Miss Aelene M. Wood. The lecture was given under the auspices of teachers in the grade schools of Kansas City.

MR. THURSTON OWENS, until recently vice-president and general manager of the LaCrosse Gas & Electric Company, LaCrosse, Wis., has become secretary and general manager of the San Diego Gas & Electric Appliance Company, San Diego, Cal. The company will install and maintain complete gas and electric equipments in all classes of buildings. Show rooms will be established at 939 Sixth Street, which will be headquarters for gas and electric appliances of the latest and most efficient models.

PROF. HYLON T. PLUMB, of the engineering department of the General Electric Company, with headquarters in Salt Lake City, Utah, delivered a lecture on the subject of "Electricity on the Farm" in the Commercial Club rooms, Twin Falls, Idaho, on Saturday evening, March 21. The lecture was illustrated with lantern slides and was presented in a highly interesting and instructive manner. It was given under the direction of the Jovian League of Twin Falls, of which Mr. H. T. Fulton is president, and H. S. Bates, secretary. Arrangements have been made to have other lecturers discuss electrical subjects before the League in the course of the next few months.

MR. WILLARD DONE, State Commissioner of Insurance of the state of Utah spoke before a meeting of the Electric Club which was held at the Commercial Club, Salt Lake City, on March 26, on the subject of "What the State Is Doing to Protect the Insured." He outlined clearly the relations which exist between the insurance companies, their agents, and the insuring public, and the manner in which the state supervises the placing of insurance so as to protect the interests of all three. He paid a high tribute to the insurance agents doing business within the state, saying that with but few exceptions they are working to the best interests of their policy holders.

MR. CHARLES E. MOSLEY, former treasurer of the Central Group of Bell Telephone Companies, resigned on March 31. Mr. Mosley entered the service of the Bell System April 1, 1889, as manager of the first long-distance line in the West, which connected Chicago and Milwaukee. He was later made district superintendent in charge of the Western District of the Long Lines Department and was chiefly occupied in locating telephone routes through Ohio and in arranging for entrances of the long distance lines into Cleveland, Toledo, Youngstown and other Ohio cities. Mr. Mosley was elected secretary and treasurer of the Chicago Telephone Company, April 1, 1893. He has served under six different presidents of the Chicago Telephone Company, since he came with the company, and he retires from the service of the Bell System with the hearty good wishes and congratulations of his friends in the rounding out of an honorable service covering a period of 25 years.

MR. WILLIAM RUFUS ABBOTT, who succeeds Mr. H. F. Hill as general manager of the Chicago Telephone Company, has been prominent in the business life of Chicago for many years. He was born in New York in 1869, and educated in the public schools. His first position after leaving school was in the auditor's office of the Erie Railroad, which position he filled from 1885 to 1889. He resigned to become cashier of the Westchester Telephone Company, in February, 1889, and in 1890 went with the Metropolitan Telephone & Telegraph Company as order clerk. Both the Westchester and the Metropolitan companies have since been absorbed by the New York Telephone Company. Mr. Abbott went to Chicago in 1893 and became identified with the Chicago Telephone Company, with which organization he has been continuously ever since. He has filled creditably the positions of order clerk, chief clerk to the general superintendent, special agent in charge of rights of way and claims, superintendent of suburban division, and general commercial agent.

MR. ALLARD SMITH has been elected general manager and a member of the Board of directors of the Cleveland Telephone Company. Mr. Smith was born at Eau Claire, Wis. He graduated from the University of Wisconsin in 1898, in the electrical engineering course. In August of the same year he secured a position in the drafting department of the Chicago Telephone Company and has been in the service of the Bell System continuously ever since, filling the following positions: switchboard installer, underground construction inspector, engineer of central-office specifications, chief clerk to the general superintendent, division superintendent of construction, and engineer of outside plant. As division superintendent of construction Mr. Smith built the telephone subway from Chicago to Racine, which is now a part of the subway system connecting Chicago with Milwaukee. When the Central Group of Bell Telephone Companies was formed in 1911, Mr. Smith was appointed outside plant engineer of the Group, his duties having to do with properties in Ohio, Indiana, Illinois, Michigan and Wisconsin. In 1912 he was appointed chief engineer of The Cleveland Telephone Company and the Central Union Telephone Company of Ohio, which position he held at the time of his election as general manager of The Cleveland Telephone Company.

MR. HORACE F. HILL, who has recently been elected vice-president of the Central Group of Bell Telephone Companies, was born in Boston, Mass., in 1860, educated in the public schools and entered the Post Office Department in 1877. During his 15 years in the postal service Mr. Hill rose to the rank of chief clerk in the Boston Post Office. Mr. Hill resigned from the Government service in 1892 to take employment with the American Telephone & Telegraph Company in New York. In 1896 he was appointed assistant general superintendent of the Long Lines Department of that company and was prominent in the development of what is now the long-distance service of the Bell System. In 1903 he was made general manager of the Central Union Telephone Company, with headquarters in Chicago; and was elected vice-president of the Central Union Telephone Company in 1907, retaining also the title and duties of general manager. During the latter year the headquarters were removed to Indianapolis. In 1911 the organization of the Bell System was rearranged and the Central Union Telephone Company became a part of what is now known as the Central Group of Bell Telephone Companies. The group included the Chicago Telephone Company, Wisconsin, Michigan State, Central Union and The Cleveland Telephone Companies, with headquarters in Chicago. Mr. Hill was appointed general manager for the group, in charge of plant, traffic and engineering work. Under another re-arrangement in 1912, Mr. Hill became general manager of the Chicago Telephone Company and the Illinois Division of the Central Union Telephone Company, in which capacity he served until April 1, 1914, when he was elected vice-president, in charge of operation, of the five Central Group companies. Mr. Hill has had a long and honorable service with the Bell System, extending over a period of 20 years, and his advancement is a source of great satisfaction to his many friends throughout the electrical fraternity.

OBITUARY.

MR. CLARENCE B. WIGGINS, assistant general manager of the Delaware & Atlantic Telegraph & Telephone Company, Camden, N. J., died after a short illness of pneumonia on March 18. Mr. Wiggins was a prominent member of the Masonic Order, Elks and the Rotary Club.

MR. HERMAN C. TAFEL, of Louisville, Ky., died suddenly of heart failure at his store last week. Mr. Tafel had been in the electric supply business for the past ten years and had just completed arrangements for the incorporation of his business, capitalized at $75,000. He was a native of Scott County, Ky. He leaves a widow; two sons, Paul and Robert, both of whom are interested in their father's business; and a daughter.

MR. J. H. WALLACE, president of the New York Independent Telephone Company, died suddenly in New York City on March 27. Mr. Wallace tried ineffectually for many years to introduce an independent telephone system in New York City. Prior to his going to live in New York City, he was a prosperous real estate operator in St. Louis. He was also interested in the formation of several independent telephone companies in the West.

DATES AHEAD.

American Institute of Electrical Engineers. Pittsburgh, Pa. April 9-10. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society Twenty-fifth general meeting. New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Contractors' Association. First annual convention, Cedar Rapids, April 21 and 22.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17 for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Allen-Bradley Company, Milwaukee, Wis., has issued a folder on its Type H motor starter, entitled "Guard the Motor." These starters, which are of the resistance type, are designed to start induction motors.

Belden Manufacturing Company, Chicago, Ill., has issued a little booklet illustrating and describing a number of varieties of clips, tips, terminals and connectors. Sizes and prices are given in all cases. The company also manufactures much similar material to customers' specifications.

Maschinenfabrik Oerlikon, Oerlikon, Switzerland, has issued bulletin No. 78 which describes its motor-driven blowers for medium pressures. These are driven by either direct-current or polyphase motors. Brochure No. 576 is a very completely illustrated pamphlet which describes booster sets for use in connection with storage batteries in central lighting or railway plants. Various types of these machines are illustrated together with their control gear. Many connection diagrams are shown to make clear the manner in which the boosters are used and the way in which the regulating equipment is connected.

The Alberger Gas Engine Company, Buffalo, N. Y., is installing a complete gas engine plant at the factory of Barnhart Brothers & Spindler, Monroe and Throop Streets, Chicago, Ill. The company makes gas engines in sizes from five to 600 horsepower for natural gas, producer gas, illuminating gas, gasoline, kerosene, crude oil and other liquid fuels. A new catalog, describing Alberger tandem horizontal gas engines, is available for distribution. There is also ready for distribution an attractive chart illustrating the horizontal section of the single-cycle gas engine and other gas engines of various characteristics.

Independent Electric Manufacturing Company, Milwaukee, Wis., has obtained the services of H. L. Van Valkenburg, who was formerly connected with the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, as engineer in charge of the rheostat department, in which he developed a large number of devices. Mr. Van Valkenburg later was associated with Allis-Chalmers Company as engineer in charge of the detail apparatus department, and was afterwards chief engineer of the Walker Electric Company, of Philadelphia. Mr. Van Valkenburg will have charge of the engineering department of the Independent Electric Manufacturing Company, and at the present time is giving his attention to a number of new lines which will shortly be put on the market by this company.

Asbestos Protected Metal Company, Beaver Falls, Pa., is marketing a new form of prepared roofing which has been named Aegisroll. The body or base of this roofing is wool felt impregnated by waterproofing and completely enveloped in a coating of asphalt compound. To the upper surface of this base is attached pure asbestos felt, while the lower surface is protected by a coating of crushed quartz. Both the asbestos and the crushed quartz are imbedded into their respective surfaces while the asphalt is hot and they are, therefore, permanently attached. Due to the advancements made by the company in permanently coloring asbestos felt, this roofing can be furnished in a variety of attractive colors, making possible artistic combinations between roofs and the color treatment of the building.

The Garford Manufacturing Company, Cleveland, Ohio, has been organized with a capitalization of $500,000 seven-per-cent cumulative-preferred stock and $800,000 common stock. Mr. Garford has bought $150,000 preferred stock at par and $250,000 preferred stock has been issued to the bondholders of the Dean Electric Company, there being outstanding $250,000 of the Dean Electric Company's bonds. This stock takes up the bonds. Officers of the Garford Manufacturing Company are: President, A. L. Garford; vice-president, A. G. Dean; treasurer, A. L. Patrick; secretary, John Watson; directors are John Sherwin, president of the First National Bank of Cleveland; John Brophy, manager of the Cleveland Automatic Machine Company; attorney, H. H. Johnson, of Cleveland, and E. F. Allen, president of the American Lace Manufacturing Company. The new company proposes to continue to manufacture the products heretofore manufactured by the Dean Electric Company, such as telephone apparatus, automobile horns, etc.

M. B. Austin & Company, 701 West Jackson Boulevard, Chicago, now control the sales and output of the National Electric Company, 149 West Austin Avenue, Chicago, manufacturer of electric utility stoves, electrical sleeping blankets and heating pads, vibrators, electric washing machines, vacuum cleaners and other electric specialties. The city of Urbana, Ill., has ordered 15,000 feet, No. 8 single-conductor, 4,000-volt "Safety" steel-taped cable for series lighting of the city's parks and boulevards. This cable order was sold under specifications prepared by Professor Bryant, of the Illinois State University. Shreveport, La., has bought 9,000 feet, No. 14 two, three and four-wire conductor, "Safety" steel-taped cable to complete a modern fire-alarm system. The Lincoln Park Commissioners have purchased through W. F. Cummings Company, electrical contractors, 37,000 feet No. 6 lead-covered paper-insulated cable, manufactured by the Safety Insulated Wire & Cable Company; 13,000 feet four-conductor, lead-covered paper-insulated cable used in connecting old to the new circuits and 10,000 feet, No. 6 30-per-cent triple-braid rubber-covered wire, used in concrete posts of the extension of the Lincoln Park Commission's lighting system north on Sheridan Road from Foster Avenue to Devon Avenue.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has issued a number of publications, of which one describes its large meter factory. Views of the different departments in this extensive establishment are shown and the construction of the meters produced is described in some detail. Another publication describes the systematic maintenance of watt-hour meters. This shows and describes at some length proper methods for installing meters and for testing them, pointing out the various adjustments that can be made to rectify errors and also showing a typical testing equipment suitable for this purpose. Another publication deals with electric clocks. These are arranged so that any number of secondary clocks can be controlled from a master clock. The publication shows a large number of fine views of installations of various kinds in which these clocks have been employed. Another publication describes the Santo-Bohner floor-cleaning, polishing and waxing machine. This machine is electrically driven and is particularly designed for use on parquet and linoleum floors. The equipment is made with either direct-current single-phase or polyphase motors ranging up to 250 volts. Other recent publications issued by this company, chiefly in the form of leaflets, deal with a variety of motor-driven equipment for machine tools including planers, boring machines, portable hoisting equipment, centrifugal pumps; others deal with drum-type controllers, field rheostats and regulating equipment, etc. Still another publication describes nitrogen-filled spherical tungsten lamps for use as automobile headlights; these range from 50 to 100 candlepower. The same publication also deals with standard tungsten lamps for similar purposes.

General Electric Company, Schenectady, N. Y., announces the receipt of the following among a multitude of orders: Great Northern Power Company, Fond du Lac, Minn., a 12,000-kilowatt alternating-current generator, 12,000-kilowatt water-cooled transformer and accessories. Mt. Whitney Power & Electric Company, Visalia, Cal., twenty 500-kilowatt transformers. Appalachian Power Company, Bluefield, W. Va., a 345-kilowatt motor-generator set and three 125-kilowatt transformers. Central Iowa Light & Power Company, Fort Dodge, Ia., three 300-kilowatt transformers, switches and accessories. Bergen Point Iron Works, Bayonne, N. J., eight 110 to 125-horsepower mill-type motors with control equipments, 36 smaller motors ranging from 25 to 100 horsepower, 120 two-motor coal-car equipments, 16 transformers ranging from 50 to 425 kilowatts, switchboards, switches, accessories, etc. Atlanta Steel Company, Atlanta, Ga., a 500-kilowatt synchronous motor-generator set and switchboard. Bethlehem Steel Company, South Bethlehem, Pa., 3,000-horsepower induction motor, switchboard and accessories. Pennsylvania Steel Company, Steelton, Pa., a 500-kilowatt motor-generator set. Texas Portland Cement Company, Dallas, Tex., 71 motors ranging from 5 to 500 horsepower, switchboard, controllers and accessories. Dunnellon Phosphate Company, Rockwell, Fla., 15 motors ranging from 50 to 300 horsepower, switchboard, switches, etc. Oklahoma Portland Cement Company, Ada, Okla., a 500-kilowatt Curtis horizontal turbogenerator and a 625-kilowatt alternating-current generator. The Oneida Community, Sherill, N. Y., a 750-kilowatt Curtis turbogenerator. Chicago & Alton Railroad Company, Bloomington, Ill., four 300-kilowatt motor-generator sets, three 150-kilowatt transformers and switchboard apparatus. Boston & Maine Railroad Company, for the plant at the Hoosac Tunnel, three 1,500-kilowatt water-cooled transformers. Upper Hudson Stone Company, Marlboro, N. Y., five motors ranging from 50 to 300 horsepower, three 200-kilowatt transformers and switchboard apparatus. Hebard Cypress Company, Hebardville, Ga., a 750-kilowatt Curtis turbogenerator and switchboard. American Bottle Company, Streator, Ill., a 500-kilowatt Curtis turbogenerator complete with switchboard and accessories. Crescent Portland Cement Company, Wampun, Pa., a 2,500-kilowatt Curtis turbogenerator with switchboard apparatus. Alpha Portland Cement Company, Philadelphia, Pa., four 1,000-kilowatt rotary converters, four 1,050-kilowatt water-cooled transformers and switchboard. Singer Manufacturing Company, South Bend, Ind., two 2,500-kilowatt Curtis turbogenerators with 75-kilowatt turbo-exciters, a 300-kilowatt generator and accessories. New England Box Company, Concord, N. H., 81 motors ranging from one to 50 horsepower, three transformers, switchboard, switches and accessories. Independent Envelope Company, Indianapolis, Ind., a 75-kilowatt generator with exciter, two 5 and six 10-horsepower motors and switchboard equipment. Cherokee Brick Company, Raleigh, N. C., seven motors ranging from 5 to 250 horsepower, transformers and switchboard apparatus. Racine Rubber Company, Racine Junction, Wisconsin, 100 and 200-horsepower induction motors, a 200-kilowatt synchronous condenser and switchboard apparatus. Timber Butte Milling Company, Butte, Mont., 20 motors ranging from 7.5 to 75 horsepower, 5-kilowatt motor-generator set and oil switches. Riverside Portland Cement Company, Riverside, Cal., three 15 and one 200-horsepower motors. Three Forks Portland Cement Company, Trident, Mont., seven motors ranging from 25 to 200 horsepower, two 30-kilowatt transformers, switchboard, etc., Endicott-Johnson Company, Lestershire, N. Y., two 7.5, two 35, and three 50-horsepower motors. American Cement Plaster Company, Acme, Tex., 20 motors ranging from 3 to 25 horsepower, with switches, etc. International Portland Cement Company, Spokane, Wash., two 150-horsepower motors and starting compensators. Crescent Portland Cement Company, Wampum, Pa., 200-horsepower, 480-volt synchronous motor.

Record of Electrical Patents.

Issued by the United States Patent Office, March 24, 1914.

1,090,841. Electropneumatic Brake System. J. S. Doyle, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. Brakes are applied upon grounding the circuit through brake valve, controller or conductor's cord.

1,090,868. Printing-Telegraph System. F. R. McBerty and A. H. Adams, assignors to Western Electric Co. Electromagnetic means for printing the messages.

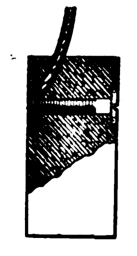
1,090,872. Electrical Conductor. P. P. Nungesser, assignor to Nungesser Carbon & Battery Co., Cleveland, O. Flexible metallic pigtail connection clamped to carbon brush. (See cut.)

1,090,877. Vibrating Circuit-Breaker. P. M. Rainey, assignor to Western Electric Co. An interrupter comprising an induction coil and a contact-making armature.

1,090,887. Binding-Post for Electric Terminals. A. B. Simpson, Jersey City, N. J. Has metal strip to cap carbon electrode of dry cell.

1,090,888. Connector for Electric Wires. A. B. Simpson. Binding-posts hold wires between folds of metal strip.

1,090,894. Internal-Combustion Engine. L. E. Viard, Bar-sur-Seine, France. Electric ignition by spark plug on head of piston and terminal on cylinder head.



1,090,872.—Pigtail for Brush.

1,090,902. Electrical Valve. J. W. Beckwith, Spokane, Wash., assignor of one-half to H. A. & L. D. Holland Co. An electromagnetic valve-operating mechanism.

1,090,907. Pneumatic-Dispatch-Tube System. F. E. d'Humy, assignor to Western Union Telegraph Co. Contact device in tube operates timing device for motor-control switch.

1,090,909. Primary Battery. E. G. Dodge, assignor, to New Jersey Patent Co., West Orange, N. J. Covers arrangement of electrodes in Edison-Lalande cell.

1,090,910. Scraping Machine. A. H. Fargo, West Newton, Mass. Includes motor-driven scraper.

1,090,917. Electric Ignition System. T. Hubert, C. and C. E. Lockwood, said Hubert assignor to American Circular Loom Co., Portland, Me. Comprises generator, transformer, spark plugs and means for short-circuiting transformer secondary on opening generator circuit.

1,090,919. Well-Boring Apparatus. I. Kitsee, Philadelphia, Pa. Includes electric drive and electromagnetic feed and clamping means.

1,090,920. Means for Assembling Cores of Dynamo-Electric Machines. E. R. Knight, assignor to Allis-Chalmers Mfg. Co. Covers mechanical means for pressing core into yoke.

1,090,924. Electric Cooking Apparatus. J. Lawrence, London, England, assignor to Electric Heat Storage Co. An electric grill with heating element imbedded in ribs of heat-storage mass.

1,090,926. Electroplating Apparatus. G. A. Lutz, assignor to American Circular Loom Co. Articles to be plated are held by rings on the cathode.

1,090,929. Lamp-Fixture. H. D. McFaddin, East Orange, N. J. A lamp bracket for bed-posts, etc.

1,090,930. Electric-Lamp Socket. R. R. McIlvaine, Wilkinsburg, Pa. A key socket in which sections of the body are held by a coiled spring. (See cut.)

1,090,983. Electric Lamp. E. A. Hawthorne, Bridgeport, Conn. Battery and lamp with locking control by rotatable cap.

1,090,989. Electric Sign. G. T. Kelly, Chicago, Ill. Endless chain makes and breaks contacts for lamps.

1,090,990. Electric Transmission of Energy. I. Kitsee, assignor to American Telephone & Telegraph Co. Covers means for simultaneously transmitting telegraph and telephone messages over the same line.

1,090,992. Gas or Vapor Electric Lamp. R. Küch, assignor to General Electric Co. A mercury-vapor lamp with two mercury reservoirs.

1,091,003. Electrically - Controlled Elevator. T. G. Mason, Toronto, Ont., Canada. Includes push-button control from floors.

1,091,012. Electrical Switch Mechanism. R. W. Pachaly, Chicago, Ill., assignor of one-half to T. H. Garland. Includes electromagnetic control of dynamo in axle train-lighting systems.

1,091,014. Cigar-Lighter. G. F. Paldani, Waukegan, Ill. Provides electric ignition.

1,091,021. Electric Ignition-Fuse. K. Schaffler, *rekte* Glössl, Vienna, Austria-Hungary. Conductors short-circuited upon ignition.

1,091,022. Candy-Making Machine. P. H. Schlueter, Chicago, Ill. Has motor drive.

1,091,038. Signaling Device. S. Chase, Los Angeles, Cal. Electromagnet moves an arm located in front of the bull's-eye.

1,091,046. Coil for Electrical Purposes and Method of Producing Same. E. A. DeWolf, assignor to J. R. Leeson, Boston, Mass. Layers of yarn protect ends of coil.

1,091,098. Electric Hammer. B. Valiquet, Chicago, Ill. An electric motor drives operating cam.

1,091,102. Railway Signaling Apparatus. B. F. Wooding, Denver, Colo. Covers contact device for electrical signals to engine cab.

1,091,127. Wireless Receiving Apparatus. R. R. Goldthorp, Hartford, Conn. Condenser, detector and connecting wires inclosed within tuning coil.

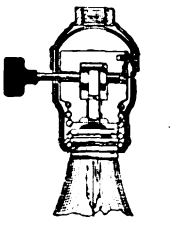
1,091,133. Block-Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Automatic system employing a two-phase system of track relays, power being obtained from three-phase source.

1,091,134. Normal - Danger - Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Automatic single-phase system employing track relays.

1,091,153. Electric Clock. J. J. Moore, Chambersburg, Pa. Electromagnet supplies energy to balance staff.

1,091,155. Electric Switch. T. E. Murray, New York, N. Y. A box-inclosed switch with box-locking means.

1,091,159. Transmitting Apparatus for Electric Signaling. P. O. Pedersen, Copenhagen, Denmark. A contact-making device with auxiliary contacts to prevent sparking.



1,090,930.—Lamp Socket.

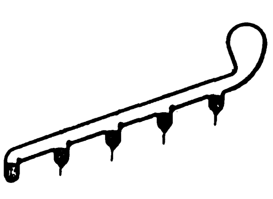
1,091,185. Anode and Anode-Hook. H. R. Boissier, Great Neck, N. Y. For an electrolytic apparatus.

1,091,193. Telephone-Exchange System. E. E. Clement, assignor to F. C. Stevens, Attica, N. Y. An automatic telephone system.

1,091,222. Method for the Electrical Production of Light. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A mercury-vapor lamp with conducting projection to reduce the cathode resistance.

1,091,223. Apparatus for Operating Vapor Converters. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. A single-phase mercury-vapor rectifier with means for obtaining four phase currents.

1,091,225. Protection of Feeders of Electrical Distribution Systems. P. V. Hunter, Heaton, England. A circuit-breaker actuated by two balancing transformers controlled by balancing strands.



1,091,244.—Mercury Rectifier.

1,091,226. Electrical Socket and Receptacle. L. Kellner, New York, N. Y. Covers details of the key switch.

1,091,242. Direction - - Indicator for Electro-Mechanical - Telegraph Systems. W. K. Queen and T. F. Pickett, Needham Heights, Mass., assignors to Q-P Signal Co. Includes wrong-direction alarm apparatus.

1,091,244. Electrode for Gas or Vapor Electric Apparatus. M. von Recklinghausen, assignor to Cooper Hewitt Electric Co. A mercury-vapor converter having a number of positive electrodes with an intermediate negative electrode. (See cut.)

1,091,255. Chain Links. H. Taylor, Chicago, Ill. The links have connected channels for the electric wires leading to the fixture lamps.

1,091,256. Electrical Distribution System. P. H. Thomas, assignor to Cooper Hewitt Electric Co. A series motor has a mercury-vapor rectifier shunted across the motor field to take the discharge when the field circuit is broken.

1,091,295. Spark Plug and Air Compressor. D. B. Combs, Waverly, O. A collar mounted on the base has pockets for controlling valves.

1,091,382. Apparatus for Sterilizing Liquids by Means of the Ultra-Violet Rays. T. Nogier, Lon, France. A special casing for holding a quartz-tube mercury-arc lamp.

1,091,420. System of Regulation for Dynamo-Electric Machines. V. G. Apple, assignor to Apple Electric Co., Dayton, O. An electromagnetically controlled rheostatic regulator for the shunt field.

1,091,451. Ignition Plug. A. R. Bullock, assignor to A. J. Hudson, Cleveland, O. A spark plug with spiral passage to impart a whirling motion to the gases.

1,091,465. Signaling System. F. B. Adam and L. H. Arens, assignors to Frank Adam Electric Co., St. Louis, Mo. A combined switch and circuit-closing device for controlling any one of a group of circuits.

Reissue No. 13,704. Heat-Dissipating Means for Electrical Apparatus. H. A. Rhodes, assignor to Universal Motor Co., Denver, Colo. Original No. 981,690, dated Jan. 17, 1911. A spool has sheet-metal foil interposed between layers of the coil, the extremities of the sheets being slit and bent into engagement with the spool.

Patents Expired.

The following United States electrical patents expired March 30, 1914:

579,556. Multiple-Series Electrical Distribution. F. B. Badt, Chicago, Ill.

579,582. Electric Meter. G. Hookham, Birmingham, Eng.

579,611. Electric Heater. W. R. Smith, Manchester, N. H.

579,633. Telegraph Transmitter. C. L. Buckingham, New York and J. Gardam, Brooklyn, N. Y.

579,634 to 579,636. Printing Telegraph. C. L. Buckingham, New York and E. Germann, Brooklyn, N. Y.

579,699. Microphone. A. W. S. Davis, Lowell, Mass.

579,707. Electrical Generator. S. V. Essick, Yonkers, N. Y.

579,725. Insulator and Holder for Electric Railways. W. C. Keithly, San Francisco, Cal.

579,728. Trolley System. W. H. Walker, Pittsburgh, Pa.

579,738. Method of Overcoming Electrical Phenomena in Goods, Etc. B. W. Child, Boston, Mass., and M. A. Replogle, Cedar Falls, Iowa.

579,759 and 579,760. Electric Railway. F. Mansfield, Philadelphia, Pa.

579,780. Electrical Governor for Marine Engines. G. A. Tower, Richmond, Va.

579,790. Mouthpiece for Telephone. C. L. Cohn, Boston, and M. Martin, Malden, Mass.

579,877. Mold for Manufacturing Secondary-Battery Plates. F. King, London, Eng.

579,916. Battery Cover. H. J. Brewer, New York, N. Y.

579,929. Electrically Controlled Railway-Signal. F. McBrien, Newark, N. J.

579,933. Signaling. J. G. Schreuder, Edgewood Park, and J. P Coleman, Swissdale, Pa.

Electric Vehicle Section

Influence of Motor Characteristics on Operation of Electric Trucks.

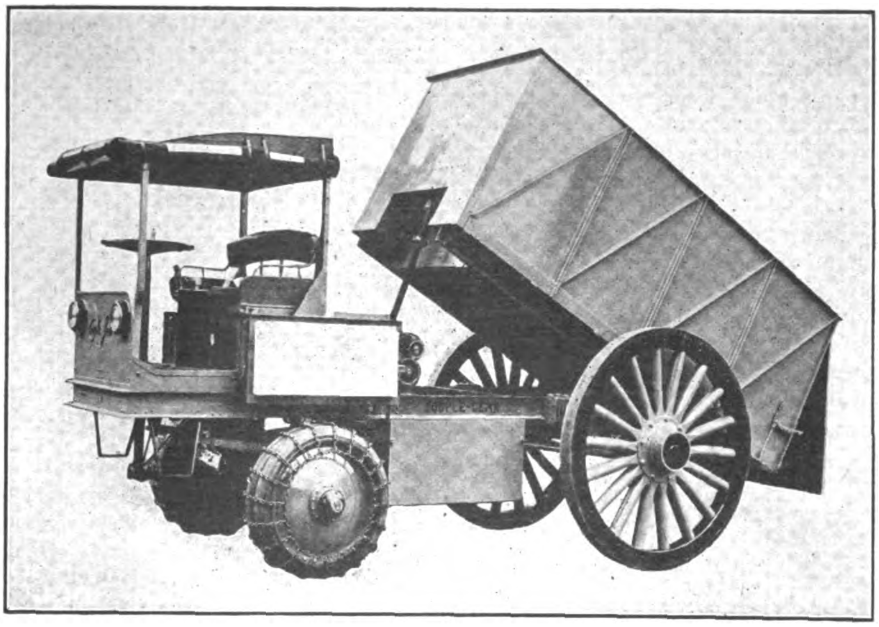
At the March meeting of the Electric Vehicle Association of America, T. H. Schoepf, of the Westinghouse Electric & Manufacturing Company, delivered a paper entitled, "The Performance Characteristics of Electric Motors and Their Influence on the Operation of Electric Trucks." Mr. Schoepf's paper treated of the adaptability of the magnetically-saturated and the magnetically-unsaturated motors for motor-truck service.

In the first part of the paper he discussed the operating characteristics of both types of motors on overloads, calling attention to the higher torque ratio obtained with the unsaturated motor and the higher speed ratio obtained with the saturated motor. Considering two motors of equal rating, the saturated motor when required to work on overload will take a heavier current than the unsaturated motor under the same conditions but will drive the car at a higher speed. Particular stress was laid on the fact that a motor that will give satisfactory service in one city, may fail to do so in another. A saturated motor may easily become unduly loaded (and probably burn out) in a city having considerable grades or bad weather conditions in winter. Particular attention should, therefore, be paid to motor selection because of the difficulty of producing well-proportioned and well-designed saturated and unsaturated motors within the same frame. Mr. Schoepf refrained from expressing a preference for either type of motor and merely emphasized his belief that satisfactory saturated and unsaturated motors cannot be made within a single frame. His curves and figures, however, show that the unsaturated motor is in general more economical to operate and has a less relative heating current than the saturated motor on overload.

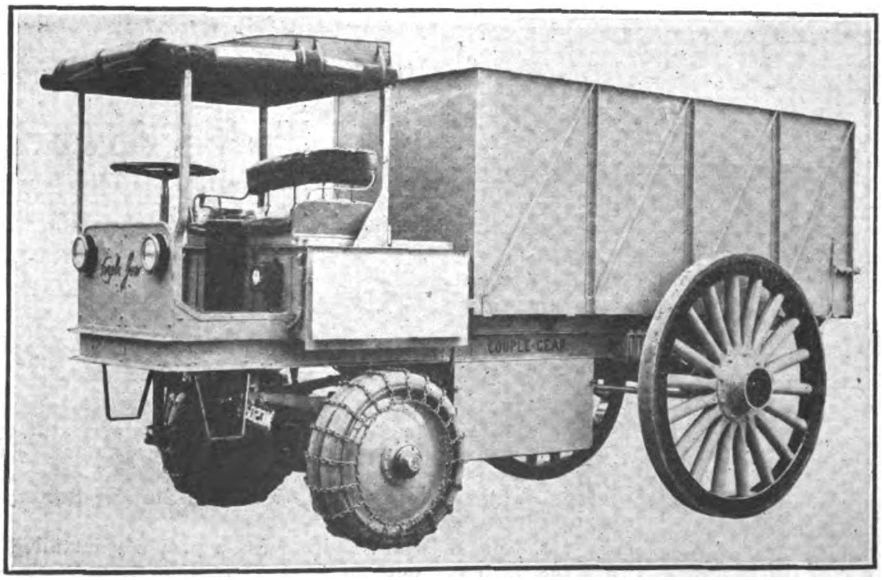
◆

New Electric Dumping Coal Car.

In the two accompanying illustrations is shown a new model of an electric self-dumping coal car. Its capacity is seven tons and it has front drive of the Couple-Gear type. The driving wheels are of the special type A pattern and embody the latest ideas in this class of drive. The rear wheels are 67 inches in diameter and have a six-inch by 1.5-inch two-part steel tire. The spokes are four inches and the axle is of the Timken roller-bearing type. About 85 per cent of the live load of the car is carried on the rear wheels.



Dumping Coal Car Built by Couple-Gear Freight Wheel Company.



Electric Self-Dumping Coal Car—Bin at Rest in Chassis.

The battery equipment consists of 44 cells, each with 31 plates; the cells are bolt connected. The average speed of the car on ordinary city streets is about seven miles per hour.

The dumping mechanism is operated by a motor through a telescopic screw controlled from the driver's seat. As soon as the body of the wagon has been raised a certain distance the rear end door opens automatically, allowing the coal or other contents to be quickly dumped. The body is entirely of steel. The entire construction is similar to that of the

Couple-Gear cars that have been in use in Boston for about four years; but in the new model springs are also provided for the rear axle. The front spring suspension consists of two half-eliptic and the rear spring suspension has two quarter-eliptic and two half-eliptic springs; of these one is in front and the other at the rear of the axle.

The car is made by the Couple-Gear Freight-Wheel Company, Grand Rapids, Mich.

◆

Electric Battery Vehicles.[1]

The importance to the central station of the load to be obtained by a general use of electric vehicles can hardly be over-rated. It is in practically all cases an "off-peak" load; and as it will in nearly all cases come on during the night, when the majority of the other consumers have ceased to make any demand on the supply, it will have a tendency to flatten out the generating station load curve in a most favorable manner. Every central-station engineer knows the beneficial effect that such an improvement in the station load-factor will have upon the cost of generation, rendering it possible to reduce the selling price to all consumers, and, by the increased demand thereby created, greatly benefiting the electrical industry generally. Little wonder, therefore, that the central-station engineer, now fully appreciating these possibilities, is keen on doing all that he can to popularize the electric vehicle and to facilitate its adoption. The natural outcome of this keenness was the formation, by the Incorporated Municipal Electrical Association, of the Electric Vehicle Committee. The object of this committee is to promote the adoption and use of the electric vehicle for business and pleasure purposes, and its constitution is framed on co-operative lines. The majority of its members are outside the Incorporated Municipal Electrical Association and consist of representatives of the electric manufacturing interests, the electric power companies, the electric vehicle manufacturers and agents, and others.

At the moment, the most promising opening for the electric vehicle appears to lie in its use for commercial purposes; but it is by no means improbable that the passenger-carrying vehicle, whether for business or pleasure purposes, will not eventually be considered from the central-station point of view almost as important as the commercial type of vehicle.

One frequently meets people—some of whom, unfortunately, are engineers—who, at the mere mention of an electrically-driven vehicle deriving its energy from a storage battery, grow sceptical, openly expressing their doubts as to the possibility of such a method of road traction ever proving commercially successful. They apparently base their opinions upon the failures of past years. It cannot be too strongly emphasized, however, that the electric vehicle of today is not to be judged by the experience of even a few years ago in this country. Since that time, great advances have been made in storage-battery construction, the design of the motors for electric vehicles has been improved, ball and roller bearings have been brought to a high pitch of perfection, chassis construction has been lightened, and better and more efficient rubber tires can be obtained. For the improvements in the latter three items, the electric vehicle owes much to the wonderful evolution of the petrol car in the past few years.

If we have to admit that there are limits to the scope of usefulness of the electric vehicle; if we have to concede to the petrol vehicle, as we certainly must, some of the merits that it is known to possess; if we must agree that there are certain fields that the latter will probably continue for some time to hold as pre-eminently its own; it is nevertheless true that within its own legitimate sphere the electric vehicle can show a degree of economy, and a record for reliability,

---

[1] Introductory notes by F. Ayton, secretary, Electric Vehicle Committee, England, on the occasion of a discussion at the Institution of Electrical Engineers, London, on March 19.

Twice Around the World

And Starting the Third Lap 10% above Rated Capacity

Truck No. 37 of the Chicago Commonwealth Edison Company has been operated constantly for 4 years and has traveled over

50,000 Miles—Equivalent to twice around the earth

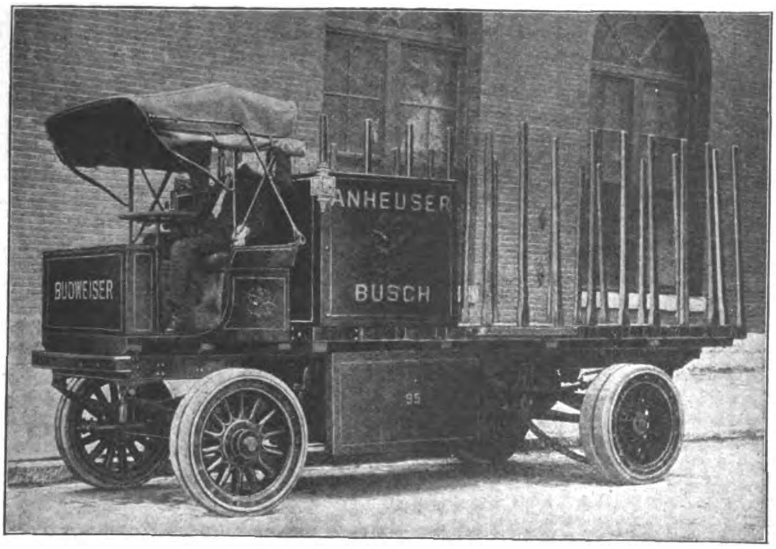
The Edison Battery is Guaranteed for 4 years to be Capable of Developing Its Full Rated Capacity

The original Battery of 60 A-6 Edison cells installed in Truck No. 37 in 1909 with a rated capacity of 225 ampere hours is still operating it and gave on bench test a few weeks ago 247½ ampere hours. During the four years the Electrolyte was renewed twice. **There were no other renewals or repairs of any kind on the battery.** Another Edison Storage Battery in similar service is just entering its **sixth year.**

Mr. Edison is still waiting for a properly installed Edison Battery to **show signs of giving out.**

EDISON STORAGE BATTERY CO., 105 Lakeside Ave., ORANGE, N. J.

Take St. Louis for instance



The Anheuser-Busch Brewing Association, of St. Louis, one of the largest breweries in the United States, operates 50 electric trucks equipped with "Exide" Batteries. This is what the company recently wrote regarding "Exide" Batteries:

> *"We are getting excellent service out of our "Ironclad-Exide" and "Hycap-Exide" Batteries. We are not having any trouble with batteries. We have had very heavy deliveries this past summer and not once did our batteries fail us. We have at this date about 50 of your batteries in service. All I can say will not praise them enough for their excellent service."*

The Union Electric Light and Power Co., of St. Louis, operates 19 electric vehicles equipped with "Exide" Batteries, 10 of them being "Ironclad-Exide".

The Commercial Truck and Mail Service Co., at St. Louis, which hauls United States mail, has 9 "Electrics" equipped with "Hycap-Exide" Batteries.

The Board of Education of the City of St. Louis uses 4 electric vehicles equipped with "Ironclad-Exide" Batteries.

The Krey Packing Co., of St. Louis, also operates 4 "Electrics" equipped with batteries of the "Exide" types.

And there are many other commercial "Electrics" as well as hundreds of pleasure cars in St. Louis which use either the "Exide", "Hycap-Exide", "Thin-Exide" or "Ironclad-Exide" Batteries.

75% of all electric trucks in St. Louis are equipped with "Exide" Batteries.

Central Stations interested in increasing the use of Electric Vehicles will find it pays to endorse the "Exide" Batteries.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide" "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries.

New York Boston Chicago **PHILADELPHIA, PA.** Denver San Francisco Seattle
St. Louis Cleveland Atlanta Detroit **1888-1914** Los Angeles Portland, Ore. Toronto

886 "Exide" Distributors 9 "Exide" Depots "Exide" Inspection Corps

with which no other existing type of vehicle can hope to compete. We shall, I think, be wise if we frankly admit the probability that each type of vehicle will have its own distinctive field of use in which it will prove, on the score of suitability and economy, practically unassailable.

In spite of the fact that it has to provide and maintain its own roadway, and that this accounts for by far the greater part of the total capital expenditure, the average cost of operating electric tramcars in this country indicates that this method of transit is still the cheapest where the traffic to be catered for warrants the outlay. The trolley omnibus, again, has proved a cheaper means of conveyance than the petrol omnibus, in spite of having to bear the additional capital charges of the trolley line and feeders. Both these examples are only instances, out of many, showing that when electric driving can be suitably applied and combined with the supply of electrical energy from a central station, the results as regards convenience, economy, and reliability, are incomparably superior to those of the small independent power plant.

The electric battery vehicle is only another instance of the same kind. It also draws its energy from the central station—not continuously, I agree; but it is able to take it at times which are very convenient to the supplier, and under conditions that properly allow of a low price per unit being charged. There is certainly a loss in charging and storage, but in comparison with the electric tramcar and the trolley omnibus, this loss can to some extent be set off against the loss in transmission connected with the two latter systems.

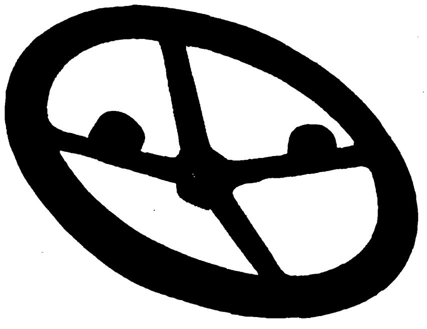
I think that these analogies, together with the well-known simplicity of the electric vehicle, its freedom from vibration, and the consequent lessened wear and tear, will go far to explain and make clear to the layman the reason why it proves in actual service to be so economical and reliable.

The position of the electric vehicle can hardly be considered apart from methods of charging its battery. With the batteries at present fitted, the impressed voltage required towards the end of the charge is in the neighborhood of 110 to 120 volts. Since the supply pressures in use are generally above 200 volts, it follows that in most cases the charging must be done through the medium of some pressure-reducing apparatus. If the use of the electric vehicle is to reach the proportions that we so ardently desire, it is essential that the charging operation should be made as simple as possible; in fact, it should be made—as it can be made—practically automatic. It therefore remains for the central-station authorities and the manufacturers to see that reliable automatic apparatus is provided. It should be so constructed that when the correct terminal voltage for the whole battery (which is a good approximate indication of the battery's condition) has been reached, the motor-generator is automatically shut down. It is of great importance that vehicles should be able to run into any place where charging facilities are provided, and get connected up with ease. This points to the necessity of standard charging receptacles and plugs. The Electric Vehicle Committee, realizing the importance of this, have decided after careful consideration to recommend to the British Engineering Standards Committee the desirability of adopting the 150-ampere plug and receptacle of the Electric Vehicle Association of America as the standard fitting for this country. The American Association has standardized upon two sizes, 50 amperes and 150 amperes, but we came to the conclusion that, as the larger size would be required for most vehicles, it was desirable to keep to that alone.

◆

Electric Traffic Regulator.

There has been demonstrated in London a patent traffic regulator device enabling the motorist to signal to following cars without taking his hand off the steering wheel. The steering wheel has two operating switches. Instead of holding out the hand when turning a corner, a block knob on the steering wheel is turned for the direction in which the driver wishes to go, and at once there appears on the regulator a white arrow on a red field which indicates to the following traffic avoiding collisions, etc. The Simms regulator is made either in one unit or in two. The device can be fitted to the hood hinges at the side of the back of the car. The electric wiring and arrangements of switches are simple and of neat appearance—damp, dust and fool proof. If desired two extra switches can be fitted at the bottom of the steering pillar operating the regulator automatically when the steering wheel has been turned through an arc of 20 degrees either side, this giving an additional indication of the turning car automatically. The current required is taken from a small battery, and the regulator can be fitted to any car in half an hour.



Steering Wheel Equipped with Direction Indicators.

The regulator takes the place of the red rear-light. This equipment is manufactured by the Simms Motor Units, Ltd., 191 Wardour Street, London, W., England.

◆

New England Section, Electric Vehicle Association.

The March meeting of the New England Section, Electric Vehicle Association of America, was held March 25 at the offices of the Lynn Gas & Electric Company, Lynn, Mass. About 55 members were present, a number coming from Boston.

Sewall Cabot, of the Electric Conversion Company, Boston, an expert in wireless telephony and X-ray machinery, exhibited and described a new rectifier of the mechanical type which he has devised for electric-vehicle service. The apparatus is of the rotary type: the field is the revolving part and is operated by a synchronous motor. Mr. Cabot claimed for it an efficiency 12 per cent greater than that of a mercury-arc rectifier and 15 per cent greater than a motor-generator. The new machine exhibited is said to run on 100 amperes with 96 per cent efficiency, and on 20 amperes with 80 per cent.

J. C. Clendennin, of the General Electric Company, questioned Mr. Cabot on various phases of the apparatus, and J. S. Codman and others took part in the discussion.

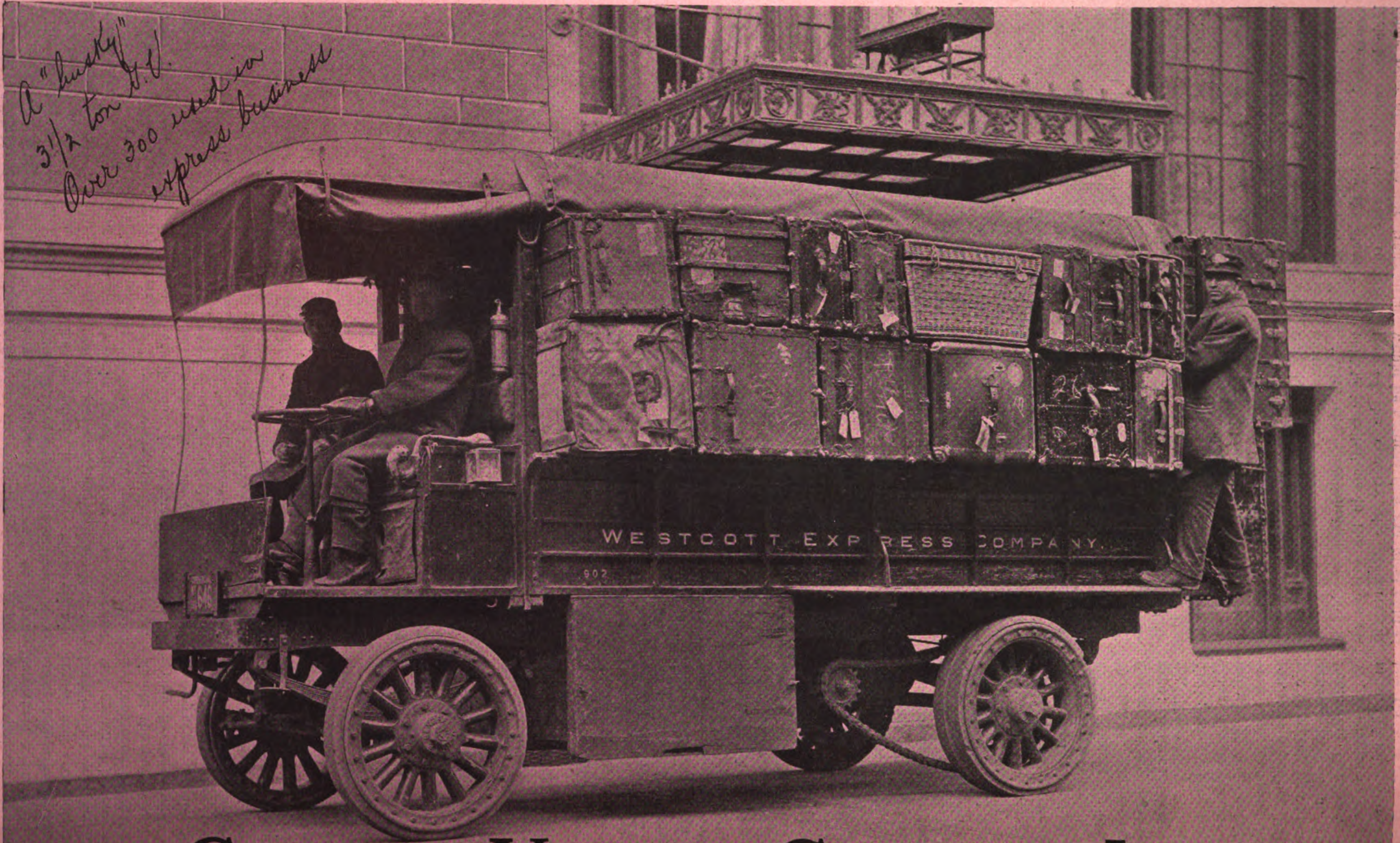
◆

The Effect of Power-Wagon Operation on Terminal Freight Congestion.

An important paper, "The Effect of Power Wagon Operation on Terminal Freight Congestion," is to be given on April 24, by Fred A. Hortter, car accountant, Boston & Maine Railroad System, before the Electric Vehicle Association of America at its headquarters in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City.

Mr. Hortter's paper is based on extended investigations conducted over a period of more than five years in both railroad and steamship fields. Inasmuch as the study of freight congestion at railroad and steamship terminals has been approached by a practical operating railroad executive, who is concerned in the solutions of the problems, rather than the particular machinery required, the findings will have particular value.

A large attendance at this meeting is expected; and a number of prominent operating railroad and steamship officials will take part in the discussion which will follow the presentation of the paper.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Electric Vehicles for Parcel-Post Service.

The Electric Vehicle Association of America is co-operating with the National Electric Light Association in the promulgation of a campaign of education with respect to the utilization of electric vehicles in parcel-post delivery service. In this connection the assistance of the Post Office authorities at Washington, local postmasters, representatives and United States senators, manufacturers of vehicles and accessories and central-station managers is being secured. Under the joint auspices of these two organizations a booklet has been published entitled "The Electric Vehicle in Parcel-Post Service for Economy and Reliability." This booklet outlines the proposition of rendering to the Post Office department authorities such collaboration as will enable them to recognize the value which has been accredited by the most conservative business organizations throughout the country to the electric vehicle as a transportation utility in city services. It discusses also the problems of the parcel-post delivery, the dependability and efficiency of electric-vehicle service, the extent to which investment has already been made in electric vehicles, the co-operation that is now available and that may be expected from the central-station interests of the country, and the relation of the present cost under the contract haulage system to what may be accomplished with electric-truck service. The experience of New York City in electric parcel-post deilvery and that of Indianapolis are discussed.

With respect to the problems of parcel-post delivery the booklet states:

"The selection of the equipment to be employed for parcel-post purposes should be made with caution against undue novelty, experiment or unknown risk, if efficient and uninterrupted service is to be assured; and the possible scope for extension is so broad as to warrant only the employment of working equipment which has been demonstrated successful elsewhere in similar operations. The vehicular transportation of this class of mail matter in its collection, transfer between railroad stations and postoffice substations, and delivery to its final destinations embraces one of the most serious and difficult problems of the entire undertaking, yet this may be resolved into practical and economical accomplishment by bringing to bear upon it the variety of experience accumulated elsewhere in performances having similar characteristics.

‘One of the purposes in view is to make known the many and particularly interesting reasons, not yet fully appreciated, as to why the electric vehicle has superior advantages over any other type of vehicle for transportation purposes within the limitations of city and suburban service, as distinguished from either long-distance service or rural delivery. The electric type of machine has been evolved under the most rigorous and exacting service during the past fifteen years, and as a successful device in quantity installations for commercial purposes has commanded the endorsement and the investment of the merchant community to a greater extent than any other kind of motor vehicle. Large installations of such vehicles exist in all the principal cities of the country and their economical performance has instilled such confidence among those conversant with their capabilities as to put them in that class of stable industrial apparatus in which permanent investment to any extent is warranted without the risk of their being superseded or radically changed beyond a rational and gradual improvement.

"Wherever they have been installed within the field of their rational application they have not only remained, but by influence of their economy have forced increase in their number. For some years they have been successfully employed in considerable numbers by many government departments, such as the Navy Department, Treasury Department, Government Printing Office, the Insular Bureau, and by some contractors in the service of the Post Office Department.

"An approximation of the value of some of these large investments is as follows:

Express and transfer companies	$3,010,000
Public service companies	3,671,000
Department stores	5,627,000
Packing house organizations	609,000
Brewers	5,350,000
Wholesale merchants and manufacturers	2,088,000
United States Government service	435,000

"As to the direction in which practical co-operation can be effected between the committees of the associations mentioned above and those of the Postoffice Department having parcel post operations in charge, it may be pointed out that, having no specific scheme to prosecute and being interested primarily in promoting a justified disposition on the part of the Department to prefer the application of electric vehicles within the range of their capabilities, the association committees stand ready to co-operate in furthering whatever policy or practice may be determined upon by the Department.

"With the establishment of electric vehicle installations in the various cities of the country the Department would be assured that the local public-service electricity-supply companies can exert a particular fostering influence to insure the successful, uninterrupted and economic services of these installations whether they are owned and operated by contractors or owned and operated by the Department, and should the policy of Department ownership be determined upon, this local co-operation would be the greatest possible insurance which the Department could have against whatever risk might be incurred.

"Probably the co-operation of these two associations might be very desirable to the Department in the possible educational influence which they could exert among all interested.

"If the continuation of the existing contract method of securing transportation service should be the final decision of the Department and presuming that the use of electric-motor vehicle equipment is preferred, the co-operative efforts of these associations could be of particular value in furthering plans by which the contractors could secure and successfully employ such equipment."

President Frank W. Smith has appointed a special committee on parcel-post delivery. The chairman, James H. McGraw, president of the McGraw Publishing Company, New York, has already inaugurated the campaign and several meetings have been held with a view to mapping out the most effective way of accomplishing the purpose of the organizations. Other members of the committee are C. A. Terry, vice-president of the Westinghouse Electric & Manufacturing Company, New York; E. S. Marlow, manager, commercial department, Potomac Electric Power Company, Washington, D. C.; S. G. Thompson, Public Service Electric Company, Newark, N. J.; W. P. Kennedy, consulting engineer, New York, and O. H. Caldwell, *Electrical World*, New York.

For the National Electric Light Association, President J. B. McCall, Philadelphia, Pa., has appointed the following representatives: Frank W. Frueauff, president, Denver Gas & Electric Company, chairman; C. L. Edgar, president, Edison Electric Illuminating Company of Boston; L. A. Ferguson, vice-president, Commonwealth Edison Company, Chicago; Arthur Williams, general inspector, New York Edison Company, New York; W. W. Freeman, general manager, Union Gas & Electric Company, Cincinnati; F. M. Tait, president, Dayton Power & Light Company, Dayton; J. A. Britton, vice-president, Pacific Gas & Electric Company, San Francisco; T. I. Jones, general sales agent, Edison Electric Illuminating Company, Brooklyn, and T. W. Peters, manager commercial department, Columbus Power Company, Columbus, Ga.

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THE PENALTY OF THE SMALL ORDER.

One of the most common sources of dissatisfaction and friction between the jobber in electrical supplies and the contractor and small dealer is the question of discount and the amount of protection that the jobber is able to give to the contractor and dealer against the occasional large buyer of standard electrical material. On the one hand the contractor feels, and probably with a great deal of justice, that the jobber depends upon him for the bulk of his business in the long run, and at the same time is not able to or does not make him a price that allows him the best opportunity for conducting his business at a profit.

On the other hand the jobber feels that it is the contractor's own method of doing business that initiates all the hardships. There are a good many angles to this situation. There is one angle, however, which does not appear to have been given the proper amount of consideration. As pointed out by one large jobber, many contractors are prone to buy in small quantities. Since the introduction of the parcel post this evil is apparently on the increase. Now it must be understood that small orders cannot be handled economically. It is pointed out by the same jobber that almost any supply house can take the aggregate cost of handling the small orders from the small contractor and dealer for a year, divide this aggregate by the total number of orders, and find that the average charge for each order is about $2.50. The jobber contends that the small orders cannot be handled without losing money. It is also contended that in this case the buyer is paying for his own extravagance, because the deficit has to be made up. One of the things that the small buyer must realize is that hand-to-mouth methods in the purchase of electrical supplies is an extravagance. He could save himself a considerable amount of money in a year if he would provide his business with sufficient resources so that he could buy a goodly proportion of his material in bulk. In this way he could economize on freight charges, could eliminate mistakes and be in pocket just the difference that the jobber has to charge against him for handling his small, unprofitable orders and what would be required to supply the same amount of material in the same period of time in bulk. An intelligent co-operation between the small buyer and jobber along these lines would pay appreciable dividends.

MUNICIPAL OWNERSHIP AND TAXES.

In a talk upon "Municipal Ownership" before the Young Men's Christian Association in New York City on March 23, Mr. Arthur Williams, of the New York Edison Company, pointed out the causes for the greater efficiency of privately owned utility companies over those owned and operated by municipalities. He also took occasion to mention in this connection the popular misconception often entertained by citizens that where low rates for utility services are obtained at the expense of taxpayers, the expense ultimately falls upon the property owning classes to the advantage of the non-property-owning.

It is well known that many municipally owned utilities have been conducted at a loss, which is oftentimes obscured by insufficient methods of accounting, which fail to give proper consideration to the questions of depreciation and adequate return upon the capital invested. This capital is usually represented by bonds, interest and principal of which must be paid out of taxes if it is not taken from operating revenues. Moreover, where depreciation is not properly covered by an amortization fund, the investment will be gradually dissipated, and in time the plant must either be abandoned or new bonds issued, these becoming an additional burden upon the taxpayers. Even where this condition is realized, it is sometimes thought that the citizens in general are securing a benefit at the expense of the taxpayer, that is, the property owning element of the community.

Such a point of view overlooks the fact that taxes do not always come out of the pocket of the one who makes the direct payment to the collector, but are frequently paid indirectly by other classes of citizens. Where taxes are levied in the form of license fees, or as personal property taxes, upon the equipment of stores, factories, etc., or upon the buildings in which such mercantile and industrial businesses are carried on, it should be realized that the taxes constitute one of the expenses of carrying on the business and must ultimately come out of the revenues which the consumer has to pay. A large proportion of taxes, therefore, are paid indirectly by the ultimate consumer of the materials handled in industrial and mercantile operations; in other words, upon the general citizen regardless of whether he be a property holder or not. Probably the only form of direct tax which is not passed on to the consumer is the tax which is levied upon land values or other forms of property which do not represent the accumulated product of labor. Ground rent is collected in any case to the full extent of its value and is also ultimately paid by the final consumer, and the tax upon such value merely deflects a portion of such ground rent into the public coffers. The consumer has this burden in any case, but his burden from the classes of property previously mentioned is determined by the tax rate; consequently any idea that the consumer is getting something for nothing in case taxes are levied upon general property (as is the case in almost all communities) by having the municipality supply free service for such utilities as schools, parks, etc., or partly free services, as it does where an inadequate rate is charged for electric current, is largely fallacious.

WILL REGULATION BY COMMISSIONS SURVIVE?

The legal principle of the right of the public to control, in any manner not prohibited by the constitution, public utility corporations and indeed any other business activity affecting the public interest, is well established. Numerous instances of its application are to be found in the legal history of both this country and England. The need for its exercise has become much more prominent, however, with the growth of corporations operating under special legal privileges and in channels where the business is naturally monopolistic in character and is hence not subject to such regulation as competition affords.

In the past such regulation as has been attempted has been largely carried out through the activities of state legislatures and city councils. Action by these bodies, being seldom based upon full knowledge of the conditions or an investigation of them, has resulted in an appeal to the courts, where the justice of the enactment has been decided. This is well illustrated by the numerous laws for fixing the passenger rates of the steam railroads at two cents per mile. Most of these were finally approved by the United States Supreme Court, but not in those cases where such a rate could be shown to be confiscatory.

The modern scheme of regulation by a permanent commission has been developed as affording a more satisfactory method for applying the powers of the state to such control as may be found needful. This method is now on trial. Such a commission is a body whose functions are partly legislative and partly judicial. It has transferred to it the legislative powers of the state legislature or the national congress, usually under limitations and subject to change by the body creating it. Such a commission may, however, be created and have certain of its powers stipulated by the constitution, in which case it is to that extent independent of the legislature. This is well illustrated by Arizona. The judicial function of the commission appears in its duty of investigating facts, hearing evidence in disputed cases, and making decisions and orders in conformity to the facts thus developed and to the law. Cases pending before such a commission have the same status as cases pending in court, and no one can properly attempt to determine what the decision should be until all the evidence has been heard and digested by those conducting the hearing. To attempt to decide a case except upon the basis of the law and the facts as disclosed by the evidence is to entirely disregard American principles of justice.

Curiously enough, however, we find with respect to the case now pending before the Interstate Commerce Commission regarding the increase in freight rates which has been petitioned for by a number of the Eastern railroads, not only numerous citizens, but also many commercial and other organizations, actually presuming to express opinions through public speeches and resolutions as to how this case should be decided. Many newspaper editors have similarly expressed themselves. Such action is comparable to expressing opinions as to the guilt or innocence of the accused in a criminal trial before all the evidence in the case has been submitted and while the trial is still in progress. In the case just referred to it has even been reported in newspaper dispatches that the President of the United States has expressed an opinion on this matter, but such a report is hardly believable and must be attributed to the activity of some publicity agent anxious to influence public opinion, or possibly the decision of the Commission itself, in this matter. Any such attempt to thus influence a judicial body represents the grossest effrontery and is a thing not usually tolerated with respect to court cases. Even more strictly is it true in England that no publication would venture an opinion as to how a court case should be decided before its judicial trial is completed.

If commission cases are to be decided upon any other grounds than their merits as established by the evidence brought out in the investigation and hearings and upon the established principles of law and public policy which relate to them, it must be evident that this form of regulation will eventually fail. The proper attitude toward this function of government upon the part of the citizenship of the country as reflected in public opinion, is just as essential as the proper selection of men to serve upon the commissions. The latter consideration also represents a possible element of failure in the working out of the commission idea. Our present judicial system, which is several centuries old, has survived, and will continue, in spite of the occasional appointment or election of corrupt judges and miscarriages of justice, but can a new system of corporation control survive under any but the most promising conditions for its satisfactory working?

THE KINGS COUNTY LIGHTING CASE.

The principles which must govern public service commissions in their decisions and orders insofar as these are not established by statute or constitution must be developed through the decisions of the higher courts, to which commission cases are from time to time taken on appeal. An instance which has just come to hand is that of the Kings County Lighting case, which was appealed to the courts from the Public Service Commission for the First District of New York. This case is treated at some length in our department of Public Service Commissions this week, but it will be well here to call attention to its importance in establishing certain principles, since it will no doubt constitute a precedent for future cases in New York State.

The Appellate Division, which passed upon the matter before it was taken to the Court of Appeals, had found the Public Service Commission in error on three points. One of these involves going value. The higher court now decides that it is necessary to give consideration to this item in appraising utility property for rate-making purposes. Its definition of going value agrees with that followed by the Wisconsin Railroad Commission, whose view makes going value represent the losses during the period of development of the business due to the income not being sufficient to provide a fair return to the investors upon the invested capital. The Commission is required to determine as nearly as may be from the available evidence whether such losses were necessitated in the case under consideration, and if so, what was their amount. The opinion of the court does not establish any particular going value in this particular case, although it intimates that the evidence demonstrated the existence of conditions in the case of the Kings County Lighting Company which would establish an element of going value.

The Court of Appeals upheld the lower court in overruling the Commission on the question of appreciation in land value. The Commission had regarded the increase in land value as an element of income, but the court does not recognize it as such. In the last paragraph quoted, however, the court indicates that although the present value of land is to be included as an element of the value of the physical property, cases might arise where the appreciation was so great as to constitute an unreasonable burden upon consumers and that it would not necessarily be considered in the same light in such cases.

The Commission made no allowance for the value of paving done by the city over company mains that were already laid. The Court of Appeals upheld the Commission on this point, overruling the lower court, and points out that the value of paving is due to an expenditure by the city and not by the company and represents no investment by the latter. It also points out that the method of determining value by cost of reproduction less depreciation is merely a rule of convenience and not one to be rigidly followed where it is not in accordance with equity. The attitude of the court on this point, as related to its determination of the increment of value in land, may not seem entirely consistent, since both the values in question are socially created and the utility company may seem as fully entitled to the one as to the other. There is a difference, however, since the legal title to the land and consequently to any increment in its value, is already vested in the company; whereas street paving lies upon public land and has its title vested in the public, even in cases where it may have been done by the company. The one is a question of expense; the other a question of ownership.

Missouri Utilities Discussing Classification of Accounts.

At a special meeting of the Missouri Electric, Gas, Street Railway and Water Works Association, held at St. Louis, Mo., on April 1 to consider the tentative classification of accounts proposed by the Missouri Public Utilities Commission and affecting all of the members with the exception of street railways, three committees were appointed to report back on April 14, in St. Louis. These committees are studying the questions involved in detail, and will acquaint the associations with their findings, at the same time recommending alternatives from the proposed classifications and suggesting constructive changes for the better. The committees themselves will meet in St. Louis on April 13, will report on April 14, and will attend a meeting of the Public Utilities Commission on April 15.

About 50 members of the Missouri Electric, Gas, Street Railway and Water Works Association, attended the April 1 meeting, at which Phillip J. Kealy presided. It was the sense of the meeting that several classifications should be adopted, based on the aggregate volume of business done by the various public service companies. Under the proposed classification the smaller companies will be heavily burdened. The present draft is regarded as altogether too elaborate by the Missouri Association. Resolutions were adopted asking the public utilities commission to extend the date of the hearing from April 15 to a later time in order to give those principally affected time to study the proposition in detail. Another resolution, asking that in no event, shall the new classification be put into effect before January 1, 1915, was adopted. If the new methods are adopted during the current year, an infinite amount of recopying of records will be necessary, it was said.

The three committees appointed are as follows, the first named in each instance being the chairman: Depreciation Committee—Phillip J. Kealy, Kansas City Railway & Light Company, Kansas City, J. M. Scott, R. C. Russum, C. E. Brenton, J. H. Foster. Committee on Historical Matters—Hugo Wurdack, Light & Development Company, St. Louis, S. E. Bronson, Adrian Steele, F. B. Saunders, J. Hall. Committee on Classification for Small Companies—Edwin Gruhl, Union Electric Light & Power Company, St. Louis, V. L. Elbert, S. W. Henderson, W. J. Achelpohl, S. B. Irelan.

The Missouri Public Utilities Commission, in drafting the new classification, which contains more than 90 pages, ordered the utilities to put the depreciation fund in bank to draw interest, and also to substract the depreciation fund from the capital. It is believed by the Missouri Association that a serious mistake has been made here, as the capital will gradually be reduced to nothing under that plan.

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Electric Vehicle Association's Convention to be Held in Philadelphia.

The Electric Vehicle Association of America will hold its fifth annual Convention this year in Philadelphia, Pa., during October. The exact dates are to be announced later.

The Philadelphia Section of the Association, organized during the present administration and now having a membership in excess of 50 secured during its short life of a few months, is planning to make the 1914 convention not only the largest but the most interesting and constructive that the Association has ever held.

The papers to be presented this year will be of an unusually high class. They will treat extensively with a large number of pertinent subjects. The titles and authors of the papers will be reported later. An effort is being made to have all papers printed and available fully one month in advance of the convention, so that sufficient time will be given for their proper study and consideration before presentation and discussion.

It will be of interest to know that at the time of the last convention of the Electric Vehicle Association, held in Chicago, the Association had 437 members and sections in New England and Chicago, aside from the general office in New York.

At this time the Association has about 650 members, a gain of over 200 in five months, or at the rate of about 500 new members a year, and there is every reason to feel that the 1,000 membership mark will be reached by next October.

Whereas the Association last year had but two sections, now sections are established in New England, Chicago, Philadelphia, Washington and Cincinnati, with every likelihood that at least ten sections will have been organized by the time of the next convention, October, 1914.

Pending the announcement of convention committees, communications regarding the Philadelphia 1914 convention should be addressed to the executive secretary of the Association, Engineering Societies' Building, 29 West Thirty-ninth Street, New York City, who will be pleased to receive suggestions of any nature calculated to help make the convention as successful as is the Association's work generally.

Society for Electrical Development Awards Membership-Campaign Prizes to Jovians.

The Society for Electrical Development, incorporated, has mailed checks in payment of the prizes awarded in the campaign for membership carried on in its behalf by the Jovian Order.

The first prize of $500 for the Jovian League securing the greatest number of subscribers was awarded to the Cleveland Jovian League.

The first prize of $250 to the individual securing the greatest number of subscriptions was awarded to J. C. Bartlett, Bartlett Garages, Incorporated, Philadelphia.

The second prize of $150 for the individual securing the next greatest number of subscriptions was awarded to H. F. Viot, Shelby Lamp Division of General Electric Company, Omaha, Nebr.

The third prize of $100 for the individual securing the third greatest number of subscribers was divided equally between W. J. Trott, of the Fostoria Incandescent Lamp Division of General Electric Company, Fostoria, O., and C. A. Taylor, of the Banner Electric Division of General Electric Company, Youngstown, O.

Each of these checks was accompanied by a letter from the Society, expressing its thanks to the prize winners for their co-operation and assistance.

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Meeting of Chicago Section of Electric Vehicle Association.

Everett P. Stroup, Chicago representative of the Columb Tyres Import Company, Incorporated, of New York City, spoke on the subject, "Pneumatic Tires for Electric Vehicles," at the luncheon of the Chicago section of the Electric Vehicle Association of America held in the Hotel Sherman on April 7. Mr. Stroup emphasized the fact that resiliency is the most important quality to be obtained in any solid or pneumatic tire. At the present time most manufacturers obtain the desired resiliency in electric-vehicle tires by building them with less fabric than is generally used in making tires for gasoline cars, thus weakening the tire in order to obtain the desired resiliency. Mr. Stroup then exhibited samples of a patented elastic fabric, which will give the desired resiliency to a tire without decreasing the amount of fabric used. The Russian-French India-Rubber Gutta-Percha Telegraph Company, of Riga, Russia, manufactures tires made of this fabric under the trade name, "Prowodnik," the tires being imported into this country by the Columb Tyres Import Company, Incorporated.

Plans for the regular meeting of the Chicago section on May 6, were discussed. Chairman Homer E. Niesz presided.

Program of New York Meeting of American Electrochemical Society.

The twenty-fifth general meeting of the American Electrochemical Society will be held in New York City on Thursday, Friday, and Saturday, April 16 to 18, 1914. The arrangements for the meeting are in the hands of the New York Section, and a smoker on Thursday night and steamer party on Friday are complimentary affairs tendered by the New York Section.

The headquarters will be at the Chemists' Club, 52 East Forty-first Street. There will be technical sessions on Thursday morning and afternoon in the Chemists' Building, and on Saturday morning and afternoon in Earl Hall, Columbia University. The smoker on Thursday evening will be at the Chemists' Building, and there will be a dinner-dance on Saturday evening, at the same place.

On Friday there will be an all-day excursion by steamboat around New York Harbor and Staten Island, combined with visits to the plants of the American Smelting and Refining Company, the United Lead Company, and the Waclark Wire Company.

On Thursday, at 9 a. m., there will be the annual business meeting, followed by a symposium on "Power Problems in Electrochemistry." The following papers will be presented:

C. P. Steinmetz, "Characteristics of Electrical Energy as Affecting Chemical Industries."

P. W. Sothman, "Efficiency of Power Transmission versus Utilization in Local Electrochemical Industries."

F. A. J. Fitzgerald, "Some Economies in the Use of Energy in Electric Furnaces."

W. S. Horry, "Power for Electric Furnace Work."

At the afternoon session there will be the following papers:

Wilder D. Bancroft, "Electrolytic Flames."

C. A. Hansen, "Electric Steel Castings."

Eugene B. Clark, "Electric Furnaces for Steel Making."

W. P. Lass, "Advantage of Southeastern Alaska for Hydroelectrochemical Industries."

The presidential address, entitled "Some Economic and Esthetic Aspects of Electrochemistry" will be given by E. F. Roeber, on Thursday evening.

On Saturday the following papers will be presented:

E. A. Smith, "Progress in Leaching and Electrolytic Treatment of Copper Ores in South America."

Robert R. Goodrich, "Hydro-Electrometallurgy of Copper."

Rudolph Gahl, "Leaching of Copper Tailings."

Ralph W. Deacon, "Metal Inventory in an Electrolytic Copper Refinery."

O. P. Watts and A. C. Shape, "Addition Agents in the Deposition of Zinc from a Solution of Zinc Sulphate."

Frank C. Mathers and Ralph O. Overman, "The Effect of Addition Substances in Lead-Plating Baths."

Frank C. Mathers and Hugh M. Marble, "Electrodeposition of Cadmium."

C. W. Bennet, H. C. Kenny, and R. P. Dugliss, "Electrodeposition of Nickel."

C. W. Bennett and A. W. Davison, "Electrolytic Deposition of Brass on a Rotating Cathode."

Gustave E. F. Lundell, "A New Method for the Determination of Free Cyanide in Electroplating Solutions."

E. F. Northrup, "Electric Conduction at High Temperatures and Methods of Measurement."

F. A. J. Fitzgerald, "Laboratory Notes on Some Electrical Properties of Silver Sulphide."

Claude N. Hitchcock, "Polarization Single Potentials."

Reinhard Beutner, "New Cell Arrangements for Direct Determination of the Free Energy."

R. Stuart Owens, "Experiments on White Lead."

Oliver W. Storey, "A Microscopic Study of Electrolytic Iron."

O. P. Watts and M. H. Li, "The Effect of Addition Agents in the Electrodeposition of Iron."

O. L. Kowalke, "The Permanency of Base-Metal Thermocouples as Affected by Their Microstructure."

National Fire Protection Association Convention to be Held in Chicago.

The eighteenth annual meeting of the National Fire Protection Association will be held in the auditorium of the Insurance Exchange Building, Chicago, Ill., on May 5, 6 and 7. The sessions will begin promptly at 10 a. m. on each of these days. A program of exceptional interest to the members and to the public generally is being prepared. Address on special topics are announced as follows: Dr. S. W. Stratton, director of Bureau of Standards, Washington, D. C., "Possible Co-operation Between the Federal Government and the National Fire Protection Association;" Frank D. Chase, president of Chicago Chapter N. F. P. A., "Adoption of N. F. P. A. Standards by State and Municipal Actions;" William H. Merrill, manager of Underwriters' Laboratories, Chicago, "New Features in the Work of Underwriters' Laboratories." The afternoon of May 6 will be devoted to a visit to the Underwriters' Laboratories, for a special program of tests.

Underwriters' Label Service Discussed at Chicago Jovian Meeting.

A. R. Small, of the Underwriters' Laboratories, spoke before the Jovian League of Chicago on April 6, on the subject "Underwriters' Label Service."

The present Underwriters' Laboratories were started at about the time of the World's Fair in Chicago. Soon it was deemed advisable to publish a semi-annual list of approved fittings, but this soon proved inadequate and the label service adopted, first on rubber-covered wire, then on rigid conduit and now on about 25 varieties of electrical devices and materials. Over 40,000,000 labels were issued last year, which necessitated about 300 inspectors inspecting the products of 1,000 factories.

An inspector does not spend his entire time at any one factory, but makes periodic visits. In factories where rigid conduit is made, the inspector makes about four visits a week; while in those factories where rubber-covered wire is made, the inspector makes about five visits in two weeks.

On each inspection he watches the company's tests, after performing them himself. Samples of previously inspected materials are then picked out at random and subjected to re-inspection by the inspector. It is obviously impossible to re-inspection all material in the shipping room, but by taking samples at random, a good idea of the general qualities of the products is obtained. In any cases where the material is found to be of poor quality, the inspector subjects the products of the company to such rigid and frequent inspection, that the company voluntarily raises its standards.

The message conveyed by the Underwriters' Laboratories' labels is hence that articles bearing them at least fulfill the minimum requirements of the Laboratories and were tested at the factory to the best of the inspector's ability.

The Underwriters' Laboratories is chartered under the laws of Illinois with a stock of $1,000. No profit is sought, the various insurance companies making donations for buildings and equipments, and the actual expense of the label service being paid for by selling the labels. At the end of each year, an account is rendered to the manufacturer, and the difference between the charge for the labels and the cost of the actual service adjusted. In no case is the label service over 1 per cent of the manufacturing cost.

Victor W. Tousley, chief inspector of the city of Chicago, presided. Frank D. Chase, of the National Fire Protection Association, made a few remarks.

Meeting of Philadelphia Company Section, National Electric Light Association.

The March meeting of the Philadelphia Electric Company Section National Electric Light Section, which was held on March 16 in Franklin Institute, Philadelphia, marked the fifth anniversary of the section's birth. It was instituted on March 15, 1909, with 151 charter members; on the date of the present meeting the membership was 823. An informal birthday dinner was held in the Bingham Hotel prior to the meeting, at which about 50 members of the Section were present. The Institute was specially decorated for the birthday anniversary, plants were placed about the speaker's table and an electric sign containing the inscription "5th Anniversary" was displayed upon the wall above the speaker's head.

Another birthday feature was the presence of Prof. William J. Humphreys, physicist of the Weather Bureau, United States Department of Agriculture, who spoke upon the topic, "The Thunderstorm and Its Phenomena." Professor Humphrey's is believed to be the greatest meteorologist in the world, and in addition to this he has a very lucid manner of expressing himself so that even when handling so difficult a subject his hearers were at all times able clearly to grasp his meaning. Dr. Humphreys stated that recent discoveries have shown that the electricity in a thunderstorm is not the cause of the storm, but is the result of up-drafts of air through the raindrops causing them to spray and thus generate electricity. The electricity he declared, was no part of the genesis or maintenance of a thunderstorm, but was merely incidental to it, just as dust is to a duststorm and so on.

The March meeting of the Meter Department Branch on March 2 was observed as a Mexican night. The feature of the night was a description of the "Mexican War as It Really Is," by Charles F. Gerhard, which was illustrated by a private collection of lantern slides made from photos taken by M. J. Slattery, a Philadelphia mining engineer, who has lived in Mexico for several years. Mr. Gerhard is thoroughly familiar with Mexico and described the slides and conditions in an entirely informal manner which made the talk a realistic trip to Mexico. An elaborate musical entertainment program had been prepared in connection with this meeting, but the blizzard which prevailed on that night prevented some of the talent from arriving. Several friends were on hand, however, and did their share toward making the affair a success. Smokes and refreshments were served as usual.

The meeting of the Engineering Department Branch on March 12 took the nature of an anniversary celebration of the founding of the famous Edison Station, located at 908 Sansom Street, Philadelphia. This station was opened March 5, 1889, and 38 employees of the company who had been in the service for more than 20 years, were presented with gold medals. These included W. H. Johnson and W. C. L. Eglin, vice-presidents of the Philadelphia Electric Company, and many other men who today occupy prominent and responsible positions in the company's affairs. Speeches were made by the company's president, Joseph B. McCall; W. H. Johnson and W. C. L. Eglin, vice-presidents, A. J. DeCamp, general manager, J. T. Maxwell, general agent, P. H. Bartlett, superintendent of the Meter Department, and others. Nearly 400 employees, including every official of the company, were in attendance.

The Accounting and Commercial Departments held a combined meeting on March 10. The speakers were H. R. Kern, auditor of the Philadelphia Electric Company, who presented a very able paper dealing with commercial law as applied to contracts. Prof. W. H. Lough, of the New York University School of Accounts and Finance and secretary of the Alexander Hamilton Institute, also spoke; his subject was "Business Principles." Mr. Kern's paper and the discussion which followed were very helpful in that it brought out the solution of many problems that arise in the course of a day's work by the contract department. Prof. Lough's address brought out the point that each man in an organization must be individually efficient and so share a portion of the executive burden which cannot in the nature of things be borne entirely by the executives of a company. A feature of this meeting was the presence of the company's general agent, J. T. Maxwell, who kindly consented to act as presiding officer.

Technical League of America.

The Technical League of Engineers and the American Society of Engineering Draftsmen have merged to form a new organization known as the Technical League of America. The president is Charles W. Weick, and the general secretary is Walter M. Smyth, 74 Cortland Street, New York City.

This consolidation is the result of a comprehensive study of every phase of the question of placing the engineering profession on a higher plane and obtaining for the engineer and his assistants the economic and social recognition which is due them. The League cordially invites those members of existing national societies who believe in advancing the status of the engineer through the medium of legislation and organized effort to join the League. A similar invitation is extended to members of state and local societies and all engineers not now in other organizations. The scope of the society includes engineers, draftsmen, inspectors, superintendents and others in the lines of architectural, civil, electrical, marine, mechanical, mining and structural engineering.

Institute of Radio Engineers.

On the evening of April 1 a meeting of the Institute of Radio Engineers was held at Fayerweather Hall, Columbia University, New York City. R. H. Marriott, radio inspector of the United States Department of Commerce for the port of New York, presented an interesting paper on "Specifications for Steamship Radio Equipment." The paper gave conclusions which Mr. Marriott has drawn from his long experience in radio work, and was directed especially toward improvements which should be adopted in the design and installation of emergency transmitters in particular. It was advocated that spare parts of such items as are subject to derangement should be furnished, and that a storage battery of sufficient capacity to run the main transmitting set for six hours should be supplied.

The paper was discussed by J. S. Stone, A. N. Goldsmith, G. Hill, E. J. Simon, A. F. Parkhurst, A. A. Hebert, and John L. Hogan, Jr. In the discussion there was brought out the difficulty of creating sufficient interest among the steamship companies to warrant the large investment necessary for the installation of transmitters as suggested by Mr. Marriott, in spite of fact that the United Fruit Company and one or two other corporations have been willing to go to such great expense in the matter of ship insurance by radio. Mr. Hogan described a new ship installation of the National Electric Signaling Company, in which two motor-generators (one of two kilowatts and one of one-half kilowatt) are used.

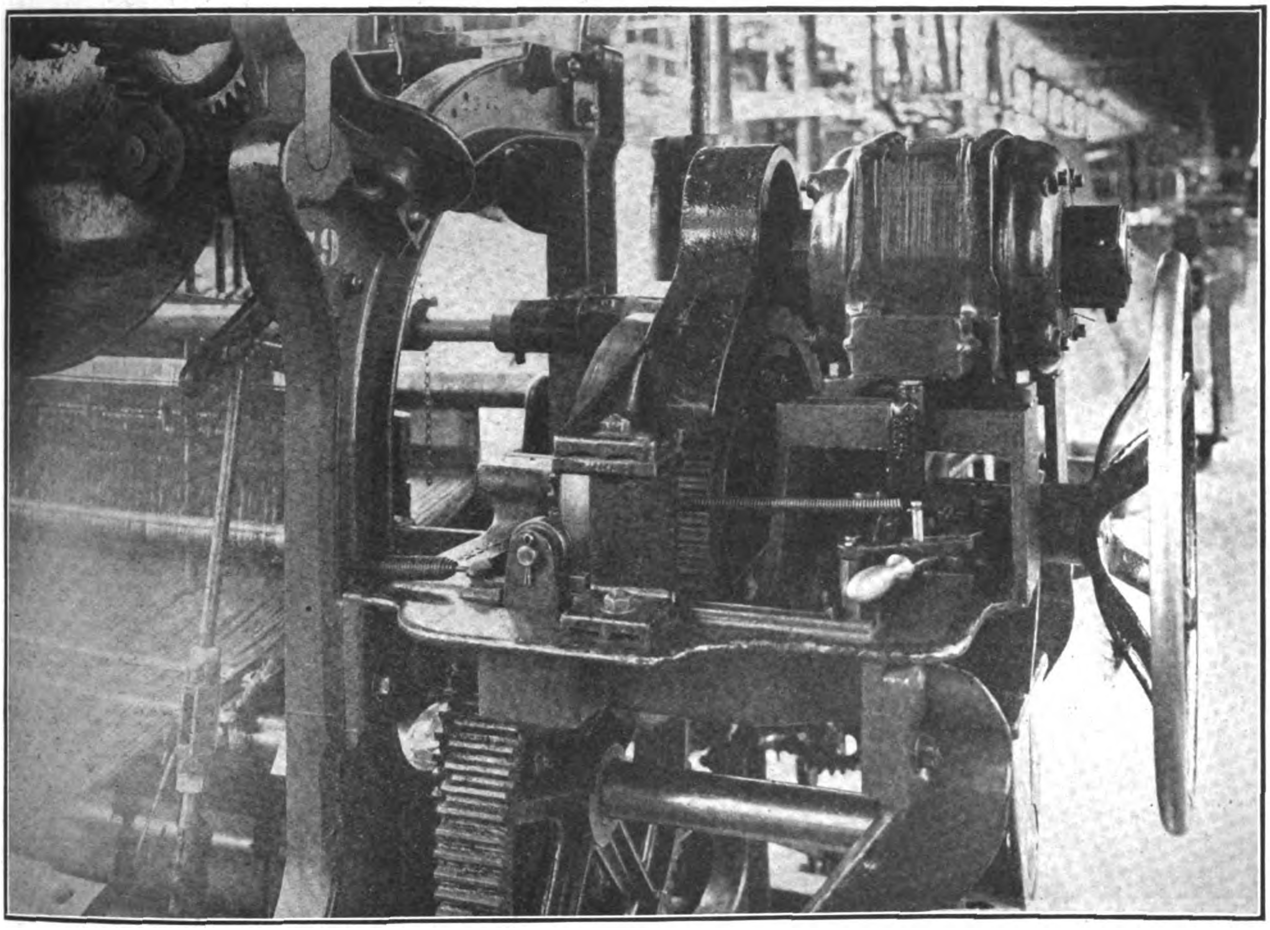
White Way at Jersey City.

The first "white way" in Jersey City, N. J., was placed in operation on April 1. The installation comprises 67 6.6-ampere magnetite arc lamps, distributed alternately on either side of Newark Avenue, from Warren to Brunswick Street, and in the vicinity of the City Hall on Grove Street. The lamps are placed at intervals of about 75 feet. City Commissioner James Ferris has been instrumental in establishing the improvement.

Electricity in Carpet Manufacturing.

There is a considerable field for the sale of central-station power in carpet and rug mills; and where steam-electric plants are now employed, a profitable load can be secured by supplying power for machines and departments which are constantly being added and enlarged. A discussion of the many advantages of central-station service as applied to this field is presented in this article.

Although the advantages of electric drive are nowhere more important, or more desirable, than in plants engaged in the manufacture of carpets and rugs, there has been a tendency on the part of many manufacturers to adhere to the more or less obsolete methods of drive. This may perhaps be accounted for when it is considered that in the northeastern states, where most of the larger mills are located, the old original buildings are still in service and the water or steam power plants originally installed are still forced to do duty. It is true that in many such cases the demands for power have been so great that no further additions were possible to the plants and in these instances recourse was had to central-station service for the additional load.



Motor Driving Carpet Loom in Factory of Bigelow Carpet Company, Clinton, Mass.

There is still considerable of this excess load available and it forms very profitable business for the power companies but the time is not far distant when it will come to a choice between installing central-station service throughout, or building a complete new steam-electric power station that can properly take care of the existing and anticipated business. New mills are, of course, alive to the advantages of purchased power and it is the purpose of this article to show that considerable savings can be effected by the substitution of central-station power for the older methods now employed.

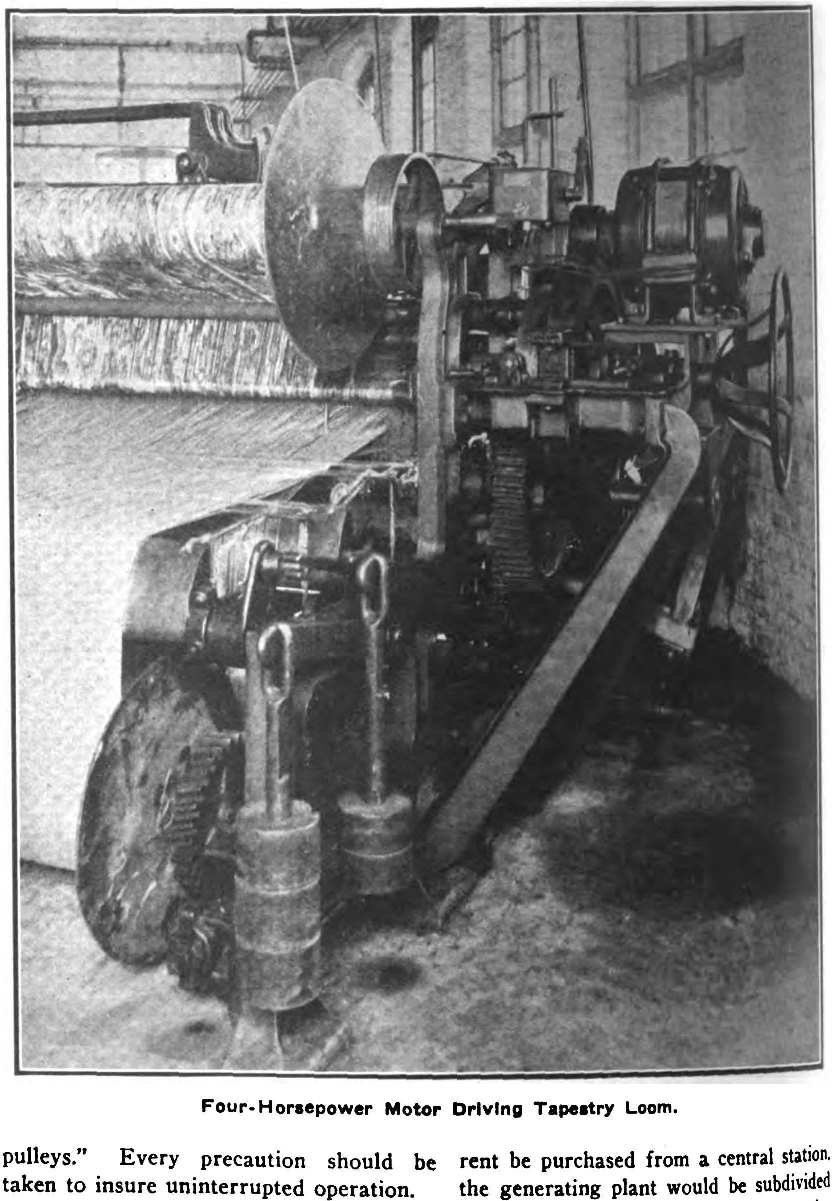
The adoption of the electric drive accomplishes more than simply the displacement of the main drive on the mechanical plant. The initial studies and plans of the designing engineer are much simplified. Subdivision with all its advantages is permitted. The consumption of power in each department is automatically indicated. More uniform speed is secured. Production is increased, the quality of the product is improved, and the repair account is reduced. More continuous operation is assured. True, energy is received from a prime mover, as in the mechanical system, and is delivered, either directly or through shafting and belting, to the machinery in the mill. In this respect the two systems are alike. But here the similarity ceases.

The engineer is relieved of many problems which would prove very embarrassing if he were designing a mechanically driven mill. An excellent illustration of this was furnished by the first textile mill to adopt the electric system. A mill site had been purchased which was located on an elevation adjacent to a canal. This canal was originally built for towage purposes. Its course had been laid out along the river bank. Consequently there were no available mill sites between the canal and the river. The engineers of this mill had intended to drive it mechanically and were considering two alternatives. One plan was to place the wheels beneath the mill and carry the tail race through very expensive masonry beneath the canal; they were also considering placing the wheel-house between the canal and river and operating the mill by means of a rope drive across the canal. As soon as the electric drive was brought to the attention of the engineers, its simplicity immediately appealed to them. After long and careful consideration they decided to adopt it. The results have abundantly justified their action.

The problems attending the use of the mechanical system are hardly less complex if the mill is to be driven by a steam engine. The sites for the boiler house must be convenient to water for steam and condensing purposes. The mill building must be placed immediately adjacent to the engine house. In all mechanically driven mills the first driving shaft (whether it be the water-wheel shaft or the crank shaft of the engine) must be parallel to the shafting to be driven, and at a comparatively short distance therefrom. These conditions are self-evident, but they occasion, nevertheless, much careful thought and study on the part of the engineer. The usual solution of these problems is found in a compromise, for, to meet the above requirements, either the mill buildings are not placed in the most advantageous position, or the power house is not located at the most suitable point. Comparatively few sites are selected for a mechanically driven mill which are ideal for both the generation of power and the manufacture of carpet. With the electric drive the engineer enjoys the utmost freedom, and can locate the several buildings at the points best adapted for their respective purposes.

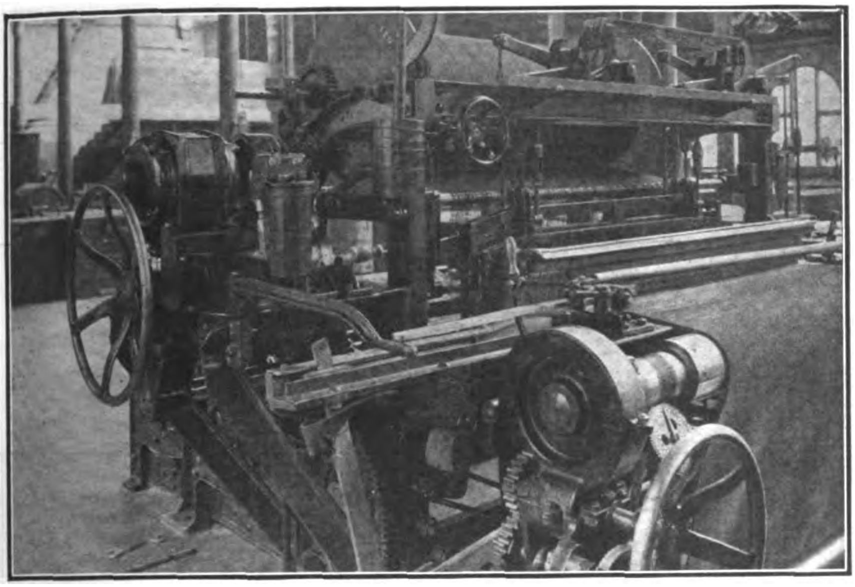
In order to obtain the full benefit of the electric drive, the mill is divided into sections, each operated by its motor. Each of these motors may be stopped or started independently of all the others. The motors are suspended, in an inverted position, from the ceiling of the room. This plan saves valuable floor space, and also permits the use of horizontal belts. In the spinning room, where large amounts of power are required in a comparatively limited space, and where the line shafting can be operated at high speed, the motor is generally directly connected to the shafting by means of a flexible coupling. In other departments the conditions are not so favorable for this plan, but each section is generally still further subdivided into what may be termed sub-sections, as each motor is equipped with one, two, or four pulleys, the number being determined by the arrangement of the shafting. Two pulleys are placed on one end of the motor when it is located between two shafts to be driven thereby. If the two shafts are located on the same side of the motor, a pulley is placed on each end of the latter. If four shafts are to be driven, and if the motor can be located between the two central shafts, two pulleys are placed on each end of the motor. This arrangement eliminates large belts, saves one or more steps in transmission, reduces friction losses and minimizes the wear on the motor bearings. It results also in greater steadiness in the speed. The variations of power in one sub-section are not felt in any other, for if the belt driving that subsection slips, the other sub-sections are not affected. This uniformity of speed is very valuable, especially in the mule room, and is one of the most marked and important characteristics of the electric drive.

The greater reliability of electric drive is one of the most important considerations to a manufacturer. "No dividends are earned while the belts are on the loose pulleys." Every precaution should be taken to insure uninterrupted operation.



Four-Horsepower Motor Driving Tapestry Loom.

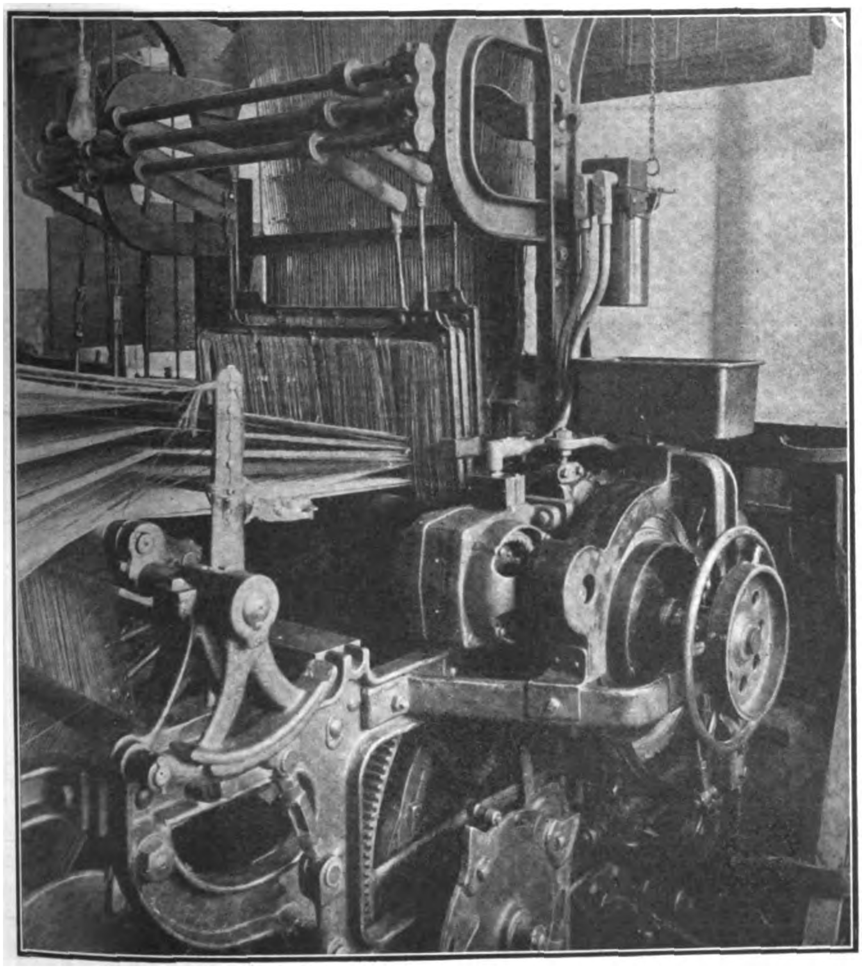
If the mechanically driven establishment be of sufficient size to require two or more generating plants, each engine must be operated entirely independently of all the others. If an accident occurs to one of these engines or to the main drive, all of the machinery driven thereby must be shut down until repairs may be completed. No provision can be made for driving this machinery mechanically from other engines belonging to the same corporation. An accident to the fly wheel on an engine in a certain mechanically driven mill resulted in stopping the entire mill for over a month. The looms were engaged in filling a very profitable contract. That profit would have been lost had not this same concern been using the electric drive in another portion of its yard. A motor was transferred to the above weave shop and operated the looms until the repairs on the engine were completed. One of the engines on the mechanically driven plant may be overloaded and another may be underloaded, but, as a rule, the excess cannot be transferred economically from one to the other. If, on the other hand, current be purchased from a central station, the generating plant would be subdivided into several units, each capable of independent operation. While each unit may be stopped or started at will, they are all connected to the same bus-bars on the switchboard. The load may be divided equally between them, or some may be made to carry more than their proportion. At any time that the demand upon the station does not require the operation of all the units, one or more may be stopped. If an accident happens to one of these units it would probably not be known out-



Two-Horsepower Motor Driving Wilton Carpet Loom.

side of the station, for if proper provision has been made, the overload capacity of the remaining units would be sufficient to maintain the supply of current.

Subdivision within the mill affords the same protection as does the subdivision of the generating plant. For instance, a belt broke in a weave shop in an electrically driven mill. There was danger that it would catch and wind about the shafting and sprinklers, but an operative quickly threw the switch controlling the motor. Only that section in which the trouble occurred, representing less than five per cent of the total power required to drive the mill, was affected; the balance of the mill continued its operation as before. Had this mill been driven mechanically, very serious damage would have been done, for much more time would have been required in shutting down. In the case refererd to, as the belts were on the tight pulleys when the switch was thrown, the load itself acted as a brake and no damage ensued.



One-Horsepower, 550-Volt Motor Geared to Carpet Loom.

While every precaution may thus be taken to provide against a breakdown, it is not because such interruption is more likely to occur in an electrically driven mill than in one operated mechanically. In the latter such provision is almost impractical, while it may be arranged very readily in the former. The electric system affords that security from interruption, upon which the success of any manufacturing enterprise must depend.

The mechanical system offers but limited facilities for enlargement. In some cases only the high pressure half of a cross-compound engine has been installed. This plan was followed in a certain mill, in the expectation that the low pressure half would be added the following year. The sheave pulley and foundations for the compound engine were installed. For eight years this mill has been driven by this single-expansion engine, and there is no prospect at present of the completion of the plant. This plan necessitated at the outset the determination of the extent of the enlargement, as well as the character of the goods to be manufactured, yet it may be found later that, on account of changes in the market conditions, the provisions for such addition were entirely inadequate. If the complete engine were installed at first, the result would still be uneconomical, for the engine must be operated under partial load. As in the previous case, the degree of the extension must be limited by the capacity of the engine first installed.

If no provision is made in advance, the increased capacity can only be obtained by the substitution of a larger engine and the rearrangement of the main drive, or by the addition of a second engine. The first method will generally require the shutting down of the mill for a considerable period. The second method will incur the additional operating expense of a second independent steam plant.

If the mill is operated from a central station, an extension will not require any changes in the present driving arrangements. No shutdown will occur. No provision need be made for more than the immediate requirements. Motors will be added to drive the new machinery, and the balance of the mill will be driven as before. In case the enlargement amounts to a doubling of the present capacity, a weave shed may be erected, in which shall be placed the looms already in operation and those to be added, the old weave shop being filled with preparatory machinery. This may be accomplished by the electric drive with a minimum stoppage of the machinery and with the least change in the driving arrangements.

Of all the textile industries, the carpet is perhaps the most interesting, especially

Carpet Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Carpet manufacturing plant having a maximum production of 40,000 yards per week and an average production of 22,000 yards per week. The plant operates 54 hours per week.

Total connected horsepower, 800. Total number of motors installed, 48. Average kilowatt-hours per month, 45,300.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	45,420	May	43,950	September	45,920
February	40,820	June	44,490	October	39,700
March	38,390	July	44,200	November	48,700
April	61,020	August	45,000	December	46,100

Load-factor, 10.4 per cent; operating-time load-factor, 24 per cent.

The approximate electrical energy consumed per 100 yards of carpet manufactured is 4.75 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M.	Application.
1	10	1150	Geared to 1.5-ton freight elevator serving six floors.
1	35	900	Belted to line shaft driving starching machines; and carpet-winding machines.
2	35	900	Each driving a 40-inch blower in dry room.
1	25	900	Direct-connected to a 36-inch ventilating fan in starch room.
1	35	900	Belted to line shafting driving loom and scouring machine.
1	25	900	Belted to line shaft driving scouring machines.
2	5	1150	Each belted direct to a 16-inch ventilating fan.
7	20	900	Each belted to a line shaft driving 0.75 and 1-yard Brussels carpet looms.
4	15	900	Belted to line shaft driving Wilton carpet looms.
4	20	900	Belted to line shaft driving 0.75 and 1-yard Brussels carpet looms.
1	15	900	Belted direct to one stamping machine.
1	20	900	Belted direct to one carpet-winding machine.
1	10	900	Geared direct to one one-ton freight elevator, serving five floors.
2	20	900	Belted to line shafting driving 0.75 and 1-yard Brussels carpet looms.
1	1.5	1150	Geared direct to one carpet-cutting machine.
1	10	900	Belted to line shaft driving woodworking machines, including two planers; two saws; and two nailing machines.
1	10	900	Belted to line shaft driving bit winders.
1	5	1150	Belted to line shafting driving bobbin carriers.
1	10	900	Belted to line shafting driving cotton-winding frames.
1	3	1150	Belted direct to 16-inch fan in dyehouse.
1	10	900	Direct-connected to 32-inch blower.
1	3	1150	Geared direct to vacuum pump.
1	35	900	Belted direct to a 40-inch blower.
1	20	900	Belted to line shafting driving carpet-winding machines.
1	35	900	Belted to line shafting driving spinning and winding frames.
1	20	900	Belted to line shafting driving 0.75-yard Brussels carpet looms.
1	10	1150	Belted to line shafting driving winding frames.
1	30	900	Belted to line shafting driving special carpet looms.
1	10	1150	Belted to line shafting driving winding frames.
3	0.5	1150	Each driving small ventilating fan.
1	1	1150	Geared to bale hoist.

Carpet manufacturing plant producing a high grade of carpet. Considerable of the work is done by hand. Plant operates 10 hours per day.

Total connected horsepower, 32.25. Total number of motors installed, 4. Average kilowatt-hours per month, 1,921.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1310	May	2220	September	1690
February	1880	June	2100	October	2150
March	2160	July	1680	November	2210
April	2360	August	1560	December	1730

Load-factor, 11 per cent; operating-time load-factor, 23 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
2	15	900	Each belted to line shafting driving eight Cromption & Knowles Wilton carpet looms 6-4 wide, 60 picks per minute, 30 picks per inch.
1	2	1150	Belted to short line shaft driving sizing warps; and one carpet-winding machine.
1	0.25	1600	Belted to Singer sewing machine.

in the weaving department, for there are Axminster, Wilton, Brussels and plush looms and these all differ greatly in design and operation from the looms employed in other textile industries.

In the past the machine manufacturer has been content to specify that this machine will take approximately so many horsepower, and the mill owner added one upon another till the engine was loaded. This condition is not so today for when it is proposed to apply electricity it is necessary to know exactly what horsepower each machine would necessitate and the burden of determining the same has fallen upon the men introducing the electrical apparatus.

First the motor must be large enough to handle the machine or machines when all are operating under full load conditions and yet should be so applied that the load will never drop below half load —preferably about three-quarters load.

It is necessary to know all the details in connection with looms as the power to drive varies with almost each one of them. As the result of the data taken and the experience of the various engineers in laying out the various drives, they can go into a mill, make a brief survey of the machinery, its operation and drive, and advise the owners just what installation to make, where individual drive, group drive, or both, is best, giving the cost for doing the same in dollars and cents with an estimate of the saving in power, if any, and the expected increase of production.

In a textile mill the practice is or should be to spin yarn and weave cloth at the highest speed possible dependent upon maintaining uniform good quality of said yarn and cloth. When the loom is being operated at this ultimate speed, if a sudden variation of speed occurs at the instant when the warp is under tension, there is a tendency for the warp to part, banging off the loom and shutting down production on that loom until the weaver joins the broken ends and starts it up.

If the loom will operate with speed varying five per cent several times per second it is certainly plausible that it will operate at a constant speed corresponding to the highest speed. So by applying an individual motor geared directly to the loom it is possible to operate the loom not only at 2.5 per cent higher speed but since this speed is absolutely uniform the speed can be increased still higher, and operating at this speed the uniformity of operation results in less banging off or shutting down of the loom and hence a resultant still greater increase of production. What has been found true of the looms is also true of many other departments.

Electricity properly applied to the textile industry results in an increase of production of approximately 5 to 8 per cent. Experience has shown that this varies a great deal above and below these figures in certain cases.

In the majority of cases experience has demonstrated that this increase of production is dependent upon the skill with which the electric drive is applied.

Commercial Practice Management, Rates, New Business

A New Advertising Device.

The newest electrical advertising device to make its appearance in New York City is the symmetroscope. One of the first of these machines can be seen in the window of the Forty-second street office of the New York Edison Company. A huge horn-shaped affair lined with mirrors is the most conspicuous part of the contrivance. This horn, which is always revolving, contains coins or fruit or other interesting objects which are tumbled about on the mirrors, thus producing a series of images that almost persuades the observer that the horn is plentifully crowded. And just when one becomes very interested in the affair the horn tips backward, shutting its contents from view, and a large sign unfurls in exactly the spot on which the observer's eye is focused. The horn tips every three revolutions and ten different signs are displayed in succession. Another way of using the symmetroscope is to throw on a clutch that prevents the horn from tipping. Then on its edge are placed a number of circular signs which are always before the observer.

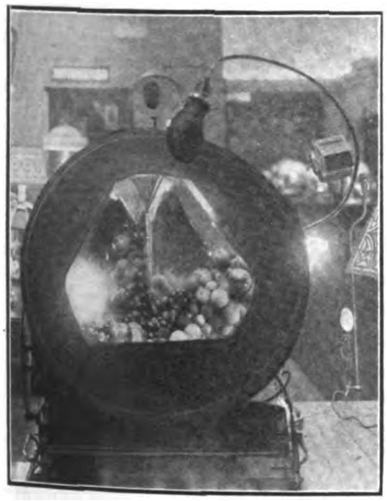


Fig. 1.—Symmetroscope.

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Proposed Meter Bureau for Louisville.

An ordinance providing for the establishment of an inspection bureau for gas and electric meters in Louisville, Ky., has been passed by the lower branch of the City Council, being a substitute for a measure on that subject introduced some weeks ago. The measure provides for inspection on complaint of a customer, upon the deposit of a fee of 50 cents, which is forfeited in case the meter is reasonably accurate, but is to be refunded in case it is found to be fast.

Holyoke Municipal Plant Drops Free Lamp Renewals.

The lighting department of the city of Holyoke, Mass., has discontinued free renewals of all incandescent lamps, and will hereafter sell them to users at cost. It has been the practice to renew carbon-filament lamps free, but to charge for tungstens. The effect of the change is likely to be to stimulate the use of the newer and more efficient type of lamps and to rapidly eliminate the carbon lamps.

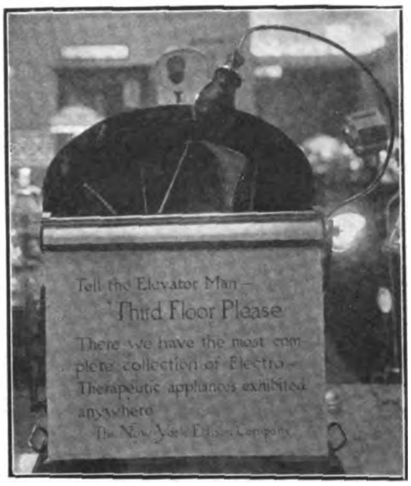
Tell the Elevator Man—
"Third Floor Please"
There we have the most complete collection of Electro-Therapeutic appliances exhibited anywhere
The New York Edison Company

Fig. 2.—Sign of Symmetroscope.

Successful Domestic Display at Kansas City.

The first annual domestic display of the Kansas City Electric Light Company, of Kansas City, Mo., began on April 1 and continued until April 11. Miss Marie J. Russell, head of the company's specialty department, proposed and arranged the exposition. Attaches of the General Electric, Westinghouse, Simplex, and other companies had charge of various branches of the exhibits. A feature was an attractive Japanese garden, in which tea and biscuit, cooked with electric stoves, were served to guests. A rest room for women was another attractive department, being divided from the main floor by a partition of flowers. The exposition was used particularly to demonstrate electrical devices for summer use, though those for all-year utility were not neglected. On the evening of April 10, a special reception was held for the benefit of those who were not able to attend during the day. The display rooms of the company, at Fifteenth Street and Grand Avenue, which were utilized for the purpose were handsomely decorated with flowers and palms, carrying out the Japanese garden effect.

The event will be an annual one, according to present plans, the exposition having proved very successful. Miss Russell joined the company last November, coming from the local branch of General Electric Company.

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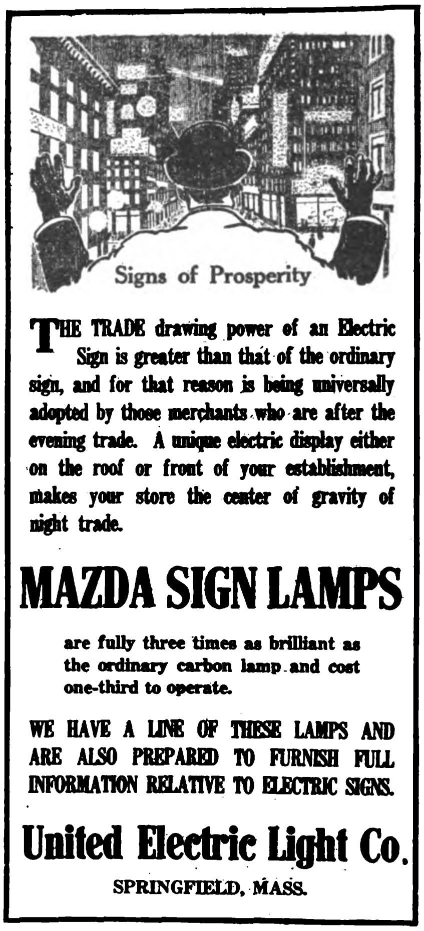
Lancaster, Pa., Makes Big Increase in Installation of Electric Motors.

The Edison Company of Lancaster, Pa., has recently issued a booklet entitled "The Electric Motor, Its Uses and Users." This gives a number of illustrations depicting the difference between homemade, old fashioned methods of operating domestic and farm utilities and the neat and effective motor drive. There is a complete list of electric motor users and installations on the lines of the company as of January 1, 1914. It seems as if Lancaster has every conceivable character of industry and that the Edison Electric Company has motor drive installed in each in some particular. This booklet is undoubtedly one of the strongest and most effective arguments for the increase of the motor load of the central station that has ever been produced. Since January 1, 1908, when there were 2,965 horsepower in motors connected, there has been an increase to 12,154 horsepower in motors connected on January 1 of the present year. The superintendent of the commercial department, under whose construction the booklet has been prepared, is H. J. Von Nieda.

Springfield Sign Campaign.

The United Electric Light Company, Springfield, Mass., is carrying on a campaign for promoting the use of electric signs. The company does not sell signs, but endeavors in various ways to interest customers in their use. Advertisements now running in Springfield newspapers call attention to the advantages of this type of advertising, and the economies effected by the use of Mazda lamps therefor.

The company sells Mazda lamps suitable for sign work. In some cases, where it seems advisable, it secures sketches and quotations from sign manufacturers and submits them to the customer. Ordinarily, after securing a prospect the company turns him over to the manufacturer, with whom he can deal direct, to the mutual advantage of the sign maker and the central station.



Signs of Prosperity

THE TRADE drawing power of an Electric Sign is greater than that of the ordinary sign, and for that reason is being universally adopted by those merchants who are after the evening trade. A unique electric display either on the roof or front of your establishment, makes your store the center of gravity of night trade.

MAZDA SIGN LAMPS

are fully three times as brilliant as the ordinary carbon lamp and cost one-third to operate.

WE HAVE A LINE OF THESE LAMPS AND ARE ALSO PREPARED TO FURNISH FULL INFORMATION RELATIVE TO ELECTRIC SIGNS.

United Electric Light Co.

SPRINGFIELD, MASS.

Advertisement in Springfield Newspaper.

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Alliance to Have an Electric Show.

The Alliance Gas & Power Company will hold an electric show from April 14 to April 18, inclusive, at Alliance, O. It is planned to make as complete a demonstration as possible of every current-consuming device and the organization work already accomplished indicates that the affair will be an entire success.

Meeting of Ohio New-Business Committee to be Held at Dayton.

The Committee on New Business Cooperation of the Ohio Electric Light Association will hold a meeting at the Dayton Club, Dayton, O., on Wednesday, April 15. At the morning session an address of welcome will be made by Mayor George W. Shroyer and a paper will be presented by E. L. Callahan, of Chicago, entitled "Suggestions to Assist Central-Station Salesmen to Secure New Business."

During luncheon there will be an address by Charles Wuichet.

At the afternoon session there will be a round-table discussion covering the following topics: "How Can This Committee Assist The Small Companies In Obtaining New Business?" "The Handling of the Chronic Kicker;" "The Wiring of Old Residences;" "What Per Cent of Gross Revenue Should Be Expended For New Business, and How Should It be Divided Between Salaries, Advertising and Miscellaneous Expense?" "What Benefits May Be Derived From Commercial Application of Electric Heating Devices?" "What Disposition Can Be Made of the By-product of Woodworking Factories?"

Other topics may be introduced by sending them in advance to the chairman of the committee, Thomas F. Kelly, of Dayton.

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Effective Washing-Machine Campaign in Pittsfield.

A concrete example of the benefits to be derived from co-operation in the electrical industry may be found in Pittsfield, Mass., where an effective washing-machine campaign was executed by the Pittsfield Electric Company, working in connection with the machine manufacturers, contractors and dealers.

In planning the details of the campaign it was decided to share the profits accruing from the sale of the machines with every central-station employee and every employee of a contracting firm who would turn in to the sales department the names of prospects. The details of this scheme are described fully in a communication sent to all employees and published in the daily papers in connection with the company's advertising, as follows:

"The Pittsfield Electric Company will run a washing-machine campaign during the month of January, 1914. The machines handled will be the Thor Electric and the Red Electric. The price of the Thor Electric is $85 complete, installed in the house, including a man to demonstrate same but not including any wiring. The price of the Red Electric, under the same conditions, is $50.

"In event of the customer not wishing to pay cash for the machine he may obtain same by depositing $10 when the machine is delivered and paying $1.50 a week thereafter until paid for.

"A free trial for one week will be given to any one expressing a desire for same.

"Introducing the new sales policy January, 1914, the Pittsfield Electric Company will give to any of its employees, who brings in a prospect which afterwards results in a sale, a five dollar gold piece as soon as the first $10 on the account is paid up. This offer is also open to contractors and their employees.

"These prospects must be turned in to the new-business department where a careful record of them will be kept.

"The party turning in the prospect's name must have been in conversation with the prospect, or some member of the prospect's household and know that they would be interested.

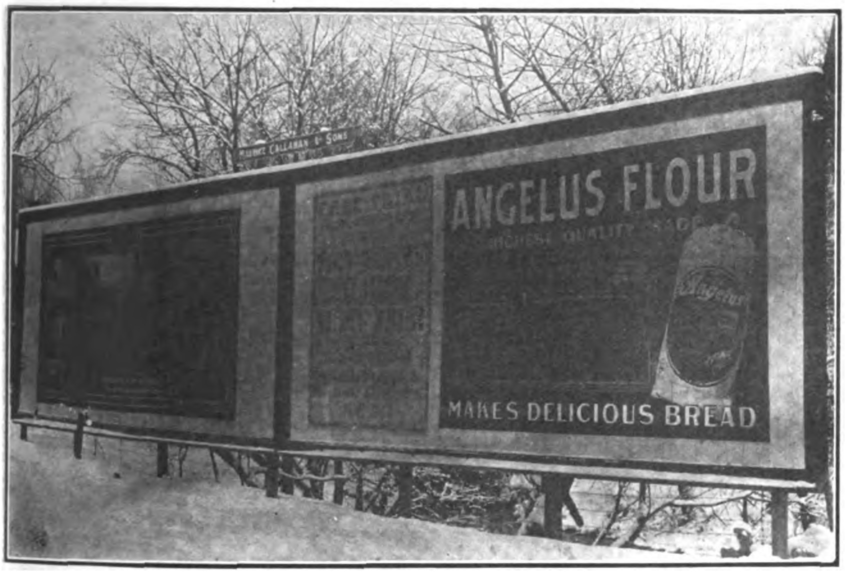


Fig. 1.—Billboard Containing Washing-Machine Poster.

"The main object of the campaign is to advertise electric service in the home and in the event of this campaign proving successful this policy will be carried out in other branches during the year. The success of this scheme depends upon the individuals of the electrical industry in Pittsfield.

"Will you please try and bring in at least one prospect thereby showing that you approve of this plan?

"A five dollar gold piece does not grow on every bush and this looks like pretty easy picking.

"Start the New Year right and make the year 1914 the most successful year the Pittsfield Electric Company has ever known.

"After a washing machine has been installed, the customers may receive a five-dollar credit for every washing machine which they are able to dispose of, providing we are not already working on the prospect."

The washing-machine manufacturers supplied the Pittsfield company with considerable attractive literature dealing with the economy and convenience of electric washers, and also with suitable cuts to be used in newspaper advertising. Billboard posters were also furnished, the central station paying only for the space used in every case. Circulars written in Chinese were a feature of the campaign and these brought several sales. The machines necessary to place with prospects desiring a demonstration were furnished directly by the manufacturers who billed the Pittsfield company only for the washers actually sold.

Early in the campaign the contractors were called together and explained the details and all entered energetically into the spirit of the movement, not so much on account of the profits in sight, but because of their belief that a campaign of this kind must necessarily create a lasting influence and give impetus to the slogan, "Do It Electrically."

A sample of one of the newspaper advertisements used during the campaign is reproduced herewith, also one of the posters used on the local billboards. A series of letters were sent to all customers of the company, inclosing literature bearing on the merits of electric washers, and flyers, etc., were also sent out with all of the monthly bills.

The first letter, which brought many direct returns follows:

"Within the next few days we will bring to your personal attention the Thor electric home laundry machine.

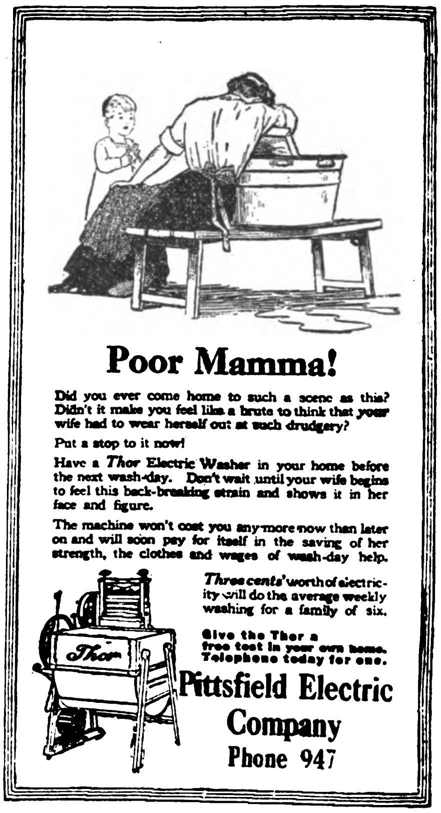
"After thorough and exhaustive tests we have decided to recommend this machine to our customers as embodying the greatest number of requirements for use in the home.

"The machine has a reversible power wringer which makes that part of the washing easy and shortens the time in which the clothes must dry.

"It is a cylinder-type machine, the same idea that is used in the big laundries, and absolutely does away with hand rubbing and wear on the clothes.

"It washes efficiently and in a sanitary manner anything from your largest blankets to your smallest and daintiest handkerchiefs, doing all this in less than one-half the time required when done in the old way.

"We call your attention to our plan whereby, if you are interested, you may see the machine in your own home, under your own conditions, washing your own clothes. This means that you may have the Thor in your own home for one week with no obligation whatsoever to yourself beyond telling us to take it away if you do not want it. Very truly yours, etc."



Poor Mamma!

Did you ever come home to such a scene as this? Didn't it make you feel like a brute to think that your wife had to wear herself out at such drudgery?

Put a stop to it now!

Have a *Thor* Electric Washer in your home before the next wash-day. Don't wait until your wife begins to feel this back-breaking strain and shows it in her face and figure.

The machine won't cost you any more now than later on and will soon pay for itself in the saving of her strength, the clothes and wages of wash-day help.

Three cents' worth of electricity will do the average weekly washing for a family of six.

Give the Thor a free test in your own home. Telephone today for one.

Pittsfield Electric Company
Phone 947

Fig. 2.—Newspaper Advertisement.

The campaign described resulted in 100 prospects being turned in the first month and almost double that number the second. All electrical interests of the city entered into it and the Pittsfield company has the reputation of doing things. H. W. Derry, general contract agent of the Pittsfield Electric Company, is largely responsible for the success of the campaign, which was planned and executed under his personal direction.

Electric Sign Data

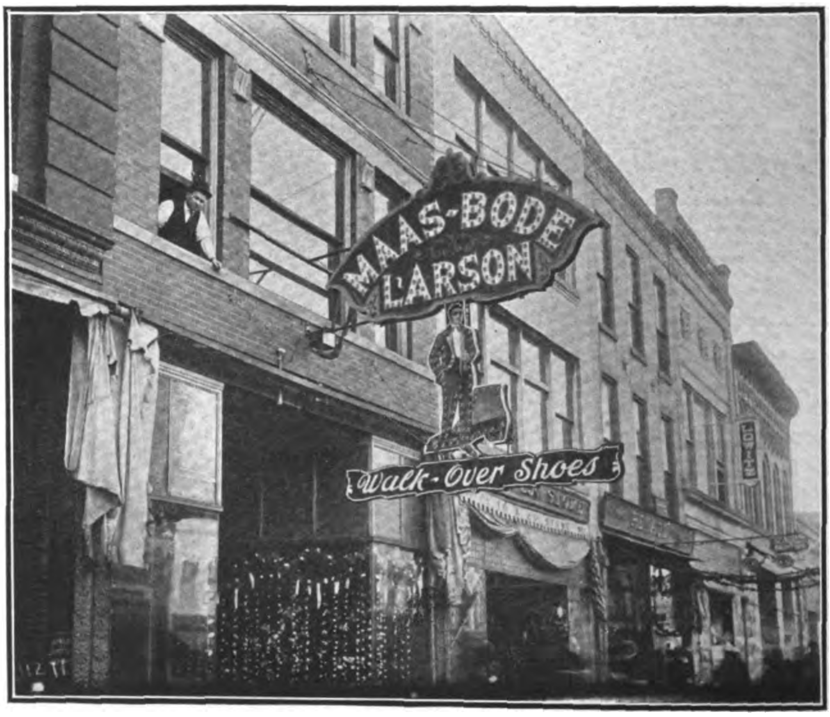
Suggestions Regarding Sign Construction.

It is not the purpose here to attempt to advise sign manufacturers how they should construct their signs, but it frequently happens that if central-station and sign salesmen are conversant with the general principles that govern approved sign construction much better results can be obtained. The prospective customer always elicits more interest in a proposed sign if he is allowed to make suggestions concerning the make-up of the text and the effects desired, and by friendly guidance on the part of the salesman the manufacturer can be supplied with sufficient workable data from which final sketches can be prepared. Too often all the details are left with the manufacturer who is supposed to read the mind of the purchaser.

Sign letters and letters of solid electric signs can, of course, be any size, there being no limit but the sky. For signs over the sidewalk, however, if the limit of the size of letters to 24 inches is maintained, it will give a city a very neat and attractive appearance and there will never be trouble with city officials, civic leagues or city councils and commissions over sign ordinances. In setting this 24 inch limit, a one line sign, in other words, one line of electric letters should be strictly adhered to, and if the customer desires a two line sign, a smaller letter should be used.

In roof displays and roof signs, the conditions are reversed and the larger sign you can get, the more satisfied your customer will be.

When planning roof display, care should be taken to figure over the sign desired, and see that there are not too many letters to go into the desired space. The distance the sign is to be read is, of course, a factor in determining the size and no rule can be laid down regarding this as there is no definite distance at which signs can be read. A sign that can be read a mile in one city will not be read a quarter of a mile in another on account of the different atmospheric conditions.



Effective sign erected by the Federal Sign System (Electric) Chicago, admirably suited for shoe emporiums.

There are 123 five-watt lamps in the letters reading "Maas-Bode Larson" and 75 five-watt lamps in the familiar figure of the man stepping over a shoe.

The background is a deep blue enamel except the man and shoe, which are black and white.

Sign is double faced and each side flashes on and off alternately.

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Electric Signs in Kansas City Must Be Hinged.

An ordinance attacking overhead electric signs recently was defeated in the City Council of Kansas City, Mo., electric contractors leading in the fight against the measure. Another ordinance, passed several years ago, has been withdrawn from its niche, and will be enforced after the municipal election on April 7. The measure provides that all overhead electric signs must be hinged in order that they may be drawn back to the building during the day time. Not more than 5 per cent of the signs in use in Kansas City comply with the ordinance and electrical contractors are promised a period of extreme activity.

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Unique Sign of Tampa Electric Company.

An unique electric sign has been installed upon the office building of the Tampa Electric Company, of Tampa, Fla. It contains the words "Tampa Electric Co.," surrounded by rows of lamps representing electric feeders. To the right is shown an electric generator outlined in electric lights which are so controlled as to give the impression that the generator is revolving. The rows of lamps representing electric feeders are carried from this generator to a street car and a house, both outlined in electric lights. The street car is located at the top of the sign with the word "Railway" above it, while the house is located at the lower left and has the words "Light—Heat" beneath it. As the word "Power" is placed beneath the generator, the sign reads, "Railway, Light, Heat, Power." The sign hence fulfills its mission most thoroughly, giving not only the usual applications of electricity but illustrating each application. The slogan burns continuously, while the generator and electric-feeder lamps are so wired and controlled as to give the impression of rotation and motion respectively.

Electrical Construction

ORGANIZATION AND SYSTEM MEAN SUCCESS.

By **W. S. Hanbridge.**

To foster trade among the Electrical Contractors, to reform abuses and to secure freedom from unlawful and unjust exactions, to settle differences between its members, to promote more enlarged and friendly intercourse between its members and to diffuse accurate and reliable information among its members as to the standing of merchants, builders and others engaged in the erecting of buildings or the furnishing of electrical materials therefor:—these are the objects of the California State Association of Electrical Contractors, of which Mr. Hanbridge is secretary. This article was written by him for the "Daily Commercial News" of San Francisco, Cal. While the writer has dealt entirely with the Electrical Contractor, he feels that what he has said can be easily applied to any other business.

There are engaged in the electrical contracting business three kinds of contractors. This classification justifies the oft repeated criticism—"why is there such a variation in the bids submitted for electric work"—leaving out the fact that there is an extreme difference of opinion as to what certain architects mean when they make up plans and specifications. We might call them Progressive, Semi-progressive and Non-progressive.

In the progressive class are found those men who are giving all of their time to the studying out and putting into practice in their own business of all of the most up-to-date methods. Their idea is to have a perfect understanding of their costs; what is required to make a profit; what it costs them to do business; how to keep in touch with the most modern way of doing work; how to render perfect service to their customers and thus retain same, using only the very best standard materials; continually developing new fields and thus enlarging their possibilities.

These men also give a great deal of their time to their trade association and committee work that goes with such association. They have satisfied themselves that through association is the only way they can keep strictly up-to-date and hold their place in the front rank, which is necessary in order to make their business a success. They have learned the value of sitting down to the table with their competitors and discussing their various troubles and successes.

They have also learned that their competitor's troubles are their troubles, and that they both have to overcome the same difficulties, the same labor troubles, the same dishonest "peddling" of figures and non-payment of bills. They both deal with the same architects, who don't know how to write an electrical specification, or get up a good plan, and also the architects that get up a good specification and plan. They both use the same kind of material, that often fails to give results; in fact they have awakened to the fact that they both have the same troubles and that "two heads are better than one," and that an association of heads allows the complaints of many to be viewed from a number of different angles and be repaired from as many viewpoints.

It is only necessary for progressive contractors to attend these meetings, store away in their heads, for future use, the good points that are brought out, and they can call on same as they need them.

They have surrounded themselves with men that are progressive, who will guard the interest of a customer just as carefully as they will guard their own interest.

Progressive contractors are always members of their respective trade organizations. They are ever jealous of the good name of such organizations. Loyal at all times, willing to give as well as take, ready to defend and continually working to build up same to that high point where every fellow competitor will be a member and get the same results.

It does not mean that every progressive contractor succeeds, because he is by necessity a pioneer and in any place that it is necessary to do pioneering work some brave fellow must fall by the wayside, but if his fellows follow the path that he has helped to blaze, success is sure to crown their efforts, because these men have realized a long time ago that in order to build a more modern and perfect house, known as co-operation, they cannot have a foundation built up upon the rocks of pools. Attempts to gouge the public and other competitive methods are sure to fall from their own weight. Their foundation must be built so solid that nothing can creep in and spoil what the contractor has accomplished. To put it in a few words, "He builds well, who builds with knowledge."

The semi-progressive electrical contractor we meet often. He usually belongs to what we call the "show-me" class; that is, they say they want to be shown, but are seldom in such a receptive mood, as they know more than any one else around them, no matter what the subject may be. Sometimes they do and often they do not belong to the associations that are trying to build up their business. They make a practice of agreeing very nicely with themselves, but usually any plan that is advanced, although same may be approved, and be for the good of the majority, is all wrong. They are usually too busy to sit down and talk things over with their competitor, too busy to attend to meetings or committee work, unless they have some pet measure that they desire brought up. They are usually strong for street-corner meetings, at which every plan is criticised and found wrong if they are not advocates for same. While they are strong in condemning conditions, architects, contractors and others that do not follow the ethics of their trade or profession, they are generally the people to fall for a "peddled" bid, accept a poor credit risk, make mistakes in their estimates, have no cost systems, cannot see the use of same, in fact, their own personal bump of egotism is such that it is hard for a good live progressive idea to get into their business, but once in awhile one does get by, and as they reap the benefits of same, do they give the men or association the credit for having accomplished something for them? No! No! Far from that. The idea would never have been thought of if it were not for them.

Still they are useful to the progressive contractor when he can get them to associate with him, for although they will not allow themselves to be helped, many an electrical contractor who is progressive and has his mental notebook ever in hand, has been saved a bad credit risk, or avoided a bad condition, that our semi-progressive friend has dropped during his talk.

Most of these semi-progressive contractors endeavor to satisfy their customers and give them a square deal, but owing to the fact that they do not know where they stand, they are just as liable to hurt themselves as their customers. In fact, they are too often ready to meet a figure, ready to use any kind of material, ready to take a bad credit risk. If such electrical contractors can succeed under present conditions, it would be unnecessary to have organizations to better the business. They seldom speak a good word for any organization, or of what they are trying to accomplish; the result is, they destroy faster than they build.

How much better it would be if these men would all join together with their more progressive brothers and assist in building up the industry; doing their share of the work, and thus hastening the day when we would all be progressives.

Last but not least is the non-progressive electrical contractor. He was born a long, long time ago; his age entitles him to a great deal of wisdom. He has learned that the unprotected public knows very little about electrical wiring. His principal mission on this earth seems to be to separate the unsuspecting public from their money for a very poor job of wiring.

He rarely belongs to any organization that is working for the good of the business. He usually meets the organizer with a very determined "you have to show me first—if you succeed I am with you, but none of this pioneering game for me. If you fail, I am ahead." Occasionally he gets into an organization, but only stays long enough to find out that you can take out no more than you put in. In other words, not being willing to put in any time, money or effort, he gets nothing out of it. The result is he seldom wastes a postage stamp for the purpose of sending in his resignation and must chuckle with glee whenever he finds that the secretary has wasted one on him in an endeavor to notify him that he is in arrears.

What do such contractors care for the time given by more progressive contractors in an endeavor to better the business; they are not in business for their health. Their policy is "The public be damned"; its money they are after and their motto is "Get all you can of it, but be sure and don't give too much for it." What do they care for the electrical contracting business? There will be business when they are dead and gone.

If you could follow their trail you would find that they were the men before the day of the underwriters' inspector; they did not even put the necessary wire in a building to make the lights burn. You will find their path strewn with broken promises and disputes, you will also find them to be the contractors that are today causing the departments of electricity the most trouble, and objecting to every progressive movement that is brought up in the shape of ordinances, rules, etc., for the benefit of the business.

They never have realized, or if so, do not care, that a safe job of wiring is absolutely necessary for the protection of life and property.

Among this same class of contractors can be found the handy man, who is willing to do anything from cleaning out the basement to painting the roof. Knowing nothing about the business he takes chances that a contractor who knew would not dare take. In fact, he is the leech of the business.

In closing I will say to you, electrical contractors, to what class do you belong? Are you progressive, semi-progressive or non-progressive? If you are not in the right class, why not get there at once, as the time is coming when you must be progressive or drop out of the race.

How about you, Mr. Owner, Mr. Architect, Mr. Builder and others who may be buying that commodity known as electric wiring, are you buying the good safe kind that Mr. Progressive Electrical Contractor is selling, or are you buying "just lights" that Mr. Non-Progressive Electrical Contractor is selling? Taking a chance that no accident may occur, or are you just imposing upon poor good-natured Mr. Semi-Progressive Electrical Contractor, who would not harm you intentionally, but often has to take advantage in self defense?

Won't you think of this the next time you are taking bids for wiring and the variation seems great?

Won't you stop and think whether or not you are asking Mr. Progressive Electrical Contractor to figure against Mr. Semi-Progressive and Mr. Non-Progressive Electrical Contractor?

Mr. Progressive Electrical Contractor will give you quality and service at the right price.

Mr. Semi-Progressive Electrical Contractor will do the best he can, as he does not know how far he can go without hurting himself, and the result is quality bad and service poor.

Mr. Non-Progressive Electrical Contractor intends to get your money and give you nothing at all if he can get away with it.

Is this not a good reason for the variation in bids on electrical wiring?

Electrical Equipment of Brunswick Lunch.

A number of special electrical features are incorporated in the restaurant of the Brunswick Lunch Company at 442 East Water Street, Milwaukee, Wis. This building contains three floors and a basement, the first floor being devoted to a dairy lunch; the second floor, to a grill room seating about 100 people, and a kitchen; the third floor, to a private banquet hall seating about 40 people, a serving room, bakeshop and office and the basement, to a laundry, refrigerating plant, and other power applications.

Power is obtained from the underground conduits of the Wells Power Company, over its 220-volt three-wire lighting mains and its 220-volt power mains. At the service panel are located the two watt-hour meters for lighting and power service together with the service switches and cutouts. From the service panel a two-wire power feeder is carried to a power cabinet and a Campbell time-switch located in the basement. The power cabinet is divided into two sections, one of which is fed through the time switch and the other direct from the power mains as shown in the diagram. The time switch is set to be open from five to seven-thirty in the evening, or during the period of peak load on the generating plant of the Wells Power Company. In this way the restaurant is enabled to obtain a reduced rate on its entire power consumption.

In the basement a sub-power cabinet is fed from the off-peak section of the main cabinet. This auxiliary cabinet supplies power to laundry machinery including a washing machine, mangel and extractor. To the off-peak buses in the main power cabinet are also connected lines leading to a meat chopper, ice machine, vacuum machine, potato peeler, and the first, second and third floors.

The upper part of the cabinet is devoted to the distribution of all-day power and supplies current to the all-day power feeder for the first, second and third floors, and to a brine pump in the basement. Provision is made for several spare feeders in each section of the cabinet.

The all-day and off-peak feeders

leading to the first, second and third floors are carried through a common distributing cabinet on each floor. The three-wire lighting feeders are carried through separate cabinets on each floor thus keeping the lighting and power wiring entirely separate. Both power and lighting feeders are carried in conduit throughout the entire building.

In the dairy-lunch room on the first floor illumination is obtained by means of six 30-inch semi-indirect fixtures, while 22 150-watt 15-inch "Compo" indirect units together with side bracket lights are used to light the grill room. Waterproof white-enamelled steel reflectors are used in the kitchens to permit of rapid and efficient cleaning. The lights throughout the building can be controlled from the cabinets or from push-button switches.

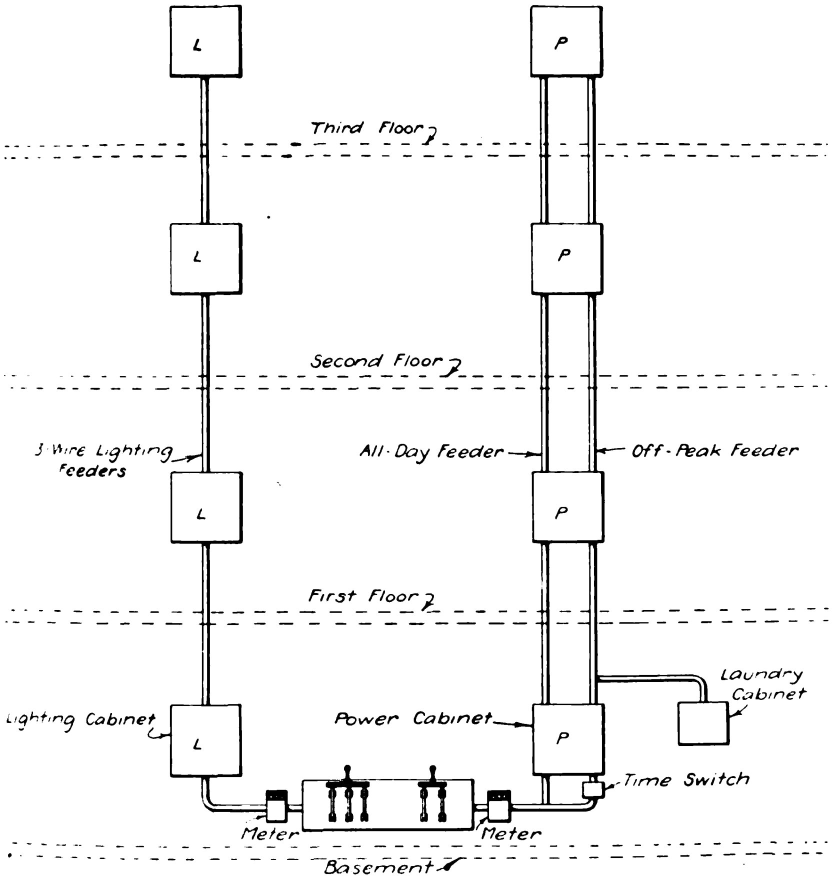

Diagram of Layout for Feeders and Cabinets.

Particular attention was paid in layin laying out the light circuits, to so group the lights that no groups of lamps need be kept burning when their light is unnecessary, thus making it possible to confine the illumination in all cases to only those sections of rooms, corridors, etc., where it is necessary.

Several other means were employed to increase economy of operation. One of these is a 14-station full-metallic intercommunicating telephone system. The object of incorporating such an extensive telephone system in a restaurant of this size, was to obtain greater efficiency by placing close to every employee means for communicating with all departments.

In order to prevent employees leaving lamps burning in the large refrigerators in the basement, the switches for these refrigerators are located on the outside together with small pilot lamps over the doors to serve as reminders to any employee who forgets to turn off the refrigerator lights after using them.

Among the other interesting features are bake-oven lights, stove lights and a three-horsepower push-button controlled dumbwaiter. The bake-oven lights consist of small incandescent lamps located in recesses on the exterior of the ovens in such a way that their light will be projected through small glass-covered openings into the ovens. Asbestos-covered wire is used where the wires are subjected to heat and each lamp is automatically lighted upon the opening of the corresponding oven door by means of a knife switch mechanically connected to the door. In order to secure sufficient and properly distributed illumination on the stoves in the main kitchen, Benjamin show-window-type mirror reflectors are placed near the edges of the stove hoods.

The push-button-controlled dumbwaiter is of the Burdette-Rowntree type and is provided with a push-button-controlled bell-calling system. This dumbwaiter is used to carry orders and material from one floor to another, a five-horsepower elevator being employed for freight and heavy material.

Among the power applications not previously mentioned are ventilating fans, two dish-washing machines of one horsepower each, a one-horsepower potato-peeler, a one-half-horsepower meat cutter, a three-horsepower ice-cream freezer, a one-fourth-horsepower remote-controlled vacuum-cleaning system and a 15-horsepower motor-driven six-ton ice plant. The ice which is manufactured is used only for serving purposes, the refrigerators throughout the building being kept cool by means of brine at low temperature forced through the refrigerators by a three-horsepower pump in the basement. The brine for both the ice-plant and the refrigerators is kept cold by means of compressing and expanding carbon-dioxide in place of the usual ammonia.

The electrical equipment of the building was installed by Henry Newgard & Company, of Chicago and Milwaukee, the elevators and dumbwaiters by the S. Heller Elevator Company, of Milwaukee, and the lighting fixtures by Grassler and Gezelschap, also of Milwaukee.

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Wiremen's Qualifications.

The question what are the qualifications of a wireman has been much discussed in England lately and in connection with the controversy that is at present raging between electrical wiremen and their employers, it will doubtless continue to the fore for some time. Demands for higher pay and better conditions are met with demands for credentials of fitness to ensure that shoddy work shall not be put in. The London Electrical Masters Association, which includes many of the leading installation contractors in the London district, has just issued a new code of rules in the course of which the following definitions or descriptions are put forward for the men's acceptance.

Wireman.—A fully qualified wireman must be over 21 years of age, and have served an apprenticeship or have been engaged in the trade for a period of not less than seven years.

Improvers or Assistant Wiremen.—Shall either have been indentured for a term of not less than three years, or have been continuously engaged by a responsible firm or firms for a similar period in learning the trade of wireman, but have not the qualifications mentioned for a wireman.

Apprentices.—All apprentices shall be properly indentured for a term of not less than three years.

Co-operation With Central Stations.

Many central stations in the country are today willing to co-operate with contractors if the latter will do their part in making such a proposition feasible. In a number of cities the central stations are willing to pay the contractor for a job of wiring and collect from the consumer in installments, which are added to the bills for the monthly consumption. In other cities the central station is willing to do the soliciting for new work and turn the contracts over to local contractors when the customer has been secured.

To make the latter practice most feasible the central-station solicitor should be able to quote a price for a given job of wiring at the time the prospect is solicited. Where it is necessary to call in a contractor after the house owner is interested and have him estimate the job, and even then perhaps not be able to name a price upon the spot, there is danger of losing the prospect. This was pointed out by P. L. Miles in a paper read at a meeting of central-station commercial men in Toledo, O., on February 25. Mr. Miles also pointed out that this objection could be overcome if estimates were based upon some simple scale of prices such that the solicitor would be able to quote a price by simple inspection of the premises. Such scales of prices can be based upon a flat rate per outlet, flat rate per room and various other systems which are equally or nearly as simple.

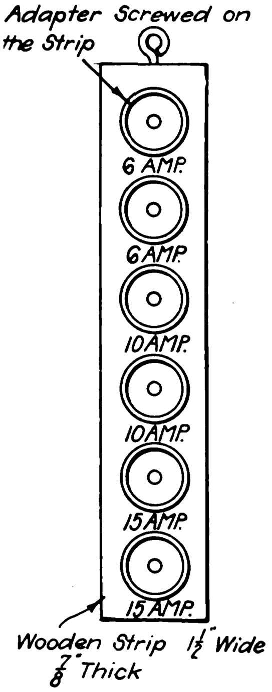
Objection to this system is sometimes made by contractors for the reason that some houses will run above the average price, while others fall below it, and the contractor may consequently be involved in a loss upon certain particular jobs where the estimates are made upon such a basis. If, however, average prices are used in such an estimate, the contractor will gain as much upon those which fall below the average as he loses upon jobs which fall above the average, and consequently in the course of a month should come out with the same margin of profit as if each job had been estimated upon its merits.

If the contractors in any town can agree among themselves upon such a scale of prices it will greatly facilitate solicitation by central-station salesmen and while increasing the efficiency of the latter, will throw a large amount of additional business into the hands of the contractors. Many central stations are willing to follow out such a scheme of co-operation if the contractors show a disposition to carry out their end of the agreement.

Scales of prices of this nature are already in effect in certain Ohio cities such as Toledo, Dayton, Cleveland and Columbus, and also in many cities outside of that territory, such as Baltimore, Boston and New York. It is not an untried experiment, and with a carefully chosen scale the contractor is assured an increased amount of business at a fair average profit. Co-operation of this kind will assist both the contractor and the central station and will at the same time promote their cordial relations.

Plug-Fuse Holder.

The accompanying illustration shows an arrangement for mounting plug fuses so as to be conveniently available for use.



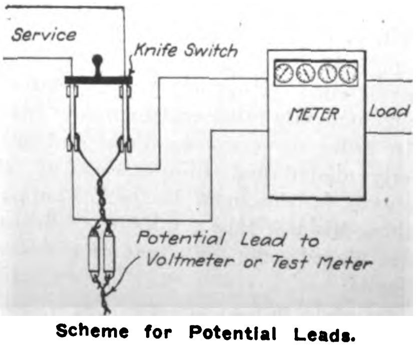
Plug-Fuse Holder.

A wooden strip 1.5 inches wide and seven-eighths inch thick has lamp adjusters mounted upon it in any convenient number. A screw-eye on one end enables it to be hung in a convenient place. The fuses are screwed into these adapters and are then available for use at any time. It is well to mark the carrying capacity of each fuse at its side so that the correct fuse can be picked out readily.

Edward Machette.

Connecting Potential Leads in Meter Testing.

When testing meters the potential circuit can be conveniently connected by making use of the following arrangement. Two cartridge fuses of about 40 or 50-ampere size have a piece of No. 10 copper wire threaded through them and they are then filled with lead. These are connected in the potential leads and at the upper ends of these leads another piece of No. 10 wire is soldered on and bent in the shape of a hook. These terminals are hooked over the switch blades or other convenient place and the lead weight preserves good contact.



Scheme for Potential Leads.

George W. Martin.

Wiring Ordinance Adopted in Memphis.

An ordinance regulating the installation of electric wiring in public buildings has been passed by the City Commission of Memphis, Tenn. It also provides that all wires in the business center of the city be placed in rigid iron conduits.

Among the Contractors.

The Avery-Loeb Electric Company, 114-116 North Third Street, Columbus, O., has secured the wiring and lighting contract for the new Chapman Theater to be erected in that city. The figure for the basic work is $2,000. The house is designed for vaudeville, as well as moving pictures, and will have a fully equipped stage. A novel feature of the lighting will be liberal use of the indirect system. The company has also recently secured the following contracts: Rewiring the Norwich Hotel, Columbus, involving about $1,000, in preparation for the placing of telephones in each room; electrical work on the Hanna Paint Company building, Columbus, a six-story fireproof structure; wiring and cabinets for the new Hardin County Jail at Kenton, O.

The Hill Electric Company, which is now under the management of Harvey Hill and Julia M. Hill, has recently moved into new and larger quarters at 110 West Lincoln Avenue, Wellington, Kans. This company deals in all kinds of supplies, besides doing a general electrical contracting business.

The McKeever Electric Company, Columbus, O., is the successful bidder for the lighting installation on the new Williams bridge, north of the city. The contract calls for 15 standards, each having lamps aggregating 250 watts, and amounts to $1,500. The bridge is to be over a half mile in length and will cost $125,000.

A contract has been secured by the Erner-Hopkins Company, 45-55 East Chestnut Street, Columbus, O., for a 640-horsepower, 3-phase, 440-volt, 60-cycle motor, equipment from the Yellow Poplar Lumber Company, of Ironton, O., which is reconstructing its plant, one of the largest in the state. The Erner-Hopkins Company is now installing the power feeder for the filtration plant of the Lima State Hospital, Lima, O. The contract amounts to $7,000. The company is also at work on the wiring, light and power equipment for the local plant of the Ford Automobile Company, the building has four stories and a basement. This contract calls for $7,800.

Charles A. Gibson has recently established an electrical contracting business at 9 South Stanislaus Street, Stockton, Cal.

A recently established electrical contracting and fixture business is that of the Home Electric at 321 North California Street, Stockton, Cal.

The Newberry Electrical Company, of St. Louis, Mo., which recently secured the wiring and other contracts for the new Southeast High School in Kansas City, Mo., will use Kansas City union workmen. Union sympathizers protested against awarding public contracts to companies who use nonresident labor. The agreement to utilize Kansas City workmen on the high school followed.

The McMaster Electric Company, of 135 East Spring Street, Columbus, O., has been awarded the contract for the electrical work on the moving-picture theater and store room at Linden, a suburb of Columbus.

Clark & Schuck, of Perth Amboy, N. J., have been awarded a contract for the installation of electrical fixtures in the new Y. M. C. A. building on Jefferson Street.

The N. C. Pickard Electrical Company, which recently established a branch in Kansas City, Mo., will retain that at Kansas City, Kans. N. C. Pickard will supervise both. A feature of the new establishment is a revolving disk, several feet below the level of the display window proper, which permits the exhibition of electric irons and other accessories. The Pickard Electrical Company will shortly resume work on the Young Men's Christian Association and Bethany hospital building on the Kansas side. Both were retarded by lack of funds by the city.

The electrical department of the Gas and Electric Appliance Company, of which E. W. Regensburger is superintendent, has recently added a complete line of electric fixtures to its stock at its store at 441 Sutter Street, San Francisco, Cal. The company has also lately engaged in the wiring business, in which it has been enjoying fine patronage.

W. S. Hanbridge.

Among the men who have brought the contractors of California into the strong organization which they have established, none has done so much as the secretary, W. S. Hanbridge.

Mr. Hanbridge knows the electrical contracting business from every angle, and his broad, active experience in the business, his unusually wide acquaintance among the trade and his ability as a mixer and organizer, together with his ever earnest interest in Association affairs and anything tending towards betterment in the electrical contracting business, has made him the logical man for the work he has done.

W. S. Hanbridge,
Secretary of the California State Association of Electrical Contractors.

He is secretary and treasurer of the California state association of Electrical Contractors, an office which he has occupied for the last three terms and to which all his time is devoted. He was also first president of the association. He is also a director of the National Electrical Contractors' Association.

Mr. Hanbridge is a Jovian, taking an active part in that organization's affairs, and was one of the first Pacific Coast members of the Society of Electrical Development.

A big man physically and one who is accustomed to take big, liberal views of things, Mr. Hanbridge is a man that is highly esteemed by all who come in contact with him.

Important Electrical Contract on Central-Station Building.

The new structure to be occupied by the St. Joseph Street Railway, Light, Heat & Power Company, located on the southwest corner of South Sixth and Francis Streets, St. Joseph, Mo., will be when completed one of the most up-to-date and attractively lighted buildings of the West.

The outside walls will contain approximately 5,000 lamps arranged to represent large butterflies in various colors, American Beauty roses, flambows with shooting flames, rope chains of gold, etc., covering the entire facade surface of the building.

The entire building is to be wired in iron conduit and the arrangement of wiring the interior of the building for demonstrating electrical devices will be very elaborate.

This work is being done by the St. Joseph Electrical Company, 117 South Eighth Street, St. Joseph, Mo.

Electrical Construction in Rochester.

During the past year there was great activity in construction in Rochester, Minn., in which the firm of E. M. Raetz & Company took a prominent part. Among other work of the more customary character the following may be mentioned as of interest.

The Clinical Building of Drs. Mayo was equipped with a number of motors and a signal system for quickly locating persons in the building. A telephone system was also installed, providing for intercommunication and for connection to the city exchange.

The power plant of the State Hospital was completed, the equipment including coal and ash-handling machinery, automatic stokers, generators, switchboard, wiring and accessories. Two new buildings were added to St. Mary's Hospital, as well as a new power plant. The Nurses' Home connected to the latter institution is a four-story building and this was completely equipped electrically. The Service Building was provided with a modern kitchen equipment, including motor-driven appliances, refrigeration and ice-making plant, and electric elevator. There is also a signal system with pilot lamps which are controlled from the patients' beds. A new laundry was installed with modern motor-driven machinery.

New lighting equipment was installed in the Kahler Hotel, the Union National Bank and the store of E. A. Knowlton Company, including show windows.

The First Baptist Church, just completed, is equipped with indirect fixtures and a motor-driven blower for the organ and signal lamps connect the organ loft with the pulpit and the front of the church.

The Schuster Brewing Company installed alternating-current motors throughout its plant, replacing the direct-current motor drive that had previously been used.

Dollar Wiring Kinks.

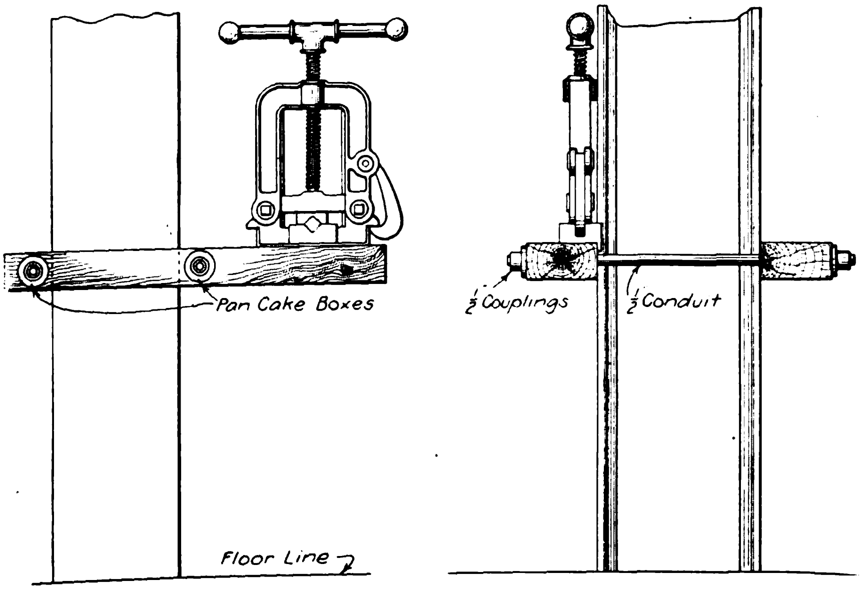
Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Mounting Vice In Steel Building.

The accompanying illustration shows a good method for setting up a vice in a steel-and-concrete building, where it is often inconvenient to carry a bench from floor to floor.

The vice is first screwed to a piece of two-by-four timber, then two holes are bored large enough to take one-half-inch conduit and as far apart as the width of the steel column. A similar piece is prepared to go back of the column. Then two nipples are cut as shown and a pancake box used on each end of the pieces of conduit for washers. The clamps are tightened up by using half-inch nipples.

Samuel Gelbman.



Mounting Vice In Steel Building.

Metal Molding.

It is very troublesome and almost impossible for one man to run wires in metal molding and cap it up where there are long runs. This is especially true on side walls and ceilings or where there are a number of wires, because the wires will slip out between the capping and the molding.

To overcome this I cut five or six pieces of capping about an inch long. As the wires are laid in the molding I clamp one of these pieces every four feet. This holds the wires in place until the permanent capping is clamped on the molding. Almost any kind of a metal-molding job can be done in this way with only one man without a helper.

Alexander Fischer.

Straightening Wire.

Open cleat wiring can be made to look very well if the wires are stretched taut and all kinks taken out of them. The best method I know of for removing kinks in the wire is to fasten one end, after slipping the wire through the nail hole in a solid knob. Hold the knob at an angle to the wire and walk away with it, keeping some tension on the wire. This will iron out all the kinks very nicely.

Howard H. Douglas.

Recovering Small Tools.

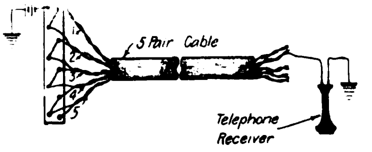
In wiring old houses it quite often happens that a knife or other small tool is accidentally dropped down a partition. I found that a good way to recover such tools is to utilize two dry cells, a suitable length of lamp cord, and two small magnets from an old door bell. One end of the cord is connected to the battery and the other to the magnets and the magnets are then let down in the partition. After dangling them around for a while one will soon feel the added weight on the magnets, due to the tool clinging to them, and they can then be carefully pulled up.

Herman Trask.

Cable Testing.

At times it is necessary for an electrician to test a cable alone. I have used the following method satisfactorily.

The accompanying illustration shows a five-pair cable with one end connected to a strip, *T*. On this strip one wire of each pair is connected to a wire of the adjacent pair, thus tying all the pairs together. The first wire is grounded through a battery. At the other end of the cable, one side of a telephone receiver is grounded and the other is used to locate the end of the wire connected to the battery. When found, this is labeled and it and its mate are twisted together. The wire of pair No. 2, which is now connected to the battery, is found by trial and it is then twisted with its mate and also labeled. This procedure is followed until each pair has been isolated.



Connections for Testing Cable.

Charles Harris.

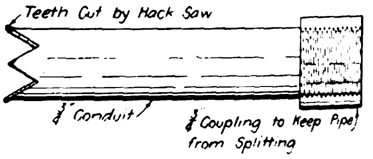
Changing the Tone of Gongs.

When many bells are to be put up in a building and it is desired to distinguish between the sound of the different bells, the following scheme may be used. The tone of the bell will be altered if a slit is made in the edge, which can be done by means of a hacksaw. As the resulting tone will depend upon the depth of this slit, it is possible to arrange a number of bells of the same size whose tones can be distinguished very easily from one another.

W. Weller.

An Improvised Drill.

While working recently on a conduit job which required the drilling of two holes to take three-quarter-inch pipe, I found myself without the proper drill. I made a drill by taking a piece of conduit six inches longer than the thickness of the wall; with a hacksaw I cut notches in one end of this, so as to form teeth, and then took a ball-peen hammer and spread the teeth with the ball end so that they would make a hole a little larger than the conduit. This drill is shown in the accompanying illustration. A coupling was put on the other end of the pipe so that the hammering would not knock it to pieces and split it. This was found to answer very nicely.



Drill Made from Conduit.

F. F. Andriano.

Public Service Commissions

Conducted by William J. Norton

DECISION OF THE COURT OF APPEALS IN THE KINGS COUNTY LIGHTING COMPANY CASE.

The recent decision of the New York Court of Appeals in the Kings County Lighting Case affirms the decision of the Appellate Division in part and remits the proceedings to the Public Service Commission (First District) for redetermination. The Court, in reviewing the decisions of the commission and lower court, rendered important holdings on disputed questions in valuations of public utilities.

History of the Case.

The Public Service Commission for the First District issued an order, October 20, 1911, reducing the price to be charged for gas in the Thirtieth Ward in the Borough of Brooklyn (2 P. S. C. R. 659) and in pursuance of a rehearing held upon the application of the defendant, a subsequent opinion and order, November 17, 1911 (2 P. S. C. R. 714). The company appealed to the court, and May 9, 1913, the Appellate Division of the Supreme Court for the First Department filed an opinion reversing the determination of the commission and directed that the matter be remitted to the commission for action in accordance with the opinion of the court. (Reprinted in 4 P. S. C. R. Advance Sheets No. 5 p. VIII.) From this decision the commission appealed and on March 24, 1914, the Court of Appeals rendered a decision as above stated. The Appellate Division held that the decision of the commission was wrong in three respects—allowance for going value, for paving over mains, and for annual appreciation in the value of land. The decision of the higher court is chiefly concerned with these questions.

Going Value.

In the commission's decision no distinct and separate allowance was made for going value but the commission held that it was taken into account in valuing the plant as a "going" and not as a "defunct or static" concern and that it was also considered in fixing the fair rate of return. The Appellate Division contended that there was no proof of the latter fact in the record.

"Thus the first question certified requires us (the Court of Appeals) to decide whether "going value" is to be appraised as a distinct item, or whether it is sufficient to regard it as something vague and indefinable to be given some consideration but not enough to be estimated. The valuation of the physical property was determined by ascertaining the cost of reproduction less accrued depreciation. Preliminary and development expenses prior to operation were included, but no allowance was made for the cost of developing the business. By that method the plant was valued in a sense as a "going concern." In other words "scrap" values were not taken; but to say that that sufficiently allows for "going value" is the same as to say that "going value" is not to be taken into account. The problem is to determine what is fair to the public and the company. The public is entitled to be served at reasonable rates and the company is entitled to a fair return of its investment on the value of the property used by it in the public service. (Smith v. Ames, 169 U. S. 466; San Diego Land Company v. National City, 174 U. S. 739; San Diego Land & Town Company v. Jasper, 189 U. S. 439; Minnesota Rate Cases, 230 U. S. 252.) It would have been entitled to a return on the valuation adopted by the commission, if it had no customers, but was just ready to begin business, whereas it had a plant in operation with an established business, which every one knows takes time, labor and money to build up."

Going Value in Condemnation Proceedings.

"We concur fully in what he (Mr. Justice Clarke) has said on the subject and in his conclusion that there is no 'logical difference between allowing "going value" in the valuation of a plant when it is to be taken entirely by the public and allowing the same element when valuing the same plant for rate-making purposes.' A case since decided should be added to the rate cases cited by him in which "going value" has been allowed, i. e., Public Service Gas Co. v. Board of Commissions, (87 Atl. Rep. (N. J.) 651).

"It is no answer to say that in condemnation cases the exchange value is taken, and that that depends on the rates charged, the thing to be determined in rate cases. Of course, a rule of valuation might be adopted in a condemnation case which would not work in a rate case; but if the cost of reproduction less depreciation rule be adopted, as appears to have been done in National Waterworks Company v. Kansas City (62 Fed. Rep. 853) and Omaha v. Omaha Water Company (218 U. S. 180), the leading condemnation cases in the federal courts in which 'going value' was considered, it is impossible to see why the 'going value' could not be determined in both classes of cases in precisely the same way."

Allowance for Early Losses.

"The investors in a new enterprise have to be satisfied as a rule with meager or no returns, while the business is being built up. In a business subject only to the natural laws of trade, they expect to make up for the early lean years by large profits later. In a business, classified among public callings, the rate-making power must allow for the losses during the lean years, or their rate will be confiscatory and, of course, will drive investors from the field. In the former class, the value of the established business is a part of the 'good will' and may be determined by taking a given number of years' purchase of the profits, or exchange value may be considered. In the latter case, a different rule must be adopted. * * *

"If a deficiency in the fair return in the early years was due to losses or expenditures which were reasonably necessary and proper in developing efficiency and economy of operation and in establishing a business, it should be made up by the returns in later years. If there was a fair return from the start the corporation has received all it was entitled to, irrespective of how much of the earnings may have been diverted to the building up of the business.

"To view the matter in another aspect, take the case of a public service corporation with a plant constructed just ready to serve the public. It is going to take time and cost money to develop the highest efficiency of the plant and to establish the business. Three courses seem to be open with respect to rate making, viz.: (1) to charge rates from the start sufficient to make a fair return to the investor and to pay the development expenses from earnings, a course likely to result in prohibitive rates except under rare and favorable circumstances; (2) to treat the development expenses as a loss to be recouped out of earnings, but to be spread over a number of years, in other words, as a debt to be amortized; that involves complications, but would seem to be fairer to the public and certainly more practical than the first; (3) to treat the development expenses, whether paid from earnings or not, as a part of the capital account for the purpose of fixing the charge to the public. The last course would seem to be fairest both to the public and the company, as well as most practical."

The opinion points out that this third method, approved by the Court, does not open the way to an overissue of securities, since it is concerned "not with the proper capitalization upon which to issue securities, but solely with the fair return which the company is entitled to receive from the public. Treating a reasonably necessary and proper outlay in building up a business as an investment for the purpose of determining the fair rate of return to be charged is far from holding that it should be treated as capital against which securities might be issued."

Further the Court says: "We do not say as matter of law that the third course above outlined should be adopted as an original proposition. That may present a question of economics, depending on the particular conditions involved." * * *

Losses Due to Poor Management.

"It is urged that an unprofitable business will thus have a greater value for rate-making purposes than one profitable from the start. That again overlooks the fundamental consideration that a public service corporation is entitled to a fair rate of return from the beginning of its investment and no more. If the shareholders have been deprived of a fair return on their investment because of the time and expense reasonable and properly required to build up the business, they have, to the extent of that deprivation, added to their original investment and are entitled to a return upon it." * * * Experience is proverbially expensive. With the advantage of that experience the same or an equally efficient plant could be constructed today at a cost much below the actual and necessary investment of the company in both plant and experience." * * *

"Of course, a reasonable need for the service from the start and reasonably good management are assumed. While, within reasonable limits, service may be provided for anticipated needs, a company should not construct a plant in a wilderness and, after a city has been built around it, expect to recoup its losses while waiting, nor should it expect to recoup losses from bad management. I do not include in the latter mere mistakes or erros in judgment which are almost inevitable in the early stages of any business. The fair return is to be computed on the actual investment, not on an overissue of securities, and the failure to pay dividends to the investors must be due to the causes under consideration, not to an accumulation of a surplus or to expenditures for permanent additions or betterments, which are included in the appraisal of the physical property: in other words, the actual net earnings are to be taken."

Definition of Going Value.

"Making proper allowance for the matters just considered and perhaps for others which do not now occur to me, I define 'going value' for rate purposes as involved in this case to be the amount equal to the deficiency of net earning below a fair return on the actual investment due solely to the time and expenditures reasonably necessary and proper to the development of the business and property to its present stage, and not comprised in the valuation of the physical property."

Method of Determining Going Value.

"It remains to consider how 'going value, is to be appraised. That presents a question of fact, the determination of which is primarily within the province of the rate-making body. It is proper for this court, however, to indicate a permissible method or methods, as in People ex rel. Jamaica W S. Company v. Tax Commission (196 N. Y. 39) it indicated a rule for valuing a special franchise for taxing purposes, which has generally been followed.

"Obviously, the most satisfactory method is to show the actual experience of the company, the original investment, its earnings from the start, the time actually required and expenses incurred in building up the business, all expenditures not reflected by the present condition of the physical property, the extent to which bad management and other causes prevented or depleted earnings, and any other facts bearing on the question, keeping in mind that the ultimate fact to be determined is not the amount of the expenditures, but the deficiency in the fair return to the investors due to the causes under consideration."

Original Data Lacking.

The books covering the early periods of operation were not available. However, the Court held that the question should be determined upon the best evidence available.

"Here, I may repeat that mere difficulty in the proof would not justify a confiscatory rate. The value of the physical property was shown by opinion evidence as to the cost of reproduction. The same kind of evidence was given by two witnesses for the relator as to the cost of building up the business to its present state."

In regard to the testimony offered by one of the witnesses before the commission, the Court says: "He explained at length how he arrived at that figure. He assumed the existence of two plants, situated exactly alike in the same community and with the same physical property, (1) the actual plant with its established business; (2) a suppositional plant with no business. He then estimated the length of time and expense required by the second plant to develop its business to the stage and revenue of the actual plant. There would appear to be as good ground for admitting the opinion of a qualified expert on such a subject as on the cost to reproduce the physical property. Of course, the commission was not bound by that evidence. It had in addition the experience of the relator and its predecessor as to payment of dividends, the amount of capitalization of both, and the value of the physical property in its present condition determined as above stated. With nothing opposed to those facts and the opinion evidence it was not justified in ignoring the evidence of 'going value' or of merely attaching some inappreciable importance to it. (See Bonbright v. Geary, 210 Fed. Rep. 4, 54, 56)."

Paving Over Mains.

The commission made an allowance in its valuation for paving where the expense was actually incurred by the company. The lower court held that the full allowance should be made for the present value of the city paving over mains and services, even if the company had not borne the cost, on the ground that "it is a valuable advantage which the present owner has which a prospective buyer would have to pay for." On this question the Court of Appeals says: "The question has a double aspect. What will be fair to the public as well as to the relator? (Smith v. Ames, supra.) Should the public pay more for gas simply because improved pavements have been laid at public expense? The case is not at all parallel to the so-called unearned increment of land. That the company owns. It does not own the pavements, and the laying of them does not add to its investment or increase the cost to it of producing gas. The cost of reproduction less accrued depreciation rule seems to be the one generally employed in rate cases. But it is merely a rule of convenience and must be applied with reason. On the one hand it should not be so applied as to deprive the corporation of a fair return at all times on the reasonable, proper and necessary investment made by it to serve the public, and on the other hand it should not be so applied as to give the corporation a return on improvements made at public expense which in no way increase the cost to it of performing that service."

Appreciation in Land Values.

The Court of the Appellate Division held that the allowance of $35,000, in the commission's calculation of the company's income, as the annual increase in the value of the land of the company, was erroneous. "The land is used for the business of the company and is appropriate therefor. So long as the land is held and used for such purpose increase in value cannot be considered as income or as available for the payment of debts, taxes or dividends."

This opinion is sustained in the higher court in the following statement: "We agree with the Appellate Division that annual increase in the value of land is not income. Of course, under the rule of the Ames Case (supra), land might become so valuable as to require its use for other purposes and as to make a rate based on it unfair to the public. The present is not such a case."

ILLINOIS.

The Spring Valley Utilities Company was granted a certificate of public convenience and necessity authorizing the construction of a distribution system for the furnishing of electric current in the village of Mineral, Ill.

The Lena Electric Light and Power Company. The Commission has authorized the maintenance and operation of the Company's transmission lines constructed across the tracks of the Chicago Great Western Railroad Company at Pearl City, Stephenson County, in accordance with plans approved by the Commission.

INDIANA.

The City of Vedersburg has petitioned for authority to increase rates for electric lighting to private consumers. The city has been charging 8 cents and asks for a rate of 10 cents per kilowatt-hour.

MASSACHUSETTS.

Limiting Conversation on Party Lines. The Public Service Commission, after conference with officials of the New England Telephone and Telegraph Company, on the subject of limiting the conversation of subscribers on party lines to five minutes, has received from the company a statement which sets forth that it seems impracticable to establish a rule thus limiting conversations, but that co-operation may be brought about among subscribers to this result. It is suggested that the following statement be enclosed with bills to subscribers: "Satisfactory service on party lines depends very largely upon the willingness of the joint users to co-operate with one another in their demand on the service. The company accordingly respectfully requests party line subscribers to limit their conversations to five minutes when others wish to use the line, and to give immediate right of way in case of emergency calls." The Commission approves this effort on the part of the company.

The Old Colony Gas Company of East Braintree was authorized to issue 2,000 shares of new capital stock, 1,000 shares of common and 1,000 shares preferred, at $100 per share. The proceeds are to be applied to the payment of notes outstanding.

MISSOURI.

The Jefferson City Light, Heat and Power Company has been ordered to file a complete inventory of its property to be used in an investigation by the Commission of the rates and service of the company. A complaint was entered by the mayor of the city alleging excessive rates and inefficient service.

NEW JERSEY.

The Public Service Electric Company. The Board has ordered the Public Service Electric Company to comply with the terms of an ordinance with the city of Plainfield, under which it agreed to supply electric energy for lighting the municipal buildings of such municipality without charge. The company contested the clause in the ordinance holding that it constituted an unjust discrimination. The Board considered its jurisdiction in a controversy of this nature, and decided that it comes within its purview, being a necessary and predestined complement to the contractual rights and obligations of the ordinance. In its decision the Board says: "The Board is of the opinion that when a public utility bargains with a municipality for right of entry upon and occupancy of the public streets, the public utility acts in a unique capacity. In such capacity it may assume obligations to make a return for such franchise privileges as it seeks, and may express such in terms of money or service; it may in such capacity lawfully undertake to pave the streets traversed by cars, or undertake to pay to the municipality in money a certain portion of its receipts, or undertake to afford a stipulated amount of free service, such as free lighting, free telephone service and the like for municipal buildings. The obligation so undertaken is one assumed by the public utility as a bargainer with a body politic. It is one thing to promise service without charge when so bargaining; it is a radically different thing for a utility duly enfranchised to sell service to the public generally. In the one case it buys a particular privilege from a particular body politic; in the other case it sells services to consumers generally; in one case it buys a franchise, in the other it sells a service. The Board therefore, is clearly of the opinion that for the company to light without charge the public buildings of the city of Plainfield does not involve undue or unjust discrimination, but that the company is bound to afford such lighting service without charge to the city."

The New Jersey Power Company. The Board of Public Utility Commissioners has granted the Jersey Power Company permission to issue $40,000 of its capital stock, subject to conditions, for the construction of a new transmission line from Boonton to Wharton, by way of Fox Hill, Millbrook and Dover, with a branch to Rockway, a total distance of about 15 miles. The Company's application requested permission to issue stock for $50,000, but the Board holds that the issuance as specified is ample. The company, at the hearings, announced its intentions of leasing the power station of the Jersey Corporation at Boonton, and the discontinuance of the power plants at Dover and Bernardsville now operated by the Eastern Pennsylvania Power Company, the interests controlling these companies being practically identical. The conditions stipulated by the Board for the issuance of this stock are: (1) the Jersey Power Company must relieve the property of the Eastern Pennsylvania Power Company of a mortgage now held by a Pennsylvania corporation of the same name, and (2) that the company is not to undertake to furnish service locally in Boonton and Hanover Townships, except as specifically permitted by the Board. The Board further states that the Eastern Pennsylvania Company must arrange for the amortization of its power stations that are to be discarded, as well as that of the circuit to be displaced between Millbrook and Dover; the Board also goes on record that its approval of this stock issue does not imply its approval of a contract for the sale of power proposed between the Jersey Power Company and the Eastern Pennsylvania Power Company of New Jersey.

NEW YORK.

Several important matters are pending before the Public Service Commission which are not likely to be settled until the new commissioner has qualified. In the case of the application of the Astoria Light, Heat & Power Company for the authorization of an issue of 5.5 per-cent bonds to take up certain notes which it has given to the Consolidated Gas Company, the commission has deadlocked with two votes to two. The view taken by the new Commissioner will determine this controversy. George M. S. Schulze, recently appointed, has not qualified as commissioner in place of John E. Eustis.

OHIO.

The Ohio Light and Power Company was authorized to issue $2,255,000 of first-mortgage bonds to be sold at not less than 85 per cent of par value. The proceeds are to be used in the purchase authorized by the former public service commission, of the properties of the light, heat and power companies at Fremont, Lancaster, New Lexington, Newark, Fostoria, Mt. Vernon, Logan, Shawnee, New Straitsville and Crooksville. The Commission stated that the approval of the bond issue shall not be construed to mean an approval of the purchase or of the price to be paid for the different properties.

VERMONT.

Telephone Order Suspended. The application of the Franklin County Telephone Company and the Champlain Valley Telephone Company for a suspension of the recent order of the Public Service Commission on telephone rates was granted, pending an appeal by these companies to the Supreme Court. Provision was made for the refunding of the excess charged and collected above the rates prescribed by the commission from the effective date of the Commission's order, in case these rates are sustained by the court.

WISCONSIN.

The City of Sheboygan applied to the Commission for a certificate of convenience and necessity authorizing the construction of a municipal lighting plant. The applicant alleged that the present company, the Sheboygan Railway and Electric Company, is giving inadequate street lighting service and has applied for an increase in rates. The Commission denied the city's application, deciding that in view of the fact that the plant had changed owners, and that these owners had expressed a willingness to install the new equipment necessary to give adequate service, the city should not be burdened with an additional plant.

The Sheboygan Railway and Electric Company made application for a rehearing and reconsideration of the Commission's order of February 3, 1911, in which it decreased the rates for city lighting from $74 to $68 per arc lamp per year. The company desired to put this business on an actual consumption basis. The reasons assigned for wishing a rehearing were that there were errors made by the commission's engineers, that the company had now come under new ownership, and that the city desired to build a competing plant.

The Commission having already denied the application of the city for a certificate of necessity and convenience, decided that there were not sufficient grounds for a rehearing and therefore dismissed the petition.

The Milton Light, Water and Power Company was authorized to establish a minimum charge of 75 cents per customer per month.

The Milwaukee and Fox River Valley Railway Company was authorized to use $10,000 of the total issue of $25,000 of bonds, authorized by the Commission in November, 1912, to secure its outstanding indebtedness.

Discrimination Between Telephone Companies. Upon complaint of the Ettrick Telephone Company, the Commission investigated certain toll agreements and toll charges of the La Crosse Telephone Company, the Western Wisconsin Telephone Company and the Western Crawford County Telephone Company. The Commission held that there did not appear to be any discrimination against the Ettrick Company and the complaint was accordingly dismissed.

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Report on English Municipal Trading Undertakings.

As much interest has been manifested in the United States concerning the result of municipal operation of public utilities in English cities, United States Consul Halstead, of Birmingham, England. has prepared a comprehensive report thereon. It covers the street cars, gas and electric lighting, water, markets, etc., and shows the profits and losses, rates levied for all the different purposes, etc., in the cities of England and Wales. Gas is sold for domestic lighting supply at 26 cents to 87 cents per 1,000 cubic feet, and electricity for the same purpose at 5.5 to 12 cents per kilowatt-hour. Considerable profits accruing from operation of the municipal plants are shown as going toward the reduction of general taxes. The report was transmitted by the Department of Commerce to Congress, and has been printed as House Document No. 710; it contains 24 pages. Copies may be obtained free by those who apply to their representative in the United States Congress.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 200.—Electrically Operated Phonograph.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

No. 204.—Highest Voltage.—What is the highest known voltage ever developed in any apparatus?—M. L., Oak Park, Ill.

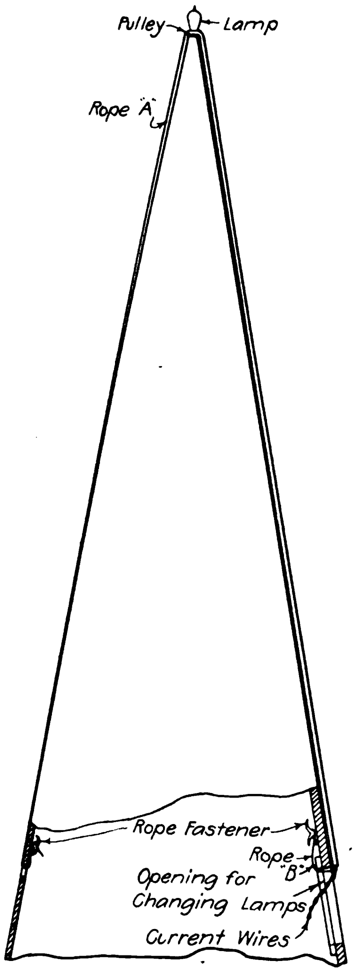
No. 213.—Electric Motorcycle.—Is there on the market at the present time an electrically propelled motorcycle or quick-delivery car? If so please describe same briefly and give manufacturer's address.—A. J. L., Hazelton, Pa.

No. 215.—Suction Street Sweeper.—Has the use of electrically operated suction street sweepers ever been tried out by any street-railway company to keep its tracks free from dust and dirt? The kind I have in mind would be operated from the trolley line just like a snow sweeper, but instead of throwing the dirt over the rest of the street would suck it up into a dust compartment.—V. B., Milwaukee, Wis.

No. 216.—Frosted Nitrogen-Filled Tungsten Lamps.—The new nitrogen-filled tungsten lamps produce an intense, concentrated light so that looking into the exposed lamp causes very harmful glare. Is frosting of the bulb recommended for reducing this difficulty, or does frosting cause the lamps to run too hot? What effect has frosting on the life and efficiency of these lamps?—D. A. T., Albany, N. Y.

Answers.

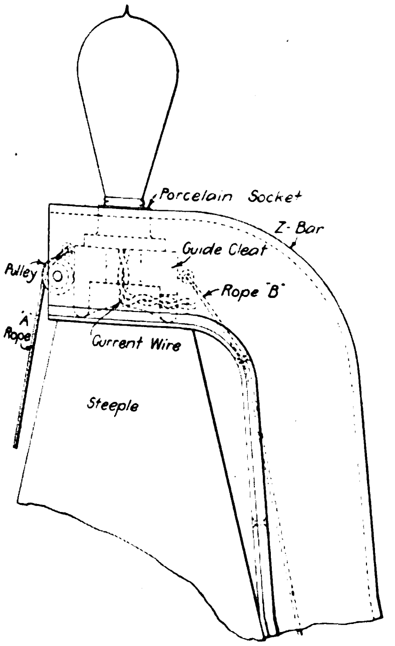
No. 199.—Steeple Lights.—We have a proposition of putting an electric light on top of a church steeple which is extremely high. The nearest opening to the top of the steeple is 30 feet below the apex. I should like to inquire through your columns whether any contractor ever had a job of this kind and as to how he arranged things so that the


Pulley
Lamp
Rope "A"
Rope Fastener
Rope "B"
Opening for Changing Lamps
Current Wires

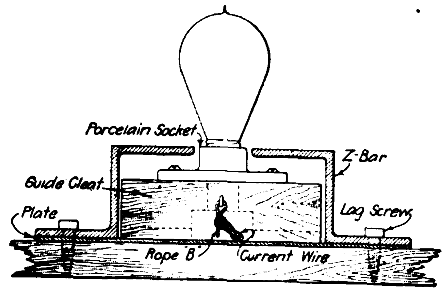
No. 199.—Fig. 1.

lamp would be protected from hail and easily lowered for replacement, so as not to require the frequent services of a steeple jack. Being a church tower, any device installed must, of course, be of sightly nature.—F. W. R., Freeport, Ill.

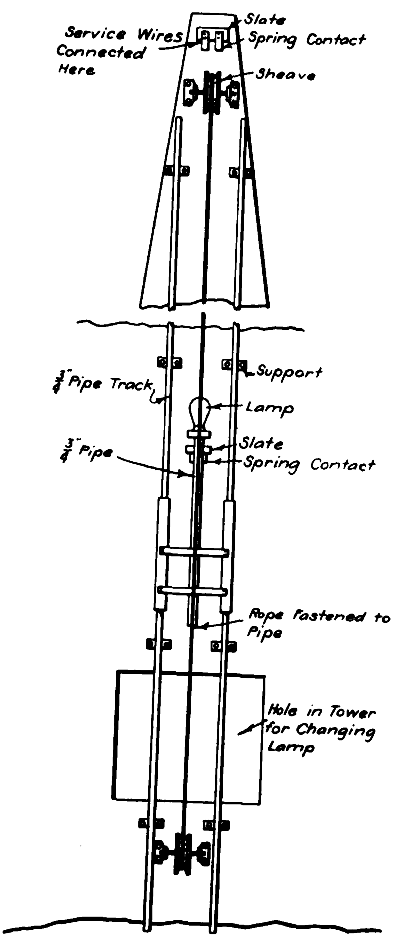
In my estimation the simplest and easiest manner of renewing or replacing a burnt out lamp used for illuminating the top of a steeple is by means of a light structural-steel runway composed of Z-bars and plate which make a guide for hoisting and lowering lamp to and from top. Fig. 1 shows lamp in position, where runway is shown on right-hand side (lowering rope *B* and current wires pass through this) and hoisting rope *A* is shown on left-hand side. An opening is made at a convenient place in tower for changing lamps, and here the ropes *A* and *B* are fastened. Fig. 2 is an enlarged view of the top and shows lamp in position at top of steeple. The Z-bars are bent to a suitable radius with a plate riveted to under side. The lamp in porcelain receptacle is mounted on a cleat through which the current wires lead, and on each side of cleat are screw-eyes which take hoisting and lowering ropes *A* and *B*. A suitable pulley is also put at end of Z-bar to act as a stop for lamp and a guide for rope *A*. Fig. 3 is a detailed sectional view to show how the two Z-bars are fastened or riveted to plate, forming a runway or groove for cleat to slide in; this is lag-screwed to side of steeple. I believe this construction makes for the lightest and best solution for this problem, on account of the light weight of Z-bars and plates that can be used. It also does not disfigure the steeple.—D. D. S., Chicago, Ill.


Porcelain Socket
Z-Bar
Guide Cleat
Pulley
Rope "B"
A Rope
Current Wire
Steeple

No. 199.—Fig. 2.

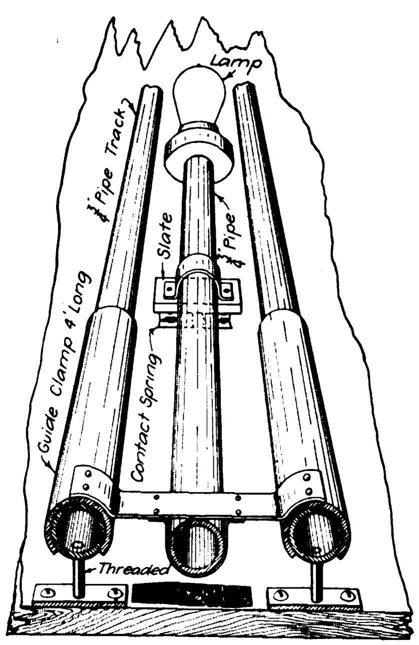

Porcelain Socket
Z-Bar
Guide Cleat
Plate
Lag Screw
Rope "B"
Current Wire

No. 199.—Fig. 3.


Service Wires Connected Here
Slate
Spring Contact
Sheave
¾" Pipe Track
Support
Lamp
¾" Pipe
Slate
Spring Contact
Rope Fastened to Pipe
Hole in Tower for Changing Lamp

No. 199.—Fig. 4.

Take two lengths of three-quarter-inch pipe, each 30 feet long. Fasten same to the steeple as per Figs. 4 and 5, using about five supports on each side. Then make a carriage to travel on this track or guide as follows: take a piece of pipe four feet long and make two sliding clamps to fit over the track as per sketch; fasten same to the four-foot pipe, the first crosspiece to be two feet from top of pipe and the next one nine inches lower. Having the top of pipe two feet clear without clamp guides allows one to raise the lamp high enough since the upper sheave is lower than the lamp. Then draw a rope through both sheaves and fasten both ends on lower end of the carriage; this makes an endless rope and by drawing this either way one can lower or raise the lamp as wanted. Then make a slate block with two spring contacts, connected to the lamp terminals, and fasten same on the carriage about 12 inches from the top; also make a slate block with two stationary contacts for mounting on top of the track. Having spring contacts on at least one of the blocks is sure to give a good connection and by placing the spring contact block on the carriage makes it easy to repair same if the spring should break. Then by connecting the service wires to the top contacts you will have no trouble with a moving wire or cable, which is liable to get out of order. The service wires may be run up through the two long pipes, these serving also as con-


Lamp
¾" Pipe Track
Slate
Pipe
Guide Clamp 4' Long
Contact Spring
Threaded

No. 199.—Fig. 5.

duits so that the top of the steeple need not be cut at all. If it were desired, the sheaves could be mounted with the axles inside the steeple, so that one rope would run inside and the other outside, but this would require difficult cutting of the slate or other surface near the top.—W. I. P., Menominee, Mich.

No. 210.—VOLTAGE DROP IN ARC LAMP.—What is the voltage drop across the arc of an open-type direct-current arc lamp using 30, 40 and 50 amperes? Also the voltage drop in an open alternating-current arc using the same currents.—J. S., Sagamore, Mass.

The voltage consumed by the arc, at constant current, increases with the increase of arc length, and is very closely proportional thereto. It is independent of the character, that is direct or alternating, of the current. Plotting the arc voltage e as a function of the arc length l we get for every value of current i a practically straight line. These lines are steeper for smaller currents; that is, low-current arcs consume a higher voltage for the same length than high-current arcs, the increase being greater the longer the arc. These lines when plotted for carbon arcs intersect in a point which lies at $l=-0.03$ inch and $e=36$ volts; that is, the voltage consumed by the arc consists of a part $e_0=36$ (for the carbon arc), which is constant or independent of the arc length and of the current in the arc, but different for different materials, and a part, e_1, which is proportional to the arc length, or rather to the arc length plus a very small quantity, which depends upon the current, being larger the smaller the current. Plotting the arc voltage as a function of the current we get curves which increase with decrease of current, the increase being greater the longer the arc. Subtracting from the voltage e the constant part, $e_0=36$ volts, which apparently represents the terminal drop of voltage, or the voltage which supplies the energy used in producing the conducting vapor stream at the negative and the heat at the positive terminal, leaves the voltage $e_1=e-e_0$ as the voltage consumed in the arc stream. The curves of the arc-stream voltage e_1 as a function of the current i can with good approximation be expressed by the equation $e_1=k_2/\sqrt{i}$, and since we find for constant value of current $e_1=k_1(l+0.03)$, as a function of the arc length and current the voltage of the arc stream is expressed by

$$e_1=k(l+l_1)/\sqrt{i} \qquad (1)$$

and the total arc voltage by

$$e=e_0+k(l+l_1)/\sqrt{i} \qquad (2)$$

where e_0, k and l_1 are constants of the terminal material; k, however, also varies with the gas pressure in the space in which the arc exists. Equation (2) represents the characteristics with good approximation, except for long low-current arcs, which usually require a higher voltage than calculated, as might be expected from the unsteady nature of such long thin arcs. Since e_0 represents the power consumed in producing the vapor stream and the heating of the positive terminal, and k the power dissipated from the arc stream, e_0 and k are different for different materials, and in general higher for materials of higher boiling point and thus higher arc temperatures. For carbon e_0 is approximately 36 volts and $k=130$. For the limits of your problem the volts drop can be represented by

$$e=36+130(l+0.03)/\sqrt{i}.$$

Beyond the limit of your problem the equation will not hold good on account of the unstable nature of carbon. The result, however, is close enough for practical purposes.—H. E. W., Chicago, Ill.

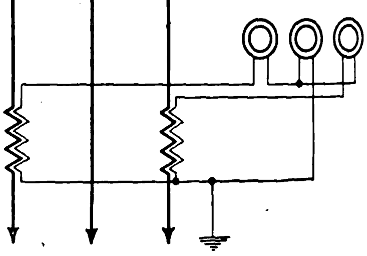
No. 211.—INDUCTION MOTOR ON UNBALANCED CIRCUIT.—A three-phase induction motor is operating at constant motor load on a delta circuit from which a lighting circuit is tapped off of one phase. The voltage on this phase is hand-regulated from 10 per cent buck (during the day) to 10 per cent boost (during the night); the other phases are left to shift for themselves. How does the current of the motor vary in each of the other phases? How does the power-factor vary? How does the efficiency vary?—C. E. R., Menominee, Mich.

If the voltage across one phase of a three-phase induction motor is increased or decreased, over the voltage across the other two phases, the unbalancing of the current will be much greater than the unbalancing of the voltage. This current will depend on the impedance of the motor and the relation between the impressed voltage of the circuit and the counter electromotive force of the motor. The effect of this cross current in the windings of the motor will be to increase the heating above its normal operating temperature. For example: a 25-horsepower squirrel-cage motor operating at 10-per-cent increased voltage on one phase at full load will become as hot as when carrying 25-per-cent overload on normal conditions; and if running idle on the line it will become as hot as if it were carrying 80 per cent of normal load under normal conditions. This heating is due to the I^2R loss and increased core loss due to the increased voltage; consequently, the efficiency will be reduced correspondingly. The increased current caused by the unbalancing of voltage on one phase will be largely wattless current and the motor will require more magnetizing current, hence the power-factor will be decreased.—H. C. C., New York City.

The action of three-phase induction motors on unbalanced circuits is discussed by Profs. S. B. Charters and W. A. Hillebrand in a paper entitled "Reduction in Capacity of Polyphase Motors Due to Unbalance in Voltage," Transactions of A. I. E. E., Volume XXVIII, 1909, Part 1, page 669. The exact amount of the effect of a maximum unbalance of 10 per cent in voltage upon the current, power-factor and efficiency cannot be given, as this will depend upon the motor design. As R. E. Hellmund says in his discussion of the above mentioned paper, "The amount of unbalancing in the current depends not only upon the unbalancing of the voltage, but also upon the design of the motor." In general, the effect of the unbalance will be to reduce the capacity of the motor. This reduction may be as great as 40 per cent with a voltage unbalance of 10 per cent, if it is not desired to exceed full-load current in any phase. The current in the high phase will of course be the limiting condition. The efficiency of the motor will be decreased, due to increased copper loss for a given output.—L. M. K., San Diego, Cal.

No. 212.—AMMETERS FOR THREE-PHASE CIRCUIT.—How should three ammeters be connected on a three-phase 2,200-volt switchboard when only two current transformers are available?—F. S. H., Calgary, Alta., Canada.

Connection may be made as in the sketch herewith. Each ammeter will then indicate the current in the corresponding lead; that is, the right-hand meter shows the current in the right-hand lead, the center meter the current in the center lead, and the left-hand meter the current in the left-hand lead. It is well to ground one point of the transformer secondary circuit to protect the ammeters from possible short-circuit between the high-tension primary and the secondary.—L. M. K., San Diego, Cal.



No. 212.—Ammeter Connections.

In a three-phase circuit at any instant the vector sum of the current in any two phases is equal to the current in the third phase. According to the diagram, in the third ammeter we get the vector sum of the currents in the other two phases.—J. H. M., San Francisco, Cal.

[Similar answers from C. M., Ann Arbor, Mich.; W. H. M., Hutchinson, Kans.—Ed.]

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Ozonizing apparatus has been installed in connection with the ventilating equipment of several London underground railway or "tube" stations.

American Telephone & Telegraph Company Will Not Require Any New Financing.

At the annual meeting of the American Telephone & Telegraph Company, held in New York on March 31, Theodore N. Vail, president of the company, told the stockholders that no new financing would be necessary before the first half of 1916. He said that arrangements had been made by some of the associated companies to finance themselves for the immediate future and to repay some of the money advanced by the parent concern.

Referring to the working agreement with the United States Attorney-General for the dissolution of the American Telephone & Telegraph-Western Union affiliation and the recent decision regarding the Bell Telephone Companies in Portland, Ore., Mr. Vail said: "This decree does not disturb any established relations, but in the case of Spokane, where the Bell Company had purchased, but not merged, the opposition company, the question of the merger is left to the determination of the local authorities. If they do not consent to a merger, the Bell Company is to sell the securities of the opposition company. In the case of the Northwestern Long Distance Telephone Company, a toll line having some interstate connections, whose securities were purchased by the Pacific Company, the decree requires the sale of those securities and also requires the restoration of the connection of that company with the opposition exchanges which have been merged with the Bell exchanges. It also requires the sale of the independent Long Distance Company's small interstate line.

"This decree and the working agreement dispose of all questions between the Department of Justice and the company, establish a satisfactory working arrangement with the independent companies and afford a basis upon which the business of the company may in future be conducted."

Mr. Vail said no suit was pending in any state or federal court against the American Telephone & Telegraph Company claiming any violation of any anti-trust law, state or federal.

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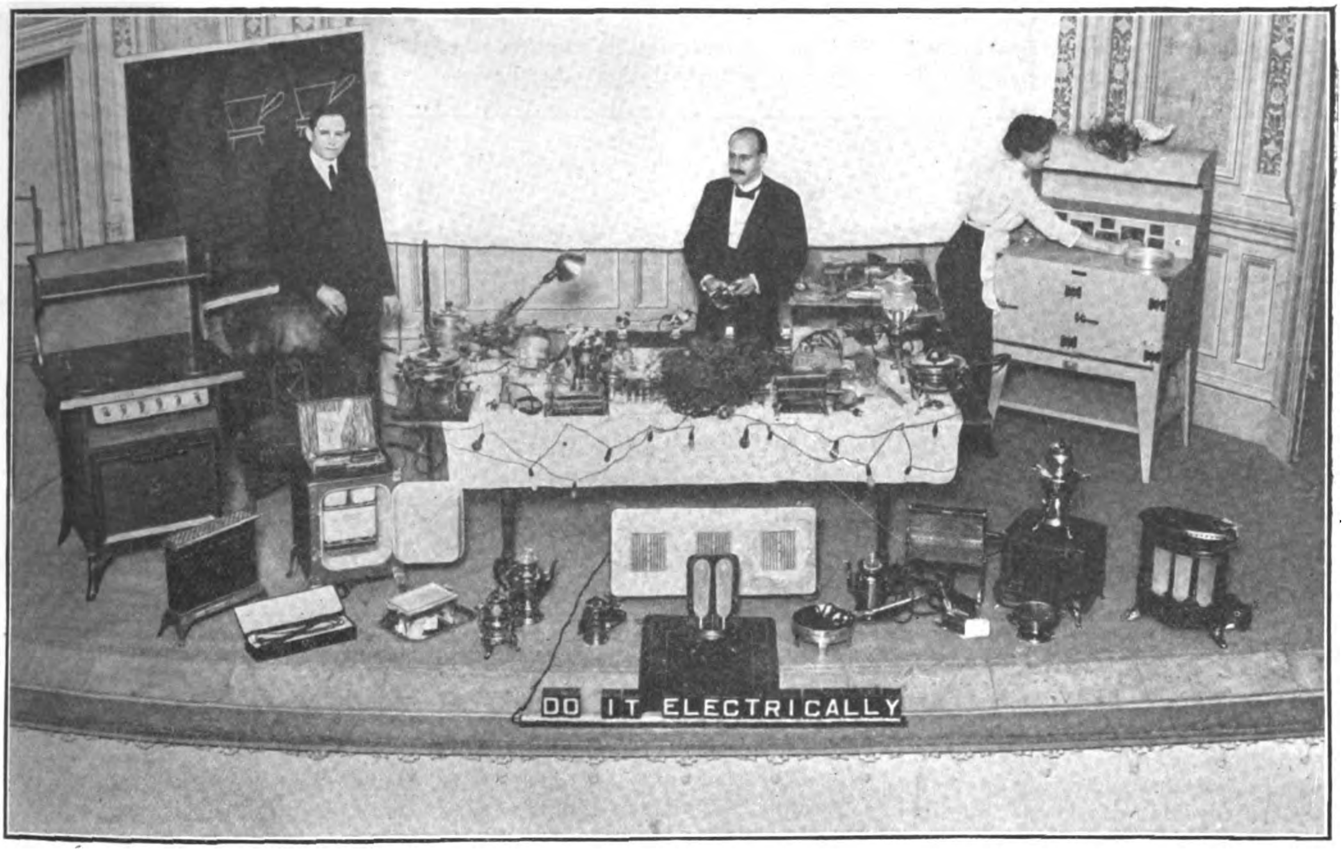
Household Devices Discussed at Meeting of Los Angeles Engineers.

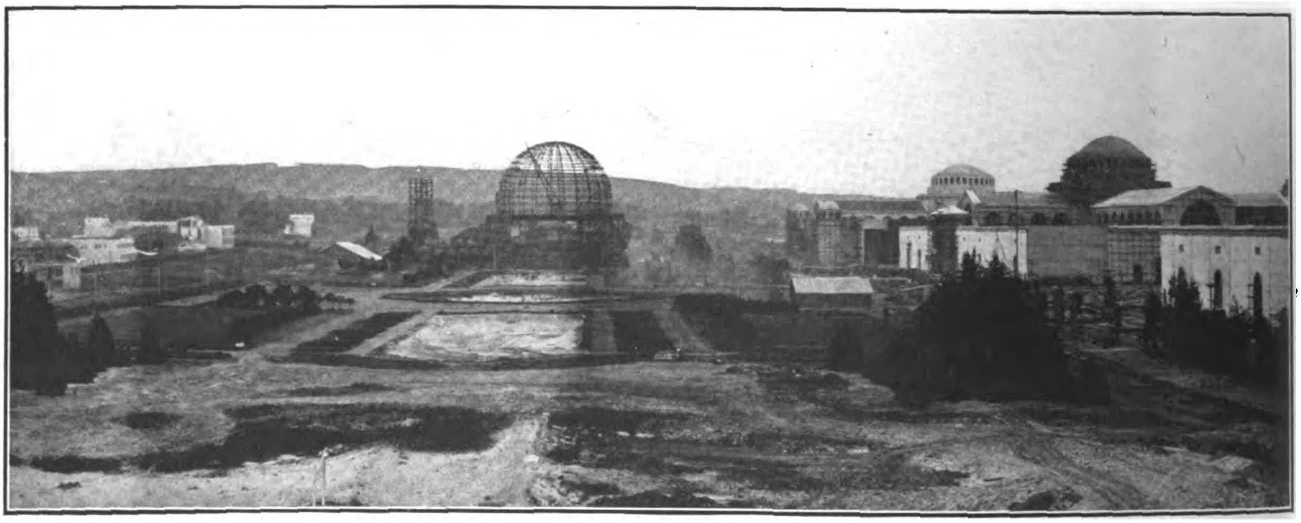
On Thursday evening, March 26, before the Los Angeles Section of the American Institute of Electrical Engineers and their friends at Choral Hall, Temple Auditorium, Los Angeles, Cal., a lecture was deilvered by Max Loewenthal, formerly of New York, on "Electricity as a Source of Heat." On the spacious platform were grouped several hundred electrically heated appliances for household service ranging from a cigar lighter to the latest type of electric range. The lecture table was handsomely decorated with a lighted flower basket and strings of lamps. In front of the stage was an electric sign spelling out the new slogan, "Do It Electrically." Mr. Loewenthal, who for the past 18 years has specialized on electric heating and electrical merchandising, reviewed by means of experiments the historical development of the heating industry, showing specimens of almost every known electrical-heating unit and system devised in this country and abroad, including kryptol, silundum, helion, etc. Many interesting experiments were shown demonstrating the proper use of appliances so as to insure economy in the consumption of current, the experiments being illustrated by means of blackboard illustrations. A demonstrator during the talk baked a loaf of bread and a cake in an electrical oven which was afterwards divided among the audience. After the experimental and descriptive part of the entertainment a number of very interesting slides were shown and the program was concluded by the display of a motion-picture playlet entitled, "Every Man's Opportunity," depicting the transformation of an unhappy and disorganized household into a joyful and contented home after the introduction of electrically heated appliances.



Mr. Loewenthal Demonstrating Electrical Heating Apparatus.

How the Panama Exposition Looks Today.

The accompanying cut reveals some of the glories of the huge Panama-Pacific International Exposition, to open in San Francisco in 1915, and shows a part of the main exhibit section. The picture was taken from the south side of the grounds and on the extreme left is seen the exposition fence. The large groups of buildings seen clustered on the right lie between the south gardens and an elaborately landscaped marine boulevard on the shores of San Francisco harbor. As will be noted, the exposition lies in a great natural amphitheater encircled on the south, east and west by the hills of San Francisco and the wooded slopes of the Presidio reservation, part of which are seen in the background.



Left Half of View of Partially Completed Buildings of Panama-Pacific International Exposition.

The large steel frame seen in the center of the gardens is that of the dome of the huge Palace of Horticulture. It is 186 feet in height and 152 feet in diameter and when completed will be covered with glass. At night colored searchlights will play upon the glass from within, giving the dome the effect of a gigantic soap bubble, sparkling and irridescent in all the colors of the rainbow.

In the foreground before the Palace of Horticulture is seen a part of the south gardens, which will be marvels of tropical transplanting. A few of the trees to be used in this section may already be seen in the above photograph.

The large group of buildings on the right consists of eight exhibit palaces, four of which face on San Francisco harbor and four of which border upon the south gardens. The buildings facing the south gardens and forming a continuous east and west facade are, left to right, the Palaces of Education, Liberal Arts, Manufactures, and Varied Industries. The palaces facing the harbor are those of Food Products, Agriculture, Transportation and Mines and Metallurgy.

The large white dome from left to right is that of the huge Palace of Education; this dome is 160 feet in height and 100 feet in diameter. The next dome, which is of similar proportions, and which has not yet been painted, is that of the Palace of Liberal Arts. And next, behind the dome of the Palace of Liberal Arts, may be seen the dome of the Palace of Food Products. The next building to the right and prominent in the picture is the Palace of Manufactures, on which the dome has not yet been superimposed. The cross naves in this palace, at the intersection of which the dome will be placed, are 110 feet in height. The next dome seen is that of the Palace of Transportation. At the extreme right of the picture appears one corner of the Palace of Varied Industries. In the opening in the center of the group and to the right of the first two domes, will be located the huge Tower of Jewels, which will rise in superb terraces to a height of 433 feet. The tower will be cleft by an archway 125 feet high, through which visitors will enter from the main gates of the exposition into the court of honor, the Court of the Universe.

Thousands of men are now at work on the exposition grounds and construction is proceeding with unparalleled rapidity. One of the exhibit palaces, Machinery Hall, area nine acres, is now practically completed. Three buildings are almost finished and all exhibit palaces will be ready to receive exhibits on July 1 of this year.

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Improvements in Springfield Street Lighting.

Prof. H. E. Clifford, of Harvard University, an expert on city lighting, has been in consultation with the Board of Supervisors of Springfield, Mass., relative to improvements in the street lighting system in that city. The present contract for electricity supplied by the United Electric Light Company expires May 1, and it is planned to make a new contract on the basis of increased lighting facilities.

Professor Clifford, while expressing himself as pleased with the present lighting system as a whole, makes some important suggestions. He says more uniformity is desirable, with more regularly intense lighting on the main streets, shading off to the suburbs by easy gradations. Lamps of greater candlepower should be installed at street corners, he says.

It is suggested that the present mast-arm attachments for arc lamps be replaced by straight poles or turnover arms. Professor Clifford objects to a mingled gas and electric lighting scheme on the same streets. It is suggested that incandescents be used more frequently on the residence streets.

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Railless Electric Vehicles and Tramways Compared.

Theodore Gribble in the course of an exhaustive comparison of the economics of tramways and railless electric vehicles recently made before the Institution of Civil Engineers, London, for the purpose of defining the sphere of usefulness open to the trackless trolley vehicle, showed that it requires no more current to carry the passenger by the latter than by a tramway. He showed diagrammatically the respective capital expenditure and working expenses under analogous conditions for services of different traffic density, ranging from a service at 30 minutes' interval to one at 2.5 minutes' interval. His conclusions are as follows:

(1) That with a traffic density rep-

resented by a 25-minute service (that is to say, that of one of the large tramways), the economy of construction and operation is still in favor of railless electric traction; as to the cost of operation by about 7 per cent, and as to cost of construction by about 44 per cent.

(2) That the economy increases inversely with the traffic density; so that with a time interval of 30 minutes, the economy of operation is about 36 per cent, and that of cost of construction about 70 per cent.

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John Gott, a Noted Cable Engineer, Dead.

The death of John Gott, at Brighton, England, on March 8, from pleurisy and pneumonia, will be read with much sorrow by telegraph engineers and electricians throughout the world. He was one of the few remaining pioneer submarine cable engineers and the value of his work in electrical testing and practical telegraphy is widely known, and his genial disposition endeared him to all who were associated with him.

Mr. Gott was born at Kendal, Westmoreland, England, in 1840, and entered the telegraph service early in life. His first employment was with the Electric & International Telegraph Company. About the year 1861 he was selected to serve at Naples, Italy, in the supervision of international traffic passing over the Italian Government land lines. In 1863 he went to Tripoli where he was employed in the operation of the first Mediterranean cable, later going to Malta on this same work.

In the year 1865 he was selected to accompany the steamship *Great Eastern* as one of the electrical staff when that vessel made her first attempt to lay a transatlantic cable. In 1869 he accepted the position of superintendent and electrician at St. Pierre, Miquelon, when the cable of the first French Atlantic Cable Company was laid.

Mr. Gott was one of the first men to work the mirror galvanometer for transmitting submarine cable messages and the first to install Lord Kelvin's siphon recorder.

In the year 1870 he carried out a unique experiment by which he transmitted wireless signals through a distance of about three miles at St. Pierre, Miquelon, using the earth as a conductor. In the same year he invented an instrument he called "fault searcher coil," which has proved extremely useful in the localization of faults in subterranean lines. This fascinating invention led to devising a means for communicating between ship and shore through a picked up cable without cutting the cable or disturbing the sheathing wires.

In 1877, in a paper in the *Journal* of the Society of Telegraph Engineers, London, he described an ingenious experiment he had carried out in telephonic transmission by means of a siphon recorder in support of the theories of Professor Bell's telephone invention, which had only shortly before that been made public.

In the year 1881 he introduced an important modification of Lord Kelvin's formula for testing the measurement of the elctrostatic capacity of condensers and cables and the value of this method has been so well recognized by submarine cable engineers that it is now used as a standard test and is known as Gott's capacity test.

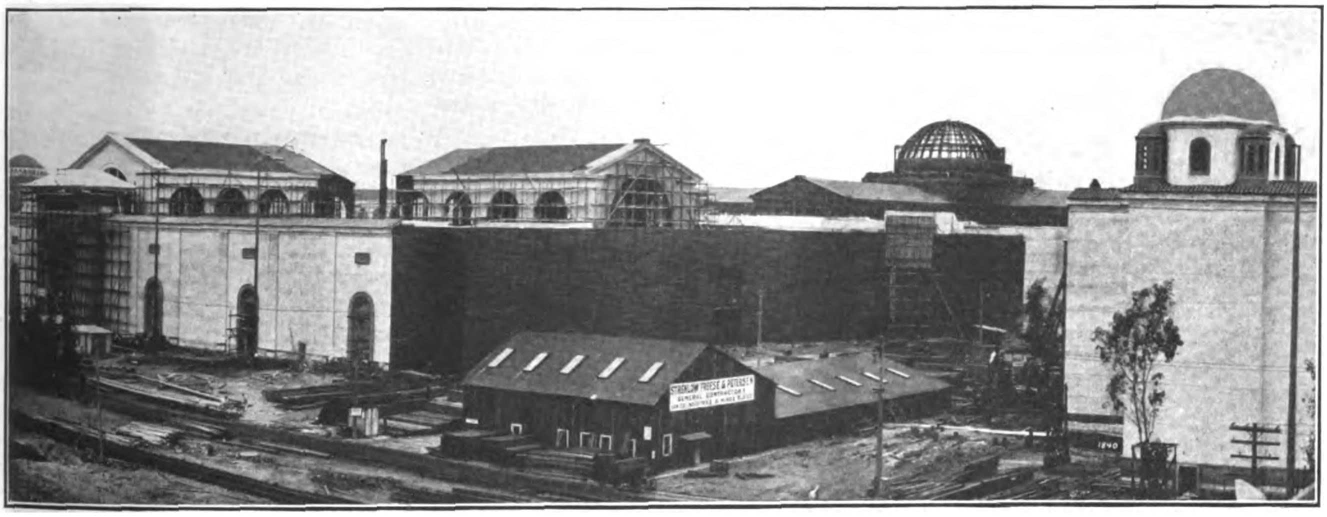
In 1884 upon his retirement from the French Cable Company's service he became chief electrician of the Commercial Cable Company, a position he held until his death.

In 1902 he made another important discovery which is known as the Gott ratio arm. His method made it possible to avoid the necessity for making temperature corrections in tests for the resistance of Wheatstone bridge coils by introducing coils of manganin for one of the ratio arms. It also makes it possible to obtain measurements in modern units by means of a bridge wound to discard standards.

Mr. Gott's crowning success, however, was his recent invention whereby he made it possible to communicate between the Pacific Coast of the United States and Canada directly with Europe without the aid of human retransmission at intermediate stations. This fitting climax to his long career is acknowledged to have been the greatest triumph in telegraphy in the present century. By its means cables and landlines can be linked up together and the ordinary Morse method of operation used. He also recently invented a new and improved system of quadruplex working.

Being a man of retiring disposition and great modesty, there is not so much on public record of his accomplishments in submarine cable telegraphy as there should be, but he was always ready to assist those who sought his advice, and his advice was always that of a man of sound judgment, ripe experience and kindly purpose. As chief engineer of the Commercial Cable Company it fell to his lot to examine many proposed improvements and to take part in many expeditions ashore and afloat. He was a deep student of submarine telegraph engineering problems and had no peer in the testing and localizing of faults and breaks in submarine cables. He made some valuable suggestions for extending, in electrical testing, the use of curve sheets in the application of graphic methods to the localization of cable breaks. These suggestions were adopted and are largely used today. In the pursuit of his scientific researches he was restless and untiring and at times he became so absorbed in his work that he often forgot both food and sleep.

His death is a deplorable loss to the telegraph profession as well as to his many friends.



View of Partially Completed Buildings of Panama-Pacific International Exposition.—Right Half.

Byllesby on Public Service Commissions, Competition and Holding Companies.

In one of the most illuminating reports ever presented to its stockholders by a public utility corporation, President H. M. Byllesby, of the Standard Gas and Electric Company, in the report for 1913, discloses some interesting views upon the subject of public service commissions, competition and holding companies.

Concerning public service commissions, Mr. Byllesby says:

"Your directors express a hopeful feeling regarding the benefits which are beginning to result from the establishment of independent and capable public service commissions, their experience being that these commissions approach the problems of public utility corporations with an increasingly fair-minded attitude and a desire to do justice to all parties, and that as their knowledge of the services rendered and the problems encountered increases their attitude is becoming more favorable to the proper protection of these interests. It is unfortunate that in many cases the laws under which these commissions are established are too narrow in their scope and unnecessarily limit and hamper the jurisdiction and activity of these bodies, but as the great benefits of the work undertaken and carried through by these commissions is more fully realized, it is to be hoped that there will be shown a disposition by the law-making bodies to extend rather than restrict the jurisdiction of the commissions.

"One of the great benefits which will inure to public service corporations from the establishment of these commissions lies, it is believed, in the supervision which is exercised over the stock and bond issues of the utility corporations. Such supervision, and the necessity of a full disclosure to the commissions of the objects and purposes of each issue and the price at which the securities are to be sold, cannot fail to have the effect of putting these securities on a more stable basis and thereby greatly increasing the confidence of investors in this class of securities.

"In the matter of rate regulation, the tendency of the commissions, as we view it, seems to be to allow to the public service corporations a divisible return which, after deducting from net earnings or having charged into operating expenses a suitable depreciation charge, will allow to the corporation a return upon the fair value of its property which shall be equivalent to the current return upon capital invested in other enterprises in the locality where the utility operates. The adoption of this rule will be entirely satisfactory to Standard Gas and Electric Company."

With respect tocompetition, President Byllesby states that in the large and diversified holdings of Standard Gas and Electric Company there is no case where it is stifling competition. In every city or town where the company is interested it is represented by only one company, there being no case where the company owns the stock or holds an interest in two or more competing companies. In only two cases are any of the subsidiary companies of Standard Gas and Electric Company operating where there is competition. One of these two cases is the City of St. Paul, Minnesota, where through its holdings in Northern States Power Company it is interested in one of two competing electric light companies, and the other case is in the city of Eugene, Oregon, where its subsidiary, Northern Idaho and Montana Power Company, is in severe competition with a municipally owned and operated electric lighting plant.

Speaking of holding companies, Mr. Byllesby says:

"Notwithstanding the existing agitation against holding companies, it is believed that companies of the character of Standard Gas and Electric Company have little to fear. The present attack is only on holding companies whose subsidiaries are engaged in interstate commerce, and even then only on such holding companies as control subsidiaries which are natural competitors. In other words, the attack on holding companies is simply a part of the present campaign against trusts and monopolies. Standard Gas and Electric Company in no way comes within the purview of any legislation against holding companies. With a few minor exceptions, none of its subsidaries is doing an interstate business. Where they are, should it become necessary, some re-arrangement can easily be effected without in any way affecting Standard Gas and Electric Company. In not one single instance does Standard Gas and Electric Company control subsidiaries which are natural competitors. Its subsidiaries in every case are located in different municipalities and so situated that competition, one with the other, is an impossibility. In other words there is no element of a trust or monopoly as defined by the anti-trust laws in the situation of Standard Gas and Electric Company. Holding companies in the utility field have so thoroughly demonstrated their great advantages in the way of economical management and facilities for financing over those possessed by isolated local utility companies that it is hardly within the realm of possibilities that any serious attack will ever be made upon them."

The total earnings of the Standard Gas and Electric Company for the year ended December 31, 1913, were $1,539,310.96; general expenses and taxes, $36,506.52; net earnings, $1,502,804.44. Deducting interest on bonds, $615,669.72; collateral trust notes, $79,419.20; preferred stock scrip, $5,892.49; miscellaneous, $50,042.83; loss in sale of securities, net, $273.73, the net income is $751,506.47. Added to surplus at beginning of year this makes the gross surplus $1,760,165.70. Deducting profit and loss charges as follows: Dividends in preferred capital stock paid in cash, $362,456.12; paid in scrip, $471,398; accrued payable in scrip, $78,566.33; total, $912,420.25; premium on coupon notes redeemed, $18,500; premium on bonds redeemed, $150,000; total, $1,080,920.45, leaves surplus at end of period of $679,245.25.

The Standard Gas and Electric Company serves through the companies it controls an estimated population of 1,656,002, and has consumers to the number of 287,532.

The company owns a controlling interest in the following companies: Louisville Gas & Electric Company, operating in Louisville, Ky.—control of this company is owned through Standard Gas and Electric Company's own holdings and its ownership of the stock of the Mississippi Valley Gas and Electric Company; Arkansas Valley Railway, Light and Power Company, operating in Pueblo, Colorado, and surrounding territory; Tacoma Gas Company, operating in Tacoma, Olympia and Puyallup, Wash.; Everett Gas Company, operating in Everett, Monroe and Snohomish, Wash.; Western States Gas and Electric Company, operating in Stockton, Richmond and Eureka, Cal., and a number of smaller communities; San Diego Consolidated Gas and Electric Company, operating in San Diego, Cal., and surrounding territory; Mobile Electric Company, operating in Mobile and Whistler, Ala.; Fort Smith Light and Traction Company, operating in Fort Smith and Van Buren, Ark.; Southwestern General Gas Company, owning and operating natural gas fields and supply lines to Fort Smith and Van Buren, Ark.; Oklahoma Gas and Electric Company, operating in Oklahoma City and El Reno, Okla.; Enid Electric and Gas Company, operating in Enid, Okla.; Muskogee Gas and Electric Company, operating in Muskogee, Ft. Gibson and Sapulpa, Okla.; Ottumwa Railway and Light Company, operating in Ottumwa, Iowa; Mississippi Valley Gas and Electric Company, a holding company incorporated for the purpose of assisting in financing the acquisition of the Louisville, Kentucky, properties and now owning a portion of the capital stock of the Louisville Gas and Electric Company.

The company owns a large but not controlling interest in the Northern Idaho & Montana Power Company, operating in certain parts of Montana, Idaho, Washington and Oregon, and the Northern States Power Company, operating in certain parts of northern Illinois, Wisconsin, Minnesota and North Dakota.

McGraw of Omaha, Sioux City, and Los Angeles Expanding.

The Interstate Electric & Manufacturing Company, of Sioux City, Iowa, and the Joseph R. Lehmer Company, of Omaha, Neb., have consolidated as the McGraw Company, of Omaha, Sioux City and Los Angeles. The change is one of name only. The two companies comprising the consolidation have been owned by the same interests controlling the new McGraw Company since the death of Mr. Lehmer. Max McGraw continues as president of the combined companies. The authorized capital has been increased to $250,000.

Max McGraw has had a rather remarkable career in the electrical industry. It is only a comparatively short time ago when Max had saved his first $500 and embarked in business as "Max McGraw, Electrician." That was in 1899, and he was 17 years old. His business place was in the basement of 401 Fourth Street, Sioux City. The McGraw Electric Company was founded in 1900. Mr. McGraw, senior, bought out the half interest owned by the younger McGraw's partner, acting only, however, as a silent partner. Very soon some good sized contracts came along and in the spring of 1913, when the Sioux City stock yards doubled the size of its electric light and power plant, the contract for the entire lighting equipment was given to Max McGraw.

The firm moved to new quarters in 1902, securing the first floor and basement of the building now owned and occupied by the McGraw Company. Later on, in order to do business on a bigger scale, the Interstate Supply Company was organized, the stockholders being Max McGraw, M. G. McGraw, Ross Brown, J. G. Boyd, W. S. Warfield, Jr., and L. E. Packer.

In 1907 Max McGraw organized a company independent of the Interstate Supply Company for the purpose of manufacturing magneto, telephone and light and power switchboards. The company continued in successful operation as the Interstate Electric Manufacturing Company until 1910, when it was consolidated with the Interstate Supply Company, the consolidation being known as the Interstate Electric & Manufacturing Company.

Through all the years of hard work and unremitting progress, McGraw held as his ideal Joseph R. Lehmer, who in the early days was in the railroad mill supply and electric equipment business in Omaha. The Joseph R. Lehmer Company was an outgrowth of this and proved to be one of the most progressive dealers in electrical supplies in the country. In February, 1912, Joseph R. Lehmer died and his estate sold out to the man who had considered the founder and the business his ideals. There were many disadvantages in continuing the two businesses under separate names, and the two companies were consolidated as the McGraw Company, with Max McGraw as its president.

The officers of the new company are President, Max McGraw; vice-president, W. F. Van Kuren; vice-president, C. A. Fried; secretary, A. A. McGraw, who succeeds E. B Perrigo; treasurer, W. J. McGraw.

The company celebrates its consolidation with the publication of a brand new bulletin which will be called "McGraw's Equipper." The initial issue relates with much detail the entire story of the founding and development of the business.

Trade Directory of South America.

A complete revision and detailed classification of the names of South American importers and merchants, made by the American consular officers in co-operation with the Bureau of Foreign and Domestic Commerce, has been published as a section of a new edition of the "World Trade Directory." The lists have been brought up to date and are presented in uniform style, with a finding index.

A new feature is the listing, so far as the information could be obtained, of (1) the American and other foreign agents of South American importing firms, and (2) of the names of the parent firms of branch houses located in various South American cities.

The directory does not aim to include the names of South American exporters, nor are the names of manufacturers given, except those who are, or seem likely to become, purchasers of American materials or merchandise. The publication is a directory of South American buyers for use by exporters and manufacturers in the United States.

The directory is in octavo form, bound in buckram, and is sold at $1 per copy. Those desiring one or more copies of this directory should send order to the Superintendent of Documents, Government Printing Office, Washington, D. C.

BOOK REVIEWS.

"Electrical Engineering." By Clarence V. Christie. New York: McGraw-Hill Book Company. Cloth, 417 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company for $4.00.

The broad title which Professor Christie has given to his book might lead one to expect a somewhat ponderous and unhandy volume; but owing to the simple, clear, and terse language used, and the rigid exclusion of superfluous matter, a large amount of ground has been covered in a reasonable number of pages. The book is intended to serve as a foundation for lecture courses to students in electrical engineering; the theory and characteristics of machines being developed from the fundamental principles of electrostatics and electromagnetics. This is the end that the author has had in view; he has given us a groundwork which, in his own words "may be extended to suit the requirements of particular classes." In the opinion of the reviewer, Professor Christie has modelled his book on the right lines. The tendency on the part of many writers is to publish all they know on a particular subject without regard to the requirements of the average reader. It is always possible to follow up a particular line of study by referring to the published proceedings of the scientific societies, or to the technical journals; and the value of a textbook depends less on the mass of information contained therein, than upon the soundness of the views it expresses, its clearness, and its suggestiveness. A book that is not to some extent stimulating—that is not more than a mere compilation of previously known facts or principles uninfluenced by the personality of the writer —is of little value, whether it be an engineering treatise or a narrative of a less restricted kind. Professor Christie has given us a book which, from the teacher's point of view, has many admirable features. No self-respecting teacher will follow without comment or modification a text which is the outcome of another mind: he will want to use the book as a foundation for additional matter drawn from his particular fund of knowledge and his personal experience. This new book, written for teachers and students by a professor of experience, appears to fulfill these requirements, and it should therefore meet with a favorable reception as a school textbook.

Chapter I treats of Electrostatics, a subject which usually receives but scant attention in engineering textbooks. The following chapters deal successively with Magnetism and Electromagnets; the Electric Circuit; Direct-Current Machinery; Synchronous Alternating-Current Machinery; Transformers; Induction Motors; Alternating-Current Commutating Motors; Rotary Converters; and Overhead Transmission Lines. An error occurs on page 398, where the formula for line inductance is incorrectly stated: the reader should refer to page 99 for the correct formula. On page 135 and subsequent pages, the word "absolute" is used to denote the value of electromotive force or current resulting from the vectorial addition of its components: this is somewhat confusing, and a more apt word might perhaps be found. At times the author is inclined to err on the side of saying too little, thus giving credit to the reader for more imagination or a more thorough capacity for mathematical reasoning than he may perhaps possess; but this occurs rarely, and if it may be accounted a fault, it is more easily overlooked than the more common offense of saying too much. As a whole, the book is a notable example of a well planned work which, being clearly conceived in the first instance, has been executed in a consistent manner. The author knows always what he wants to say, and is never tempted to write what the reader does not want to read. A. STILL.

"The Inspector and the Troubleman." By Stanley R. Edwards and A. E. Dobbs. Chicago: Telephony Publishing Company. Cloth, 196 pages (5¾x8¾ inches), illustrated. Supplied by the Electrical Review Publishing Company for $1.00.

This book is written for the telephone troubleman, more especially the one dealing with outdoor lines in the small exchanges of the country. It is written in a conversational style, representing largely a dialog between a new employee and his manager. It is consequently written in a simple manner and takes things up in a very elementary and yet practical way. It deals essentially with the practical problems coming up in every-day work, although bits of electrical theory are introduced from time to time in explanation of the practical conditions encountered. The book will be of value not only to the worker on telephone lines, however, but to others who are looking for practical information on the handling of overhead lines, cables, etc. A number of diagrams to show connections and methods of mounting are given and a few halftone illustrations are included. The method of treatment will be especially valuable to those who have had no preparation for electrical work by a previous study of physics or mathematics. The book suffers from lack of an index.

"Problems In Alternating-Current Machinery." By Waldo V. Lyon. New York: McGraw-Hill Book Company, Incorporated. Cloth, 136 pages (6x9½ inches), two illustrations. Supplied by the Electrical Review Publishing Company for $1.50.

"Electrical Engineering Problems." By F. C. Caldwell. New York: McGraw-Hill Book Company, Incorporated. Cloth, 105 pages (6x9½ inches). Supplied by the Electrical Review Publishing Company for $1.00.

Both of these books will be found very useful in class work with electrical engineering students and will also be a help to the man who is studying alone by giving him a chance to test his knowledge of the subject. Professor Caldwell has indicated the time necessary for the solution of each problem and where the problems are taken for examination questions this will assist in determining the number of problems which may be done in any given time. Professor Caldwell has covered both direct and alternating-current circuits, the questions being divided as follows: direct-current circuits, 43; magnetism, 41; armatures, 60; dynamos, 49; motors, 29; alternating-current circuits, 160; power, 58; transformers, 64; symbolic expressions, 24; alternators, 20; motors and other machinery, 64. Mr. Lyon's problems deal entirely with alternating currents and are divided as follows: transformers, 98; generators, 99; motors, 130; rotary converters, 61; polyphase circuits, 75; nonsinusoidal waves, 44. Both authors propose providing answers to the problems, which will be available to instructors. Professor Caldwell has these already available and Mr. Lyon expects to have them ready in the autumn.

"Handbook of Electrical Methods." Compiled from the *Electrical World*. New York: McGraw-Hill Book Company, Incorporated. Cloth, 285 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

"Electric Car Maintenance." Selected from the *Electric Railway Journal*. By Walter Jackson. New York: McGraw-Hill Book Company, Incorporated. Cloth, 275 pages (9x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company for $3.00.

These books represent compilations respectively from the *Electrical World* and the *Electric Railway Journal* of articles which have appeared from time to time representing principally actual practice among companies in different parts of the country. The matter dealing with electric cars will appeal especially to the man engaged in shop work and repairs. A little additional matter has been included in the volume dealing with braking and wiring diagrams. The compilation of articles from the *Electrical World* is also decidedly practical in its scope, since it takes up ways of doing things rather than descriptions of apparatus, commercial matters or design of machinery. The various matters included are grouped in chapters with the following heads: General Notes; Line Construction and Equipment; Meters; Operation of and Changes in Circuits; Switchboards and Power-House Details; Signs and Special Lighting; Lamps and Circuits; Transformers, Oil Switches, and Circuit-Breakers; Interior Wiring; Motors, Switches and Generators.

"The 'Mechanical World' Electrical Pocket Book for 1914." Manchester, England: Emmott & Company, Limited. Cloth, 258 pages (4x6 inches), illustrated. Supplied by the Electrical Review Publishing Company for 25 cents.

"The 'Mechanical World' Pocket Diary and Year Book for 1914." Manchester, England: Emmott & Company, Limited. Cloth, 376 pages (4x6 inches), illustrated. Supplied by the Electrical Review Publishing Company for 25 cents.

While these books do not pretend to be complete handbooks on their respective subjects, they contain much of interest and value to the mechanician and the electrician. Both contain blank pages for a diary. The electrical pocketbook has additional material in this year's edition on telephones, ship equipment, lifting magnets, dry batteries, and sparking distances, and several of the other parts have been rewritten and revised. Much of the data is taken from American practice. The mechanical year-book has had added a section on milling and gear cutting and one on grinding, while other new material has been introduced into different sections. There are a number of new tables of much value and American screw threads have been included. Books of this kind are always good friends to have at hand for hasty reference.

"Fowler's Mechanical Engineer's Pocket Book, 1914." Edited by William H. Fowler, Manchester, England: Scientific Publishing Company. Cloth and leather, 576 pages (4x6 inches), illustrated. Supplied by the Electrical Review Publishing Company in cloth for 50 cents; leather and gilt edges, 75 cents.

"Fowler's Mechanics' and Machinists' Pocket Book and Diary, 1914." Edited by William H. Fowler. Manchester, England: Scientific Publishing Company. Stiff paper, 408 pages (4x6 inches), illustrated. Supplied by the Electrical Review Publishing Company for 25 cents.

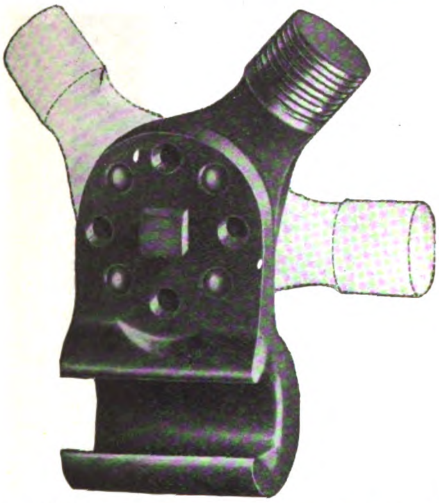
These books contain much useful information for the mechanical engineer and machinist and the machinist's pocketbook is provided with blank pages for a diary. The mechanical engineer's book is in the sixteenth annual edition and contains sections devoted to the following subjects: tables and formulas, steam boilers and fuels, steam engines, steam turbines, locomotives, valve gears, internal-combustion engines, pumps, hoisting machinery, strength of metals, springs, ventilation and heating. The machinist's pocketbook is in the sixth annual edition and has sections devoted to the following subjects: tables, construction materials, machine tool design, metal cutting tools, high-speed tool steel, drilling and boring metal, shop practice, emery wheels, gearing, belts, shafting, etc. Both books contain much information of value.

New Electrical and Mechanical Appliances

The Anthony Adjustable Conduit Hickey or Bender.

A very convenient tool is illustrated herewith. As its name implies, it is intended for use in bending rigid conduit. The tool was invented by a thoroughly practical electrician and was tried out under a great variety of different conditions on large jobs in different parts of the country before it was offered for sale to the general contracting trade.

The tool is made of crucible cast steel. The jaws are so shaped that the tool may be instantly applied at any desired point of the conduit and instantly released; the jaws do not permit the tool to slip off while bending force is being applied in any direction.



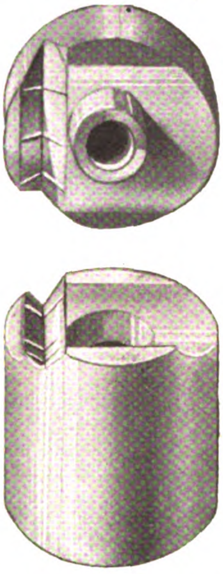
Adjustable Conduit Hickey or Bender.

An important feature of the tool is that it can be readily adjusted to several angles. This is possible because the swivel piece to which the handle is applied has four lugs that fit into corresponding holes in the body of the tool and thus permit changing the angle of the handle by 45 degrees at a time. A few of these positions are indicated in the illustration. Thus it is easy to secure the necessary leverage with any convenient position of the tool.

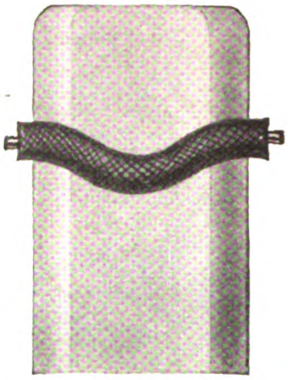
These tools are now made for one-half-inch and three-quarter-inch conduit. A one-inch size is being prepared. The tools are manufactured by M. B. Austin & Company, 700 West Jackson Boulevard, Chicago.

Star Split Porcelain Knob.

The Star Porcelain Company, Trenton, N. J., has for some time manufactured the form of split knob illustrated herewith and this knob has been tried out under service conditions with excellent results. The two parts of the knob are so shaped at their meeting faces as to interlock and prevent turning of one part on the other. The cap has a thimble fitting into a socket in the base to make the knob self-centering. At one side of this sleeve and socket is a curved groove in which the wire is placed and securely held when the cap has been added and the whole knob tightened in place. This curve serves to draw up the wire and clamp it without injuring the insulation and it obviates the need of separately tying the wire in place. Thus the use of these knobs simplifies and greatly facilitates the construction work and thus also reduces its cost.



Split Knob Showing Meeting Faces and Grooves.



Section Showing How Wire is Held by Knob.

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The Hubbard Reference Book.

The Hubbard Reference Book for 1914 contains 134 pages of the most interesting descriptive and illustrated matter relating directly to the utilization of pole-line material. The book is unique as a reference, giving as it does a complete description of the various elements of line construction and showing beautifully reproduced photographs of actual construction of every character. It will be found of interest not only to the central-station manager, but also to the engineer of the industrial plant, and in fact to anyone desiring information regarding the running of line wires. A series of tables gives the construction details of 131 different high-tension lines, establishing information under the following headings: company; location of lines; length in miles; voltage; frequency; style of pole; height; standard spans; insulators; wire arrangement; overhead ground wire; line wires; transformers, type and connections; lightning arresters; line transposition and telephone lines. Supplementing these tables are data sheets illustrating the style of pole construction and the arrangement of the cross-arms and insulators. The illustrations give the reader at a glance the characteristics of each line.

The Hubbard Reference Book has been compiled by the Electrical Materials Department of Hubbard & Company, Pittsburgh, Pa., and has combined with it a catalog of Peirce brackets and other construction specialties of Hubbard manufacture. This line includes hammer drills, expansion bolts, wall brackets, spreader brackets, cross-arm straps, bracket arms, cross-arm brackets, transposition brackets, pole brackets, special brackets, secondary racks, clamp pins, steel pins, insulator pins with spring threads, distributing racks, single-knob fixtures, pole seats, back braces, insulated forks and turnbuckles, anchors, pole-top pins, hinged tungsten arms, transposition arms, fire-alarm fixtures, high-tension extensions, "Presteel" poles, high-tension brackets and high-tension fixtures.

The Capital "Safety First" Electric Washer.

A new type of electric washing machine with many unique features has been placed on the market by the Capital Electric Company, Insurance Exchange Building, Chicago. The most striking feature of this machine is its principle of washing, which is distinctively new in machines of this kind. Instead of merely agitating the clothes by oscillating or rotating a cylinder or tub, it provides a motor-driven pump which forces a powerful stream of hot suds through the clothes which are placed in a perforated cylinder within the tub. It is claimed by the manufacturer that this principle produces the most thorough cleansing action, since the hot, soapy water is forced through all of the pores of the clothes regardless of the density of the fabric. The cylinder in which the clothes are placed is given a slow rotating motion at the same time, thus exposing every portion of its contents to the stream of hot liquid. At the opposite side of the cylinder there is a suction action, produced by the continuous circulation of the pump, that draws the hot suds downward through the clothes and intensifies the cleansing operation. This washing is said to be so perfect that the clothes are made snow-white by a single 10 to 12-minute operation of the machine, thus eliminating the need for the boiling that usually follows.

The principle of operation is made clear from Fig. 2, which shows a portion of the machine cut away to disclose the proper relation of the internal parts. The inclosed motor is placed beneath the tub and is directly connected to the propeller blades, operating just like a fan. These blades are in the tub directly below the cylinder in which the clothes are placed so that the latter cannot come in contact with the rapidly rotating blades. The motion of the cylinder is derived through the force of the water and is independent of any mechanical connection with the motor. In fact, the entire washing part of the machine is entirely free from gears, levers or shafts. The shaft connecting the motor and wringer is entirely inclosed and the gear connection between the shaft and the wringer rolls is also entirely inclosed. All the features of the design are carried out so as to make use of the "safety first" idea, which has, therefore, been properly included in the name of the machine. This "safety first" principle applies both to the clothes and to the operator. Since the cylinder is perfectly smooth and there are no mechanical agitating or pulsating parts within it, there is no tearing or wear on even the most delicate lingerie, lace or other fabric.

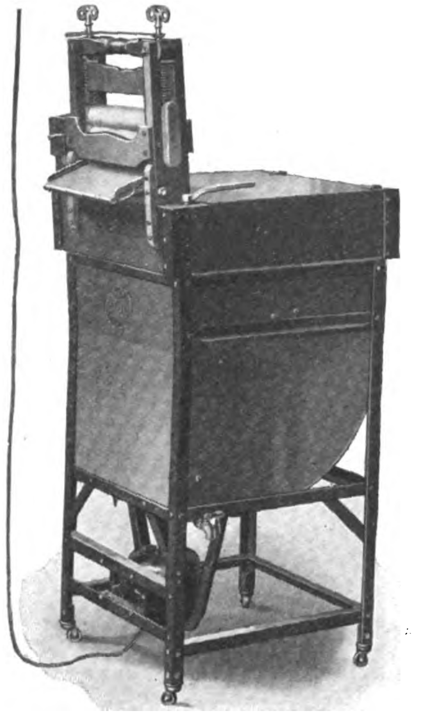


Fig. 1.—Capital "Safety First" Electric Washer.

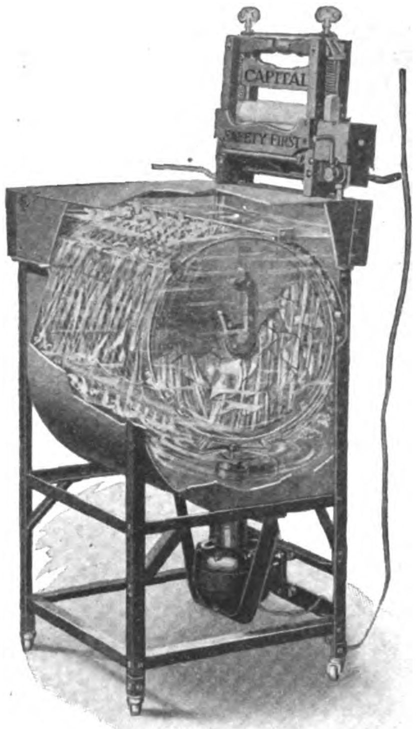


Fig. 2.—Principle of Operation of the Washer.

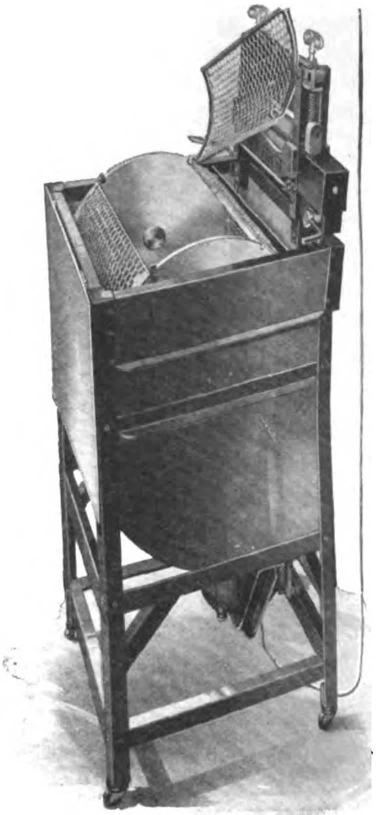


Fig. 3.—Cylinder Raised for Removal of Clothes.

In Fig. 3 the machine is shown with the cover removed and a portion of the cylindrical surface of the perforated cylinder lifted off. Access to the clothes is readily obtained by a patented means for lifting the rotating cylinder to the top of the machine. By removing a portion of its surface the clothes can be readily taken out, run through the wringer and a fresh batch placed into the cylinder again. The wringer has ball bearings and a safety release; it is reversible. The wringing operation can be carried on separately or simultaneously with the washing operation.

The illustrations show both the simplicity of the construction of the machine and also its compact and rugged outlines. The framework is of angle iron and is mounted on universal castors, thus making the machine readily movable from place to place. The tub is of heavy galvanized steel and the cylinder of zinc. If desired, a copper tub can be obtained at slightly additional cost. The body has a light gray color and the framework is finished in black. Every part of the machine is easily cleaned.

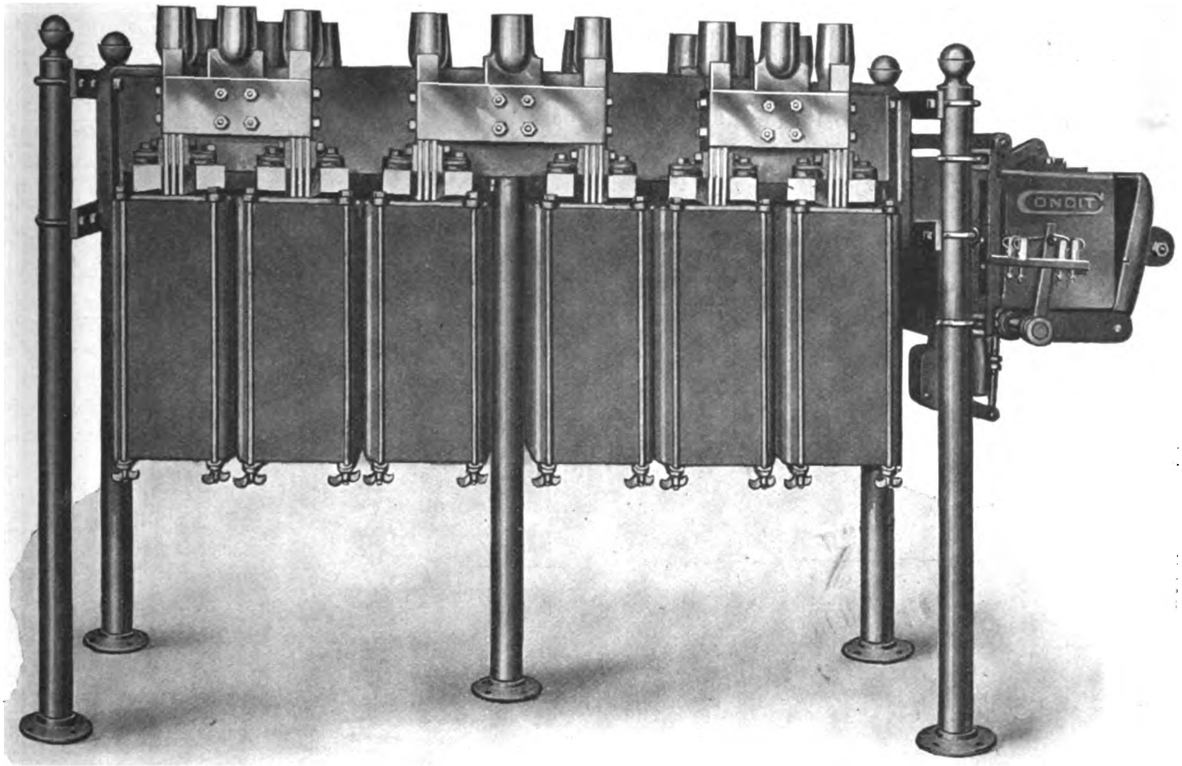
The size of the machine is 24 inches square by 39 inches high to the top of the tub. The capacity is 12 large sheets at one time. A varied assortment of rugs, bathrobes and blankets can be placed in the tub. When white clothes are washed as many as 100 pieces, consisting of sheets, table linen, underwear, handkerchiefs and children's clothes can be placed in the machine at one time. The machine is noiseless in operation and neat and clean in its appearance. Its operation is exceptionally economical. The Capital Electric Company is so convinced that the many merits of the machine need only to be fully observed in order to be appreciated, that it has arranged to install the machines on 15 days' free trial.

A 4,000-Ampere Electrically Operated Oil Switch.

There has recently been put into service at the plant of the Ludlow Manufacturing Associates, Ludlow, Mass., a 4,000-ampere electrically operated oil switch. This switch is, so far as is known, the largest of its type in this country.

The switch is used for the control of a 2,500-kilowatt, three-phase, 40-cycle, 575-volt turbogenerator whose maximum continuous output approximates 4,000 amperes per phase.

While other equipments to handle this output could have been purchased, the Condit Electrical Manufacturing Company was the only manufacturer in this instance to offer a switch which was enough of an actuality to merit the manufacturer's and purchaser's confidence, and which was not manifestly a combination of standard switches of a lower rating.



Three-Phase, 4,000-Ampere Oil Switch.

On account of the questionable thermal characteristics of switch contacts whose areas are arbitrarily increased in an attempt to secure high ampere capacity, two switch elements in multiple are used for each pole.

Massive copper blocks constitute the stationary contacts. The current-carrying parts are supported by insulators clamped to the main frame. All parts through which the switch terminals pass, or which are surrounded by the electric circuit, are made of composition. Each pole of the switch is provided with three terminal lugs to accommodate the three 1,400,000-circular-mil rope-core cables constituting the turbogenerator leads.

The moving contacts are of the laminated brush type. These are sectionalized, each part bearing independently on the stationary contact. Arcing in making or breaking the circuit is handled by auxiliary contacts of nonarcing metal.

In the tank construction are employed some very interesting mechanical features. The tanks are of boiler iron, electrically welded, and consequently of practically equal strength throughout. Instead of being supported at the top, the tanks are held onto the switch frame by long rods bolted through lugs welded onto the tank bottom. A deflector plate supported on porcelain insulators prevents oil throwing and serves as a guide for the brushes.

The variation in contact resistance of the two legs of the switch, which are in multiple, was about five per cent on test, resulting in a practically even distribution of current.

On a heat run of 5.5 hours at 4,000 amperes the individual legs showed a temperature rise of 26.5 degrees centigrade with a current density of 660 amperes per square inch. The tanks showed a temperature rise of 18 degrees centigrade, except on the adjacent faces of the individual tanks where the total flux of the two conductors cut the tank surfaces and where a rise of 31 degrees occurred.

The switch withstood a high-potential test of 10,000 volts between terminals and frame, and the operating coils 1,000 volts between windings and frame. The closing magnets require a total of approximately 80 amperes, and the tripping magnet 2.2 amperes at 110 volts.

This switch is a part of the equipment installed under the direction of Lockwood, Greene & Company, Boston, architects and engineers, as an extension to the power plant of the Ludlow Manufacturing Associates.

Silit.

A new material for use as an electrical resistor for high temperature has been brought out by Siemens & Company, in Berlin, Germany, under the name of "Silit." This material consists of carbide of silicon, prepared according to a patent of Dr. Egly. In this process free silicon is added to the silicon carbide and the two mixed up with a liquid binding material which can be afterward burned out, the carbon of the binder combining chemically with the free silicon.

This material has high density, good electrical conductivity, considerable strength and resistance to chemical agents. It also successfully withstands high temperatures. Moreover, it withstands sudden changes of temperature without injury, as can be demonstrated by quenching in water from a red heat.

This material is made up in various forms of resistors, such as regulating rheostats, dimmers, heaters, stoves, etc.

A New Improved Laboratory Portable Meter.

There has been a demand for a line of laboratory standard instruments, approaching in accuracy the meters of the precision type, suitable particularly for direct-current measurements and therefore operating on the D'Arsonval principle.

The ultimate limitation of such instruments, so far as permanence is concerned, is stability of magnetization of the permanent magnet. The old type of bipolar or double-air-gap D'Arsonval construction, while sufficiently reliable for ordinary use, is considered by many to be somewhat questionable for use in instruments whose accuracy and permanence could be rated as high as that of precision instruments.

This limitation is said to be overcome in the improved direct-current line of meters known as the Type PL laboratory portable meters, manufactured by the Westinghouse Electric & Manufacturing Company. They are made on the same design as the standard Type PL portable meters which are adapted to general testing work except that their extra long scale and strong magnets make them especially adapted for use as a semi-portable laboratory meter. They operate on the D'Arsonval principle, having a moving coil and permanent magnet, which renders them free from all residual errors.

VOLTS
LABORATORY STANDARD VOLTMETER
FOR DIRECT CURRENT
WESTINGHOUSE

New Laboratory Meter, Hinged Cover Removed.

The Type PL meter differs, however, from other meters using the D'Arsonval principle in having a single air gap through which the moving coil, pivoted at one edge, swings. It is claimed that the single gap permits of maximum torque per unit weights for the following reasons:

(1) The magnet will retain a higher permanent strength because the total air gap is relatively narrow and need never be disturbed. The complete movement can be taken out for inspection or repairs without removing any part of the magnetic circuit. Magnets in which the coil surrounds a cylindrical core forming part of the magnetic circuit, as in the usual double-gap movements, are subject to change in field strength if the coil is removed, because the cylindrical core has to be removed in order to remove the coil.

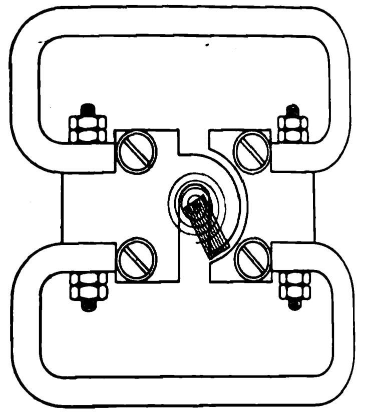
(2) The strength of the magnet can be higher in the single-gap than in the double-gap movement for the magnets of the latter can be only as strong as they would be when the core is out otherwise they would lose a large part of their strength the first time the core and coil were removed.

(3) Since the coil when pivoted at one side counterbalances to some extent the weight of the pointer and thus reduces the counterweight necessary when the coil is pivoted in the middle, as with the double-gap movement, the single-gap movement allows of a minimum total weight of movement.

(4) The strong magnets produce a high torque, which, with the light weight of the moving element, gives a high ratio of torque to weight, thus reducing friction errors to a minimum.

The accuracy of these meters is further assured by treating, magnetizing, and artificially ageing the magnets with their pole-pieces complete according to the process originally developed by Madame Curie, the well known discoverer of radium, this process being recognized as incomparably superior to all other processes. To further guarantee against change in strength, the magnets after treatment are stored for six months. Any magnets that show a decrease in strength after this time are rejected. The moving coil and pointer are then assembled in the magnetic structure and the manufacture is completed without disturbing the magnetic circuit, an arrangement impossible in the ordinary bipolar D'Arsonval instruments.

The light metal frame on which the moving coil is wound moves through the air gap of the magnets and makes the reading inherently dead-beat. This important feature enables readings to be taken quickly and prevents violent fluctuations from injuring the pointer or the moving element.



Single-Gap Moving System.

The scale, which is 11.5 inches long, subtends an arc of 100 degrees, giving large open divisions that are of uniform length throughout. The scale has diagonal markings which facilitate accurate readings of fractions of divisions. A mirror extending the entire length of the scale enables the prevention of parallax in reading. These meters are mounted in polished walnut carrying cases that have easily removable hinged covers.

For use with the millivoltmeters, combination laboratory portable shunts are supplied. These combination shunts include three shunts of any desired capacity up to 200 amperes mounted in a single box with suitable terminals.

These meters are supplied as voltmeters or as millivoltmeters. The millivoltmeters can be used as ammeters in connection with shunts for current measurements of high accuracy.

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Train Control and Stop Being Tested.

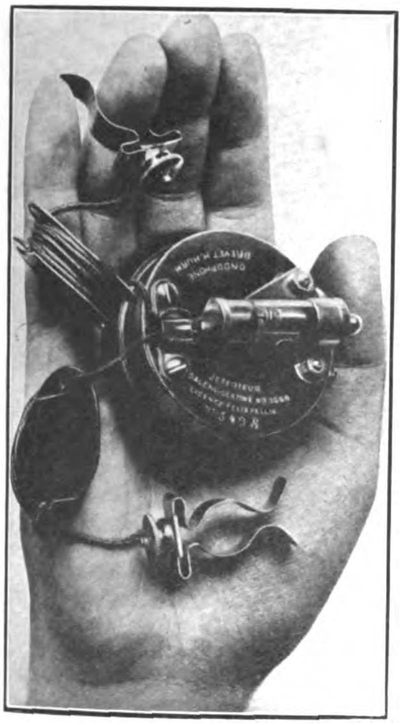
An automatic electric train control and stop, invented by John Labarre, is being tested on the Colebrookdale branch of the Reading Railway. It is so arranged that, in the event of an engineer passing a danger signal and failing to observe it, it will cause an electrically controlled arm fastened to the locomotive to apply the air brakes, bringing the train to a halt. Up to the present time the device has proven satisfactory and it is expected by its inventor that the device will be favorably received by railroad companies in general.

Ammeter Shunt for Millivoltmeter.

Vest-Pocket Wireless Receiving Instrument.

The large wireless stations, such as the Eiffel Tower in Paris, are now sending out time signals very regularly each day, and even weather signals, but up to the present the need of a more or less complicated receiver has prevented the general public taking advantage of these signals on as large a scale as is hoped for in the future. What remained to be done was to devise a small instrument like the Ondophone illustrated herewith, which can be carried even in the vest pocket and is entirely self-contained. No battery or extra apparatus is needed in order to hear the signals by the use of the combined crystal detector and telephone.

An open umbrella makes a good enough antenna when within 30 miles of Paris, and all that is done is to connect one of the metal clips through a flexible cord to the umbrella and connect the second clip to the ground. With a larger metal object, such as a bicycle or automobile, the signals can be heard as far as 120 miles from the Eiffel Tower, so that the tourist can stop anywhere out on the road in order to ascertain the exact time and set his watch. Other metal objects, such as a stove, wire fence or grating, bedstead and the like can be used, and for long distances, such as 300 miles, a good plan is to use a telephone circuit as an antenna, by connecting on to any existing telephone apparatus. Within the city of Paris, a double antenna wire of 80 feet mounted on the roof allows of hearing the German and English wireless stations, even though numberless zinc roofs are in the way.



Compact Wireless Receiver.

The Beaver as a Booster.

The Borden Company, of Warren, O., manufacturer of hand pipe-threading and cutting tools, is making use of a unique suggestion to the trade respecting the condition of business at present and the outlook for a considerably improved demand. The Borden Company has adopted the trade name "Beaver" for its square-end pipe cutters and "Easy Worker" die-stock. These Beaver cutters and die-stocks have been found especially useful by electricians for cutting off electric conduit square, and without leaving a burr. The company states that orders for 1914 are 25 per cent ahead of a similar period in any other year, and that the outlook is that the next six months will surpass any similar prior period.

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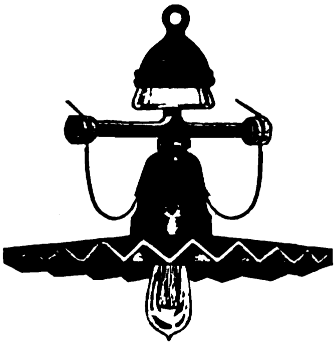
Improved Outdoor Swinging Fixture.

Until a short time ago the center span and rope suspension type of outdoor lighting fixtures were made without a joint below the insulator arm that holds the line wires. The weight of the line wires generally pulled the reflector out of the horizontal plane, so that the light was not evenly distributed.

To overcome this objection the Kyle line bracket shown in the accompanying illustration, as made by the Line Material Company, South Milwaukee, Wis., has two swivel joints, one above and one below the insulator arm. These joints permit the reflector to hang horizontal always. The light is therefore evenly distributed at all times. A locking screw is also provided so that the joint below the arm may be made rigid, as this may be desirable in exceptionable cases.



Improved Outdoor Fixture.

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Lubricating Qualities of Oil Not Affected by Filtration.

Elaborate tests which the Richardson-Phenix Company, Milwaukee, Wis., had made at the laboratories of Cornell University for the purpose of studying the physical qualities of lubricating oils, filtered by the company's oil filter, showed that oil filtered under these conditions could be used over and over again indefinitely without losing any of its original lubricating qualities.

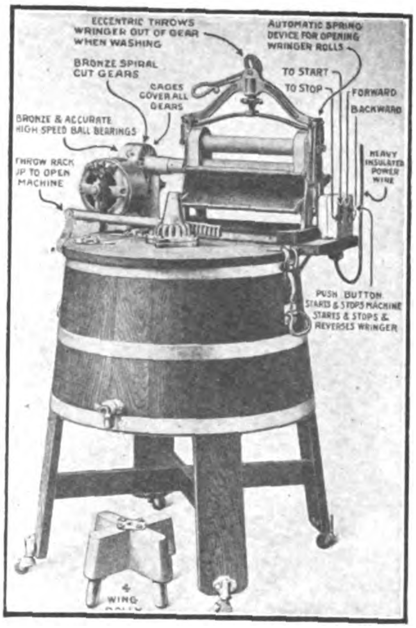
Samples of oil taken from the filtering system of Hotel McAlpin, of New York City, were found to have a slightly greater viscosity than new oil, with the result that at low bearing pressures the filtered oil gave a slightly greater coefficient of friction than new oil and at high pressure a coefficient of friction less than that of new oil.

The difference between room temperature and bearing temperature with filtered oil was found to be practically the same as with new oil, the difference never being more than a few degrees Fahrenheit.

◆

The "Electric Lady" Washer.

The "Electric Lady" washer is a new machine whch is just being placed on the market by the Michigan Washing Machine Company, Muskegon, Mich. This machine has been carefully designed to include valuable electrical and mechanical features. For example, the whole machine is controlled by push buttons. All moving parts are fully protected and an automatic electric wringer release insures absolute safety to the operator's hands. Ball bearings are used where the greatest strain occurs and bronze bearings in other places. Quiet operation was considered essential so that all moving parts are carefully designed to run quietly and the materials are so selected that the wear is small. Adjustment is also provided for wear. A Westinghouse small motor furnishes the power.


ECCENTRIC THROWS WRINGER OUT OF GEAR WHEN WASHING
AUTOMATIC SPRING DEVICE FOR OPENING WRINGER ROLLS
BRONZE SPIRAL CUT GEARS
CAGES COVER ALL GEARS
TO START
TO STOP
FORWARD
BACKWARD
BRONZE & ACCURATE HIGH SPEED BALL BEARINGS
THROW RACK UP TO OPEN MACHINE
HEAVY INSULATED POWER WIRE
PUSH BUTTON STARTS & STOPS MACHINE STARTS & STOPS & REVERSES WRINGER
4 WING

"Electric Lady" Washer.

Sprague Portable Ozonators.

The active movement initiated some years ago for the conservation of public health has laid great stress on the importance of pure air. As a means of promoting purity of air there has been urged recently with considerable success the use of ozonators which have been found to improve the quality of the air, particularly in rooms housing a large number of people. They have also been used in removing odors from cooking, smoking or various trade processes; in moving-picture theaters the unpleasant odor due to perspiration, etc., has been practically eliminated by the equipment of these establishments with ozonators. In a large building where a ventilating installation has been provided an ozone equipment may be incorporated in it so as to introduce the ozone into the ventilating air before it is distributed in the building. However, as there are but relatively few buildings that have actual ventilating systems there is a demand for portable ozonators, which has been met by the Sprague Electric Works of General Electric Company, New York City, by the apparatus illustrated herewith.

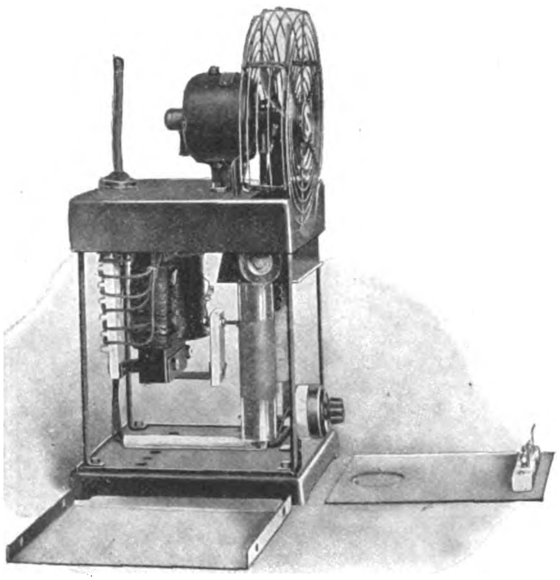


Fig. 1.—Household Ozonator with Sides of Casing Removed.

These Sprague portable ozonators are made in two types, both of which are arranged for connection to direct-current and also to alternating-current circuits. In the latter case the current is supplied directly to a transformer which develops high-tension current for the ozonizing tubes. In those ozonators to be used on direct-current circuits there is provided a small rectifying machine which is driven by the fan motor that is mounted on the top of each of these equipments. The two types of ozonators above referred to are known as the household and universal types. These are practically identical in general design, except that the ozone capacity of the universal size is four times that of the household equipment.

In Fig. 1 herewith is shown the household ozonator, which is designed for destroying odors in kitchens, laundries and other household apartments. It is also suitable for use as an aid to the ventilation of offices and other small rooms in which a relatively large number of people may work or congregate. The apparatus includes within the case a transformer and the ozone-producing tubes. The case has a substantial iron base and top, and sheet-steel sides readily removable to give access to every part of the equipment. The transformer changes the supply voltage to that suitable for operation of the ozone-generating tubes. In the household size there are two of these ozone tubes, each of which consists essentially of two concentric tubes, of which the inner is a steel pipe surrounded by a glass tube with metal coating; the air passing through the intervening space between the tubes is subjected to a high-voltage discharge. The air enters the casing through the holes in the bottom and passes through the space between the inner and outer tubes. The electric discharge taking place in this zone changes the oxygen of the air into ozone. The ozone-charged air is then drawn through an orifice in the top of the casing and mingles with the air that is circulated by the fan on top of the equipment. The fan is eight inches in diameter and serves to maintain an adequate circulation of the air through the ozone-generating tubes and for diluting and distributing the ozone throughout the room being ozonized. This fan may be operated independently of the ozone equipment. Each ozonator is provided with a four-point snap switch, giving complete control of the operation of the apparatus. The first point of this switch turns the fan on without energizing the ozone equipment; the second point connects one-half of the ozone tubes thus giving one-half of the ozone capacity; the third point connects in the remainder of the ozone capacity; the fourth point opens both the fan and ozone circuits.

The larger size, known as the universal ozonator, is shown in Fig. 2, this particular one being arranged for connection to direct-current circuits and therefore including adjacent to the fan the rectifying machine above referred to. The universal ozonator contains eight tubes, thus providing four times the ozone capacity of the household size. This type of ozonator is therefore more serviceable for offices, lunch rooms, hospitals, moving-picture theaters, assembly halls, etc.

In each of these types the equipment is built entirely of noncombustible materials. Not only are the sides of the casing removable but the grid holding the ozone tubes can be removed bodily and the tubes cleaned of any dust or other particles that may have been lodged therein on account of the continual passage of the air between the tubular surfaces. The current consumption of the household size of ozonator is 60 watts and of the universal size 75 watts. The ozone capacity of the former is 175 milligrams of ozone per hour and of the universal size 700 milligrams per hour.

The Edison Business Builder.

The Edison Lamp Works of the General Electric Company, with the issue of April, changes the form of "The Edison Business Builder." For the past year it has been an occasional and irregular publication dealing with individual problems as they arose, but beginning with the present issue it will appear as a monthly magazine similar to the former series, but of extended scope and wider effort.

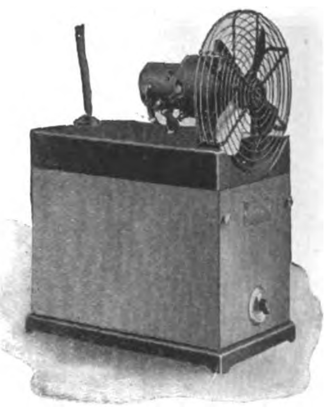


Fig. 2.—Universal Ozonator for Direct-Current Circuit.

The April issue, which is designated as Volume 1, Number 1, is handsomely printed on non-glazed paper. There are many interesting and valuable articles relating to illumination, both from technical and practical viewpoints. There is also a chapter devoted to magazine advertising which presents a study of the national advertising campaign promulgated by the Edison Lamp Works. Another interesting feature is a chapter devoted to co-operative publicity. This illustrates the many ways in which the lamp works will co-operate with the dealer in extending the utilization of incandescent lamps.

Electric Towing Locomotives for Panama Canal Locks.

The first lot of electric towing locomotives for hauling vessels through the locks of the Panama Canal are now being received at the Isthmus. In all 40 of these "electric mules" are being built by the General Electric Company for this purpose. The machines weigh 82,500 pounds; measure 32 feet 2.5 inches long, by 8 feet wide, by 9 feet 3 inches in greatest height over the cabs. They have an available tractive effort as high as 47,500 pounds and a windlass rope pull of 25,000 pounds. Four of them, two on each side, will ordinarily propel steamships through the locks. Sometimes six engines will be needed to handle extra large vessels. In every case two locomotives astern, acting as a brake on the ship's movements, will give direction to her course. No vessel will be allowed to enter the locks and go through on her own power.

The locomotive is built up of cast-steel side and end frames, cross ties and bedplates. It is mounted on two axles with wheels in accordance with M. C. B. standards. The entire frame is supported from journal boxes of the regular railway type by means of coiled springs. The sides and top of the body are inclosed by sheet-iron covers which fit in place and are very easily removable. At each end are inclosed cabs so that the the locomotive may be operated from either end.

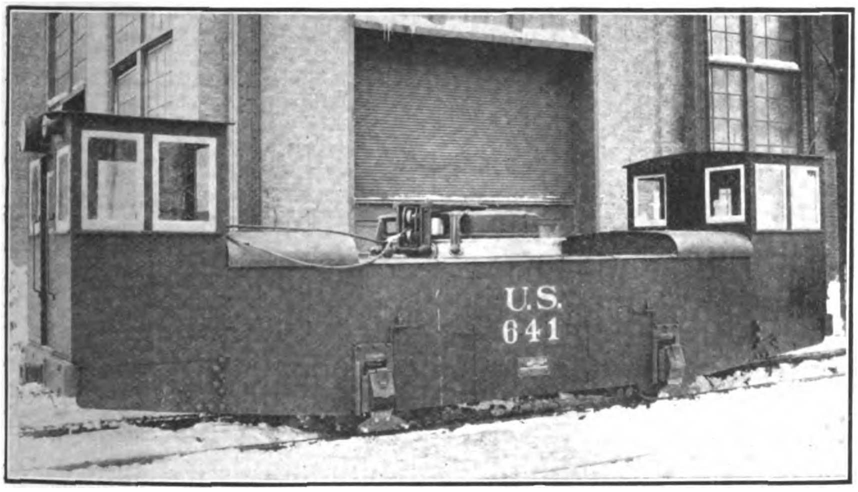
The locomotive is propelled by means of a rack rail while towing and while going up or down the steep grades from one level to another at a speed of two miles per hour. While running idle or on return tracks, the speed is changed to five miles per hour and the machine is propelled by the regular traction method, the rack pinion being entirely released. This change is effected by manually operated clutches located in the gear mechanism in connection with a lever in each cab similar to a steam locomotive.

The locomotive is driven by two 75-horsepower totally inclosed motors of the mill type, one being direct-connected through reduction gearing to each axle. Three-phase, 25-cycle, 220-volt current is used and is collected by contact plows. The motor and traction gearing is mounted on a common baseplate, which in turn is mounted on a driving axle and spring suspended to the locomotive frame in the same way as in regular railway practice.

In the center of the locomotive is located a vertical windlass with drum, the capacity of which is 800 feet of one-inch steel hawser cable. The windlass with its driving motors and gearing is mounted on a solid baseplate and is likewise independent of the movement of the locomotive frame. The cable drum extends above the locomotive cover and has a floating guard placed around it to retain the cable while coiling loose.

The windlass cable is handled by two 20-horsepower motors, also totally inclosed and of the mill type. One is geared for a rope speed of 12 feet per minute at a pull up to 25,000 pounds at two-foot radius, and its function is to adjust the position of the ship for anchor or while being towed through the locks. The other motor is geared for a rope speed of 200 feet per minute at two-foot radius, and its duty is to take up slack or pay out cable or wind in any part of the entire length of cable as may be required. The cable drum is driven through a friction device which can be set at any desired value from zero up to the full capacity of the motor.

The traction motors, as well as the windlass motors, are controlled from either cab, that is, the control equipment is duplicated. The two traction motors are operated by one master controller and contactors forward and reverse; while the windlass motors are operated by a reversible drum controller, and the clutch on the main vertical shaft by a solenoid. In a later article we will be able to give a more detailed description of the mechanical and electrical construction and performance of these machines.



Electric Towing Locomotive for Panama Canal Locks.

Flexible-Jointed Pipe for New York Water-Supply System.

An important contract has just been concluded calling for the manufacture of 9,800 feet of 36-inch, flexible-jointed, cast-iron submarine pipe for use in connection with the New York City water supply. It will form a siphon under the Narrows so as to carry to Staten Island the water brought from the Catskill Aqueduct. The siphon will extend from 79th Street and Shore Road, Bay Bridge, Brooklyn, to the junction of Arrietta Street and Stuyvesant Place, Staten Island.

In order to lay this pipe, which will weigh approximately 3.800 tons, it will be necessary to dig a trench across the Narrows, which on account of the dense traffic will be a very difficult job since the specifications require that no more than 1,000 feet of channel may be obstructed at any time. Further difficulties in the laying of this pipe will likely be afforded by the tides, currents and great depth of water, and the total excavation necessary.

Experiments made by engineers for the City of New York with 36-inch flexible-jointed pipes have proved that such joints are water-tight before, during and after deflection under water pressure up to 2,000 pounds per square inch, and give every promise of being acceptably tight joints without the necessity of submarine calking.

In addition to furnishing 3.800 tons of submarine pipe, the contract also calls for furnishing over 300 tons of hub and spigot cast-iron pipe.

The essential features of the flexible joints, are: the flexible bell turned on the interior and reinforced by a band of wrought iron, set, shrunk, or pressed on; a spigot having a tap grooved for the retention of the lead; a narrow turned collar to bear on the bell in order to insure uniform leaded space to carry the weight. The angle of maximum deflection of the joint is to be 10 degrees 50 minutes.

The average laying length of the pipes is to be at least 12 feet. The pipe is to be coated inside and outside with a bitumastic solution, or bitumastic enamel. Before the first coat has been applied, each pipe shall be subjected to a hydrostatic pressure of 350 pounds per square inch, and to a hammer test under this pressure.

The pipe will be cast at the Trafford City foundry of the Westinghouse Machine Company, which has secured the contract, and the machine work, of which there is a very considerable quantity, will be performed at the East Pittsburgh works of the company. When the pipe has been finished it will be shipped to New York and loaded on barges from which it will be lowered into the water in sections.

Latest Approved Fittings

ASBESTOS.—Asbestos Wood Company, Nashua, N. H. The H. W. Johns-Manville Company, New York, N. Y., sole agents.

"Cransite Asbestos Wood" is the equivalent of ordinary asbestos board. It is not a non-absorptive material, but is non-combustible and possesses considerable mechanical strength.

Approved March 9, 1914.

AUTO-STARTERS.—General Electric Company, Schenectady, N. Y.

Two and three-phase starters in sizes including 200 horsepower for circuits of 110, 220, 440 and 550 volts.

CR-2361. For automatic control. Contactors and air-cooled compensators mounted as a unit on a slate panel. These starters require separate switches to disconnect all the line wires.

CR-1034. For manual operation. Oil-immersed switch and air-cooled compensators mounted as a unit in a metal case. With and without overload and no-voltage release coils. In the off position the compensator and motor windings are disconnected from the line.

Approved March 16, 1914.

AUTO - STARTERS. — Triumph Electric Company, Cincinnati, O.

Two or three-phase starters, in sizes including 50 horsepower for circuits of 110, 220, 440 and 550 volts. Special four-pole double-throw switch mounted on slate front with air-cooled transformer. These starters require separate switches to disconnect the line wires.

Approved March 16, 1914.

AUTO-STARTERS.—Wagner Electric Manufacturing Company, 6400 Plymouth Avenue, St. Louis, Mo.

Catalog Nos. 6-B-1, 7-B-1, 8-B-1, 9-B-1, 10-B-1.

Oil-immersed switches and air-cooled transformers mounted in metal cases. In the off position the switches disconnect the motor and transformer windings from the line.

Approved March 16, 1914.

AUTO-STARTERS.—Western Electric Company, New York and Chicago.

Two and three-phase starters in sizes including 200 horsepower, for circuits of 110, 220, 440 and 550 volts.

CR-2361. For automatic control. Contactors and air-cooled compensators mounted as a unit on a slate panel. These starters require separate switches to disconnect all the line wires.

CR-1034. For manual operation. Oil immersed switch and air-cooled compensators mounted as a unit in a metal case. With and without overload and no-voltage release coils. In the off position the compensator and motor windings are disconnected from the line.

Approved March 16, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTO-STARTERS.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Five to 200 horsepower, 110 to 600 volts.

Oil-immersed switches and air-cooled transformers mounted as a unit in a metal case. In the off position the switches disconnect the motor and transformer windings from the line.

Approved March 16, 1914.

AUTO-STARTERS.—Allis-Chalmers Manufacturing Company. Works of the Bullock Electric Company, Norwood, O.

Potential-starters, five to 2,000 horsepower, 110 to 600 volts.

Types A, B, C, D and F.

Oil-immersed drum switches and transformer coils in iron cases. In the off position the switches disconnect the motor and transformer windings from the line.

This manufacturer is prepared to furnish these auto-starters with a device making it impossible to leave the handle in the starting position. Starters so equipped are deemed superior from the point of view of the fire hazard.

Approved March 16, 1914.

AUTO - STARTERS.—Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind.

Types C and CC, 10 to 100 horsepower, 110 to 600 volts.

Oil-immersed switches and air-cooled transformers mounted in metal cases. In the off position the switches disconnect the motor and transformer windings from the line.

Approved March 16, 1914.

BASEBALL GAME APPARATUS.—E. R. Ramsey, submitter, Penn Yan, N. Y. Manufactured for the above by Betts & Betts, 256 West Fifty-fifth Street, New York, N. Y.

An apparatus consisting of a sheet-metal game board, contactor box and switch box, in which the motion produced by striking a baseball operates a contactor to close the circuit through one of a number of incandescent lamps.

Approved January 31, 1914.

CABINETS.—J. B. Hauer, 23 Richardson Street, Brooklyn, N. Y.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved February 24, 1914.

FIXTURE WIRE.—Canada Wire & Cable Company, Limited, 1160-70 Dundas Street, Toronto, Canada.

Marking: one red thread woven in the braid.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 6, 1914.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

"G. E." heaters, 95-250 volts.

- Liquid heating devices.
  - Water heaters: types L-14, L-15, L-32, L-43; 150-500 watts.
  - Teakettles: types L-18, L-28, L-29; 220-575 watts.
  - Percolators: types L-27, L-37, L-47; 400-450 watts.
  - Coffee pots: type L-48; 400 watts.
  - Samovars: type L-41; 400 watts.
- Dry culinary heating devices.
  - Toasters: types D-12, D-20; 600-3,500 watts.
  - Disk stoves: types D-8, D-9, D-14, D-15, D-24 to D-26 inclusive, D-52; 225-900 watts.
  - Hot plates: type D-37, 300-1,500 watts, for use on circuits not exceeding 125 volts, but including in three-wire 125-250 volt systems, with grounded neutral, three-wire circuits and two-wire, 125-volt or 250-volt circuits.
  - Corn poppers: type D-7; 300 watts.
  - Radiant grills; type D-42; 600 watts.

Approved February 25, 1914.

SOCKETS, Standard.—Wirt Company, Armat and Lena Streets, Germantown, Philadelphia, Pa.

"Dimalite" turn-down socket. 16 candlepower, 125 volts.

A lamp holder with screw-plug attachment having a resistance suitably inclosed by means of which regulation of incandescent lamp is secured.

Approved February 26, 1914.

WIRES, Slowburning Weatherproof.—Chicago Insulated Wire Company, Sycamore, Ill.

White slow-burning braids on the outside.

Marker: Brown thread woven spirally in inner white braid.

Approved February 28, 1914.

SWITCHES, Pendent Snap.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Three-heat; catalog No. 7,020.

Approved February 27, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

BOSTON, MASS.—A large electric light and power plant is to be built by C. D. Parker & Company, bankers of Boston, on the north bank of the canal near what is known as the old Gray place.

BOSTON, MASS.—A certificate of incorporation has been granted to the Associate Power Company, capitalized at $2,500.

AKELEY, N. Y.—Preparations are being made for establishing an electric light plant here. Address the town clerk for general information.

CAMDEN, N. J.—The City Council is arranging for the adoption of ordinances enforcing the installation of underground lines throughout the city, such work to be carried out at the expense of the utility companies. The Electrical Committee is in charge. A.

CAMDEN, N. J.—In connection with its new creamery plant to be erected on Eighth Street, the Garden State Dairies will build a power plant, at an estimated cost of $75,000. A.

SOUTH ATLANTIC STATES.

WILMINGTON, DEL.—Southern Iowa Railway & Light Company has been incorporated for the Manufacture and distribution of electrical energy for light, heat and power. The capital stock is $500,000 and the incorporators are H. E. Latter, N. P. Coffin, O. J. Reichard, Wilmington.

ANNAPOLIS, MD.—The Eastern & Western Shore Railroad Company has been incorporated to construct an electric line from Annapolis to Fair Haven on the bay shore of Anne Arundel. From there a ferry will operate across the bay and a line constructed to Cambridge, Vienna, Sharptown, Salisbury and Ocean City, Md., and to Franklin City, Va., and from Salisbury to Crisfield. On the Western Shore a line will be constructed from Fair Haven to Washington. It is stated that Washington capitalists are largely interested in the enterprise and are ready to undertake financing it.

FLOYD, VA.—Citizens' Mutual Telephone Company has been incorporated, capitalized at $10,000. J. P. Williams is president; and L. C. Hylton, secretary.

KING, N. C.—The Dan River Railway Company, has been organized for the purpose of constructing an electric railway from King to Danbury, about 30 miles. Address H. D. Miller, Clemmons, N. C., president.

SOCIETY HILL, S. C.—The Society Hill Power Company has been granted articles of incorporation with a capital of $4,000. Bright Williamson, of Darlington, and J. E. Blackman, of Society Hill, are the incorporators.

CORDELE, GA.—It is now understood that the project of the proposed interurban electric railway from Chattanooga to Jacksonville *via* Atlanta includes a line from New York City to Jacksonville along the national highway over which the famous Glidden Tour passed in 1911. It is understood this route is favored with a view to eliminating the tremendous expense of buying a right of way through the states to be traversed.

GAINESVILLE, GA.—The Sugar Hill Telephone Company has been incorporated with a capital stock of $500,000 by J. L. Blackstock, Z. J. Fuller, T. G. McMillan and others to construct a rural telephone system from Gainesville to Athens Road.

CRYSTAL RIVER, FLA.—A local company has been organized to build and equip an electric light plant. Dr. J. Max Irwin is president.

NORTH CENTRAL STATES.

URBANA, O.—The Urbana Light Company, by reason of its inability to get a satisfactory franchise from the village of Mutual has decided to run its power lines around that place, with the line now building, to the Catawba gravel pits. The company refuses to light the village streets for the franchise privilege. R.

WEST UNION, O.—S. S. Jones is a member of a committee appointed to plan ways and means to secure municipal lighting.

ANDERSON, IND.—A new and elaborate system of street lighting in the business section is proposed in an ordinance to be introduced in the city Council. Address the city clerk.

CRAWFORDSVILLE, IND.—The Council plans to increase the capacity of the electric light plant. Address Fred Miller, superintendent, in regard thereto.

EVANSVILLE, IND.—The Public Utilities Company will expend $32,000 extending the car line. Address General Manager Blinn.

INDIANAPOLIS, IND.—The Louisville & Northern Railway & Lighting Company, of which Chester P. Wilson is president, is contemplating extending its line between Louisville and Charlestown, Ind., to Madison, Ind. The company is also planning to extend its lines from Charlestown to Sellersburg, Ind., for the purpose of furnishing light to the latter place, as well as to the farmers living between the two towns. G.

CHENEYVILLE, ILL. — J. E. Leach, of this village, is arranging to put in a private electric light plant here.

PANA, ILL.—At a mass meeting of more than 200 business men of Pana it was decided to organize a company for the erection and operation of a private electric light and power plant. Harvey W. Ferguson is interested.

DETROIT, MICH.—It is reported that the Detroit, Toledo & Ironton Railroad is planning to electrify its entire system under the new organization. It is proposed to equip the line between Lima and Ironton with combination electric and gasoline cars. According to the information obtained here this plan involves only the passenger equipment of the road.

MUNITH, MICH.—Munith Telephone Company, has been incorporated with a capital of $1,000.

AUGUSTA, WIS.—Augusta Light & Telephone Company will make improvements to cost $3,140. C.

BOYCEVILLE, WIS.—Boyceville Telephone Company has been incorporated with a capital of $10,000 by W. H. Pork, O. E. Skamser, V. B. Lewis and C. H. Hayes.

COLEMAN, WIS.—The Coleman-Pound Light & Power Company has been incorporated with a capital of $10,000. It will furnish light and power to the villages of Pound and Coleman. The incorporators are D. F. Smith, Green Bay; Otto Koening, Pound, H. A. Van Vonderen, John Hammer, R. J. Pardee, Coleman, and others.

GREEN BAY, WIS.—The electric lines of the Wisconsin Public Service Company will be extended from Wrightstown through Greenleaf to Brillion and thence to Reedsville and surrounding territory. About $12,000 will be spent by the company. Address C. R. Phenecie for further information.

PRAIRIE FARM, WIS.—Louis Larsen has started a movement to form a stock company and install an electric light plant here, at an estimated cost of $2,300. C.

SHEBOYGAN, WIS.—The Sheboygan Railway & Electric Company will rebuild its line between this city and Sheboygan Falls, at a cost of about $20,000. Address the general manager.

EVELETH, MINN.—This city will have a municipal electric lighting plant, either by purchasing the property and franchise of the Home Electric & Heating Company, or by building a new plant if present plans go through. Address the city clerk.

VERGAS, MINN.—J. E. King of Frazee contemplates the installation of an electric light plant in Vergas.

COUNCIL BLUFFS, IOWA.—The Central Iowa Railroad Company has been incorporated with a capital stock of $5,000. A line will be built from Omaha to Des Moines.

KEOKUK, IOWA. — The Keokuk Electric Company plans to expend $10,000 this spring in enlarging its lines. Address the general manager.

KNOXVILLE, IOWA.—The Knoxville Electric Company has been granted a franchise to establish an electric light plant. Address W. E. Rinehart, city clerk, for general information.

MONONA, IOWA.—C. S. Donaldson, owner of the electric light plant at McGregor, will build a transmission line to this place, a distance of 14 miles. C.

SIBLEY, IOWA.—The Council has directed Engineer Grover, of the Sibley Light & Power Company to prepare plans for an electric light plant. As soon as they are ready the council will advertise for bids for one of the most modern plants ever installed in a city of this size. Address the city clerk.

GILMAN, MO.—Bonds will be sold to establish an electric light system. Address the city clerk.

POPLAR BLUFF, MO.—A bond issue of $75,000 for the building of a municipal light system has been decided upon in this city.

BUFFALO, N. D.—Harry Chistensen, the town marshal, has purchased the Buffalo Electric Light, Heat & Power Company, and will enlarge the plant.

LISBON, N. D.—Farmers Success Telephone Company has been organized with a capital of $10,000. Carl Bliss and others are interested. C.

DALLAS, S. D.—The Southeast Tripp Telephone Company has been incorporated with a capital stock of $10,000 by Ernest Prinz, Herman Starner and others.

OWANKA, S. D.—The Short Line Telephone Company has been incorporated with a capital stock of $2,000 by F. B. Stiles, W. R. Littlefield, of Owanka, and others.

PENNINGTON, S. D.—The Rockerwille Telephone Company has been incorporated with a capital of $1,000 by Benjamin Rush, D. R. Morris, R. M. Peabody and T. E. Christienson.

WESSINGTON SPRINGS, S. D. The County Farmers Telephone Company has been incorporated with a capital stock of $30,000 by S. E. Miller, W. C. Grives and others.

BEATRICE, NEB.—The Iowa-Nebraska Public Service Company will soon begin the work of rebuilding its lines throughout the city. The intention is to practically replace the old wires and poles with new ones. The present plant will also be rebuilt and made fireproof. W. C. Ross, Omaha, receiver of the company, and L. A. Williams, of Norfolk, are interested.

OMAHA, NEB.—Architects Thomas R. Kimball and George Prinz are preparing plans for two telephone exchange buildings and after completion $80,000 worth of telephone equipment will be installed.

LEAVENWORTH, KANS.—The Chamber of Commerce has endorsed plans for the construction of a $350,000 power plant at the old Brighton mine, two miles west of Lansing. The power will be sold in Leavenworth and adjacent towns. M.

SOUTH CENTRAL STATES.

ALVATON, KY.—Alvaton Home Telephone Company has been incorporated with a capital of $400 by J. E. Poe, E. M. Jenkins, Mun Isabell, Ed. C. Satterfield, J. C. Myers, J. S. Kirby, and others.

ASHLAND, KY.—The Selby Shoe Company will purchase additional electrical machinery for the operation of its plant some time during the coming summer. G.

BLOOMFIELD, KY.—The Calrose Rural Telephone Company has been incorporated by J. C. Drake and others, for the purpose of building a line of telephone. G.

CONCORD, KY.—The Concord Telephone Company, has been organized by Julius Ashenhurst and others with a capital stock of $2,000, and will construct a line. G.

CUPID, KY.—The Cupid & Mt. Eden Telephone Company has been incorporated, capitalized at $240, by A. Skinner, W. B. Mattingly and R. B. Ridgeway.

IRVINE, KY.—This city is preparing to offer for sale an electric-lighting franchise, in pursuance of which a plant will be built to furnish current for lighting and other purposes in the town. The mayor can give information. G.

LOUISVILLE, KY.—Samuel D. Jones, business director of the Board of Education, is planning to install electric lights and vacuum cleaners in all of the public schools this summer. G.

MAYSVILLE, KY.—A municipal electric lighting plant, to cost about $22,000, will probably be constructed here, according to plans now under consideration. A steam turbine, transformer and other equipment for 125 arc lights will be required. G.

PRINCETON, KY.—Mayor R. W. Lisanby can give information regarding a project to establish electric light plant in this city. G.

DONELSON, TENN. — Donelson Telephone Company has been incorporated with a capital of $5,000, by E. E. Ridley, Robert Pendleton, W. W. Castleman, B. H. Williams and George Phillips, to operate a telephone exchange here.

INVERNESS, MISS. — The Inverness Telephone Company has been incorpated with a capital stock of $1,500 by J. T. Duncan, J. F. Jones and others.

GROSSE TETE, LA.—H. Adams, of this place, is solicitating subscriptions to build a telephone line between Grosse Tete and Maringouin.

PONCHATOULA, LA.—A charter has been granted to the Upland Telephone Company with a capital of $10,000. John E. Martin is president; Charles P. Matti, vice-president and general manager; and Everett Spraker, secretary and treasurer.

CHEROKEE, OKLA. — Plans are under consideration for running an electric power line from Cherokee to Jet, to furnish lights there and possibly power for a water plant. Many of the farmers along the proposed line have also taken the matter up enthusiastically and are anxious to get service from the line if it is built. P.

PARITA, TEX.—Parita Telephone Company, has been incorporated with a capital of $2,500 by A. Pirie, Roy Barnburg and Jo. Campbell.

SAN ANGELO, TEX.—J. D. Sugg, owner of the street railway system here, has announced the completion of plans for the expenditure of more than $150,000 within the next six months. Mr. Sugg proposes to construct a large power plant to furnish electricity for his car system. He will also furnish electricity to light San Angelo in competition with the other company here.

SHERMAN, TEX.—The Sherman Chamber of Commerce has taken up the matter of lighting the principal business streets with ornamental lighting.

WESTERN STATES.

BLOOMFIELD, MONT.—Bloomfield Mutual Telephone Company has been organized, with Joseph Kitchen, president. A line will be built to Lindsay and a switchboard installed here. C.

MISSOULA, MONT.—The Potomac Telephone Company has been incorporated with a capital stock of $10,000, and will build a telephone line from Missoula *via* Bonner to Ovando. The incorporators are M. D. Flynn, W. L. Stockton and others.

MISSOULA, MONT.—Residents of Blackfoot County have filed articles of incorporation for Big Blackfoot Telephone Company. The line will run from here to Bonner, and Ovando and Potomac. C. A. Smith and others are interested. The capital is $10,000.

SCOBEY, MONT.—Richard Coughlin and D. Bennett have announced their intention of installing an electric light plant and lighting system here. O.

DENVER, COLO.—The Denver Gas & Electric Company will expend $20,000 on improvements. Address Henry L. Doherty, manager.

BRIGHAM CITY, UTAH.—A new telephone system is being promoted by A. J. Nelson, and it is proposed to run the line south from Strevell, Idaho, through Blue Creek to Blue Springs, thence southeasterly to Blind Springs and Tremonton, where connection will be made with the Bear River Valley Telephone Company.

FILLMORE, UTAH.—Messrs. Yates and Richards, of Salt Lake City, Utah. have filed on a water-power site in the canyon near Fillmore. They have submitted a proposition to the City Council relative to installing an electric-lighting plant for the city, the cost of which is estimated at approximately $17,500. U.

MIAMI, ARIZ.—The Globe-Miami Traction Company has been formed to build an electric road between Globe and Miami. Vote on a franchise will take place at an election to be held in the immediate future. D. O. De Tar, of Globe, is president. M.

SPOKANE, WASH.—Salmon River Power & Light Company has been incorporated with a capital of $400,000 by C. L. Mackenzie, H. H. Bloomer, Grant Smith, Edward Riggs, and Ralph Irvin.

YAQUINA, WASH.—Yaquina Bay Telephone Company has been incorporated with a capital of $50,000.

PORTLAND, ORE.—George H. Cecil, United States District Forester, recently issued a special permit to the Golden Gate Mining Company, an Arizona corporation developing mines in the Whitman National Forest, in the Blue Mountains of Eastern Oregon, to erect a power house, conduit and auxiliary improvements for the generation and transmission of electric power. The company expects to begin work this summer. When the project is completed, the power is to be used for the operation of the company's mines. The project is located in Grant County, and the water will be diverted from Granite Boulder Creek. The powerhouse will be six miles from Greenhorn. A quarter acre reservoir, and conduit 4,000 feet long will be installed, and 500 horsepower will be developed.

The total cost of the project is estimated at $25,000. O.

IMPERIAL, CAL.—Articles of incorporation has been filed for the El Centro, Imperial, Calexico Electric Railway Company, the capital stock of which is $200,000. The purpose of this company is to erect an electric line 20 miles in length from this city to Calexico, by way of El Centro. It is understood that this is to be the beginning of a network of electric lines that will thread the entire length of the valley. T.

LOS ANGELES, CAL.—The Pacific Electric Railway expects in the near future to electrify the Salt Lake line between Pasadena and Los Angeles, and use it for through passenger service.

LOS ANGELES, CAL.—This city is planning to spend between $50,000 and $100,000 on an electrical display for the city for next year, 1915, when the fairs are being held in San Diego and San Francisco. This work will include some unusual features. T.

NEWPORT BEACH, CAL.—Bids will be received up to May 4 for a telephone and telegraph franchise in this city.

NORTHAM, CAL.—The residents of this place have under consideration the ornamental illumination of the county road south of this place for a distance of four miles, the property owners in the vicinity to be assessed for the construction and maintenance of the system. The City Trustees of Buena Park, a short distance from this place, have ordered Grand Avenue illuminated along its entire length. T.

POMONA, CAL.—Under the direction of the Civics Committee of the Chamber of Commerce of this city, Paul F. Higgs is preparing plans for a system of decorative street lighting for this place. This proposed system will include 300 ornamental lights and a large electrically-lighted arch. T.

PLACERVILLE, CAL.—The Truckee River General Electric Company is preparing to begin construction of its power project, for which a permit was issued by the Forest Service last September, which requires the company to commence work within 12 months on unit No. 1 of the project consisting of several reservoirs and ditches and two power plants, which are to be located on Pilot Creek in El Dorado County, and to complete that part of the project within four years from the date of the permit.

SAN FRANCISCO, CAL.—The State Railroad Commission has granted authority to the Marion County Electric Railways to construct a street railway line in Mill Valley and to sell stock to finance the proposition to the extent of $67,000. T.

VISALIA, CAL.—Rights of way are being secured for an electric road to connect the new town of Venice Hill with Visalia. The proposed line will be eight miles in length and will connect with the east side Southern Pacific branch, the new eastside Santa Fe line and the terminus of the Visalia electric, completing a loop for the latter and traversing a rich agricultural district. T.

CORDOVA, ALASKA.—James J. Godfrey, president of the Mother Lode Mines Company, has announced that extensive development plans are under way by his company and that a large power plant will be installed.

NEW CORPORATIONS.

CLEVELAND, O.—The Ex-el Electric Company has been incorporated with a capital stock of $10,000 by L. J. Kohn and others.

CLEVELAND, O. — The West Ninth Street Electric Company has been incorporated with a capital stock of $10,000 by N. Greenhut, and others.

KANSAS CITY, MO. — Funsten Electric Company has been incorporated with a capital stock of $10,000 by Robert Funsten, F. K. Funsten and John Donnell.

BURTON, WASH.—Vashon Electric Company has been incorporated with a capital of $75,000 by H. H. Edwards, S. J. Linden, Edna W. Edwards and Ivy L. Linden.

ROCHESTER, N. Y.—Praz Electro-Technical Corporation has been incorporated with a capital stock of $2,100 by Josef Praz, Morris Hoelzle and Alfonso Spannagel, all of this city.

CAMDEN, N. J. — Beach Haven Electric Heating & Power Company has been incorporated with a capitalization of $100,000. The incorporators are G. R. Holmes, Frederick R. Bagwell and S. R. Leap.

BUFFALO, N. Y.—The Electric Dishwasher Company, Incorporated, has been granted articles of incorporation with a capital stock of $100,000. The incorporators are Eugene Cary, Richard Cary and George W. Hewitt, all of Niagara Falls, N. Y.

CRAWFORD, N. Y—The Thompson Ridge Telephone Company, Incorporated, has been granted articles of incorporation, capitalized at $1,000. The incorporators are Arlington S. Dickerson, Peter Richardson and Theodore G. Clark, all of this place.

CLEVELAND, O.—Fisk Battery Box Company, has been incorporated to manufacture and deal in electrical equipment of all kinds. The capital stock is $10,000 and A. W. Thomas, E. M. French, L. A. M. Pejau, J. L. Fairbanks and William E. Patterson are the incorporators.

MANHATTAN, N. Y.—Progressive Electric Welding Company, Incorporated, has been granted articles of incorporation, capitalized at $60,000. The incorporators are E. Von der Heyde, E. Wellesky, of New York, and C. L. White, Jr., of Passaic, N. J.

MORGANTOWN, W. VA. — National Electric Sign & Construction Company has been granted articles of incorporation, capitalized at $25,000. The incorporators are E. M. Grant, E. D. Tumlin, Albert Shuman, of Morgantown; Percy S. Dittenhafer, Canton; and E. P. Robbins, of Mansfield.

SHEPHERDSVILLE, KY.—The Shepherdsville Electric Light, Water & Cold Storage Company has been organized with a capital stock of $10,000, and it is planned to take over the existing lighting plant and enlarge it for the purpose of operating a cold storage and ice plant. S. W. Bates is president of the company. G.

TORONTO, ONT.—The Stanworth Power Company has been incorporated with a capitalization of $250,000. The incorporators include W. J. Simpson, Stewart W. Hall, Robert E. W. Duke, Alfred Wales and H. G. Hammond. The company is empowered to do a general power development and power distribution business.

NEW PUBLICATIONS.

MINE SWITCHES.—The Bureau of Mines, Washington, D. C., has published bulletin No. 68 entitled "Electric Switches for Use in Gaseous Mines," by H. H. Clark and R. W. Crocker. This is an illustrated pamphlet of 38 pages.

GOVERNMENT OWNERSHIP OF TELEPHONES.—A paper by J. Heron Crosman, Jr., commercial superintendent of the Bell Telephone Company of Pennsylvania, entitled "Proposed Government Ownership and Operation of the Telegraph and Telephone Systems in the United States," has been published in pamphlet form. The paper was read before the telephone societies of Pittsburgh and Philadelphia, and has been issued as a supplement to the *Telephone News* of March 15.

SWITCHES FOR LIGHTING CIRCUITS.—A second edition of "Lektrik Lighting Connections" has been published by A. P. Lundberg & Sons, 477 Liverpool Road, London, England, and is supplied for 15 cents. It contains very many useful suggestions and directions as to the best methods of arranging lighting circuits for convenient switching and the various methods are illustrated by diagrams. The booklet is of vest-pocket size and contains 75 pages.

PROPOSALS.

ELECTRICAL CABLE, ETC.—Sealed proposals wil be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 28, for furnishing 11,500 feet of interior communication cable; 2,000 feet plain twin conductor; 350 cords, and 25 headgears; 200 insulators; 2,000 feet soft-steel twin-conductor wire, leaded and armored, all as per Schedule 6624 for delivery at the Navy Yard, Brooklyn, N. Y.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until April 21 for furnishing 4,000 feet of phosphor bronze cable, as per Schedule 6585; 50,000 feet of double-conductor telephone cord and 2,000 feet of single-conductor plain wire, as per Schedule 6595; and four electric exhaust fans, as per Schedule 6573; all for delivery at the Navy Yard, Brooklyn, N. Y.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until May 4 for the interior lighting fixtures of a one-story building for the post office at Shelbyville, Tenn.; until May 5 of a one-story building for the post office at Wahpeton, N. D.; until May 6, of a one-story building for the post office at Grass Valley, Cal.; until May 9 of a one-story building for the post office at Hampton, Va.; until May 11 of a two-story building for the post office at Huntington, Pa.; until May 12 of a two-story building for the post office at Longview, Tex.; until May 13 of a one-story building for the post office at Excelsior Springs, Mo.; until May 14 of a two-story building for a post office at Moundsville, W. Va., all in accordance with drawings and specifications, copies of which may be obtained from the office of the Supervising Architect or the custodians of the sites named.

FINANCIAL NOTES.

At the annual meeting of the Western Electric Company, directors were re-elected.

The special meeting of Philadelphia Company to be held June 15 is for the purpose of reducing the authorized $6,000,000 five-per-cent preferred stock of the company to approximately $2,098,000.

At the annual meeting of the Charleston (S. C.) Consolidated Railway, Gas & Electric Company retiring directors and officers were re-elected. An increase of $500,000 in the capital stock of the company was authorized.

The Corpus Christi (Tex.) Ice & Electric Company and the Corpus Christi Street & Interurban Railway Company has been purchased by Newburger, Henderson & Loeb. Engineers are now formulating a plan for the development of the properties.

The upstate New York Public Service Commission has authorized the application made by the Cliff Electrical Distributing Company to issue $150,000 stock to be sold at not less than par. The proceeds are to be used to buy additional equipment.

The California Railroad Commission has approved the issue of $7,000,000 one-year five-per-cent notes of the Pacific Gas & Electric Company recently sold to a syndicate of New York bankers. The notes are secured by the deposit of $5,000,000 general-lien bonds of the company and $5,000,000 general and refunding bonds, and mature March 25, 1915.

The Denver Gas & Electric Light Company is offering through Henry L. Doherty & Company and associated brokers $3,500,000 three-year collateral-trust guaranteed six-per-cent notes at 99, accrued interest to yield 6.375 per cent, dated April 1, 1914, and maturing April 1, 1917. The notes are secured by $5,752,000 first and refunded five-per-cent bonds of the Denver Gas & Electric Light Company, due 1951, and $936,000 general (now first) five-per-cent bonds of the Denver Gas & Electric Company. The proceeds will be used to retire $2,500,000 Denver Gas & Electric Company six-per-cent collateral-trust notes, maturing April 1, 1914, to reimburse the treasury of the company for capital expenditures already made and for future extensions and improvements.

Eugene Meyer, Jr., & Company, New York, is offering seven per cent cumulative preferred shares of the Montana Power Company. The company was organized in December, 1912, in New Jersey, and owns in fee all the properties formerly owned by the Butte Electric & Power Company, Madison River Power Company, Billings & Eastern Montana Power Company, Missouri River Electric & Power Company and (the former Montana Power Company. It also owns the capital stock of the Great Falls Power Company, Thompson Falls Power Company, and the Montana Reservoir and Irrigation Company.

Dividends.

Associated Gas & Electric Company; a quarterly preferred dividend of 1.5 per cent, payable April 15 to stock of record March 31.

Dallas Electric Company; the regular semi-annual dividends of $3 a share on the first-preferred and $2.50 a share on the second-preferred stocks, both payable April 13 to stock of record of April 3.

Houghton County Electric Light Company; the regular semi-annual dividends of three per cent on its preferred stock and 2.5 per cent on its common stock, both payable May 1, to stock of record of April 16.

Illinois Northern Utilities; a quarterly preferred dividend of 1.5 per cent, payable May 1 to stock of record April 20.

Jackson Traction Company; the regular quarterly dividends of $1.75 on the common and $1.50 on the preferred stocks, payable May 1, to stock of April 16.

Metropolitan West Side Elevated; a quarterly preferred dividend of 1.25 per cent, payable March 31.

Milwaukee Electric Railway & Light Company; a quarterly preferred dividend of 1.5 per cent, payable April 30 to stock of record April 20.

Northern States Power Company; a quarterly preferred dividend of 1.75 per cent, payable April 15 to stock of record March 31.

Ottumwa Railway & Light Company; a quarterly preferred dividend of 1.75 per cent, payable April 15 to stock of record March 31.

Public Service Company of Northern Illinois; the regular quarterly dividends of $1.50 on the preferred and $1.25 on the common stocks, both payable May 1.

Puget Sound Traction, Light & Power Company; a quarterly dividend of $1.00 per share on common and $1.50 per share on preferred, both payable April 15 to stock of record April 2.

South Side Elevated; a quarterly dividend of 1.5 per cent, payable March 31.

Southern New England Telephone Company; a quarterly dividend of 1.75 per cent, payable April 15 to stock of record March 31.

Western States Gas & Electric Company; a quarterly preferred dividend of 1.75 per cent, payable April 15 to stock of record March 31.

Reports of Earnings.

NORTHERN IDAHO & MONTANA.

The Northern Idaho & Montana Power Company reports for the year ended December 31, 1913, as follows:

Gross	$668,035
Net	284,655
Other income	8,426
Total income	293,081
Charges	355,846
Deficit	62,765

PACIFIC GAS & ELECTRIC.

The Pacific Gas & Electric reports for the year ended December 31, 1913, as follows:

	1913	1912
Gross earnings	$16,202,049	$14,744,651
Operating expenses, maintenance, taxes, etc.	9,311,315	8,431,161
Net earnings	6,890,734	6,313,490
Bond interest	3,892,920	3,696,814
Balance	2,997,814	2,616,676

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1914	1913
February gross	$ 256,180	$ 114,143
Net, after expenses, interest and taxes	183,865	112,250
Balance after preferred dividends	103,865	82,250
12 months' gross	2,658,493	1,360,166
Net, after expenses, interest and taxes	2,059,611	1,211,461
Balance after preferred dividends	1,199,611	851,461

NORTHERN STATES POWER.

Northern States Power Company reports as follows for 12 months' period ending as follows:

	Feb. 28, '14	Jan. 31, '13
Gross earnings	$3,934,898	$3,916,064
Net after taxes	2,011,334	1,999,090
Surplus after charges	783,398	770,082
Balance after preferred dividends	206,051	195,652
P. C. for common stock	3.46%	3.27%

COLUMBIA GAS & ELECTRIC.

Columbia Gas & Electric Company, including the Union Gas & Electric Company, reports income account for the year ended December 31, 1913, as follows:

	1913	1912
Gross earnings	$5,497,959	$5,155,446
Operating expenses	2,574,644	2,524,475
Net earnings	2,923,315	2,630,970
Other income	471,583	....
Rentals and interest charges	2,704,194	....
Surplus	219,121	*1,826

*Deficit.

NIAGARA, LOCKPORT & ONTARIO.

The report of the Niagara, Lockport & Ontario Power Company for the year ended December 31, 1913, compares as follows:

	1913	1912
Sale of power	$1,518,622	$1,306,231
Gross profits	667,259	621,368
Expenses and depreciation	166,436	166,638
Net earnings	500,823	454,730
Other income	42,374	23,411
Total income	543,197	478,142
Surplus after charges and sinking fund	101,293	85,637

AMERICAN CITIES COMPANY.

The American Cities Company has issued its report for the year ended December 31, 1913. The income statement compares as follows:

	1913	1912
Dividends on securities owned	$1,809,162	$1,832,336
Interest on bank balance	10,448	18,446
Interest on bills receivable	30,700	30,806
Total receipts	1,850,310	1,881,588
Operating expenses and taxes	57,624	55,093
Net earnings	1,792,686	1,826,494
Interest on bonds	500,000	500,000
Net income	1,292,686	1,326,494
Preferred dividends (6%)	1,233,210	1,233,210
Surplus	*59,476	93,284
Previous surplus	135,518	42,233
Profit & loss surplus	194,994	135,518

*Equal to 0.36 per cent on $16,264,700 common stock outstanding as compared with 0.57 per cent earned on same stock previous year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 6.	March 30.
American Tel. & Tel. (New York)	122	121¾
Commonwealth Edison (Chicago)	139	139
Edison Electric Illuminating (Boston)	256	255
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	146	145
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric common (Boston)	11	11
Massachusetts Electric preferred (Boston)	61¼	61⅝
National Carbon common (Chicago)	108½	108½
National Carbon preferred (Chicago)	117½	117½
New England Telephone (Boston)	136	137
Philadelphia Electric (Philadelphia)	26⅝	26½
Postal Telegraph and Cables common (New York)	82½	83¼
Postal Telegraph and Cables preferred (New York)	69	69
Western Union (New York)	62½	62¾
Westinghouse common (New York)	74	75½
Westinghouse preferred (New York)	118	118

PERSONAL MENTION.

MR. Z. S. GWALTNEY has been appointed manager of the Salt Lake Electric Supply Company, Salt Lake City, Utah. Mr. Gwaltney has been in the electric supply business in Kansas City, Mo., for several years.

MR. WALTER I. RIGGS, who has been assistant manager of the Atlantic City (N. J.) Electric Light Company for the last six years, has been made manager of the Ocean City Electric Light plant, which was taken over some time ago by the Atlantic City Company.

MR. W. D. CHAPMAN, general manager of the Milwaukee Electric Railroad, has been placed in charge of building the Chicago, Peoria & Quincy electric road in Illinois, and of the disposition of $4,000,000 in bonds for the construction and equipment of the road, which will be 116 miles long.

MR. PRESTON S. MILLAR, secretary of the Electrical Testing Laboratories, New York City, was the principal speaker at the meeting of the Franklin Institute, Philadelphia, Pa., on April 9. The subject of the address, which was illustrated by lantern slides, was "Recent Developments in the Art of Illumination."

MR. F. B. H. PAINE, formerly general manager of the Niagara, Lockport & Ontario Power Company, Buffalo, N. Y., has established an office as consulting engineer at 26 Cortlandt Street, New York. Mr. Paine will specialize in corporate management, commission problems, inter-relations of utilities, and electric and gas contracts.

MR. GEORGE B. THOMAS has been appointed by the Interstate Public Service Company, Columbus, Ind., as manager for its lighting plants at Seymour, Columbus, Franklin and Greenwood, succeeding MR. W. F. MILLER, who has accepted appointment as manager of the municipal lighting plant at Crawfordsville, Ind.

MR. ALONZO BURT has succeeded MR. C. E. MOSLEY as treasurer of the Central Group of the Bell Telephone Companies and his title now is vice-president and treasurer. On the first organization of the Central Group in 1911 Mr. Burt was elected first vice-president and treasurer, but later gave up the treasurership in order to become operating vice-president.

MR. DANIEL ERMATINGER has been promoted to the position of mechanical superintendent of the Chippewa Valley Electric Light & Power Company, Chippewa Falls, Wis., with which firm he has been connected for a number of years, and will have under his supervision all of the power houses of the company. MR. HERMAN PEISCH, who has been with the firm for about four years, has been apointed to fill the position made vacant by the promotion of Mr. Ermatinger.

MR. L. M. WILLEY has succeeded MR. ROBERT MONTGOMERY as manager of the contract department of the Fort Worth (Tex.) Power & Light Company. Mr. Willey has been in the electrical business for 14 years in both the factory and sales departments. He resigned recently from the General Electric Company's Chicago office to take up his new duties at Fort Worth. Mr. Willey has made a great many friends in the industry, and is an ardent Jovian. He will be remembered as the very capable Pluto of the crack Chicago Jovian degree team.

MR. W. F. MINOR has been appointed manager of the Holophane Works of the General Electric Company, succeeding MR. V. R. LANSINGH, whose appointment as manager of a new department in charge of the development of metal and glass reflectors was announced recently. Mr. Minor is a striking example of the younger progressive business man and has established a fine reputation as a successful sales manager. He has been connected with the Holophane Works during practically all of his business career.

W. F. Minor.

MR. THOMAS A. WYNNE, vice-president and treasurer of the Indianapolis Light & Heat Company, has been nominated as a candidate for the next Reigning Jupiter of the Jovian Order by a host of Jovian friends. Mr. Wynne went to Indianapolis originally from Minneapolis in the capacity of a lineman. He associated himself with Mr. C. C. Perry, in what was then known as the Indianapolis Light & Power Company, at that time operating a small plant where the Columbia Club now stands in Indianapolis. In those days Mr. Wynne attended to the actual trouble shooting and he has developed with the plant and organization in all of its ramifications and vicissitudes. He has become one of the most respected and active members of the community, and numbers among his close personal friends the most influential citizens of the city of Indianapolis and of the state of Indiana. He is held by his friends to be a man of strong personality with progressive business ideas, and he is a staunch Jovian and has expressed himself as convinced of magnificent possibilities for the Order.

T. A. Wynne.

DR. DORRIS WHIPPLE, chief chemist of the Safety Insulated Wire and Cable Company, delivered a lecture at the University of Cincinnati on "Insulating Compounds," on Wednesday, April 8. Dr. Whipple discussed particularly the great importance of a proper understanding of raw material, and its relation to a perfect insulator.

MR. A. CARL SMITH, who has for some time past been connected with the Kansas City branch of the General Electric Company, has been transferred to St. Joseph, Mo., as resident sales agent. He succeeds MR H. S. WOODS, who will return to the Kansas City offices of the company to handle apparatus. Mr. Woods will spend much of his time on the road, though he will have no given route or territory.

MR. CHARELS L. UNDERHILL, chief electrical engineer of The Acme Wire Company, New Haven, Conn., delivered a lecture on the subject of "Electromagnets" before the Lehigh University Electrical Engineering Society at South Bethlehem, Pa., on the evening of March 24 and a similar lecture before the Cornell University Branch of the American Institute of Electrical Engineers at Ithaca, N. Y., on the evening of March 27. These lectures before engineering societies of universities are given with a view to expanding the knowledge regarding the actual characteristics of electromagnets of various types, and numerous experiments are made before the audiences in order to clearly show the fundamental features of design for both alternating and direct-current electromagnets. Mr. Underhill has done extensive research work in connection with electromagnets, covering a period of many years, and is at the present time actively engaged in this branch of design, so that these lectures are of particular value to those interested in the practical design of electromagnets and their varied application.

MR. WM. H. LaDUE of the Public Service Electric Company of New Jersey, gave an interesting talk on the evening of April 3 on the history of electricity in Jersey City to the employees of the company of the Hudson Division. Mr. LaDue outlined the beginning of the industry in the year 1885, when there were but few electric lights, and those placed mainly in the lower part of the city, down to the present day when current is supplied throughout the county by one of the largest power plants in the world; how, late in the eighties the first electric car was run up the Montgomery Street hill, the people looking on with amazement at such an unheard of occurrence. Stereopticon views and motion pictures were shown on the screen, depicting the linemen at work erecting and putting in place the new style cables across the turnpike to the City of Newark. The speaker discussed the advantages of placing the cable system underground and also the expense a big proposition of this kind would entail. At the conclusion of Mr. LaDue's lecture, E. Mercer, chairman of the

Educational Committee, proposed a rising vote of thanks for the speaker, which was given with a will.

OBITUARY.

MR. JOHN KINNARNEY, of Louisville, Ky., formerly superintendent of construction of the Louisville Railway Company, died at the home of his son in that city last week at the age of 60 years. Mr. Kinnarney had lived in Louisville for a number of years, but was a native of Ireland. His son, James W. Kinnarney, and four grandsons, survive him.

MR. FRANCIS WILEY JONES, 67 years old, died last week at his winter home at West Palm Beach, Fla., of pneumonia. Mr. Jones was born in Weymouth, Nova Scotia, and removed to this country in 1872, locating at Chicago, as a member of the staff of the Western Union Telegraph Company. In 1875 he organized the American Electrical Society. In 1874 Mr. Jones adapted the quadruplex system of sending messages, then just invented by Edison, to the work of the Western Union. In two years his modified quadruplex was in use all over the country. In 1880 Mr. Jones was appointed general circuit manager for the Western Union in New York City, from which position he resigned in 1882 to become president of the Union Manufacturing Company and improved many of the products of the company by his inventive ability. In 1884 he returned to the telegraphic field, becoming engineer of the Bankers' & Merchants' Telegraph Company, and shortly after was made general manager. A year later the Postal Telegraph Company took over the Bankers' & Merchants' and Mr. Jones became electrical engineer and assistant general manager of the former, retiring from office five years ago. Mr. Jones invented the Phantoplex System of sending, whereby sixteen messages might be sent at the same time over one wire, and was also the first to use dynamos to supply current to telegraph wires. He founded the New York Electrical Society, and was its first president, and was a charter member of the American Institute of Electrical Engineers. Mr. Jones was at one time president of the Old Time Telegraphers' Club, president of the Magnetic Club, a member of the New York Telegraph Club and a life member of the New York Press Club. He is survived by his widow, Mrs. Maline La Belle Jones, a daughter, Mrs. George E. Weaver, and a son, Sterns Francis Jones.

DATES AHEAD.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18. Secretary, Joseph W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Electrical Contractors' Association. First annual convention, Cedar Rapids, April 21-22.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit, June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Monitor Controller Company, Baltimore, Md., announces the appointment of Arnold Erlanger as assistant to Joseph F. Frese, who is district manager at 30 Church Street, New York City.

The Norma Company of America, maker of Norma ball, roller, thrust and combination bearings, announces the removal of its offices, on April 11, from 20-24 Vesey Street, to 1790 Broadway, New York City.

General Electric Company, Schenectady, N. Y., will spend approximately $100,000 on construction of new buildings in Erie, Pa., to house the railroad department, which will be transferred from Schenectady. The railroad department manufactures controllers and other equipment for cars.

The United States Light & Heating Company, Niagara Falls, N. Y., has removed its Chicago office from 1013 Peoples Gas Building to 2335 State street. This change brings the Chicago sales office and service station into the same building. H. A. Matthews is now in charge of the railway department of the Chicago office, R. E. Stuntz has charge of the battery and starter department and H. M. Emerson is in charge of the service department.

Viking Electric Company, manufacturer of Viking bell ringers and other Viking products, in order to take care of a rapidly growing business, is moving its plant from Albany, N. Y., to 292 Taaffe Place, Brooklyn. The new plant containing twice the floor space as the old plant will be equipped with additional machinery and more help will be taken on. The present sales office at 150 Chambers Street, New York City, where a large stock is carried, will be maintained.

The E. W. Ham Electric Company, Worcester, Mass., will do a general electrical contracting business and deal in electrical devices. The company has been appointed the sole distributing agent for New England for the Hunter Fan & Motor Company, and will stock its full line of desk fans and the celebrated "Tuerk" ceiling fans. The company has been chartered with a capital stock of $99,000, and the officers are J. Brinton Bailey, president; Edwin W. Ham, treasurer and Paul Fielden, clerk.

National Tube Company, Pittsburgh, Pa., has issued "National" Bulletin 17A, which is the second and greatly enlarged edition of Bulletin 17 issued last summer. This publication contains an address made by J. H. Nicholson and Emil Holinger before the students of the United States Naval School of Marine Engineering, Annapolis, Md.; the title of the address is "The Manufacture and Use of Shelby Seamless Steel Tubing." It is well illustrated with numerous diagrams and half-tones of various stages of tube making and of numerous typical samples of the variety of objects made from this type of tubing.

Sprague Electric Works of General Electric Company, New York City, has issued bulletin 242. This deals with Sprague control system for newspaper and rotary magazine presses. The types of direct-current and alternating-current motors suitable for driving these presses are first described and then follows a detailed and illustrated description of the full automatic control system, which includes a number of push-button stations with various safety and perfect control features. Semi-automatic control systems are also explained. Electric hoists for handling paper rolls and other auxiliaries of a large pressroom are also described.

Despatch Manufacturing Company, Minneapolis, Minn., has issued catalog No. II dealing with Despatch electric ovens and other electric heating appliances for various purposes. The Despatch ovens are especially designed for bakeries and flour-mill laboratories. They are made in a variety of sizes and types, in all of which perfect control of the heat is obtainable. Some of these ovens are made with glass front for demonstration purposes. A household electric baking oven is also made. Among the miscellaneous heating devices described are electric proofing cabinets, air heaters, laboratory furnace stoves, electric water heaters and tanks.

Simplex Wire & Cable Company, Boston, Mass., has reprinted the report of the Joint Rubber-Insulation Committee, recommending a well defined method of procedure in the analysis of rubber for insulation and other uses. The full report of this Committee provides an excellent method of avoiding misunderstandings in working with rubber analyses, and consists of 22 pages. As readers will recall, this report was prepared by a number of interests identified with this subject, including the United States Signal Service, the Bureau of Standards, the American Chemical Society, two of the large trunk-line railroads and four of the manufacturers of rubber-insulated wires, of which the Simplex Company was one.

Pass & Seymour, Incorporated, Solvay, N. Y., reports a continuous demand for Shurlok sockets. A recent bulletin issued by the company shows how the upper corners of an ordinary Hubbel shade-holder ring may be snipped off with a pair of side-cutting pliers and the ring will then clear the Shurlok without losing its gripping power. The best suggestion, however, is to use the P. & S. 23 Shurlok. The shade holder is spun on and the Shurlok put on afterwards. This makes a perfectly rigid device. The Shurlok socket is going into installations of every description, a recent conspicuous example being the complete equipment of the Union Central Life Insurance Building at Cincinnati, O., the tallest building in the country west of New York City, with Shurlok sockets.

Westinghouse Lamp Company has obtained possession of the plant at Thirty-second and Center Streets, Milwaukee, Wis., originally occupied by the Romadka Brothers Trunk Company, and is already equipping this plant for the manufacture of Westinghouse Mazda lamps. When in full operation, the company is planning upon a daily output of 20,000 lamps and employing approximately 500 operators. The establishment of this factory has been made necessary by the increasing demands for the product of this company, especially in the Central West and is to supplement the output of the present factories at Bloomfield, N. J., and New York City. After investigating conditions in 27 different cities in the Middle West, Milwaukee was selected on account of its manufacturing advantages and excellent location as a shipping center for the central and western states.

Wagner Electric Manufacturing Company, St. Louis, Mo., has recently issued bulletin No. 104, entitled "A Manual of Electric Testing." The bulletin, which is very interesting, instructive and attractive, was written and prepared by Ray D. Lillibridge, Incorporated, of New York City. About 10 pages of the bulletin are devoted to a discussion of the construction, theory, operation, care and errors of electrical meters. This is followed by a treatise on electrical testing which covers about 24 pages. A full discussion and explanation of various methods of resistance, power, motor, generator, converter and transformer testing is given. Not only are commercial tests considered, but also those giving the characteristics of the apparatus under test. In fact, this section of the bulletin forms an accurate, clear and concise manual of electrical testing. The remaining pages of the bulletin are devoted to a description of various Wagner portable instruments and accessories.

Busch—Sulzer Brothers—Diesel Engine Company, St. Louis, Mo., has issued a very attractive 112-page book entitled "The Diesel Engine." The first part of this book is a brief historical review of the development of this interesting type of prime mover; then follow discussions of the construction and operating features of the engine, together with an exposition of its advantages and adaptability for various purposes. The Diesel power plant at the works of the company is described and no less than 40 typical Diesel engine installations throughout the country are illustrated and briefly described. Comments are also given on the service given by Diesel engines to various users. The book concludes with a variety of valuable engineering data. The book is exceptionally well illustrated by a multitude of fine half-tones and its paper, printing and entire make-up are of an admirable type; the paper is glare free, thus avoiding the annoyance usually met with in the highly glazed papers used in other expensive catalogs.

Record of Electrical Patents.

Issued by the United States Patent Office, March 31, 1914.

1,091,505. Switching Device. D. D. Gordon, Chicago, Ill., assignor to The Yost Electric Manufacturing Co., Toledo, Ohio. A pull-chain socket.

1,091,528. Circuit-Detector. W. J. Murdock, Chelsea, Mass. A contact-making device.

1,091,548. Electromagnetic Bell. E. W. Vogel, assignor to The Railroad Supply Co., Chicago, Ill. Includes a gravity-return armature.

1,091,559.. Electrode. J. W. Brown, assignor to National Carbon Co., Cleveland, Ohio. Battery electrode built up in segments.

1,091,562. Plug Socket. L. J. Castonguay, Harrisburg, Pa. An electric plug socket with interlocking means.

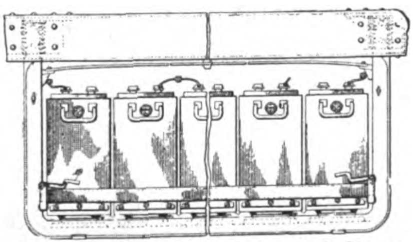
1,091,563. Vapor Electric Apparatus. J. T. H. Dempster, assignor to General Electric Co. The combination of co-operating main electrodes, and bodies of conducting material spaced at intervals between electrodes.

1,091,564. Vapor Electric Apparatus. J. T. H. Dempster, assignor to General Electric Co. A modification of 1,091,563.

1,091,579. Electric Transmission of Intelligence. I. Kitsee, assignor to American Telephone & Telegraph Co. Means to nullify the inductive effect of power wires.

1,091,582. Electric Water-Heater. R. Lockhart, Winnipeg, Canada. Includes electric radiating tubes.

1,091,583. Battery Support and Clamp. W. MacGlashan, assignor to The Studebaker Corporation, South Bend, Ind. For electric vehicles.



1,091,583.—Battery Support and Clamp.

1,091,585. Massage-Vibrator. W .N. Motter, assignor to General Electric Co. Has electric-motor drive.

1,091,586. Cigar-Lighter. J. F. O'Connell and C. E. Whiteman, La Grande, Oreg. Includes electric ignition.

1,091,589. Induction-Coil. A. Plecher, Las Animas, Colo. Includes use of two magnetic cores.

1,091,613. Dynamo-Electric Machine. E. F. W. Alexanderson, assignor to General Electric Co. Includes use of saturated and unsaturated poles and two exciting circuits to maintain constant voltage.

1,091,614. Dynamo-Electric Machine. E. F. W. Alexanderson, assignor to General Electric Co. A modification of 1,091,613.

1,091,616. Graphite Conductor. W. C. Arsem, Schenectady, N. Y., assignor to General Electric Co. A conductive homogeneous thread made of graphite powder.

1,091,620. Insulator. L. E. Barringer, assignor to General Electric Co. Consists essentially of asbestos, hydrous calcium silicate and lime soap.

1,091,630. Electromagnetic Device. E. R. Carichoff, assignor to General Electric Co. Solenoid-operated switch.

1,091,632. System of Vehicle Propulsion. A. Churchward, assignor to General Electric Co. A gasoline-electric system of vehicle propulsion including automatic control of gasoline supply.

1,091,637. Electric Vaporizer. C. L. Davis, Detroit, Mich., assignor of one-half to H. W. Frost. Contains heating coil.

1,091,641. Arc-Lamp. J. H. Dempster, assignor to General Electric Co. Covers feeding arrangement.

1,091,648. Method of Connections

for Starting Metallic-Vapor Lamps. F. Girard, assignor to W. C. Heraeus Gesellschaft mit beschrankter Haftung, Hanau, Germany. Electromagnetic means for short-circuiting starting resistance.

1,091,650. Electromagnet. E. J. Guay, Lynn, Mass., assignor to General Electric Co. An armature for electromagnets having a cluster of arms which project outward.

1,091,653. Telltale for Compasses or the Like. J. L. Hall, assignor to General Electric Co. Indicator driven by synchronous motor electromagnetically controlled.

1,091,659. Oil-Switch. F. H. Hewlett, assignor to General Electric Co. Arcs extinguished by oil under pressure.

1,091,661. Method and Means for Determining Ratings of Incandescent Lamps. W. G. Housekeeper and H. S. Dunning, assignors to Westinghouse Lamp Co. A photometric device employing a special recording ammeter.

1,091,669. Vapor Electric Apparatus. O. O. Kruh, assignor to General Electric Co. Wire shields protect anodes.

1,091,677. Electrically Operated I-Beam Switch. S. H. Libby, assignor to General Electric Co. A motor-operated switch.

1,091,678. Insulating Composition. F. M. Locke, Victor, N. Y. Consists of an aluminum silicate containing a boron compound.

1,091,679. Insulator. F. M. Locke, Victor, N. Y. Made of compound given in 1,091,678.

1,091,680. Vapor Electric Device. F. W. Lyle, assignor to General Electric Co. Includes thermal device for rendering tilting means inoperative at high temperatures.

1,091,694. Automatic Train-Stopping System. J. L. Neble, Omaha, Neb. Includes two separate circuits.

1,091,710. Illuminator. W. D'A. Ryan, assignor to General Electric Co. A semi-indirect reflector.

1,091,713. Induction Motor. C. L. Spinney, assignor to General Electric Co.. Projecting ends of rotor bars are at angle to center portions.

1,091,714. Electric Cooking Device. W. Stanley, assignor to General Electric Co. Includes heat-insulating deflector.

1,091,715. Electric Lamp. C. P. Steinmetz, assignor to General Electric Co. Includes a mercury-vapor lamp and several incandescent lamps.

1,091,716. Voltage-Regulator. C. W. Stone, assignor to General Electric Co. For alternators.

1,091,722. Synchronism-Indicator. V. A. Wolcott, assignor to General Electric Co. A high-tension electrostatic synchronism-indicator.

1,091,725. Insulating Composition. L. E. Barringer, assignor to General Electric Co. Consists of gum copal, castor oil, rubber, resin and colophony.

1,091,733. Electric Heating and Ventilating Device. F. J. Cook, assignor to The Konsrv Electric Co., Cleveland, O. A hot-air electric-heating system.

1,091,734. Support for Electric Trolley Mechanism. C. Coseo, assignor to The Jeffrey Mfg. Co., Columbus, Ohio. A self-contained trolley-arm and support.

1,091,738. Electric Brake. R. R. Dunlop, assignor to The Jeffrey Mfg. Co. Automatic braking means for motors.

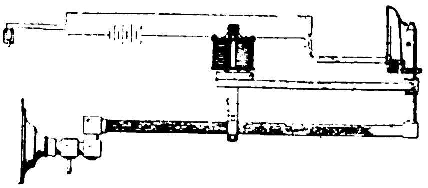
1,091,748. Dynamo-Electrical Machine. C. Ketchum, Boston, and D. H. Andrews, Newton, Mass. Armature composed of two sets of disks.

1,091,755. Gas Burner. W. W. Ogden, Maquoketa, Iowa. An electric thermostat controls flame. (See cut).

1,091,756. Train-Locating and Time-Recording Apparatus. B. F. Osborn and E. F. Zirbel, Rippey, Iowa. An electric annunciator system.

1,091,765. Automatic Selector-Switch. N. Reynolds, assignor to Western Electric Co. Includes electromagnet means for controlling brushes.

1,091,767. Electrical Connection for Sad-Irons and the Like. F. A. Rutenber, assignor to The Rutenber Electric Co., Logansport, Ind. Connection made inside of thimble.



1,091,755.—Gas Burner.

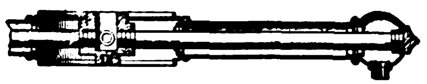
1,091,768. Method of and Apparatus for Selective Wireless Telegraphy. F. G. Sargent, Westford, Mass. A mechanical sending and receiving apparatus using dials, rotating in synchronism.

1,091,774. Electric Heating Device. M. H. Shoenberg, assignor to F. C. Morgan, San Francisco, Cal. Includes use of electric heating-coil.

1,091,788. Egg-Tester. W. K. Stebbins, Fairmount, N. D. Uses incandescent lamps.

1,091,804. Printing-Meter. J. E. Burch and F. L. Burch, St. Louis, Mo. A graphic-recording wattmeter.

1,091,808. Electric Crucible-Furnace. D. F. Calhane, Worcester, Mass. Adjustable metallic rings concentrate current in the desired regions.



1,091,961.—Electric-Light Fixture.

1,091,810. Electric Sign for Cash-Registers. C. J. Cassidy, Chicago, Ill. Includes an automatically controlled incandescent lamp.

1,091,832. Selective Signaling System. E. R. Gill, assignor to Hall Switch & Signal Co., New York, N. Y. A telephone signal system.

1,091,854. Gas-Engine. C. A. Lundy, Reno, Nev. Includes electric ignition.

1,091,875. Electrical Contact. H. J. Wiegan, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. A contact for electric circuits.

1,091,882. Electric Jacquard-Machine. K. Fanta, A. Regal, H. Vietze, and N. Wessely, assignors to Oesterreichische Siemens-Schuckertwerke, Vienna, Austria-Hungary. Electric-solenoid control.

1,091,898. Electric Bell. C. J. Schwarze, Adrian, Mich. Hammer strikes interior of bell and is magnetically controlled.

1,091,902. Bell-Ringing Apparatus. W. F. Wacker, Sioux City, Iowa. Includes electromagnetic means for oscillating shaft supporting bell.

1,091,906. Electrical Ignition Apparatus for Internal-Combustion Engines. A. Zahringer, assignor to the firm of Robert Bosch, Stuttgart, Germany. Includes means for switching ignition current to proper cylinders.

1,091,916. Electric Sign. H. Deschere, New York, N. Y. Comprises means for imbedding sockets in sign.

1,091,932. Steering-Wheel. J. S. Hill, Bethesda, Md. Imbedded incandescent lamps heat rim of wheel.

1,091,940. Motor-Controller. W. B. Lucas, Chicago, Ill. Automatic short-circuiting device for induction motors.

1,091,961. Electric-Light Fixture. R. C. Ratto, assignor to The Plume & Atwood Mfg. Co., Waterbury, Conn. A sectional fixture. (See cut.)

1,091,965. Telephone-Mouthpiece Protector. C. Russel, Columbus, Ohio. A conical insert.

1,091,995. Transformer. N. A. Wolcott and W. C. Woodland, assignors to The Packard Electric Co., Warren, Ohio. A laminated transformer core.

1,092,083. Electric Lamp. C. P. Steinmetz, assignor to General Electric Co. A vapor lamp.

1,091,117. Electromagnetically Operated Sounder. C. J. Schwarze, assignor to Schwarze Electric Co., Adrian, Mich. Includes use of disk sound-producer.

Reissues.

13,707. Registering System. R. H. Long, Oakland, Cal. Original No. 1,055,929, dated Mar. 11, 1913. For telephone systems.

13,710. Telephone-Exchange System. H. G. Webster, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Includes means for rendering line-indicator ineffective.

Patents Expired.

The following United States electrical patents expired April 6, 1914.

579,959. Railway Switch. W. G. Clark, Philadelphia, Pa.

579,975. Magneto-Electric Generator. W. Gillette, New York, N. Y.

580,011. Armature Core. S. H. Short, Cleveland, O.

580,035. Art of and Apparatus for Generating and Distributing Music Electrically. T. Cahill, New York, N. Y.

580,057. Electric-Railway System. W. Robinson, Boston, Mass.

580,092. Electric Push-Button. R. L. Moore, Statesville, N. C.

580,114. Electric-Brush Holder. T. J. Loughridge, Oshkosh, Wis.

580,139. Composition of Matter for Manufacturing Battery Cases, etc. W. Morison, Montclair, N. J.

580,166. Telephone Circuit. J. S. Stone, Boston, Mass.

580,180. Magneto and Dynamo-Electric Generator. C. H. Wade, J. Moores and H. O. Farrell, Manchester, England.

580,206. Electrical Transformer-Plate. W. Blackmore, Peoria, Ill.

580,246. Conduit System for Electric Railways. A. O. Badendreier, Washington, D. C.

580,256. Electric Arc Lamp. W. J. Davy, London, England.

580,276. Electromagnetic Coil. W. E. Harrington, Philadelphia, Pa.

580,277. Magnetic Circuit-Breaker. W. E. Harrington.

580,320. Electrical Cutout. H. C. Jones, New York, N. Y.

580,335. Attachment for Operating Telephone Call-Bells. H. W. Libbey, Boston, Mass.

580,339. Electrical Circuit-Closer. O. F. Allen, Springfield, Mass.

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REVISED ELECTRICAL RULES OF CHICAGO.

Improvements in electrical construction methods and the development of new appliances and devices necessitate rather frequent revision of official rules governing electrical construction. Thus it has become the custom to revise the National Electrical Code about every two years. The National Code, in order to cover average conditions throughout the country, cannot contain certain desirable restrictions necessitated by special conditions, such as in our very large cities. Most of these cities, therefore, have adopted electrical rules based almost entirely upon the National Electrical Code but containing additional limitations necessitated by the crowded conditions, frequent alterations and special hazards in large cities. To Chicago has fallen the distinction of taking a leading position in the drafting of such additional rules. These, while codified as a distinct set of rules and regulations, are based almost entirely upon the National Code, and like the latter require revision from time to time.

In another part of this issue will be found mention of the principal changes made in the Chicago rules during the recent revision, which has just been made public in book form. Of the 43 principal changes, 21 were made to correspond with the 1913 edition of the National Electrical Code; 4 were made to correspond approximately to the National Code; 18 revisions contain more or less important departures from the National Code, and it is of some of these that particular mention will be made in these comments.

Noteworthy among the revisions in the Chicago rules that are necessitated by the demand for improved construction is the requirement for the use of lead-covered wire for use in all underground conduits. Series arc-lighting systems are not permitted for inside lighting except by special permission. Strict specifications are laid down to insure that service switches and cutouts shall be located in a readily accessible position and very close to the entrance of the service wires into the building.

In revising the rule respecting the loading of branch circuits, the new stipulation of the National Code permitting 16 sockets or receptacles on an ordinary 660-watt branch circuit, has been adopted; but a unique additional requirement is specified for buildings used as apartments, residences, offices or stores. This is that a sufficient number of circuits must be provided to allow for at least one watt per square foot of floor surface. Under present conditions this is probably an excellent rule, but if the new nitrogen-filled tungsten lamps, or any other type of extra-high-efficiency lamps to be developed in the future, should come into general use in small units, such a requirement may prove burdensome.

A radical feature of the new Chicago rules is the prohibition, after June 30 of this year, of open-work construction in all buildings except where excessive moisture, acid fumes or corrosive vapors exist, or where the installation of other approved forms of construction is impracticable; in these cases special permission in writing must be obtained for open-work construction. Another very important prohibition is that after June 30 of this year wooden moldings will not be allowed. While both of these prohibitions may seem drastic, they are desirable steps in advance which doubtless will be followed in other places. Another striking requirement is that outlet boxes for interior conduit work must be covered in all completed installations and such boxes must be provided with fixture studs or ears for fastening the covers. Conduit must also be fastened by means of toggle or expansion bolts instead of being secured by nails or screws driven into wooden plugs in the case of brick, tile or similar walls. The draining of conduit systems in damp buildings is also required.

A set of ten new rules dealing specifically with the wiring in garages is included. These are classified as subdivisions of rule 38C. The numbering of this rule and also of rules 38A and 38B, which are sets of rules dealing with buildings in which special hazards exist, is liable to some confusion, since the rules given under section 38 deal with the wiring of theaters and assembly halls and include rules 38a, 38b, 38c, etc. The National Code does not have special rules covering the wiring in hotels, hospitals, department stores and similar buildings, such as are included in rule 38A in the Chicago set of rules, nor rules covering the wiring in exposition buildings, such as are included under rules 38B in the Chicago Code. In order to avoid possible confusion in numbering these special rules, it may seem better to change the rules 38A, 38B and 38C to 38I and 38II and 38III. Thus there would be less likelihood of typographical and other errors if the rule 38Cc, for example, be written 38IIIc. The fact that the Chicago rules follow out the general numbering system of the National Code eliminates considerable confusion and is a desirable feature. However, there seems to be no place in the National Code for special rules covering buildings in which peculiar hazards exist, excepting as sets of rules supplementing the general class 38 in the manner suggested.

THE TREND OF ENGLISH INVENTION.

The close student of technical journals, wherein are detailed the new devices which emerge from the brain and the laboratory of the inventor, is able to keep himself tolerably well informed concerning the predominating lines of inventive ingenuity in his own particular department. But we are better able to get a comprehensive view of the general trend of invention, though not necessarily of patents which eventuate into articles of practical utility, by an examination of the statistical returns and observations of those who control our official patent departments. It is among their duties to act as trained observers in such matters and very interesting their statements sometimes are. A case in point is the annual report of the British Comptroller of Patents.

From this document we learn that the problems of transport have been exercising more inventive minds in England than any other subject, "demonstrating in a striking manner the fact that this is the age of locomotion." Varied applications relating to the motor-vehicle industry stand out with an increase of 25 per cent for the year 1913. The saving of life, the regulation of speed, the construction of small dynamos for lighting and starting, the connection of head lamps to steering gear—these are some of the chief subjects covered in the locomotion department, while interest in aeronautics has been confined mainly to improvements in details of machines of well known types. Internal-combustion engines, both for motor vehicles and flying machines, have required an active department.

Fatal collisions on railways, as is generally the case, stimulated the inventor interested in signalling problems, and the number of applications in 1913 was treble that of 1912, the proposals chiefly relating to automatic or partly automatic devices for signalling or stopping trains.

Recent legislative enactments have stimulated interest in methods of signalling in connection with the winding and hauling operations in mines. Special attention has also been given to the development and perfecting of apparatus for effecting a selective and intermittent exposure of signs and announcements. The electric theater shows no signs of falling off in popularity, and this fact has encouraged the exercise of much ingenuity concerning the projection of pictures in natural colors.

REGULATION OF PUBLIC UTILITIES IN ENGLAND.

The New York Public Service Commission for the First District included in its last annual report a statement by the librarian and statistician of the Commission, Dr. Robert H. Whitten, regarding the regulation of public service companies in Great Britain. Since in that country there is no written constitution, Parliament is free from external restraints in dealing with franchises, incorporations, rates and other matters, even to the extent of confiscating private property. Public opinion, however, is a sufficient restraint against doing anything which would not generally be regarded as just. Any action taken, however, is not subject to court review.

Most companies operating public utilities have had their powers defined by special acts of Parliament, and there are very few acts which apply to different classes of public service companies. In many cases the profits and rates of gas companies are limited by an arrangement, according to which the allowable dividend is based upon the price charged to consumers according to a sliding scale. In the case of Sheffield, the salary to be paid the manager and directors increases automatically with the decrease in the price of gas. Such arrangements as these seem an admirable method of stimulating the greatest efficiency in the operation of the utility.

The issue of bonds is in general limited to a definite fraction of the capital stock, seldom more than one-third. Interest not exceeding four per cent may be paid from the capital account during the construction period, provided full publicity is given to the process, including notification of the Board of Trade. Securities are usually disposed of at auction or by a method of tendered bids, similar to the American method of awarding contracts. This has been found generally satisfactory and might well be imitated in this country. The company is privileged to set a reserve price which is filed with the Board of Trade in a sealed envelope. If the sale by bids does not equal the issue of securities, the company may dispose of the remainder to stockholders, employees and consumers at the reserve price.

Interlocking directorates and concentrated control of corporations is avoided by not giving a vote to every share of stock. The voting power decreases as the number of shares held by an individual increases. In the case of one corporation it is provided that no stockholder may have more than six votes.

A study of the British methods might be of advantage to our American congressmen at this time when there is an effort being made at Washington to change our laws so as to secure results, some of which are already in operation in England. A difficulty exists, however, in the fact that most companies in this country are incorporated under the laws of the separate states and it would only be by requiring those engaged in interstate commerce to incorporate under a federal law that control of them can thus be enforced. Such companies however are the principal ones which Congress wishes to control. Local concerns such as public service companies doing business in a single community are sufficiently controlled by local means and do not need the attention of Congress.

ARRANGEMENTS FOR CONVENTION OF NATIONAL ELECTRIC LIGHT ASSOCIATION.

The selection of the Bellevue-Stratford Hotel as headquarters for the convention of the National Electric Light Association to be held in Philadelphia next June insures adequate and satisfactory facilities for carrying on the various activities of the convention. Some interior and exterior views of the hotel are shown elsewhere in this issue. The location of the exhibits upon the top floor of the building adjacent to the Roof Garden will form the most attractive setting for this feature of the convention that has been seen for many years, if ever before. The Convention Committee is actively at work making plans for a number of features which give promise of a very successful convention.

ECONOMIES ANTICIPATED IN THE ST. PAUL ELECTRIFICATION.

No more important steam railroad electrification has been developed in recent years in this country than that of the Chicago, Milwaukee & St. Paul Railroad in Montana, considering the abolition of the present motive power from the standpoint of operating efficiency. The company's engineers estimate that electrification will save at least 25 per cent in operating costs and it is a foregone conclusion that the quality of service in this mountainous region will be vastly improved by the change. The substitution of electricity will do away with the haulage of coal, at once releasing a large number of coal cars for revenue service. Coal-storage yards will be unnecessary; water tanks will be abolished; and it is likely that the length of freight divisions will be increased from the present length of 100 to a maximum of 200 miles. Engine failures, due to poor coal and bad water, with resulting train delays and heavy repair bills are likely to decrease greatly, and in addition to the expected savings in maintenance due to the electric locomotive, the traffic capacity of the road is to be much enhanced.

It is planned to have the new locomotives capable of hauling a gross trainload of 2,500 tons on a one-per-cent grade at a speed of 15 to 20 miles per hour, whereas the steam locomotives now in use on the Montana divisions haul only 1,650 tons at a speed of from 8 to 10 miles per hour, and the rate is not uniform. Further economies are to be gained by the use of electric braking on down grades, with regeneration of power for use by ascending trains It is figured that when the entire 440 miles of line are electrified, 60 electric locomotives will handle the normal traffic, compared with 82 steam locomotives.

Wages will be saved through the reduction of overtime work on the part of delayed train crews, and by the purchase of energy from the Montana Power Company at a reported price of about five mills per kilowatt-hour, the problem of power supply will be greatly simplified, leaving the transportation matters of the road freer to receive the attention of its officials. No less than seven plants of the company will serve the railroad, and the danger of an extended interruption of service will be remote. Poles cut from the railroad company's own timber lands will be used in power distribution. It is expected that the first 113 miles of line, from Deer Lodge to Three Forks, across the Rocky Mountains, will be completed by the end of the present year, and that 16 electric locomotives will be in use on this section of the road. The entire project will cost about $8,000,000, and the results of the electrification are being awaited by all the northern transcontinental lines with keen interest.

Steam Turbines Discussed at Pittsburgh.

The fourth regular monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., Saturday, April 4. An illustrated talk was given by Francis Hodgkinson, chief engineer of the Westinghouse Machine Company on "High, Low and Mixed-Pressure Turbines."

The theoretical merit and development of the different types of turbines was gone into thoroughly, Mr. Hodgkinson using lantern slides and blackboard to make his points entirely clear. The development of the turbine was interestingly described from the 2,000-kilowatt capacity turbines in 1900 to the 30,000-kilowatt sizes of today, and the reduction of steam consumption from 18 pounds to 12 pounds and the investment charges from $120 to $60 per kilowatt capacity.

The early users of the regenerator in connection with the low-pressure turbines was touched upon, and it was related that when regenerators were first used, the regenerative period of several minutes was strived for, and that the present-day practice is to install regenerative capacity for 30 to 40 seconds regenerative periods. In places where conditions were favorable, the possibility of allowing the boilers to blow off into the low-pressure system instead of through safety valve, was suggested, the protective features of the safety valve being maintained in addition.

Mr. Hodgkinson brought out that turbine blading troubles are not caused by collision or rubbing of the blades, but rather by vibration from the steam current, and that the more substantial the blading was made, the more disastrous will be the effects from collision or rubbing.

Peoria Electric Club Has Banquet and Election of Officers.

The Peoria Electric Club held its first annual banquet at the Jefferson Hotel, Peoria, Ill., April 11. The Club is just a year old and its membership is composed of men from all the different electrical industries in Peoria. Following the dinner there was a program of speeches among which were the following addresses: "Our Club," by T. D. Buckwell; "Future Prospects of Electricity," by D. H. Lackey; "Why Electric Salesmen Should Be Live Wires," by E. H. Joseph; "Co-operation," by John W. Foster; remarks by the retiring president, C. A. Hoppin.

A novel election was held by having two tickets nominated by two committees and these two parties were called the "wets" and the "drys," the latter were elected as follows: T. D. Buckwell, of the Central Illinois Light Company, president; Louis B. Van Nuys, of the Central Electric Company of Peoria, vice-president; C. Bradford, secretary-treasurer. It was decided that a smaller number of officers could handle the club matters with less trouble and get better results than the former way of having an executive board composed of six members. A very enjoyable time was had throughout the evening. Much good will be accomplished by the Club during the coming year, if what has already been done last year is any indication.

Electric Club of Chicago.

At the meeting of the Electric Club of Chicago held on April 9, Ellis Prentice Cole gave an illustrated talk on the "Glacier National Park." This park is in the northwestern part of Montana and was established as one of the present 13 national parks in 1910. Mr. Cole described the native Indians and their customs. He then dwelt on the beautiful scenery of the park, showing charming colored pictures of its mountains, lakes, glaciers, streams, falls, flowers, etc. He made a strong plea to "see this country first."

The Entertainment Committee of the Club, of which Vice-President Berry is head, is arranging to give a "stag party" on the evening of April 29 which will be free to members.

Empire State Gas and Electric Association.

The spring meeting of the Empire State Gas and Electric Association will be held in the Alert Club, Medina, on April 22, beginning at 10 a. m. An unusually interesting program has been arranged. The morning session will be devoted to the new workmen's compensation law, which goes into effect in New York State on July 1 next, and to the accident-prevention work of the Safety Committee. The afternoon session will be more or less executive.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club, Salt Lake City, on April 2. C. C. Pratt, of the Mountain States Telephone & Telegraph Company, chairman for April, presided. Mr. Pratt appointed H. F. Holland, C. B. Hawley and G. H. Williams a committee to draft resolutions of sympathy on the death of V. F. Connolly, a charter member of the Club, who died unexpectedly at Idaho Falls recently.

Miss Helen L. Bartlett, teacher of cooking at the Salt Lake High School, read a paper entitled "Electricity and Its Application to Efficiency Methods in the Home."

Program of Iowa Electrical Association Convention.

As previously announced the fourteenth annual convention of the Iowa State Section of the National Electric Light Association will be held at Cedar Rapids, Ia., April 22, 23 and 24. Following the address of the president, A. L. Dodd, of Charles City, Ia., the following papers will be presented: "Co-operation Between Contractors and Central Stations," by J. T. Marron, Rock Island, Ill.: "The Compensation Law and Its Application," by George A. Wrightman, Des Moines: "A Few Features of the Operation of the New Development at Keokuk," by W. A. Ross, Keokuk; "The Conduct of Public Utilities Under Commission Supervision," by A. C. Huey, Chicago; "High-Tension Lightning Protection," by Prof. A. H. Ford, Iowa City; "Is There a Saturation Point in the Sale of Electricity?" by J. S. Forbes and J. C. Young, Cedar Rapids; "Sale of Electricity to Farmers," by Rufus E. Lee, Clarinda; "The Object and Results of Affiliation," by S. A. Sewall, New York.

On Wednesday evening there will be a banquet, and on Thursday there will be a theater party followed by a Jovian rejuvenation. The meetings of the convention and headquarters of the association will be at the Montrose Hotel, Cedar Rapids.

Electrical Exports for February.

The Bureau of Foreign and Domestic Commerce has issued its monthly summary of the imports and exports of the United States for February. From this are taken the following facts respecting the exports of electrical products during that month.

A falling off of about 13 per cent is reported in the total value of electrical shipments in last February compared with the corresponding month of a year ago. The number of articles shipped in the four classes for which the numbers are reported were: fans, 2,788; arc lamps, 341; carbon-filament lamps, 92,514; metal-filament lamps, 38,499. The detailed figures are given in the following table, together with those of the corresponding month in 1913, as far as the latter are available.

Articles.	Feb. 1914.	Feb. 1913.
Batteries	$ 54,488	....
Dynamos and generators	206,392	$ 180,706
Fans	36,985	38,133
Insulated wire and cables	153,607	....
Interior wiring supplies, etc. (including fixtures)	48,954	....
Lamps—		
Arc	6,918	16,378
Carbon-filament	14,255	5,747
Metal-filament	10,857	31,099
Motors	241,488	378,887
Static transformers	142,888	....
Telegraph instruments (including wireless apparatus)	6,874	14,625
Telephones	157,851	95,787
All other	848,956	1,458,607
Total	$1,930,513	$2,219,969

Electric Motor Club of Boston.

The Electric Motor Car Club of Boston enjoyed an enthusiastic get-together luncheon at the Hotel Thorndike, Boston, Mass., on April 8. President Day Baker was chairman. Two new members were welcomed—Thomas J. Glenn, of the Fireside Tire & Rubber Company, and Chester B. Raymond, of the Electric Storage Battery Company.

Arrangements were made by which a committee, of which F. J. Stone is chairman, will put in effect the suggestion and offer of Superintendent Atkins of the Boston Edison Company to utilize a large tent for advertising and demonstrating electric cars in New England cities outside of Boston. It is the plan to conduct a traveling exhibit with the tent as headquarters. Here charging will be demonstrated and an exhibit of batteries, tires and other accessories, as well as automobiles, shown. It is proposed to serve tea, prepared electrically, and in the evening to light the tent with 15 500-watt electric lamps. The project will be put into execution in the early summer.

Secretary Charles H. Miles announced preliminary plans for a convention of central-station men and electric automobile interests, on lines similar to those of the convention of last May, to be held in Boston the second week of next month, of two days' duration. The present committee, with Mr. Miles as chairman, is continued to carry out arrangements.

An electric automobilists' map of New England is to be prepared, under the auspices of the Club; it will show charging stations and routes of touring. Central stations furnishing charging facilities are subscribing for copies, of which about 10,000 will be issued. The cost to central stations is $10 per hundred, and some 2,000 have already been ordered.

The proposal of Mr. Stone was adopted, to co-operate with the Electric Vehicle Association of America in issuing prospectuses, setting forth the advantages of organization to further electric-vehicle interests.

E. S. Mansfield, of the Boston Edison Company, presented plans for the annual outing, to be held in June, and R. S. Hale invited the Club to hold it at the New England Kennel Club, East Braintree.

Mr. Hale stated that the 150-ampere Anderson charging plug had been adopted as the standard in England. He showed samples of charging cables which have been adopted there. It is known as "cab tire wire," and is a very flexible, rubber-insulated wire.

R. B. Daggett suggested the desirability of a committee to formulate the public advantages of the electric, in the best utilization of street space, the simplification of haulage problems, etc., and such a committee was appointed, to confer with the Chamber of Commerce and other public bodies.

The principal address at the luncheon was made by E. E. Fowler, of the Barrett Adding Machine Company, on "The Best Method of Boosting Business During Quiet Periods." Mr. Fowler held that newspaper advertising is the most effective and needs to be used most when business is dull. The problem of securing good salesmen is difficult, but the real test is courage.

Chicago Electrical Show to Give Prominence to Electric Vehicles, Motion Pictures and "Safety First" Devices.

In formulating plans for Chicago's seventh annual Electrical Show, which as already announced in a recent issue will be held at the Coliseum, from October 31 to November 14, 1914, the directors find that the lapse of three years since the last show in Chicago has brought to the front two industries and one nation-wide movement that will have to be given more than passing consideration in the organization of this year's exposition. While there has been marked development in all lines electrical, the most important angles to be considered are those that apply to electric automobiles (both pleasure cars and trucks) and to the motion-picture industry. The other notable movement is that which applies to "Safety First" and efficiency devices, many of which are electrical. It is the present plan of the directors to install a department of exhibits of the "Safety First" type and also a department for electric-motor-driven trucks and pleasure cars.

When the last show was given the motion-picture industry was in its infancy compared with its scope today and it is the intention of the management of the coming show, with the co-operation of some of the important manufacturers, to have an exhibit that will show how motion pictures are made and the multitudinous ways in which electricity is used in the development of a film.

Manager Homer E. Niesz has these various matters under consideration and is in correspondence with concerns identified with these branches of the electrical trades. The office of the Electrical Show have been established at Room 546 Commercial National Bank Building.

Boston Get-together Meeting.

The next get-together meeting of New England central-station men, contractors and jobbers will be held at the American House, Boston, Mass., on May 8.

Electric Vehicle Association Meeting.

The regular weekly luncheon of the Chicago Section Electric Vehicle Association of America was held in the Rose Room, Hotel Sherman, on Tuesday, April 14. No formal program had been arranged, the meeting being devoted to a discussion of the Section's activities. The advisability of substituting monthly meetings for the present weekly ones was discussed. It was also proposed that the Section reserve tables for its members at the weekly luncheons of the Jovian League and The Electric Club. These matters will be discussed further at the annual meeting of the Section on May 5. Tickets for the annual meeting will be ready for sale at the next weekly meeting of the League on Tuesday, April 21.

Many Philadelphia Jovians Pledge Their Support to Women Suffrage Movement.

Miss Dille Hastings, president of the Men and Women's Equal Suffrage League of Philadelphia, spoke at the luncheon of the Jovian Electrical League of Philadelphia at the Bingham Hotel on Thursday, April 9. The men were quite charmed with Miss Hasting's appearance but were not prepared to meet her arguments. Those who began to embarrass the speaker were soon quieted, and Miss Hastings was soon able to convert nearly every man in the room. The 200 men present nearly fell over each other in the rush to sign the suffrage pledges which were provided.

Luncheon of the Dayton Jovian League.

The monthly meeting of the Jovian League, of Dayton, O., was held at the Dayton Club on April 6. J. M. Guild, secretary of the Greater Dayton Association, delivered an interesting talk on "Co-operation." Mr. Guild emphasized the fact that the co-operation of the members of the Jovian League was one of the chief aims of the league. In closing he requested the co-operation of the Jovian League in the greater Dayton movement. The next dinner of the league will be held on April 20, at which time it is hoped that the membership will be increased to 200.

Chicago Jovian Meeting.

At the meeting of the Jovian League of Chicago on April 13, George R. Jones, purchasing agent of the Public Service Company of Northern Illinois, delivered a very interesting address on "Observations of a Purchasing Agent." Mr. Jones recounted several amusing experiences and offered many valuable suggestions to salesmen. Martin J. Wolf presided at the meeting.

The Art of Tube Lighting.

The new art of tube lighting and its future was the subject of discussion at the three-hundred and twenty-seventh meeting of the New York Electrical Society held on Tuesday evening, March 31. Dr. Frederick G. Keyes, of the Cooper-Hewitt Electric Company, gave a preliminary talk on "High-Pressure Mercury Arcs." This discussion included a brief history of the development of fused quartz, a description of mercury-vapor arcs, and a history of the high-pressure arc. He also devoted some discussion to the ultraviolet light emitted by the quartz lamp. Dr. Keyes said in part:

"The development of the high-pressure mercury arc is necessarily inseparably connected with the development of fused quartz. In view, therefore, of the intimate relation, at any rate from a historical standpoint, of fused quartz crystal with the high-pressure mercury arc it has been thought desirable to present briefly some of the more important physical properties of this material and also to exhibit a few specimens of fused quartz.

"Gaudin (1839), appears to be the first, so far as I am able to ascertain, to fuse quartz crystal and draw it into threads. Gaudin noticed some of its splendid mechanical properties but it remained for Professor Boys, in England, to make use of the physical properties of fused quartz filaments in physical apparatus.

"Shenstone, in England, succeeded between 1895 and 1900 in producing small tubes and bulbs of fused quartz, and in 1904 the art of working fused quartz had progressed to such a stage that Heraeus was able to exhibit in Paris a high-pressure mercury arc within an envelope of this refractory material. Since 1900, in fact, the whole art of working quartz and manufacturing high-pressure arcs has advanced with extreme rapidity.

"The most striking peculiarities of fused quartz are perhaps its extremely low coefficient of expansion, which at ordinary temperatures amounts to 20 times less than lead glass or platinum, and its high melting point (1,700 degrees Centigrade). The smallness of the coefficient of expansion is such that the material may be heated to redness and plunged into cold water without cracking.

"In applying fused quartz to the manufacture of high-pressure mercury arcs the first problem to be solved was the manner in which current might be introduced into the exhausted apparatus. This difficulty was partially surmounted by the use of ground plugs of so-called invar metal. Recently methods of effecting a fusion seal have been developed, one of which is in use at present by the Cooper Hewitt Electric Company.

"The relation between the light efficiency of the mercury arc and pressure is such that at about 132 centimeters one obtains 5.26 candles per watt: 132 centimeters is, however, a pressure higher than it is desirable to operate a quartz mercury arc if long life is desired. It is, in fact, preferable to operate at about one atmosphere whereupon a life of a number of thousand hours is possible at an efficiency of approximately three and one-half candles per watt.

"A most interesting feature of fused quartz is its transparency to ultraviolet light. Tubercle bacillae appear to be particularly sensitive while spore-formers are hardly affected. Fortunately, however, most pathogenical organisms are nonsporeformers. The bactericidal action of the ultraviolet light emitted by the quartz mercury vapor arc is being studied enthusiastically both in this country and abroad, and further utilization of the radiation is promised now that a powerful source of ultra-violet light is available particularly along the line of photosynthesis."

D. McFarlan Moore described his latest work with the aid of lantern slides and with a demonstration of various types of apparatus.

Mr. Moore gave a most interesting sketch of the development of tube lighting during the last 21 years, defining its present status, not only in this country but in Europe, and giving a striking sketch of the progress in various scientific branches to which it has given an impetus. One section of Mr. Moore's address, which was listened to with rapt attention, was his description of "the immorality of much commercial lighting." He took a long list of materials and showed by exposing them first under various forms of artificial light and then under daylight, how the public is misled in the selection of materials and colors. He then indicated that this deluding of the public had actually found its way into the shops of butchers, and he exhibited pieces of beef and other meats which under the daylight rays were dark and sodden, and under artificial light, bright red and attractive.

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Dr. Steinmetz Lectures in Lynn, Mass.

In Burdell Hall, Lynn, Mass., on April 8, before the Lynn Section of the American Institute of Electrical Engineers, Charles P. Steinmetz delivered a lecture on "Effect of Electrical Engineering on Modern Industry," which was greatly appreciated by a large audience. Dr. Steinmetz feels at home in Lynn, where early in his career he resided for some time while connected with the data department of the Thomson-Houston Electric Company.

The speaker pointed out that the United States was pre-eminently an agricultural country at the start and practically remained such till the time of the Civil War, since which time it has rapidly advanced as an industrial nation. Facility in transportation has been one of the greatest factors in the expansion of these years, and though we hear the railroads criticised yet they have been an agency of great advance. But more potent in some respects than steam lines are the trolley cars that pass our very doors, and not only bring the country to the city, but enable the city worker to live in the suburbs, or in the country itself.

The lecturer then took up the discussion of materials and energy as the two entities necessary to human existence and industrial growth. Civilization depends upon the utilization of materials at a distance from the point of production, and while the steam roads could take care of this in quite an acceptable manner there still remained the particular distribution of materials and transportations of energy. Here is where electricity has had its sweeping effect on modern industry and light, heat and power enter into the engineering scheme of distribution. Electric power may be used economically in small quantities, whereas the steam-engine unit is only economical on a large scale.

Electrical energy as compared with chemical energy has, however, one serious disadvantage in that electrical energy cannot be stored on a large scale. Of course, the storage battery is used but it can hardly be called a vital factor in the world's work. Take a place where navigation closes for a part of the year; no engineer would think of endeavoring to store electrical energy by means of storage batteries but instead would employ chemical energy in the form of coal. Electrical energy is not found in nature in available form like the chemical energy of fuel or the power of waterfalls. It makes no difference at what rate water is used for power, but a uniform rate must be observed to secure the maximum efficiency in the use of electrical energy.

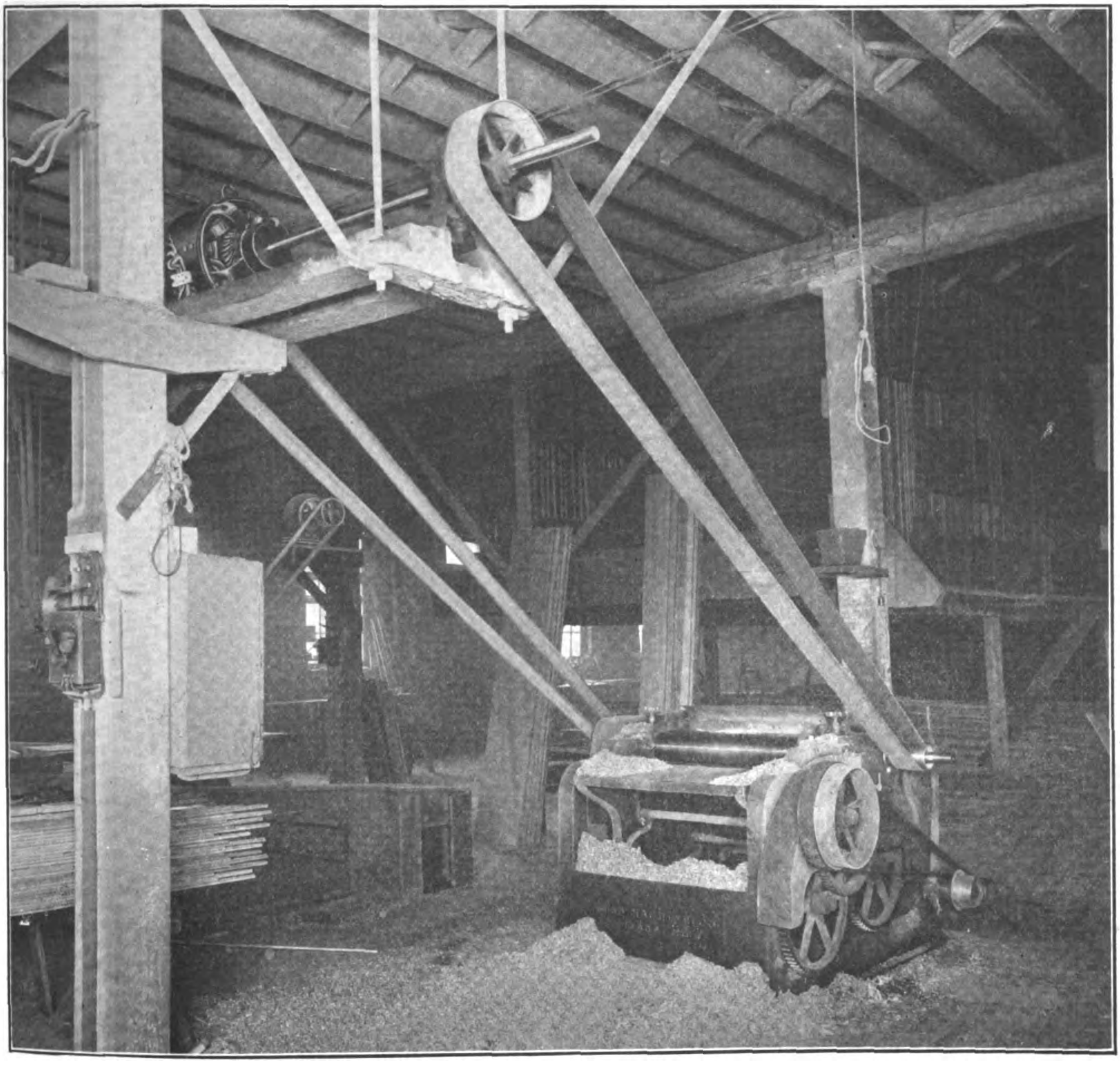
Dr. Steinmetz closed with a brilliant discussion of the alternatives possible to man when the coal supply of the world shall have been exhausted. Aside from the fact that retrogression in population in the future might become a world condition, the resources of science and invention have not yet been fully taxed.

Electricity in Woodworking Plants.

This article discusses the general advantages of electric drive and central-station power, with special reference to a new field open for the disposal of wood refuse. Detailed information concerning several special woodworking plants purchasing power is given in the data sheets.

In previous articles in this journal specific branches of the woodworking industry have been treated from the standpoint of electrification. There are, however, several types of manufacturing establishments that cannot be classed under any of the divisions already discussed and still are of sufficient importance to justify consideration from central-station engineers. In the accompanying data sheets detailed information is presented on three of such plants, devoted respectively to the manufacture of wooden wagon and carriage wheels, special store and bar fixtures, and pick and ax handles. In each of these installations, particularly the wheel plant, the machines used and the manufacturing processes are in a measure peculiar to these industries. However, the general features of drive and the particular advantages of central-station service are the same as in other woodworking industries and some repetition of the innumerable points to consider in soliciting the adoption of central-station service for such plants may therefore be in order.

One of the large items of expense in any woodworking plant is that of power. Yet it is often erroneously assumed that its unit of cost is very low on account of the wood waste available for fuel, and that consequently there is not the necessity for such economy as is practiced in other industries. There is, however, no dodging the fact that lumber at $30 per 1,000 ft. when used as fuel costs 30 times as much as coal at $3 per ton on a comparative basis of heat value.



Extended-Shaft Motor Driving Double-Drum Planer.

Progressive managers after careful study of the problem of refuse disposal, have found that the amount of wood in the finished product is somewhere around 70 per cent of the lumber purchased, and that the wood waste can be sold in quantity at a price many times over its value as fuel. Soft wood shavings are sold for bedding; hardwood shavings for insulating purposes in cold-storage warehouses, for lining cars, for packing breakables and for various uses in nurseries. The blocks of wood are either glued together into heavy door several inches thick for use in cold-storage plants, or are sold as kindling.

Producer gas from wood is another field for waste that was dealt with in a lecture recently delivered by G. E. Lygo before the Junior (British) Institution of Engineers. It was only recently, he said, that gas plant makers had given serious attention to the subject of utilizing wood for use in gas producers. This was no doubt due to the higher price of a wood-waste plant as compared with an anthracite plant and the low price of anthracite, but with the increased cost of coal, manufacturers having combustible waste materials of little value and difficult to dispose of were looking out for means of utilizing them, and the advent of reliable wood-waste suction plants had given them an opportunity of effecting considerable economy. In these plants all kinds of wood, from sawdust to pieces six inches in diameter, cotton seeds, cocoanut shells, fiber, and dust, sugarcane, coffee husks, rice husks, spent tanning bark, rubber leaf waste, surface peat, etc., could be used.

Referring to the design of the plant, many points had to be taken into consideration which were not needed with an anthracite plant. The area of the generator was governed by the nature and size of the fuel, but, roughly speaking, it was two and one-half times that required for coal fuel. The depth of the fuel depended upon its size and density. A deep fuel bed was necessary for large pieces of wood, else air passed through and ignited the gas in the top of the generator.

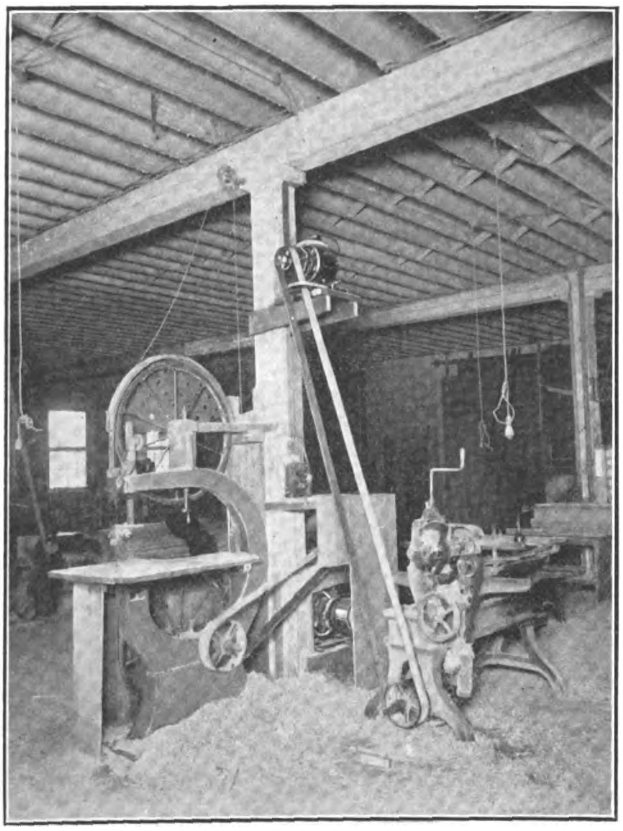
Small, dense fuel, such as sawdust and coffee husks, required a comparatively shallow bed, or its resistance would interfere with the working of the engine. The internal hopper had to be designed to suit the fuel, some fuels falling evenly in the generator, while others formed a cone in the center. The external hopper was of large capacity. A vaporizer was not required, as there was no necessity to keep down the temperature in the combustion zone, and the loss of hydrogen was more than made up by the volatile gases in the fuel.

The gas had to be cooled and washed as soon as it left the generator, else the heavy tar and dust in suspension would be deposited and choke the connecting piping. In Whitfield plants an anti-fluctuator was provided, which insured a steady flow of gas from the generator. The variation of pressure on the suction stroke rarely exceeded 1 inch of water, whereas six inches was not uncommon in plants without the anti-fluctuator.

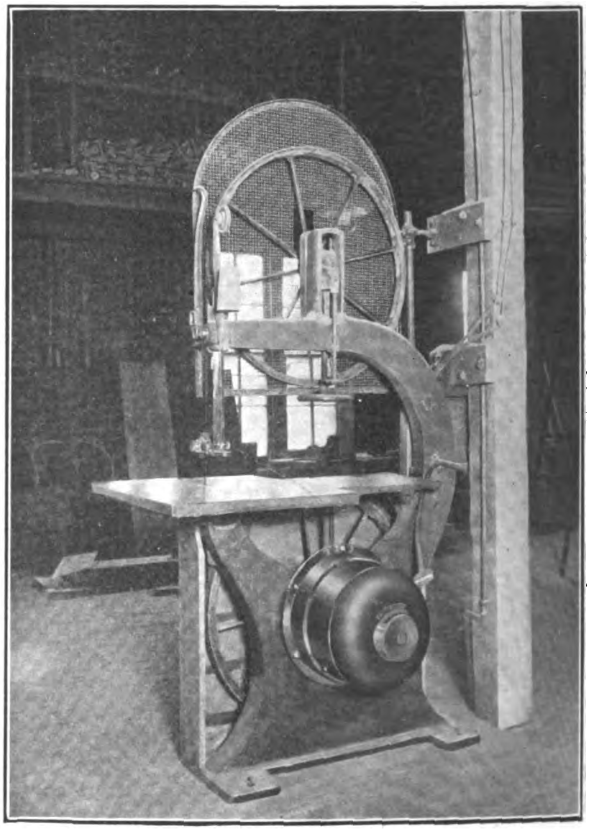
The calorific value of wood when air-dried was approximately 6,000 British thermal units per pound. The amount consumed per brake horsepower depended upon the moisture, which amounted to 10 to 20 per cent in air-dried wood and 30 to 50 per cent in fresh timber. Fuel which contained excess of moisture had to be dried until it did not exceed 60 per cent, otherwise it was difficult to make the generator fire burn evenly. The gas produced was of higher value than that from anthracite, namely, about 150 British thermal units to 170 British thermal units per cubic foot, as against 120 British thermal units to 140 British thermal units from the latter.

As regards cost of working, a test made with a Whitfield producer supplying an 84 brake-horsepower engine coupled to a 105-volt dynamo gave 540 British thermal units for 2,072 pounds of fuel consumed, or 3.83 pounds of fuel per kilowatt. The test extended over 10 hours, and the fuel consisting of oak and elm sawdust and chips from working machinery, had no value for other purposes.

In one factory, before the installation of the producer, the same work had been done by a steam plant, when, in addition to the same amount of wood waste, upward of 500 tons of coal per annum were consumed.



Band Saw and Lathe Driven by Individual Motors.



Motor-Driven Band Saw.

Importance of Speed Regulation.

The matter of speed regulation cannot be too thoroughly emphasized. Most plants employing mechanical drive suffer severely from poor speed regulation. The engine slows down under load and there is considerable slippage in each

Woodworking Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant manufacturing carriage and wagon wheels exclusively. There are 175 men employed working 10 hours per day. The average monthly output is 5,000 to 6.000 sets of four wheels.

Total connected horsepower, 347. Total number of motors installed, 31. Average kilowatt-hours per month, 34,927.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
April	27,957	August	36,865	December	36,890
May	30,981	September	37,319	January	35,777
June	28,549	October	42,138	February	34,628
July	41,278	November	36,343	March	33,206

Load-factor, 19 per cent; operating-time load-factor 38.7 per cent.

All of the wood refuse is used for furnishing steam for the dry kiln, and coal is purchased for heating purposes in winter only.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,800	Belted to a line shaft driving one 36-inch band saw; one 20-inch pony planer; and one belt sander.
1	2	1.650	Belted to a line shaft driving one 16-inch lathe; two small drill presses; and one small shaper.
1	0.5	1,650	Direct-connected to forge blower.
1	10	1,200	Belted to line shaft driving one tenoning machine; one equalizing saw; one wheel-assembling machine; and one wheel-sizing machine.
1	7.5	1,200	Belted to a line shaft driving one wheel press; three drill presses; one 16-inch double emery wheel; and one wheel-facing and boring machine.
1	5	1,800	Belted to line shaft driving one 2,000-pound freight elevator; and one post drill.
1	50	900	Direct-connected to a 36-kilowatt 240-volt direct-current generator supplying energy to several of the original direct-current motors installed in this plant.
1	20	900	Belted to a line shaft driving one tire-setting machine; three tire-welding machines; one tire bender; two tire-equalizing rolls; three drills; one wheel-boring machine; and one hub-bolting machine.
1	5	1,800	Belted direct to mechanism of freight elevator.
1	10	1,200	Belted to a line shaft driving one rim sticker; one double spindle; one screw drill; three screw drivers; one small emery wheel; two post drills; one riveter; and two thread sanders.
1	15	1,200	Belted to a line shaft driving two wheel-rimming machines; two rim-polishing belts; one rim-pulling machine; one rim-bolting machine; one rim rounder; and one 16-inch cut-off saw.
1	10	1,200	Belted to a line shaft driving one wheel-rimming machine; two rim-polishing machines; one rim rounder; and two rim-bending machines.
1	15	1,200	Belted direct to a 40-inch exhaust fan.
1	35	1,200	Belted direct to a 60-inch exhaust fan.
1	2	1,650	Belted direct to a wheel press.
1	2	1.650	Belted direct to a wheel tenoner.
1	10	1,200	Belted to a line shaft driving one wheel-finishing machine; one wheel tenoner; one flange-starting press; and one compressing machine.
1	7.5	1,200	Belted to a line shaft driving two spoke-mitering machines; and one spoke-equalizing saw. This motor is large enough for only two of the three machines connected.
1	7.5	1,200	Belted direct to one spoke-polishing belt.
1	10	1,200	Belted to a line shaft driving one spoke-tenoning machine; one mitering machine; one spoke-throating machine; and one spoke facer.
1	20	1,200	Belted to a line shaft driving two 16-inch belt sanders; and two throat-belting machines.
1	15	1,200	Belted to a line shaft driving two 16-inch belt sanders; one polishing wheel; and two four-inch belt sanders.
1	15	1,200	Belted direct to a 40-inch exhaust fan.
1	20	1,200	Belted to a line shaft driving two rim-planing machines; and one rim welder.
1	10	1,200	Belted to a line shaft driving two rim-planing machines.
1	15	1,200	Belted to a line shaft driving one hub saw; one reamer; and one lathe.
1	7.5	1,200	Belted to a line shaft driving four hub mortisers; one emery wheel; one wood-turning lathe; and one small ventilating fan.
1	35	1,200	Belted to a line shaft driving two spoke lathes; one equalizing saw; and one 8-by-8-inch air compressor. This motor runs two of the above machines at a time.
1	15	900	Belted to a line shaft driving one 24-inch equalizing saw; one 14-inch cut-off saw; and one 16-inch rip saw.
1	5	1,200	Belted direct to one rim bender.
1	2	1,650	Belted direct to one 14-inch cut-off saw.

Woodworking Data—Sheet No. 2.

Woodworking plant making a line of high-grade store and bar fixtures. All work is done on order, no stock fixtures being made. Plant operates 60 hours per week in the busy season and 48 hours at other times.

Total connected horsepower, 170.5. Total number of motors installed, 32. Average kilowatt-hours per month, 4,999.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	2,790	May	4,100	September	6,400
February	3,560	June	5,000	October	5,860
March	4,400	July	4,340	November	6,520
April	5,100	August	6,600	December	5,320

Load-factor, 5.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	1,200	Belted direct to a 50-inch fan, running at 1,000 revolutions per minute.
1	3	1,800	Belted direct to one 12-inch rip saw.
1	3	1,800	Belted direct to one 24-inch face planer.
1	7.5	1,800	Belted to a line shaft driving one 30-inch Berlin planer, double drive; and one 12-inch cut-off saw.
1	5	1,800	Belted direct to one 14-inch rip saw.
1	15	1,200	Belted direct to one 9-inch sticker.
1	5	1,800	Belted direct to one 7-inch sticker.
1	2	1,800	Belted to a line shaft driving one 8-inch emery wheel; one knife grinder; one saw grinder; and one knife grinder for scraper.
1	5	1,800	Belted direct to one scraper.
1	5	1,800	Belted to drum of freight elevator.
1	3	1,800	Belted direct to tenoning machine.
1	5	1,200	Belted to a line shaft driving two 16-inch trim saws; and one 12-inch double emery wheel.
1	3	1,800	Belted direct to one mortising machine.
1	5	1,800	Extended-shaft motor belted direct to one two-head shaper.
1	3	1,800	Belted direct to one 10-inch face planer.
1	3	1,800	Belted direct to one 24-inch facer.
1	3	1,800	Belted to a line shaft driving two 10-inch rip saws.
1	2	1,800	Belted to counter shaft driving two lathes.
1	3	1,800	Belted to line shaft driving one 12-inch rip saw; one 26-inch resaw; and plating shop.
1	5	1,800	Belted direct to one 24-inch face planer.
1	10	1,800	Extended-shaft motor belted direct to one 36-inch planer.
1	3	1,800	Belted to counter shaft driving two cut-off saws.
1	3	1,800	Belted direct to lathe.
1	3	1,800	Belted to a line shaft driving one boring machine; one 10-inch belt sander; one dado saw; and one emery wheel.
1	3	1,800	Belted direct to one 36-inch band saw.
1	5	1,800	Belted to a line shaft driving one 36-inch band saw; one emery wheel, two boring machines; one jig saw; one bobbing sander; and one dish sander.
1	5	1,800	Belted direct to one grooving machine.
1	25	1,200	Belted direct to one 60-inch sander and 26-inch blower.
1	3	1,800	Belted direct to one two-head shaper.
1	3	1,800	Belted direct to one dove-tail machine.
1	3	1,800	Belted direct to one grooving saw.
1	2	1,800	Belted to line shaft driving one 36-inch band saw; and one 12-inch rip saw
1	2	1,800	Belted direct to one 12-inch rip saw.

Small woodworking establishment manufacturing wooden handles for picks, axes, etc. The average output is 10,000 dozen per month. Plant operates 10 hours per day

Total connected horsepower, 46. Total number of motors installed, 10. Average kilowatt-hours per month, 2,676

Kilowatt-hour consumption per 12 months:

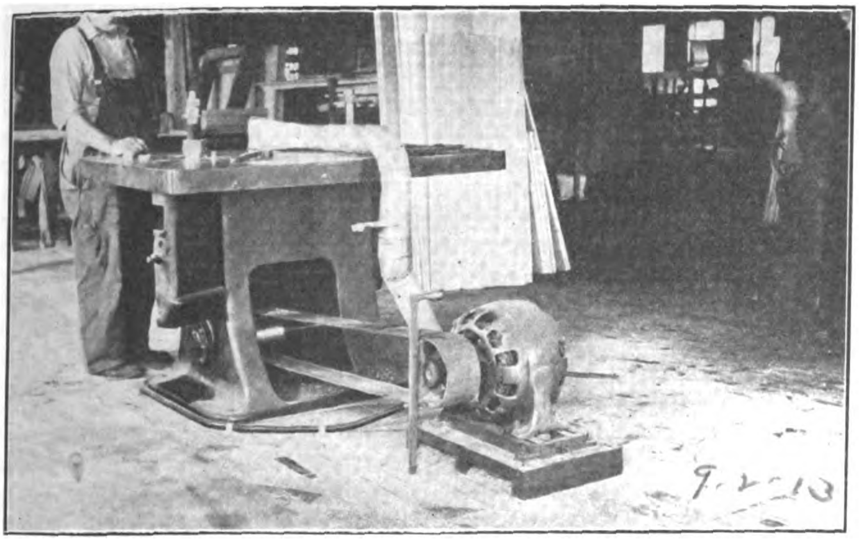
Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	2,790	May	3,100	September	640
February	1,580	June	510	October	3,590
March	1,740	July	1,261	November	4,520
April	3,550	August	2,060	December	6,780

Load-factor, 10.7 per cent; operating-time load-factor, 22.4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
3	5	1,700	Each belted to a 4-foot by 24-inch polishing machine.
1	2	1,700	Belted to a 12-foot countershaft driving two 24-inch cut-off saws.
1	10	1,200	Belted direct to a 36-inch rip saw.
1	5	1,700	Belted direct to a 24-inch rip saw.
1	2	1,700	Belted direct to a 14-inch cut-off saw.
2	5	1,700	Each belted direct to a 36-inch handle lathe.
1	2	1,700	Belted direct to an 18-inch cut-off saw.



Five-Horsepower Motor Belted Directly to Single-Spindle Shaper.

belt drive between engine and machine. It is not uncommon to find the machine at some distance from the engine running at 30 per cent less than its rated speed when the factory is carrying its average load. It is not feasible to speed this machine up 30 per cent as on light loads the speed would be so excessive as to cause rapid depreciation of the machine in question. As the output in the case of most wood-working machines is proportional to the speed, it is evident that motor drive would operate the machine at its maximum economical speed at all times, thereby increasing the output to what it should be. This is so important that the speed of each machine should be taken when the factory is running well loaded and when running light, and a comparison made with the speeds recommended by the builders of the machines. This data will serve as a basis for estimating the increase in output due to motor drive.

Determination of Energy Required.

The amount of energy required for motor drive is equal to the sum of the motor and wiring losses, the energy consumed in the mechanical connection between motor and machine, and the actual energy input to each machine. So much uncertainty attaches to the determination of the last-mentioned item that a detailed explanation is in order.

The loss of energy in the mechanical drive due to friction is rarely ever known. The difference between the indicated horsepower of the engine when operating the factory with machines loaded and when operating with machines idle is commonly taken as the actual power load. As a matter of fact the friction losses increase with the load sometimes being three times, and usually at least twice, the no-load friction losses.

The power requirements under load conditions can be measured with considerable accuracy. In case central-station power is accessible the following method can be used to advantage. The mechanical drive should be sectionalized and each section driven temporarily with an electric motor. The number and location of these motors depend on the distribution of the load. If the factory is of considerable size, and possibly several floors, at least one motor per floor should be installed and should be located near the center of gravity of the load. It may be advisable to divide the line shaft into two or more sections on some floors where the load is unusually heavy and is distributed on a long line shaft.

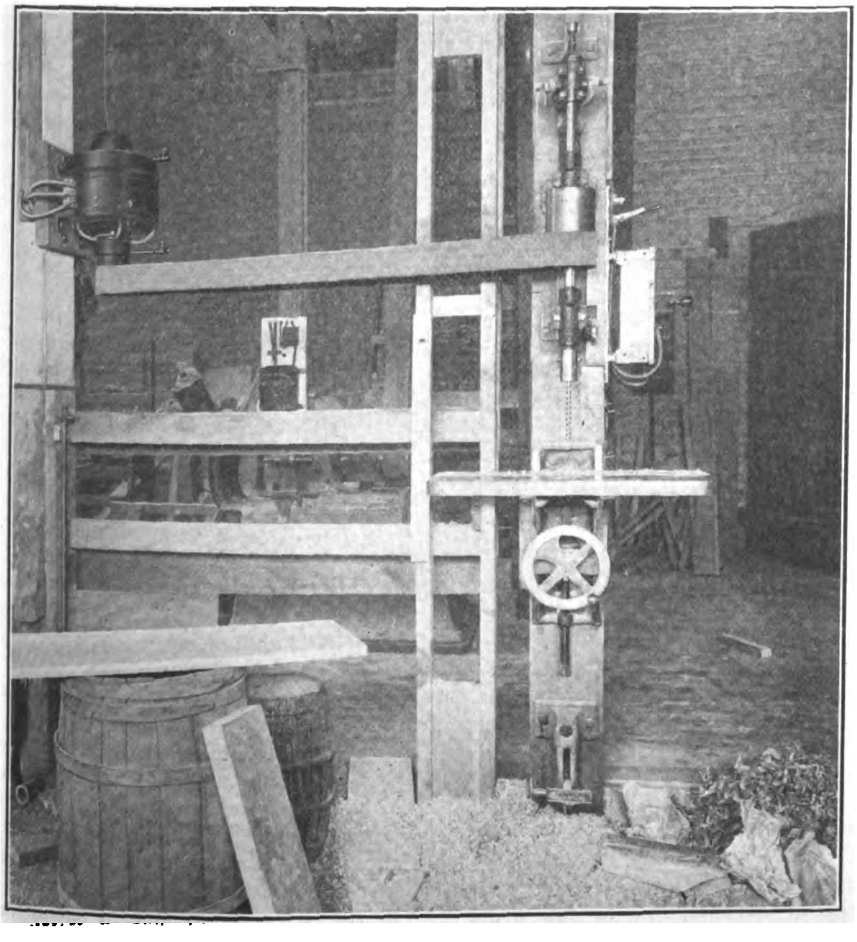
Advantages of Motor Drive.

Motor drive is of particularly great advantage to those plants where the output varies periodically. It should be kept in mind that when a small percentage of machines in a department are operated that the magnitude of the friction losses is many times that of the useful work, and that most of these losses would be eliminated by the use of motor drive. This is particularly true in overtime work.

A breakdown in the main part of the mechanical drive usually necessitates a complete shutdown of the factory. Trouble with motor drive is confined to one machine or to a group of machines.

Motor drive permits the most economical use of floor space. There is no need of a motor occupying floor space. On account of its compactness and smooth-running characteristics it may be mounted on the machine, placed under the machine, or attached to the wall or ceiling. The machines can all be located with regard to obtaining the maximum output, which can rarely be done when the machines must be driven from line shaft.

In many woodworking plants the number of holes in the floor through which belts pass to drive separate machines on the floor above have increased the fire risk. In case of fire each opening be-



Motor Driving Boring Machine.

comes a chimney which fans the fire and carries it from floor to floor.

Experience has proven that motor drive has decreased the number of accidents. Direct-connected motors; elimination of belts passing through the floors; stopping the motor quickly from several places about the machines, which may be done with very simple and inexpensive control apparatus, have all contributed toward decreasing injuries to employees.

It is evident that on account of the nature and characteristics of the manufacturing processes the induction motor is the most suitable for woodworking plants.

When accelerating machines have great inertia to overcome, such as heavy planers and matchers, as well as machines equipped with fly-wheels, such machines should be driven with motors having high-resistance rotors; and the remainder, with squirrel-cage induction motors.

Practically all woodworking machines, with the exception of lathes for special work, run at constant speed. The sparking of the direct-current motor makes this type of motor undesirable for this sort of work. Light weight, high-speed motors, involving lowest first cost, highest efficiency and power-factor are most desirable. The induction motor is well adapted for this purpose and its maintenance cost is somewhat less than for a direct-current motor. The squirrel-cage type of motor should be used whenever possible.

Mechanical Connection Between Motor and Machine.

Improper mechanical connection between motor and machine or motor and countershaft has in some instances caused unjust criticism of motor drive. For direct connection a flexible coupling should be used unless motor and machine are mounted on a common metal plate or the motor is attached to the frame of the machine. Most manufacturers of modern woodworking machines have so designed them that they can be readily adapted to individual motor drive. Chain drive or heavy belt with a spring belt-tightener is desirable when the motor must be located close to the machine but cannot be direct connected. Fly-wheels should be used on motors driving machines which have only peak loads of short duration. With all belt drives a belt speed of from 4,000 to 5,000 feet per minute is most satisfactory and economical. Pulley ratios of more than five to one under ordinary conditions should be avoided when possible by using lower speed motors. When it is desired to install a motor on a machine having a speed several times greater than that of the motor, gear drives using steel-cut gears and rawhide or cloth pinions have been successfully employed.

Commercial Practice
Management, Rates, New Business

COMPANY AND EMPLOYEE.

By W. M. Scott.

The relationship that should exist between a central-station company and its employees is a subject that is being given serious consideration by the progressive manager as he realizes that much of the success of his company depends upon the hearty co-operation of every employee. In the accompanying paper, which was presented recently before the Utah Light & Railway Company Section, N. E. L. A., Mr. Scott makes some very timely comments on this subject.

The objects and aims of the central-station company and its employees should be to the same end, viz: to get as great returns on their investments as possible consistent with fair treatment to all.

The owners should receive fair returns on their investments and all should work together to attain that end.

The public should get the best possible service at the lowest rates consistent with fair returns for the owners.

The employees of the company should in turn receive a fair compensation for their time and energy for making this possible, and if the interests of all are not mutual, there is something wrong somewhere that should be removed.

These results can best be obtained by being as closely associated as possible, and I know of no better way to become acquainted with each other and to know what the one expects of the other, than frequent company meetings.

There should never be a feeling between the company and its employees that one is ready to take advantage of the other. This feeling does sometimes exist, for the reason that there is too wide a gap; too little intercourse and too much lack of confidence between the higher officials and the rank and file.

In order to obtain the most efficient service in an organization such as ours, there must be implicit confidence between the heads of departments and those under them. In order to have this, care should be exercised in the selection of men; not only for the heads, but for any position.

I shall not attempt to name the essential qualifications of men for a successful organization in the order of their importance; but will name a few that are necessary for successful work: They are honesty, sobriety, industry, intelligence, good health, moral habits and a cheerful disposition. There are others that might be named; but these coupled with ambition will give a man a good start on the road to success.

As the company's interests are advanced, so should the employees' advance. Any employee who is satisfied with his present condition and has no desire to advance to a better one, is not worth while and is a detriment. If the best results are to be obtained he must have a feeling of assurance, that as he makes advancement and improves in his work, thereby making more for the company, that he will share in the profits of his labor, and this should be recognized and the advancement be made gratuitously.

Men are by no means equal; some are better adapted to certain kinds of work than others; they are sometimes more ambitious, more capable and more industrious than others, and are more entitled to advancement.

In order to obtain the best efficiency and as an incentive for men to improve in their service, advancements to better positions in the company's service should be made from the company's force. With proper care and judgment in the selection of men, it should be unnecessary to go outside of the company organization to get a man to fill any position in it.

The head of each department should have some man who could step into his place should he be called away temporarily, or be advanced and leave the department permanently. I have seen men who seemed to be afraid to let too much be known about their affairs, and disliked any one to be over ambitious for fear that they might get their job.

The interests of the company and its employees are, or should be, mutual, and what is good for one should be good for the other. In order to gain the good will, and thereby secure the most efficient service from the employee, it is necessary to take an interest in them, and give them some consideration other than the stipulated amount paid in monthly or daily wages. A few days' vacation, or a little outing or excursion will be appreciated more by a conscientious employee, than an advance in wages grudgingly given.

It should be the policy of the company to do everything that can be done to increase the bond between them and their employees. Their duties and surroundings should be made as pleasant as possible, so that there is a feeling such as exists in a big family, so that there will be no desire on the part of the employee to go elsewhere to look for work. Ideal conditions do not exist in an organization when the head of a department says that "He doesn't care if a man does quit, as it will be no trouble to get one as good." Conditions of wages, hours, surroundings and general treatment should be such that the best of men can be secured and retained. If the employees expect this consideration from the company, they must do their part to deserve it. They should be just as loyal to the company's interests as their own, and "Play Fair" with the company. If they go about their work with a feeling that they will do as little as they can and get as much as they can for what they do, they have no right to expect but what the company will get all they can and give as little as possible in return, and both will be losers. And if the boss is "on to his job," and has the interest of his company and himself at heart, as he should have, the employee who has such a feeling towards the company will soon be looking for another job.

As stated above, if a man expects the company to be interested in his advancement and welfare, he must "play fair" and be honest with the company, and should be just as attentive to his duties when left alone, as when under the watchful eye of his boss. A man who has to be constantly watched, or one whom you feel requires watching to be sure that he is doing his duty and properly executing what is delegated to him to do, stands little show of advancement. He has neither the interest of the company nor his own welfare at heart; but take a man in whom you have confidence and who you do not need to watch or worry about; knowing that his best energies are being exerted to promote both the company's and his own welfare, you will see that he is advanced from time to time to positions of greater responsibility and better pay, while the man who does have to be watched is at a standstill and his services are generally dispensed with at the first opportunity.

While I am not an advocate of dissatisfaction, and have little patience with those who are continually complaining of their job and their surroundings, and who are always jealous of someone else who has a better position than they have, and one who makes the claim outright or insinuates that so and so is a "pet," and his pay is raised, or he is advanced to better positions because he is a favorite; I do think that none of us should be satisfied to stay in the positions we are now in; but should qualify if possible to the highest position in the company's service, and be ready for advancements when the opportunities arise. I do not mean to convey the impression that an employee should not anticipate and receive advancements in his pay and other considerations that are advantageous to him, unless the opportunity should arise for him to fill a vacancy in a position higher than his own. On the contrary, the best and most efficient service is rendered when an employee works with a feeling of assurance that his earning capacity will be increased in proportion to the advancement he makes in the quality of his work, and the amount accomplished.

No man should ask or expect an advance in wages, or any special consideration from the company, unless he has improved in his services, and it should be unnecessary for him to have to call the attention of his superior to the fact that he has improved and is able to do more and better work, and that he should be recompensed accordingly. These facts should all be recognized and advancements made accordingly, and if done, both the company and the man would be the gainer.

The value of a man's services should be based on what he accomplishes, rather than on the position he holds, or the length of time he has been in the service of the company.

Loyalty and co-operation are essential for successful operation. So long as we are employees of the company, we should be loyal to their interests, their policy, methods and organization; refrain from criticism; but defend them at all times and under any circumstances.

There should be co-operation between the different departments and between the employees of any department and each do all they can to help the other make a success. We should not consider so much whether this move or that move is going to make a good showing for us as individuals, or for our department; but all get in and work together for what will be to the interests of our company, and if it is good for the company, it is good for us, and both will share in the profits.

We are fortunate in being associated with a company where conditions are as nearly ideal as they are. We enjoy a good many privileges that we could not enjoy elsewhere. There is no great desire on the part of the employees to break away from our home and seek another. It gives us pleasure to see the company prosperous, for we have a feeling that we are in a measure responsible for it. We may sometimes think the company has lost sight of our interest, that they could well afford to allow us a greater share of the revenues for our services. We may think that it has been a long time since there was any change in the amount of our pay check. If so, let us try and ascertain the cause. Perhaps we have not made any advancement, or improvement in our work, or if we have as individuals, perhaps the organization on the whole has not. Perhaps we are sometimes dilatory in getting down to work in the morning, unconsciously thinking that five or ten minutes will not make any difference. Perhaps we are watching the clock too closely and drop our work promptly at quitting time, when by staying a few minutes and completing a job, we would save an hour or two of some one else's time the following day, or perhaps save a day or two in a report or statement getting into the proper hands; or the same length of time in a customer getting service. Perhaps some of us may unthinkingly waste our time during working hours in telling funny stories or talking over some matter that has no connection with our work, and not only waste our own time, but the time of all who are in hearing. Let us check up and see if any of these apply to us; if so, let us "Cut it out," for all of these little things count for or against us. And on the other hand, let the company's officials and heads of departments make some observations and see whether the highest efficiency is being obtained, whether some are being held back on account of incompetence or inefficiency of others, and if there are any weak spots, let us get together and strengthen them. Let us all work together for the interests of our company, with a feeling of assurance that we will share in the prosperity; for without that feeling of assurance, no man will exert his best energies. And bear in mind always that a greater effort will be made to please on account of the good will that exists towards the company and its officials, than through fear of the consequences of creating their displeasure.

Employees should not forget that their conduct is a reflection on the company. It is important that the employees as its representatives should remember that the policy and reputation of the company is judged by the treatment the public receives at the hands of its employees. Therefore, our treatment of the public should be the same as we would expect to receive if conditions were reversed, and our customer were representing the company and we were in his place. A discourteous reply to a civil question is sometimes the cause of a direct loss of a good many dollars to the company, which in a measure is our individual loss, for unless our company is prosperous we cannot expect to be.

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Electric Light for the Poor Man's Cottage.

W. J. Fennell, borough electrical engineer of Wednesbury, England, has made a special effort to cultivate small cottage consumers. An account of the success which has already attended the effort was given by him in March to the Institution of Electrical Engineers at Birmingham. Wednesbury, like many English midland towns, is occupied as to nine-tenths of the area by industrial workers, the richer people living outside. Not even free wiring, coupled with the rateable-value system of charge or slot meters, would tempt householders of such rentals as $40 to $90 per annum to take a supply of electricity. Failing to reach what he terms the "lower middle class," Mr. Fennell turned his attention to the class below—the laborer, living in a cottage. Most industrial towns have hundreds or thousands of cottages and small houses occupied by these. They are places where the gas stove has no chance, as a fire is always kept burning in the living room; therefore lighting only is required. But if it is to be electrical there must be both free wiring and free lamps, as such consumers cannot afford 65 cents for a lamp, and if they used cheap carbon lamps they would soon want to install gas. Further, allowing a five years' life, a slot meter costs $2.50 per annum, while it is also a very unsatisfactory article and repairs or loss of revenue are heavy. A weekly payment system was felt by Mr. Fennell to be best suited to such a case, especially as this class of working man is generally noted for his weekly-payment habit for rent, clothes and furniture.

These small houses are in blocks and one service will supply from 5 to 15 houses. An ordinary 7/18 S. W. G. service is put into the most convenient house, terminating it in a service fuse, and space is allowed for fixing a meter if desired to check the consumption for each block. From the fuse a twin lead-covered cable is carried either inside or outside the houses, along the row, and is looped into each house. Where a house is not to be connected, a loop is left in the wire ready to insert when the tenant decides to come on. The cost of services averages $3.75 per house, whereas the usual cost for a few lights is about $16. The consequent saving of capital is important when comparing the value of small with ordinary consumers. Each house is provided with a wall-plug socket which takes the sub-service wires; the plug itself is connected by means of flexible wires to a pair of bow cutouts. This arrangement provides a double-pole fuse and switch ample for disconnecting a 120-watt installation, and Mr. Fennell says it is cheaper and less liable to corrosion, etc., than an ordinary double-pole switch. The wiring, which commences at the bow cutout, is quite ordinary. The cost of the wiring and fittings without lamps averages $7.25 to $8.10 per house. A local switch is at present allowed for each light, but the substitution of keyholders is being considered.

Mr. Fennell says that experiment is necessary to see whether the extra consumption is of more importance than the reduced cost of wiring. Three lamps are supplied, two 40-watt metal-filament (one for each downstairs room) and one 8-candlepower carbon lamp for the front bedroom. It is found that there is no demand for light in the other bedroom. As it is imperative to prevent any but authorized lamps being used, the simple expedient of using Edison screw caps and lampholders was adopted at Wednesbury, as lamps with this cap cannot be bought in England in small quantities, yet there is no extra expense for either holder or lamp because it is the Continental standard.

Estimates showed that an average of about 15 cents per week per house would easily cover all expenses, or $7.80 per annum, and the net profit has worked out at $1.80 per annum per consumer, or about 25 per cent of the income, "a far better return than on any other class of consumers."

Collection is carried out on a commission basis and it has been found satisfactory, a collector working insurance or other business, who knows just how to deal with this class of consumer, being engaged. Payment is made in advance on Monday or Tuesday, and the consumer is liable to be cut off on the Monday following a failure to pay.

The popularity of the scheme is unmistakable. Within 18 months the number of consumers has grown from 25 to 250. "It is quite usual for a poor woman to call for a few forms, say a dozen, and to bring them back again signed within a week."

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Jovian Section in Indianapolis Newspaper.

At the time of the Jovian rejuvenation in Indianapolis, Ind., referred to in our issue of March 28, the *Indianapolis Star* published a four-page Jovian Section. This was in the issue of Friday, March 20. The first page of the section contained 46 portraits of prominent Jovians, including Governor Ralston and Mayor Bell, who were initiated at that time. Prominent among these was the portrait of Thomas A. Wynne, Statesman for Indiana, and candidate for Jupiter.

The other three pages of the section were devoted to reading material connected with the Jovian League or with electrical matters and with advertisements of an electrical nature. In this advertising the local utility companies, contractors, supply houses and manufacturers joined to fill an equivalent of two and one-half pages.

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An Employees' Booster Club.

A recent meeting of the Employees' Booster Club of the Louisville & Northern Railway & Lighting Company and the Louisville & Southern Indiana Traction Company, held in New Albany, Ind., was addressed by F. T. Pawling, of Cincinnati, O., representing the General Electric Company, on electrical heating devices, stereopticon views and demonstrations accompanying the address.

James W. Dunbar, J. M. Merker, Henry A. Seigle and James Harman, officers of the two companies, made addresses on the subject of accident prevention, to which the traction companies operating "the big red cars" out of Louisville and into southern Indiana are now devoting considerable attention.

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Fire at Decatur.

A fire which occurred on April 7 completely destroyed the office and sales rooms of the Decatur Railway & Light Company at Decatur, Ill. All records and other literature of the company were lost.

Electric Sign Data

Getting the Sign Business.

A. L. Scott, sales agent of the Edison Electric Illuminating Company, of Lebanon, Pa., interestingly recounts his experiences in endeavoring to promote a slogan sign in Lebanon, in a recent issue of the company's house organ. The suggestions contained in this article are worthy of serious consideration and are appended herewith.

To create a desire is the one aim of the salesman,—his most efficient weapon if used properly,—but when it comes to working up a desire for a sign slogan, he has to start at the beginning,—and it's a hard proposition to find the beginning,—and produce facts all the way through.

Realizing this fact, the writer, in an effort to influence the public sentiment in favor of an electric sign slogan for the City of Lebanon, started in with the secretary of the Board of Trade, who at first did not feel any too kindly toward an electric sign for the City, but, upon being shown how cities considerably smaller than Lebanon were going ahead and doing things in a modern way,—his civic pride burst forth and with it, that desire to have his city also put on the map as being progressive.

After the first talk he realized that the Board of Trade was the proper channel through which to work to get plans laid for an electric sign slogan, so he invited the writer to attend the next meeting of the Board and take the matter up with them.

Understanding that he must do something more than tell them about other cities, the writer set about laying his plans. With only a few days left before the meeting of the Board of Trade, he hit upon a plan to get some data which might appeal to everyone attending, and particularly to those not well informed on the value of electric signs in general. A booklet entitled, "Sure Sign of Success," "Will Interest Only Progressive Citizens," was the result.

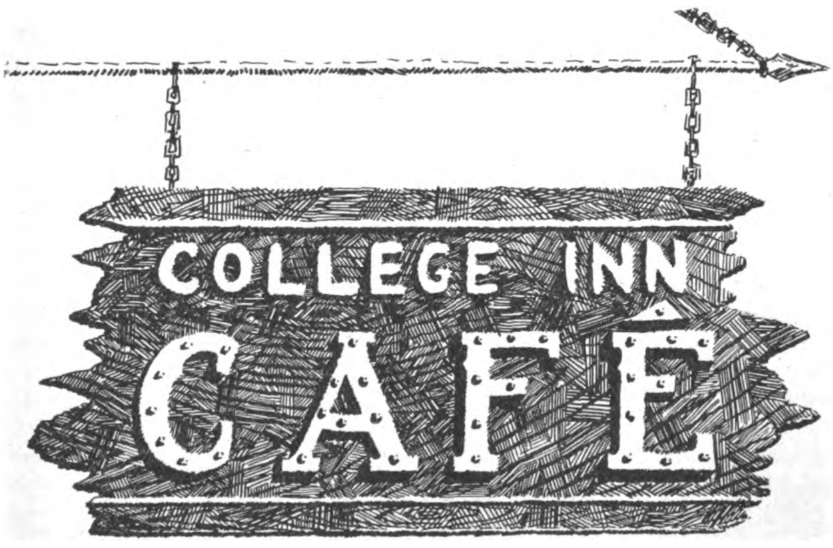
The books were handed out at the meeting, which was fairly well attended, although it was not generally known that an electric sign slogan proposition was to come up for discussion. Directly after the reading of the minutes by the secretary, the writer was called upon to tell them about Lebanon's having an electric sign, which, however, he did not do. He explained and showed them how other cities were growing through their modern methods,—trying to convince them that modern methods have power to boost any city, and at the same time, work up that much sought for "desire."

Something must have been accomplished along this line, for the entire evening was spent in the discussion of electric signs. During this discussion, the writer tried to kill two birds with one stone. Without straying too far from the line of attack which he had planned, he brought out also the value of the electric sign to the merchant. He told what other cities were doing, produced reasons for city slogans, and explained how merchants and men in various lines of business were increasing their business through up-to-date city and personal advertising, particularly electric sign advertising, while they,—the Lebanon business men,—were waiting for John Jones or Tom Smith to make the start and get a sign before they came out and announced to the public that they had decided to modernize their methods and progress to the extent of erecting a sign.

Upon expressing his willingness to answer questions, the writer was surprised to hear practically each one in attendance present two or three of them, opening up to him an opportunity to offer suggestions on sign slogans, merchants' signs, window lighting, and advertising in general.

It was interesting to note, after showing them how far behind the times the merchants were compared to those in other cities, especially in the matter of advertising, how they popped questions regarding the cost of installation and operation of signs, which as far as possible, were eluded, this not being the real object of this discussion. To convince them of the benefit to be derived from the latest, and, therefore, the most modern method of advertising, and the desirability of both the city and the merchants getting in line to promote the interests of both through this medium, was the great aim of the evening.

On a motion of the board, the writer was asked to call personally on all the absent members of the board, and on other business men for the purpose of obtaining their views and arousing interest in a proposed sign meeting.



Sign sketch for cafes and restaurants, contributed by the Greenwood Advertising Company, Knoxville, Tenn.

Sign measures 85 feet by 325 feet. There are 64 receptacles, the sign being double face.

Letters are 16-inch raised, full block with background of imported glass smalt.

The sign is of mission design and lends itself readily to any color schemes and flashing effects.

Electrical Construction

Revised Electrical Rules of Chicago.

The rules and regulations of the Department of Gas and Electricity of the City of Chicago, governing the installation of wires and apparatus for electric light, heat and power, and for the construction and installation of electric signs and displays, have been revised and published as a paper-bound book, copies of which may be had from the city clerk of Chicago for 10 cents each. The revision has been brought about chiefly through the efforts of Victor H. Tousley, chief electrical inspector, and under the general supervision of Ray Palmer, commissioner of gas and electricity. The last edition of the rules, that of 1912, formed a 207-page book, while the edition of 1914 contains 244 pages.

At the beginning of the revised book of rules are published the revised city ordinances governing electrical inspection in general (including the registration of contractors), illuminated signs, electrical construction in streets and alleys; also the electrolysis ordinance, the ordinance specifying the three standard types of electric street lamp posts, and the ordinance governing the examination and licensing of moving-picture operators and apprentices.

The Chicago rules follow very closely the rules of the National Electric Code. There are, however, certain variations and more stringent regulations which are necessitated by local conditions. Electrical work done in compliance with the Chicago rules will be accepted by the Board of Underwriters.

The principal changes and additions to the rules are given below. In each case there is given the subject matter and the nature of the change or addition. Specially important changes are given in full.

Rule 1*d*.—Protection of Constant-Potential Direct-Current Generators.—New rule in place of second and third paragraphs, to correspond with National Electrical Code, 1913 edition. Permits single-pole protection for two-wire generators.

3*e*.—Switchboards.—New additional rule; corresponds with National Electrical Code. Gives details on protection of large numbers of rubber-covered wires.

4*a*.—Resistance Devices.—Sheet asbestos and mill board not approved for mounting resistance; slate, marble or transite board, not less than one-half inch thick, must be used.

4*b*.—Resistance Devices.—Additional paragraph; corresponds with National Electrical Code. Permits use of incandescent lamps for resistances under certain conditions.

8*k*.—Motors.—New additional rule; corresponds with National Electrical Code. Deals with soft-rubber bushings for the protection of wires where they leave the frame.

Class B.—Outside Work.—Note at top of section changed to correspond with National Electrical Code. Restricts Class B rules to such portion of the installation as is not protected by service cutout and switch.

12*b*.—Underground Wires.—New sentence added to second paragraph. Requires use of lead-covered wire for underground service leads.

12*f*.—Service Conduits and Wires.—Second paragraph changed to allow service conduits to be imbedded in brick or concrete walls. Also new additional paragraph requiring service outlets to be so placed as to maintain proper clearance between light and signal wires, both where attached to building and between building and pole.

15*b*2.—Grounding Low-Potential Circuits.—The word "may" changed to *must*, to correspond with National Electrical Code. This rule now requires the grounding of one side of alternating-current secondary circuits, even where no neutral point is accessible.

15*g*.—Grounding Transformer Secondaries.—New specifications to correspond with National Electrical Code, but omitting last paragraph in fine print of latter.

16*b*.—Tie Wires.—Change in first paragraph to correspond with National Electrical Code. Allows use of marlin and similar materials for this purpose.

17*d*.—Underground Conductors.—New rule; requires use of lead-covered wires in underground conduits.

18.—Allowable Carrying Capacities of Wires.—New tables of carrying capacities for rubber and other insulations, to correspond with National Electrical Code.

20-22.—Series Arc Systems.—New subtitle at head of section. For inside lighting series arc systems to be allowed only by special permission.

23*a*.—Service Cutouts.—New specifications to insure location in accessible position and near to service entrance.

23*d*.—Branch Circuits and Cutouts.—Important changes in loading of branch circuits. New rules are as follows:

Must be so placed that no set of small motors, small heating devices or incandescent lamps, whether grouped on one fixture or on several fixtures or pendants (nor more than 16 sockets or receptacles) requiring more than 660 watts, will be dependent upon one cutout.

On new installations which are to be occupied as apartments, residences, offices or stores a sufficient number of circuits must be provided to allow for at least one watt per square foot of floor space. The floor space to be determined by the total floor area including partitions. For stores separate circuits must be provided for the show windows.

By special permission, in cases where wiring equal in size and insulation to No. 14 B. & S. gauge *standard* rubber-covered wire is carried direct into keyless sockets or receptacles, and where the location of sockets and receptacles is such as to render unlikely the attachment of flexible cords thereto, the circuits may be so arranged that not more than 1,320 watts (or 32 sockets or receptacles) will be dependent upon the final cutout.

Except for signs and outline lighting, sockets and receptacles will be considered as requiring not less than 40 watts each.

All branches or taps from any three-wire system which are directly connected to lamp sockets or other translating devices, must be run as two-wire circuits and both wires of such branch or tap circuits must be protected by proper fuses.

The above shall also apply to motors, except that small motors may be grouped under the protection of a single set of fuses, provided the rated capacity of the fuses does not exceed 10 amperes.

When 1,320 watts are dependent upon one fusible cutout, as is allowed in theater wiring, outline lighting and large chandeliers, the fuses may be in accordance with the following table:

125 volts or less.....20 amperes
125 to 250 volts......10 amperes

The first, third, fourth, sixth and seventh paragraphs above correspond to the first, second, third and fifth paragraphs of the National Electrical Code rule 23*d*

24*a*.—Service Switches.—Additional specifications in first paragraph to insure proper location and connection of service switches.

24*b*.—Double-Throw Switches.—Addition to first paragraph to correspond with National Electrical Code. Requires double-throw switches that are mounted so that the throw is vertical to be so constructed that the switch will remain in the open position when so set. (*This rule will go into effect June* 1, 1914.)

24*c*.—Single-Pole Switches.—Single-pole switches will be allowed for the control of 660 watts in branch lighting circuits in place of 330 watts, as heretofore.

24d.—Floor Boxes.—First paragraph changed to conform to National Electrical Code. Additional paragraph gives specifications on floor outlet boxes designed for use with both light and signal wires.

25a.—Heaters.—Rule changed to allow heaters of 660 watts or 6 amperes or less to be used on lighting circuits with certain restrictions. Heaters taking over 660 watts must have separate cutout and indicating switch or connector.

26.—Open Work.—Important prohibitory rule as a subtitle to section on low-potential systems, as follows:

> After June 30, 1914, open work (wiring on porcelain knobs or cleats) will be prohibited. Exception to this rule will be made for wiring in locations where excessive moisture, acid fumes or corrosive vapors exist; or where the installation of other approved forms of construction is impracticable, in which case special permission in writing must be obtained previous to starting the work.

26d.—Conduit Fittings for Motor Wiring.—Additional paragraph specifying location close to motor.

26k.—Wood Molding.—Important prohibitory rule at head of this section, as follows:

> After June 30th, 1914, the installation of wires in wooden molding will be prohibited.

26l.—Metal Molding.—Revised rule to correspond with National Electrical Code. Gives new specifications allowing metal molding to extend through partitions without additional protection; also allows 1,320 watts in metal molding.

27b.—Outlet Boxes for Armored Cable.—Changes in third paragraph to correspond with National Electrical Code. Gives specifications on the installation of outlet boxes.

27c.—Grounding of Armored Cable.—The words "ground plate" in the third line changed to *grounds.*

28d.—Outlet Boxes for Interior Conduits.—Third paragraph changed to correspond with National Electrical Code. Gives specifications on installation of outlet boxes similar to *27b.*

Also two new paragraphs added. Require outlet boxes to be covered in all completed installations. Boxes must be provided with either fixture studs or ears for the fastening of covers. Boxes must be fastened independently of the conduit.

28i.—Fastening Conduit.—New rule added requiring conduit to be fastened to brick, tile and similar walls by means of toggle bolts or expansion bolts. Nails or screws driven into wooden plugs will not be approved.

28j.—Conduit in Wet Places.—New rule requiring that conduit systems in wet places be arranged to drain.

29b.—Metal Molding.—Second paragraph changed and new third paragraph added to correspond with National Electrical Code. Specifications on installation of metal molding where passing through floors and partitions.

32e.—Cord in Show Windows.—Rule altered to allow the use of rubber-jacketed, reinforced cord in show windows and show cases in place of the metal-armored cord previously required. This rule also allows the use of ordinary flexible cord in chain fixtures in show windows.

36c.—Transformers.—Amended to correspond with National Electrical Code. Allows approved bell-ringing transformers to be mounted directly on woodwork.

38C.—Garages.—Important new rules on the electrical installations in garages, as follows:

> All wires and electrical apparatus installed in buildings or parts of buildings wherein are housed for use, rent, care, demonstration, storage or sale, one or more self-propelled vehicles or wheeled machines containing in tanks thereof volatile inflammable liquid for fuel or power, also all parts of buildings and all adjoining structures or buildings not separated from the garage proper by fire walls or floors, having openings, if any, protected by fire doors, shall conform to the general requirements of this Code and in addition thereto must conform to the special rules herein given.
>
> *a.* All wires, except such as are required for pendent lamps or portable connections, must be installed in standard conduit, armored cable or metal molding.
>
> *b.* Flexible cord for pendent lights must be standard "portable cord" (Type Letter PWp) as provided for in No. 54.
>
> *c.* Flexible cord for portable lights, motors or other apparatus must be standard cord designed for rough usage (Type Letter PWp or T) as provided for in No. 54. The portable cord must carry the male end of a pin plug connector, or equivalent, the female end being of such design or so hung that the connector will break apart readily at any position of the strained cable. The connector must be kept at least four feet from the floor.
>
> *d.* Flexible cord for charging must be standard theater cable (Type Letter T) as provided for in No. 54. This cable must carry the female end of a pin plug connector, or the equivalent, of at least 50 amperes capacity, the male end being of such design or so hung that the connector will break apart readily at any position of the strained cable. The connector must be kept at least four feet above the floor, and the male end, if not located on switchboard or charging panel, must be shielded against accidental contact.
>
> *e.* Cutouts, switches, receptacles and sockets, which are permanently located, must be placed at least four feet above the floor.
>
> *f.* For all portable lights, and all other lights located within four feet of the floor, standard vaporproof receptacles specially designed for this purpose must be used. For portable lights the vaporproof receptacle must be protected by a substantial lamp guard.
>
> *g.* Switchboards and charging panels must be placed at least four feet above the floor or must be located in a room or enclosure provided for this purpose.
>
> *h.* Motors or dynamos, not actually a part of a vehicle, shall be located at least four feet from the floor.
>
> *i.* No battery shall be tested except by means of a voltmeter.
>
> *j.* Garages containing electrical machines only, must conform to the above rules as far as they apply, except that vaporproof receptacles will not be required and electrical apparatus may be located any desired distance from the floor. The switchboard or charging panel must be enclosed or otherwise suitably arranged to protect it from mechanical injury. In private garages the charging panel must be enclosed in a compartment so constructed that access to same cannot be obtained by unauthorized persons.

39b.—Wiring for Outline Lighting.—Rule changed to require conduit systems to be installed so that they will drain; also to require the use of special fittings; open work will be allowed only by special permission.

45c.—Grounding of Transformer Cases.—Revised to correspond with National Electrical Code. Rule now requires the grounding of the cases of high-potential transformers.

50d.—Tests of Rubber-Covered Wire.—Table of multipliers for temperature correction changed to correspond with National Electrical Code.

54.—Flexible Cord.—Gives additional specifications for flexible cords of all classes, closely coinciding with those of the National Electrical Code.

58.—Metal Conduits.—Gives additional specifications for both rigid and flexible metallic conduits to correspond with National Electrical Code.

65.—Switch Construction.—Gives additional specifications for both knife and snap switches to correspond with National Electrical Code.

70.—Cabinets.—Gives additional specifications covering construction to correspond with National Electrical Code.

76.—Insulating Joints.—Gives additional specifications for construction to correspond with National Electrical Code.

81.—Transformers.—Gives additional specifications for construction of air-cooled and bell-ringing or other signaling transformers to correspond with National Electrical Code.

Program of Iowa Electrical Contractors' Association.

The annual convention of the Iowa Electrical Contractors' Association will be held in Cedar Rapids, Ia., April 22 and 23, partly in conjunction with the Iowa Section, N. E. L. A., whose convention will be held on the same dates.

The following tentative program has been announced.

Wednesday, April 22, 10 a. m.—Address of welcome, John Wunderlick, Cedar Rapids; response, George O. May;

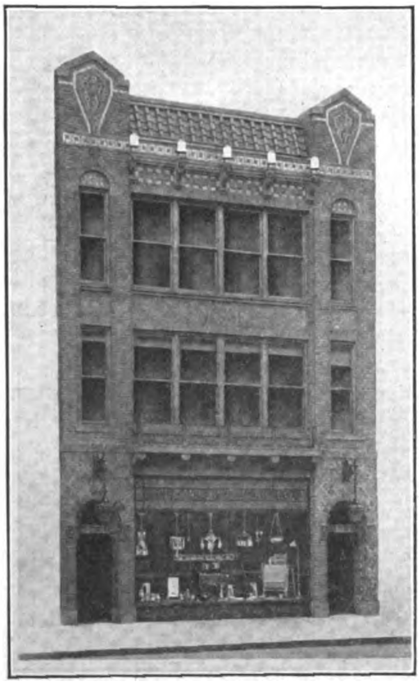
address of the president, M. McCarten; paper, "Modern Business Methods Applied to Electrical Contracting," by Ed. Kunkel, Davenport. Afternoon session, 1:30 p. m.—Paper, "Co-operation Between Contractors and Central Stations," by J. T. Marron, Rock Island, Ill.; paper, "Our Compensation Law and Its Application," by George A. Wrightman, Des Moines.

Thursday, April 23, 10 a. m.—Paper, "Uniform Plans and Specifications," by Floyd A. Wallace, Des Moines; paper, "A System of Bookkeeping for Electrical Contractors," by W. J. Ball, Moline, Ill. At 1:30 p. m. interurban cars will leave for trip to Iowa City to visit the state university, where a paper on "High-Tension Lightning Protection" will be read by Arthur H. Ford.

The entertainment features will be the same as for the electrical association.

New Store and Office Building of The Sanborn Electric Company.

The Sanborn Electric Company, contracting engineers, Indianapolis, Ind., has recently built a new fireproof store and office building which is designed to meet both the present and future needs of the company.

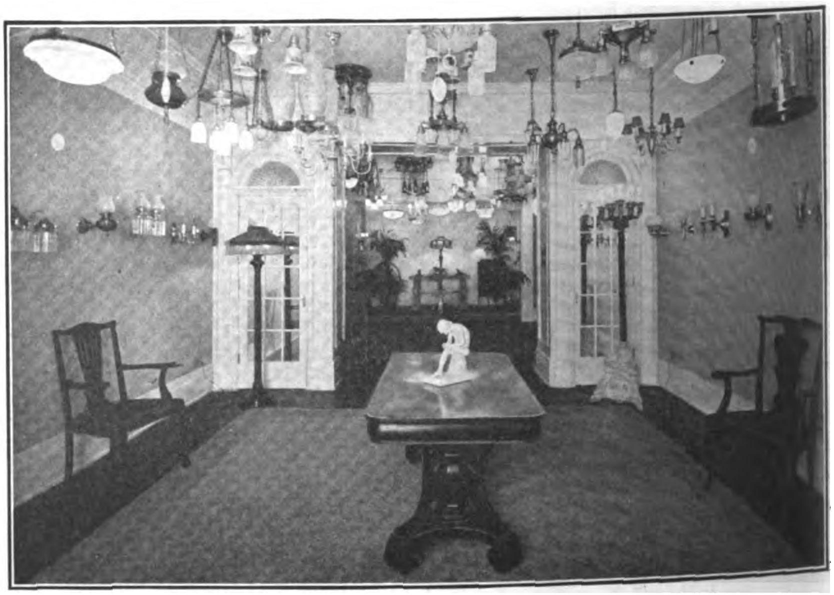


Store and Office Building of Sanborn Electric Company.

Fig. 1 shows an exterior view of the building. The front portion of the first floor is arranged to display attractively, a large line of electric stoves, washing machines, electric cleaners, cooking devices, and, in fact, "Everything Electrical.'

Glass floor and wall cases are provided for the exhibition of merchandise. These cases are well lighted and the nickel and copper devices make a very attractive exhibit. By keeping these devices under glass, they are prevented from tarnishing and becoming dirty and are hence always fresh and attractive to the customer. One section of the wall is arranged with eight swinging display cases which are about four inches deep, two feet wide and five feet high, their backs being covered with black felt over which is placed glass. Small articles such as switches, receptacles, cutouts, Mazda lamps, flash lights, etc., are mounted on the backs. Immediately behind the cases are shelves which contain the goods that are displayed. This method permits the displaying of a class of merchandise which is generally hidden away in shelving, and the fact that it is in plain sight often suggests to the customer that he is wanting such an article.

Retail Display Room.



Colonial Room in Lighting-Fixture Department.

The customer passes from this department to what appears to be the front porch of a residence, from which one enters a vestibule leading into a large reception hall. From there the visitor is conducted into an English reception room, which, in turn, opens into a fully equipped library furnished in colonial style. There is also a French room, and this in turn, opens at the rear into a solarium. The lighting fixtures shown in these rooms are suggestive of the periods of decoration represented in the different apartments; the whole being designed to give the public a clear impression of how the fixtures will appear when installed in their own homes.

A feature of these fixture showrooms is that every fixture is wired and lighted individually, there being a definite number of outlets on the ceiling, to prevent the crowding of fixtures. The fixtures are spaced a sufficient distance apart to show each one to the best advantage. Lighting fixtures for all classes of buildings are displayed.

The upper floors of the building are

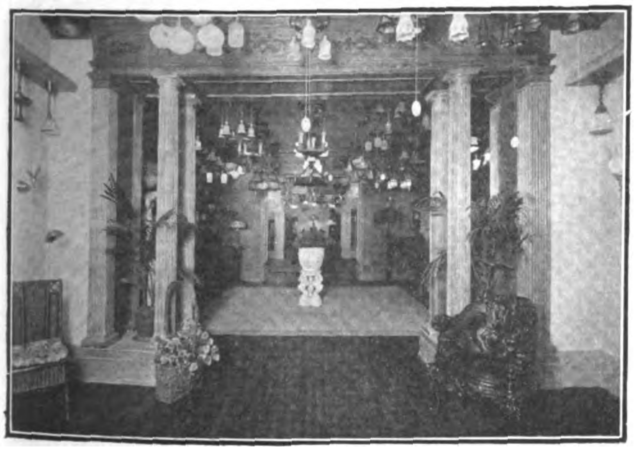
used for general and private offices, engineering department, etc., while a large basement affords storage and shop facilities.

There is a rear entrance for employees, which brings the construction men to the construction superintendent's desk by the shortest course, and is so arranged that it is not necessary for the construction men to pass through the retail department with tools, ladders, etc. An employees' room is conveniently located in the basement for the use of the construction force. A lunch table, lavatories, shower baths, etc., as well as proper facilities for their tools and clothes, are provided.

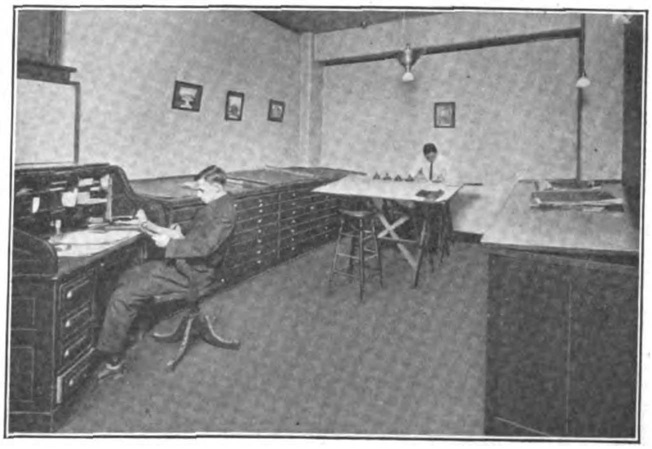
President's Office.

General Offices.

The Sanborn Electric Company has been in the electrical contracting business for the past twenty-three years. Their operations have extended to various parts of the country, one of their recent large contracts being the new three-million-dollar Michigan Central Railroad terminal station and office building in Detroit, Mich. The entire electrical equipment, including the lighting fixtures, was furnished by this company.



Vista Through Lighting-Fixture Department.



Engineering Department.

G. M. Sanborn, president of the company, is optimistic as to the future of the electrical contracting and retail business. He firmly believes that the public are ready for electrical stores and that it only remains for the contractor to develop this side of the business. The electrical contractor is the logical and natural retailer for the material and he is better qualified to handle and develop this business than a lighting company, or any other branch of the trade. However, he must seize the opportunity. If he does not make the proper investment and display, and does not fully prepare himself to handle the retail trade, he must not complain if the lighting company or someone else does it. If the contractor takes his proper place in the field, others will naturally leave the business to him. The lighting company should realize that the contractor needs encouragement to invest his money in an untried venture and should refrain from offering undesirable competition to the contractor, but should lend him every assistance and encouragement to develop a field which will be of mutual benefit.

Much has been said of co-operation, but it should be remembered that co-operation with the contractor must be of the kind that allows him to make a profit while selling devices, which also means more business for the lighting company.

Mr. Sanborn was president of the National Electrical Contractors' Association during the years of 1909 and 1910, and is at present a member of the executive committee. He was chairman of the committee which developed the standard symbols for wiring plans, the Universal Data and Sales Book and the charts showing standard sizes of conduit for wires and cables.

The Sanborn Electric Company is a member of the Society for Electrical Development and has reproduced in its showroom the emblem and slogan of the Society. Mr. Sanborn is a member of the Board of Directors of that Society and believes firmly in its future.

Electrical Rules in Grand Rapids.

The city of Grand Rapids, Mich., has separate ordinances covering the installation of indoor and outdoor wiring, as also an ordinance governing the erection and maintenance of electric signs. The chief electrical inspector of Grand Rapids is George Cotton.

It is provided that no electrical work shall be installed except by persons holding licenses issued by the Board of Police and Fire Commissioners upon recommendation of an examining board, but no fee is charged for such licenses. The fees for inspection depend upon the size of the installation, the minimum being 50 cents for less than 12 lamps or a motor of less than one horsepower. The fee increases with the number of lamps, being $6.00 for 200 to 300 lamps, and $1.00 additional for each additional 100 lamps. The fee for motors exceeding eight horsepower in size is $3.00; for generators less than two kilowatts the fee is $1.00, increasing to $5.00 for sizes above 20 kilowatts.

It is especially provided in the ordinance that the municipal inspection and the issuance of a certificate shall not relieve the responsibility of owners or contractors from damages caused by any defect.

Conduit or steel-armored cable is required within the fire limits of the city and also in all churches, theaters, other public buildings and unfinished basements of apartment houses.

The National Electrical Code is enforced with a few additional supplementary rules. Cabinets are required for main switches and cutouts. All conduit must be grounded with approved ground clamps to water pipes and grounding upon gas pipes is not permitted. Conduit is required between meter and cutout cabinets. Wooden molding is not allowed. Bell transformers are required to be installed on meter boards with fuses.

The ordinance covering outdoor work requires that wires on opposite sides of poles shall be at least 26 inches apart except in the case of telephone and signal wires. Wires of voltages higher than 600 volts must be at least 72 inches from low-voltage wires. Guy wires must contain two strain insulators, nine to eleven feet from each end. Wires running vertical on poles must be incased in wood or other insulating material for four feet on each side of a point of crossing other wires. Where light and power wires cross other wires on cross-arms the minimum allowable clearance is 18 inches. Cross-arms carrying three or more wires must have iron braces. All wires except trolley wires must be at least 15 feet above the ground at every point. Power wires on the same cross-arm must be 14 inches apart. Except on polyphase circuits not more than one transformer is permitted on one pole. Where high-potential wires (7,500 volts or over) cross other wires or run on the same poles, the high-potential wires must be above the other wires and have a clearance of six feet. Outside construction may be done without permit only in cases of emergency, and in such case permit must be secured within 48 hours.

The following general suggestions are made. In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short-circuit occur, and so that all leakage from conductor and ground may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors, and securing and attaching of fittings are specially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

The use of wire-ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use.

Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires. All services should be located so as to avoid long drops and extra brackets on the house.

* * *

LETTER TO THE EDITOR.

Comment on Kinks.

To the Editor:

The Wiring Kink of Charles Harris in April 11 issue is an old method that is mentioned in several telephone books. It is understood that the last wire will test open in making this test. Should it happen that any of the other wires were open, a trip to the other end of the cable is necessary before the test can be completed. On account of the capacity in cables it is better to use a bell rather than a receiver in making this test. With a 250-foot cable I have been able to receive a click from several of the wires at a time, that from the right one being no louder than the others.

The method of taking up slack by B. H. Fisher, in the issue of January 31, would be inefficient because the constant vibration would tend to loosen the lag screw in the wood. Use the "cheaper in the end" and more efficient methods.

H. E. Weightman.

Chicago, Ill., April 11, 1914.

Fixture Costs.

In our shop we list the cost of each item that goes into making up fixtures on standard five-by-eight-inch cards, which are suitably indexed for reference and arranged in order.

In the file these are classified under the headings One-Light, Two-Light, Three-Light, Four-Light, Miscellaneous, and Special. Cards having these designations are used as index cards in the card file.

We buy most arm fixtures ready for assembling, but make up our own showers, etc., as we find we can make up a greater number of styles of fixtures from a comparatively small stock of parts than by getting these fixtures complete. We list all parts such as pans, chains, loops, etc., and use the form shown in Fig. 1 for finding the cost of each fixture. The cost of the fixture without glassware is marked on the tag in code letters, as is also the selling price. This is done so that any kind of glassware can be put on the fixture and an accurate price given for it.

Fixture—One-light link pendant—pan-bowl fixture, XXX.

Canopy, 1 .... @	**12**
Crofoot, 1 .... @	**2**
Pipe stem, 1 .... @	**4**
Hickey, 1 .... @	**5**
Casing, 6 in., @ 15c	**8**
Wire (cord), 2 ft. @ 1c	**2**
Sockets—key (pull), 1 ..... @	**30**
Socket-covers, 1 .... @	**20**
Shade-holders, XXX	
Loops, single, XXX	
Loops, double, 1 .... @	**20**
Finishing rings, XXX	
Chain, XXX	
Hooks, XXX	
Nuts, XXX	
Bottom Knobs, XXX	
Insulating joint, XXX ...	
Special—misc., XXX	
Labor fitting	**30**
Total cost	**$1.33**

Fig. 1.—Sample Card.

These forms have a short description of the fixture at the top and are filed away under proper classification for reference at a future time. In this way any special fixture will always have its record readily available and a fixture of like construction can have its price quoted. We find this an accurate and labor-saving method of handling the fixture business.

It will pay any one who has much of this to do to put in a show room which can be darkened to show fixtures under artificial light. Shades show up much better under this condition and a better class of goods can be sold if they are properly displayed. Our trade was entirely along cheap arm fixtures until we built our show room; now we sell a better grade of fixtures and shades, for which we found no market before. They sell very readily now that we can display them to good advantage.

E. M. Raetz.

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Electrical Inspection in Oregon.

A joint meeting of local sections of the American Institute of Electrical Engineers and the National Electric Light Association was held at Portland, Ore., on April 7. F. D. Weber, electrical inspector of the Underwriters' Equitable Rating Bureau, Portland, presented a paper entitled "Is Underwriters' Inspection Necessary in Oregon?"

In this paper Mr. Weber pointed out the enormous annual fire loss in the United States and Canada, which he contrasted with the relatively small figures of European countries. He touched on the causes of fires and dwelt particularly on the fire hazard of electrical installations and apparatus, which was the fundamental reason for the formulation of the National Electrical Code. Taking up the educational and other work being done to decrease the fire hazards and therefore fire losses, he touched on the work of the Underwriters' Laboratories and the National Board of Fire Underwriters.

In Oregon the Underwriters' Equitable Rating Bureau has been organized under the insurance laws of the state. This Bureau maintains an electrical department as part of its activities. In the city of Portland this electrical department endeavors to maintain supervision over all new electrical installations except dwellings. Outside of Portland it has been making thorough inspections in all buildings except dwellings in all of the larger cities and towns in Oregon. This inspection also includes the inspection of booths in moving-picture theaters, motion-film exchanges and private and municipal fire-alarm systems throughout the state. The methods pursued in the electrical inspection work were described by Mr. Weber in detail, together with the reports based on this work.

The following Oregon towns now have ordinances and inspection by local inspection departments: Hillsboro, Ashland, Medford, Grants Pass, Albany, Salem, Astoria, Eugene, Roseburg, Marshfield, Klamath Falls, Portland, Dallas, Independence, Sheridan. The city inspection departments are a great aid in getting the proper installations, when efficiently administered, as they are generally given police power and therefore can get immediate correction, while the Bureau can only make a penalty charge in the rate. Also the immense amount of detailed work necessary to carry on inspection in the residence district should be carried on by the municipality as a police duty, supported by the money collected by the fee system for inspections or by money out of the general fund, because the Underwriters do not feel that they can afford to do this work without charging for same and if they do charge they have no authority to collect the fees and have no police authority to get enforcement.

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Louis B. Van Nuys.

Among the electrical contractors of Peoria, Ill., the Central Electric Company has a prominent place. This concern is located at 238 South Jefferson Avenue and its president is Louis B. Van Nuys.

Mr. Van Nuys was born in Peoria and has been in the electrical construction business there for 16 years, during which he has handled all classes of work from wiring old houses to power-plant construction. He at one time operated under the name Peoria Electric Company, but sold out this business and went to Chicago. Returning at a later date he took charge of the store of the Central Electric Company, which was at that time under a different ownership. He later became connected with the construction end of the business and now holds a master electrician's license from the city inspection department. Over a year ago Mr. Van Nuys and Charles D. Brainard bought control of the Central Electric Company, as the former owners were desirous of retiring. Mr. Van Nuys was made president and general manager of the company, a position which he now occupies, while Mr. Brainard became secretary and treasurer. The business has been continued under the old name and is being extended with great energy and enterprise. It covers the sale of fixtures and supplies as well as electrical contracting.

Louis B. Van Nuys.

Mr. Van Nuys is a member of the national and state contractors' associations and is vice-president of the Peoria Electric Club.

Among the Contractors.

The Edmunds Electric Construction Company, of Ft. Wayne, Ind., has increased its capital stock $13,000 with a view to enlarging its business.

Electrical contracts for the nurses' building, administration building, and the kitchen and laundry at the new Ohio State Hospital for the Criminal Insane have been awarded to the McKeever Electric Company, Columbus, O. This contract comprises the wiring and lighting equipment and calls for an expenditure of $3,700.

H. H. Carr, of Columbus, O., has been named as general contractor for the erection of 170 booths to be erected about the State House Square of that city, in connection with a "Made-in-Columbus" exhibition to be held June 8 to 14. The grounds to be inclosed are a square of ten acres. The electric wiring and light equipment is estimated at $1,500, or about one-third of the entire cost of the booths.

The Churchill-Warner Company, of Roseburg, Ore., of which F. B. Warner is manager, has the contract for the electrical work and fixtures for the new county hospital in that town. This company has also recently completed the wiring of the new Ford garage in Roseburg.

The Comet Electric Company, of Eugene, Ore., has recently completed the installation of lighting fixtures in the new Oregon Electric Railway station and also the installation of wiring and fixtures in the new Bartle-Sweaney Courts apartment building. One of its recent motor installations was that at the Eugene High School where seven motors were installed for manual-training work.

C. C. Cowles, electrical contractor, of Red Bluff, Cal., has been awarded the contract for the ornamental street-lighting system to be installed for the city of Red Bluff for a distance of four blocks on Walnut Street. Work is expected to commence at once.

F. M. Grant, of Cleveland, O., has sold his interest in the firm of Harrington and Grant and has opened an office at 1529 Prospect Avenue under the name of The F. M. Grant Electric Company. The new place is stocked with a full line of construction material and new tools and equipped with an auto truck for deliveries.

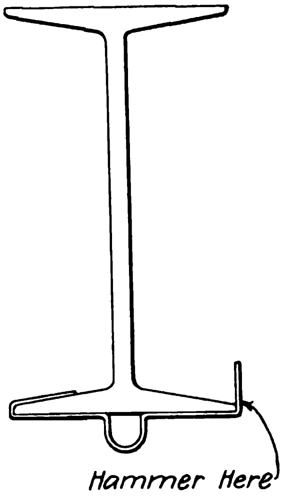
The contract for the electrical work on the G. W. Bobb wholesale grocery building, six stories and basement at Columbus, O., has been let to the Sackett Mine Supply Company, of that city, at its bid of $1,574.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

To Fasten Pipe to I-Beams.

On a recent job in a basement it was desired to run the conduit along the bottom of the I-beams supporting the floor above. To obviate the necessity of drilling and tapping these beams for the ordinary pipe-clamps, I made a number of clamps from strap iron one inch wide and one-sixteenth inch thick. One end of the clamp was bent over to fit the I-beam and the other end left straight until it had been placed in position around the beam and conduit. It was then hammered down by hammering at the point where it turned the edge of the beam. This drew it up very tight so that it held the pipe securely in place. Such clamps can also be used for two or three pipes that are run close together.



Strap for Holding Pipe to I-Beam.

E. W. Dullea.

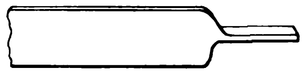
Fishing Wires.

When pulling wire with loom on it through holes that are bored nearly the size of the loom, the end of the loom often catches against the edge of the hole. We find that a small sewing thimble with a hole punched in the end large enough to receive the wire will save a lot of time and worry. Slip the thimble over the end of the wire before the fish-wire is attached and slide the thimble down until it covers the end of the loom. The thimble will guide the loom through the hole when the wire is pulled.

I. A. Slingerland.

Slotting Commutators.

I have recently tried a new method for slotting commutators and find it preferable to any that have been given heretofore in your columns. Take a tool of the shape shown in the accompanying illustration and with the same thickness as the width of the slot. Mount it horizontally in the carriage of the lathe and run it along in the slot by using the screw that controls the carriage. A number of cuts can be taken if necessary to secure the desired depth. Then the armature is turned by hand until the next slot comes in line with the tool and the carriage is run along as before.



Slotting Tool.

William T. Estlick.

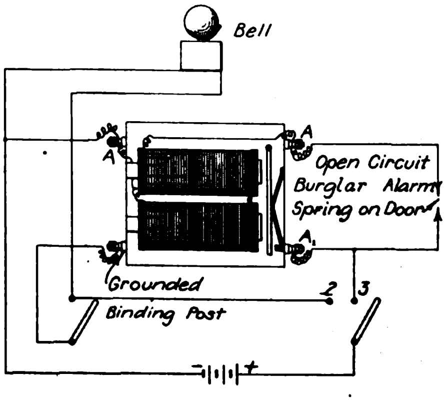
Reaming Battered Conduit Couplings.

When conduit is received from the factory one coupling is screwed on each length of it, the free end of the coupling generally being more or less battered through shipping and handling, so that it is often impossible to start the coupling on a length of conduit. I found that after reaming out the end of the coupling with an ordinary tapered reamer, the coupling will readily screw on another length of conduit.

A. J. Smith.

Burglar-Alarm System.

The burglar-alarm system shown in the accompanying diagram is valuable because it can be tested out and is not stopped by cutting the wires after it has once been set in operation.



Connections for Burglar Alarm.

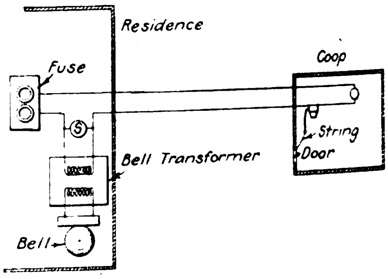
The main feature of this scheme is the metal constant-ringing box shown in the center of the diagram. This contains a magnet CC whose windings terminate in the insulated binding posts AA. Binding post A_1 is insulated except when the armature of the magnet is pulled down, which causes a contact to be made between it and the metal case. The fourth binding post is always grounded upon the metal case.

The switches are shown in the diagram. To test the bell circuit the switch is closed on contact point 2. To make a silent test of the alarm, contact is made to point 3 of the switch. To put the system in operation the switches are closed on points 1 and 3. If, now, the alarm circuit is closed by means of the contact on the door or elsewhere, current flows from the battery through point 3 of the switch, through this alarm contact, through the electromagnet of the ringing box and back to the battery. This causes binding post A_1 to become grounded on the metal case and the circuit is thus closed through switch 3 and the grounded binding posts to switch 1, and then through the bell to the battery.

William Weller.

Burglar Alarm for Chicken House.

A burglar alarm to protect a chicken house can be arranged by utilizing the electric light circuit running from the residence to the outhouse. The accompanying illustration shows the method of connection.



Burglar Alarm for Chicken Coop.

The switch in the residence is normally closed, which short-circuits the bell-ringing transformer when light is needed in the chicken house. To set the alarm at night this switch is opened, which throws the bell transformer in series with the lamp in the outhouse. The latter is mounted in a pull socket with the chain attached to the inside of the door by a light string. Opening the door will close the socket switch and the string will then break; the bell is thus started to ring and the voltage upon the lamp is not enough to cause it to light up.

L. J. Christensen.

Coloring Lamp Bulbs.

Having occasion to make the light from a tungsten lamp, used on a photometer as a substandard, match the amber color of the gas flame, I colored the bulb with a solution of Japan amber lacquer and amyl acetate. If made thin it will give a pleasing amber color that will stand the weather and it wears better than any solution I have ever used.

H. E. Weightman.

Public Service Commissions

Conducted by William J. Norton

ILLINOIS.

The Illinois Northern Utilities Company, of the city of Dixon, was authorized to purchase of the Northern Barb-Wire Company, of Rock Falls, for the consideration of $1,400, its franchise and property necessary for the supplying of electric current for power purposes.

The National Telephone & Electric Company, of Clinton, asked for authority to equalize rates. The petition show its regular schedule of rates for the different classes of service and further states that 80 subscribers of the Clinton exchange own their instruments and by reason of that fact have been granted a special rate. The Commission holds that this is unjust discrimination and gives a number of citations showing that "other state commissions have repeatedly held that no reduction from the regular rate should be granted on account of the ownership of the telephone by the subscriber." The company is authorized to require everyone to pay the regular rates for the standard of service received.

The Christian County Telephone Company, of Taylorville, entered a petition asking for authority to require the telephone users who enjoy concessions or reductions in rates, to pay the regular rates in effect for that class of service. The petition includes a list showing free and reduced rates to cities, county officials, churches and telephone operators. The Commission authorized the changes in rates asked for by the company which will destroy discrimination and require everyone to pay the regular rate for the standard of service received.

The Queen City and Shelby County Mutual Telephone Company was granted authority to increase rates. The decision states that the rates applied for seem to be satisfactory to the stockholders and other patrons of the company and the rates are ordered put in effect for service within the city of Shelbyville and for switching service to county lines.

The Citizens Telephone Company, of Pekin, was granted a certificate of convenience and necessity to build and operate a telephone exchange in South Pekin. A telephone exchange has never been established in this village. The petitioner has two toll lines running through this field and the Central Union has the same number. There was no opposition to the application.

The Christian County Telephone Company was granted a certificate of convenience and necessity to install a telephone exchange in New Kincaid. The town is now without telephone service and the petitioner is furnishing service in the vicinity.

A Certificate of Convenience and Necessity was granted George C. Hallauer to construct a transmission line from Marshall to the city of Martinsville for the purpose of furnishing electric service in Martinsville which is not at present supplied with current for electric lighting purposes.

The Local Telephone Company, of Clifton, was authorized to purchase at $6,000 the property and franchise of the Donovan Telephone Company, of Donovan.

INDIANA.

The General Service Company, of Lafayette, was permitted to put in effect a new schedule of electric light and power rates, and complaints to the Commission entered by the city were withdrawn. The new schedule provides a reduction in rates for large users of electric light and power. During the past year a change in the application of the old rates had resulted in higher charges than those previously exacted under this schedule. The agreement between the company and the complainants also provides for a refund of such excess charges exacted during the year.

The Terre Haute Traction & Light Company was authorized to issue $106,000 of bonds, the proceeds to be used for new construction.

KANSAS.

An amendment to the present public utilities act, which will materially enlarge the authority of the Commission, will be presented to the next Legislature. Following the passage of the act, a clause was found in the measure, which prevented the Commission from exercising authority over utilities which supply but one community and municipal utilities. The Commission discovered this fact when it started to provide regulations for central stations. As a result of the joker in the bill creating the Commission, that body at present has control over less than 20 of over 500 electric light companies, which escape jurisdiction by proving they supply current only within the bounds of their own communities.

MARYLAND.

Municipal Utilities. The Legislature has passed an amendment giving the Commission authority over all public service corporations owned and operated by municipalities with the exception of the city of Baltimore, and by counties. It is reported to have been one of the most popular measures of all the Commission's amendments. Heretofore the Commission has had much trouble with several muncipally owned utilities and has been powerless to provide the necessary regulation.

MASSACHUSETTS.

The Public Service Commission, in its investigation of the New Haven Railroad, comments on the circulation of false statements as follows: "To publish or to authorize the expenditure of funds of a public service corporation for publishing statements known to be false and misleading, concerning official findings as to public service corporations should be made a criminal misdemeanor. Analogous legislation as to false advertising has already been enacted (compare Acts 1911, chapter 492, and Acts 1912, chapter 489.) Investors in mining properties and purchasers of ordinary goods are not entitled to a higher degree of protection against false advertising than are investors in the securities of public service corporations subject to the supervision of regulating commissions."

NEW JERSEY.

John J. Treacy, of Jersey City, has been nominated by the Governor for the position on the Board of Public Utility Commissioners made vacant by the resignation of Winthrop More Daniels.

OHIO.

Telephone Valuations. Telephone companies have asked for an extension of time in which to make appraisals of their property to comply with the Commission's recent order. The request for more time states that the Interstate Commerce Commission has just begun an appraisal of all property, both real and personal, of all telephone companies and that as experts of the companies are requested to help, it requires the services of all the men who can be spared for this work. Some arrangement may be made to work in connection with the federal employees so that a delay will not be necessary. The suggestion is also made that the appraisal of the Interstate Commerce Commission should be accepted by the state Commission as it will be complete in every detail and will cover everything required by the Utilities Commission.

PENNSYLVANIA.

Protection from Competition. The Commission has defined its position in regard to competition between public utility companies in two decisions, one dismissing the application of the Schuylkill Light, Heat & Power Company for approval of an ordinance granting the right to furnish service in the borough of Ashland involving competition with the Eastern Pennsylvania Light, Heat & Power Company, and the other dismissing the application of the Harmony Electric Company for similar action on an ordinance of the borough of Ellwood City served by the Pennsylvania Power Company. The Commission held that the entrance of a competing company into the territory served by a public service company is of doubtful utility. In the Ashland case the Commission says: "Long experience has shown that while the temporary effect of competition between public utilities occupying the same territory is to secure lower rates, the final result is likely to be the absorption of one by the other and then an increase of rates to pay the expense of the warfare." In the Ellwood City case the Commission says: "Vested rights and interests must be duly conserved and protected. The Commission has no warrant to invite or permit limited competition anywhere unless the area and population served, the need of the community or the prospects of the muncipality, as based on its growth and development, reasonably show that the public welfare demands it. This principle of protection must be extended to the public utility to the end that the individual citizens, who have invested in its plant equipment in good faith, may be duly protected in their interests."

WISCONSIN.

Monroe Electric Company. The Commission has rendered a decision in the case of J. C. Ford, et al. vs. Monroe Electric Company. The complaint alleged unreasonable and discriminatory rates. The decision contains a discussion of depreciation, salaries of executive officers and the various forms of power schedules. The present lighting rates were found to be higher and the power rates lower than the cost of the service and a revision was made in the rates for both classes of service. The rates for street lighting were not changed although these rates were higher than the cost analysis made by the Commission would warrant. The company had changed the schedule for street lighting, providing all-night service for the same cost to the city as for the moonlight, dusk to 12:30 a. m., service previously given under its contract with the city.

Competition of Telephone Companies. In order to insure the discontinuance of competition between the two companies in the same field, the Wisconsin Telephone Company and the Ashland Home Telephone Company made joint application to the Commission for a transfer of property under the Stock and Bond Law. The Ashland Home Telephone Company desired to transfer all of its property outside of the city of Ashland together with the property of the Bayfield County Telephone Company and the North Wisconsin Toll Line Company as well as its bonds of a par value of $17,500.62 and stock of an equal amount, for the property of the Wisconsin Telephone Company within the corporate limits of Ashland. The Commission authorized the transfer of property on the above basis by providing for the issuance of bonds applied for, but stipulated that the stock of the Ashland Home Telephone Company must be transferred to the Wisconsin Telephone Company without cost to the former company. This leaves to the Wisconsin Telephone Company all of the territory outside the city limits of Ashland and to the Ashland Home Telephone Company all of the territory within the corporate limits of Ashland.

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Public Utilities Make Fine Showing at Efficiency Exposition and Conference.

The First National Efficiency Exposition and Conference was held at the Grand Central Palace, New York, from April 4 to April 11. Among the big institutions participating the exhibits of the New York Edison Company and the New York Telephone Company attracted particular attention.

The New York Edison Company showed how electricity was being utilized in the home and in industrial applications of every description. The safety features and the advantages both from a utilitarian and esthetic viewpoint, were elaborated upon.

NEW YORK TELEPHONE COMPANY
Exhibit of New York Telephone Company.

The scheme of the Telephone Company's exhibit was to show how greater efficiency may be secured by utilizing telephones in everyday business. The various elements that go to make up the telephone system were shown in detail and electrical devices, charts and phonographs were employed to demonstrate the part the telephone plays in gaining greater efficiency. Models of six of the busiest buildings in New York were shown with flashing lights indicating the number of incoming and outgoing calls. The Telephone Company also displayed two films in the motion-picture theater dealing with the work, training and environment of the telephone operator, and giving an insight also into the way in which a great telephone system is organized and its work is carried out. A special feature was an illustrated lecture by W. F. Schmidt, who told in a most interesting fashion the story of working out the telephone conversation.

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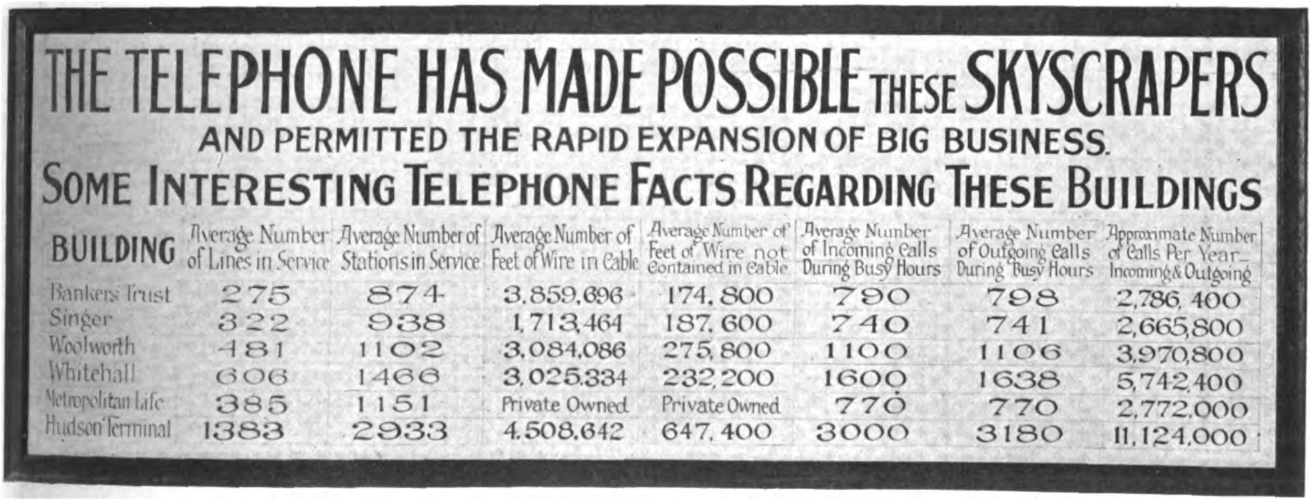
Newcomb Carlton Elected President of Western Union Telegraph Company.

At the annual meeting of the stockholders of the Western Union Telegraph Company, held on April 8, the by-laws of the company were amended so as to provide for the affairs of the company to be arranged by a board of 21 instead of 30 directors, as at present. Seven of the directors, including the president, shall constitute an executive committee. Consequently the number of directors was reduced from 30 to 21, and the representatives of the American Telephone & Telegraph Company retired from the board. The following were re-elected directors: Oliver Ames, William Vincent Astor, Henry A. Bishop, Newcomb Carlton, Robert C. Clowry, Henry P. Davison, Chauncey M. Depew, Edwin Gould, George J. Gould, Thomas H. Hubbard, Robert S. Lovett, Edwin G. Merrill, Jacob H. Schiff, Joseph J. Slocum, James Stillman. The following new directors were elected: William H. Baker, Henry W. DeForest, William Fahnestock, Percy A. Rockefeller, Mortimer L. Schiff and William H. Truesdale.



THE TELEPHONE HAS MADE POSSIBLE THESE SKYSCRAPERS
AND PERMITTED THE RAPID EXPANSION OF BIG BUSINESS.
SOME INTERESTING TELEPHONE FACTS REGARDING THESE BUILDINGS

BUILDING	Average Number of Lines in Service	Average Number of Stations in Service	Average Number of Feet of Wire in Cable	Average Number of Feet of Wire not Contained in Cable	Average Number of Incoming Calls During Busy Hours	Average Number of Outgoing Calls During Busy Hours	Approximate Number of Calls Per Year—Incoming & Outgoing
Bankers Trust	275	874	3,859,696	174,800	790	798	2,786,400
Singer	322	938	1,713,464	187,600	740	741	2,665,800
Woolworth	481	1102	3,084,086	275,800	1100	1106	3,970,800
Whitehall	606	1466	3,025,334	232,200	1600	1638	5,742,400
Metropolitan Life	385	1151	Private Owned	Private Owned	770	770	2,772,000
Hudson Terminal	1383	2933	4,508,642	647,400	3000	3180	11,124,000

Statistical Exhibit of New York Telephone Company, at National Efficiency Exposition, New York, April 4-11.

The annual report of the Western Union Telegraph Company shows total earnings for the year ended December 31, 1913, of $45,783,512.58; operating expenses, including rent of leased lines, reconstruction, repairs, taxes, etc., $42,327,121.27, leaving a balance of $3,456,391.21. Adding income from rents and investments, including rentals from real estate, amounting to $1,115,755.18, and deducting interest on bonds to the amount of $1,337,229.12 there is a balance transferred to surplus account of $3,234,917.37.

There have been added to the land line plant 623 miles of poles and 18,458 miles of wire, consisting of an increase of 25,797 miles of copper wire and a decrease of 7,339 miles of iron wire. The company now has 25,060 independent and joint offices.

Referring to the prospects of the company, either under any possible purchase by or competition of the government or as a going concern operating independently of the American Telephone & Telegraph Company, the report states:

"The relations between the American Telephone & Telegraph Company and your company have always remained the same as between two entirely independent companies. The organizations of the two companies were entirely distinct and independent and, with the exception of the president and a minority of the directors, had no officers in common. All contracts and operating arrangements were such as two independent companies could enter into under the interpretations of the existing laws, and the commercial interests of each company were carefully guarded, so that the so-called divorce of the two companies is being accomplished with very little confusion.

"As to the government purchase or operation of the telegraphs: The property of the company cannot be taken without just compensation, that is, a full and proper equivalent for the property taken must be returned to the owners. In such a case, the shareholders should receive, as a minimum, far in excess of the present market value of the shares."

At a meeting of the Board of Directors of the Western Union Telegraph Company held on April 15, Newcomb Carlton was elected president in place of Theodore N Vail, and the following preamble and resolutions were adopted as a tribute to Mr. Vail:

Whereas, Mr. Theodore N. Vail has retired from the directorate of the company and also from the presidency, and

Whereas, The connection of Mr. Vail with the Board of Directors of this company and his administration as president have been attended with signal benefits to the company, which the Board of Directors wishes to recognize, and its appreciation of which it desires to spread upon the records of the company, now, therefore, it is

Resolved, That the Board of Directors hereby expresses its very great regret that Mr. Vail has severed his connection with this company and retired from the administration of its affairs as president.

Further Resolved, That the Board of Directors of this company hereby expresses its high appreciation of the great benefits the company has received from Mr. Vail's administration and as a member of the directorate.

Among the benefits so received the board desires especially to enumerate the acquisition of the cable lines, and the inauguration of the deferred cable service which has resulted in great benefits to the public and to the company, the inauguration upon the land lines of the system of night and day letters, the extension of service by improved connections and facilities to many additional localities, the inauguration of the pension plan for the benefit of employes, the reconstruction and improvement of the physical condition of the lines, and the rearrangement of the company's organization resulting in improved discipline and service and increased facilities to the public.

Further Resolved, That the Board of Directors extends to Mr. Vail the thanks of the stockholders whom it represents, and the individual appreciation of its members, for the services which he has rendered this company, with the wish that he may long be spared to render to the companies with which he remains connected the benefits of his unusual administrative abilities, his ripe experience and sound judgment.

Additional officers were elected as follows: G. W. E. Atkins and Belvidere Brooks, vice-presidents; William H. Baker, secretary; A. R. Brewer, treasurer; E. Y. Gallaher, comptroller.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Annual Spring Meeting in Pittsburgh, April 9 and 10.

The 293d meeting of the American Institute of Electrical Engineers was held in Pittsburgh, Pa., April 9 and 10, under the joint auspices of the Committee on the Use of Electricity in Mines and the Pittsburgh Section, A. I. E. E. Meetings were held morning and afternoon of Thursday and Friday and Saturday was devoted to inspection trips to the local steel mills; the Bureau of Mines, and plants of local manufacturers. An Institute dinner was held on Thursday at which Charles F. Scott made a brief address on the advancement being made in the electrical industry. He is conducting an inspection trip of Yale students through the industrial centers of the East and commented briefly on his observations on this trip.

The meeting was called to order shortly after 10 a. m., Thursday, by A. M. Dudley, chairman of the Pittsburgh Section, who cordially welcomed the delegates to what he termed the center of the greatest mining district in the country. In referring to the main topic of the convention he said that the greatest need in the mining industry, insofar as electrification is concerned, is for greater standardization of practice and appliances.

Paul M. Lincoln was then introduced as the personal representative of President Mailloux. He briefly referred to the objects of the Institute and to its rapid growth. It is now the largest of the four national technical societies, although 10 years ago it was the smallest in point of membership. This growth numerically, he said, is indicative of the growth of the electrical industry. In concluding Mr. Lincoln spoke of the growing tendency of mine operators to electrify their mines and the obligation that this imposes on the electrical engineer to design safe and efficient apparatus.

Wilfred Sykes, chairman of the Committee on Use of Electricity in Mines was then called to the chair. Before taking up the papers he referred to the importance of regulation of electrical installations and called attention to the committee report on this subject. This report contains reprints of the German laws relating to electrical installations in mines, the English laws, the rules proposed by the Bureau of Standards, the rules proposed by the American Mining Congress, and the Pennsylvania mining law, electrical section. Mr. Sykes said that most of these rules embody the ideas and prejudices of the individuals identified with their compilation and were therefore not as broad as could be desired. He said that it is the hope of the American Institute to have an exhaustive discussion of these rules, from which a comprehensive report can be prepared which will be brought before a joint committee of the organizations interested. Such a report would be of value to state governments in framing suitable legislation and would also serve as specifications for mine operators in ordering and installing electrical equipment.

The paper entitled "Mine Duty Controllers," by H. P. Reed, of Milwaukee, was then presented by W. C. Kennedy.

Mine Duty Controllers.

The paper is devoted to discussion of the advisable types of control to be used for various mining equipment, particularly in bituminous coal mines. Complexity and theoretical details have been eliminated as far as practicable with the idea of impressing on the reader the need for certain definite features, without going into the theoretical detail of these features. Electric controllers for equipment outside of the mine proper as a rule have to meet different operating conditions than those controllers which are installed underground. The operating conditions are taken up in detail and proper control equipment is suggested to meet these conditions. The object of the paper is to bring out clearly to the mine operatives the fact that suitable control equipment is just as important as the installation of a suitable motor, and moreover that no motor, however well adapted to the service, will stand up properly if it is not operated with a controller designed and built specifically to meet the existing installation and operating conditions.

F. L. Stone, of Schenectady, opened the discussion, calling attention to the necessity of giving consideration to control eqiupment for 2,200-volt motors. This voltage is coming more into use and must be controlled in a safe and efficient manner. Oil-immersed switches are used to some extent but where the operation is frequent and the service severe, as in the case of the mine hoist, trouble is encountered due to the carbonization of the oil, which causes arcing. He said that another case of damage to oil-immersed switches is that a body of gas will form on top of the oil and finally a hot bubble will arise, and if the proper proportions of air are present a violent explosion will occur. He thought that the only alternative is a properly designed air-break contactor. Figures were presented indicating the satisfactory operation of these devices under severe conditions. In one case a contactor has opened a circuit 388,000 times without any renewals or repairs. Mr. Stone thought that the encased moisture-proof starter mentioned in the paper as being safe for use in locations where arcing is dangerous would be more desirable if built on the principle of the safety lamp. He held that it is almost impossible to make a perfectly air-tight joint through which electric wires can be brought. He asked for an expression from the Bureau of Mines on this point. Mr. Stone also called attention to the growing tendency to control motors by means of liquid controllers and in conclusion stated that flywheel motor-generator sets are very inefficient and should only be used in mine work where excessive peaks are penalized or where power-station capacity is limited.

S. G. Vigo, of Chicago, Ill., stated that difficulties had been encountered in controlling large direct-current hoist motors in the manner described in the paper. He inquired as to the size of motors best suited for the control mentioned.

Graham Bright, of Pittsburgh, spoke of the importance of periodic inspection of mine control equipment. He thought that self-starting motors are preferable for small fans and pumps used inside the mine. He took exception to the statement that the controller for mine locomotives with the series-parallel feature in the reverse lever is an advantage over the railway type of series-parallel controller, in that gathering can be accomplished with the motors in series, as the motorman in most cases uses the parallel position for all service. He also took exception to the statement that vertical hoists can best be electrified by the use of the variable-voltage system using a flywheel motor-generator set. He advocated alternating-current motors with either magnetic or liquid control, as being more economical and satisfactory.

H. H. Clark, of the Bureau of Mines, presented test data on oil-immersed switches in answer to the inquiry of Mr. Stone. A switch of this type was subjected to 75,000 breaks, without explosion, although the device was surrounded by natural gas and air. He stated that no data are available on performance beyond 75,000 breaks. He added that oil switches could be made explosion proof if the various parts are proportioned to the duty to be performed. In the tests mentioned the switch cases were left open so that the gas could become associated with the contacts except as prevented by the oil

H. D. James, of Pittsburgh, emphasized the importance of using care in selecting the proper control equipment.

C. J. E. Waxbom, of Columbus, O., thought that controllers for coal-cutting machines were much abused by the workmen. For this reason oil switches are not entirely satisfactory. Friction control allowing the motor to be started under no load was recommended.

W. M. Hoen, of Pittsburgh, brought out that for fans, wound secondary motors are best if the starting current is limited. If any great amount of speed reduction is required and resistance control is used the loss in resistance is objectional. Direct current is usually supplied to a mine because of locomotives and if fan service is supplied from the same source a separate feeder should be run from the bus bar. Mr. Hoen said that if direct current is used for pumping self-starting motors should be used up to 20-horsepower sizes. For hoist service he thought that motors of average size could best be controlled by contactors and a liquid rheostat for larger motors. The use of alternating current in the mine simplifies the control problems.

A. S. Biescker, of Scranton, thought that in some cases it was not desirable to use automatic starters for motors driving centrifugal pumps as frequently the water drains out of the runners when the pump stops and if started in this condition would result in damage.

Mr. Kennedy replied that local conditions have to be taken into consideration when applying controllers to mine pump motors.

The first business at the afternoon session was the presentation of a paper entitled, "Self-Contained Portable Electric Lamps," by H. O. Swoboda, of Pittsburgh.

Self-Contained Portable Electric Mine Lamps.

The considerable number of mine explosions caused by defects of the Davy safety lamps has encouraged the development of electric lamps. Satisfactory results, however, have been obtained only since the invention of the tungsten lamp, permitting the use of smaller storage batteries. The general requirements for electric lamps are: absolute safety, uninterrupted production of light for at least one shift, and a foolproof design. Prizes offered by the British Government in 1912 for the best electric lamp resulted in 197 different constructions being submitted. The first prize was awarded to a German lamp, which since that time has been used with great success all over Europe and which is also being introduced in this country. The construction of this lamp, consisting of several types for different requirements, and the methods of handling it in actual service, are fully described. Some figures covering repairs and renewals are given. In concluding, the author mentions the only objection that can be raised against electric portable mine lamps, that they cannot be used as detectors of mine gases, as Davy lamps can, and says that for this purpose devices distinctly separate from the lamp will have to be adopted.

The discussion was opened by H. H. Clark, of the Bureau of Mines, who said that the prime requisite of a portable electric lamp for mine duty was safety. Also, a lamp to be successful must be able to operate day after day with a reasonable amount of repairs and replacements. He thought that in this connection it is of particular importance that the battery be very sturdy. Lamp bulb replacements form one of the largest items of expense and American manufacturers should give consideration to bulbs for this service. Mr. Clark asked if the candlepower values mentioned in the paper referred to average candlepower over the stream of light and whether or not reflectors were used.

H. H. Smith, of Orange, N. J., commented on the maintenance costs mentioned in the paper. He said that the items of 20 per cent for battery repairs and renewals and 35 per cent for attendance could be materially reduced by the use of alkaline batteries. He took exception to the statement that the life of 2,000 shifts claimed for the alkaline battery did not affect cost because the other equipment does not last this length of time. He said that in the cap lamps the battery was separate from the other equipment and long life for the battery was very desirable.

R. P. Burrows stated the opinion that a primary battery was available which compared favorably with the lead cell. He mentioned a lead cell having an electrolyte of sawdust saturated with sulphuric acid as an excellent substitute for the liquid batteries. He added that the life of the lamps used depends upon the efficiency at which they are burned.

Mr. Swoboda closed the discussion; answering Mr. Clark he said the candlepower figures were average values and were measured without reflectors. Regarding alkaline batteries he thought the use of two cells not desirable for this work. The first cost is also higher and this offsets the advantages.

The Committee on the Use of Electricity in Mines prepared in printed form the rules governing electrical installations in mines of Germany, England, the Bureau of Standards, the American Mining Congress and of the State of Pennsylvania. The various rules differ in many respects but all follow the same general outline of topics covered.

The first point brought up for discussion related to definitions, the discussion being opened by H. H. Clark of the Bureau of Mines. Mr. Clark pointed out that a code of rules should tend to assist rather than restrict. The departments should be well balanced as to length of treatment with the rules governing inspection and maintenance receiving the greatest consideration. He thought that the section devoted to definitions could comprise 10 per cent of the total; the section treating character of the equipment to be used 20 per cent; installation rules 30 per cent; operation 15 per cent; inspection and maintenance 20 per cent; and miscellaneous matter 5 per cent.

C. W. Beers, of Wilkes-Barre, thought that one of the important sections of the rules should be that devoted to safety suggestions for employees. In this connection he saw no advantage from the hazard standpoint of 250-volt service over 550 volt. All apparatus should have attachments for ground connection.

C. M. Means, of Pittsburgh, said that wherever a definite set of rules governing mine electrical installations were in use the tendency was to standardize the equipment used in the territory coming under the jurisdiction of such rules. He thought this a step in the right direction and advocated a set of National rules along the general lines of the National Electrical Code.

Taking up the subject of mine plans, Chairman Sykes called upon W. A. Thomas, of Pittsburgh, to open the discussion. He thought that it was expensive and difficult to represent electrical circuits by different colors as it is necessary to re-draw these lines on blue prints if the latter are desired. He favored symbols to designated electrical apparatus and different voltages.

H. H. Clark, of the Bureau of Mines, stated that a code of symbols such as mentioned had been developed by the Bureau.

Discussing the next question of "Permissible Voltages." J. S. O'Donovan brought out the point that in steel-mill practice all voltages above 250 are considered dangerous and are treated accordingly. He thought it advisable to paint all open wires carrying over 250 volts some definite color so that they could be readily distinguished.

W. A. Thomas thought that the permissable voltage in coal mines should not be fixed in any code of rules but should be governed by local conditions. He also thought it a question as to the extent exposed wires could be marked without excessive expense.

E. M. Hewlett, of Schenectady, thought that the degree of protection provided should depend to some extent upon the class of men supposed to work under the particular conditions. Less precaution need be taken in a substation where only skilled men are employed than in a mine shaft where the maximum number of safeguards must be provided.

J. P. Clayton, of Matoon, Ill., referred to the Illinois laws which specify that trolley wires cannot carry more than 250 volts. He stated that the advent of central-station service for coal mines has made the use of high voltages desirable because of the excessive losses in transmitting low voltage current. The practice in Illinois is to carry the high voltage lines over the surface and pass the leads through drill holes at the points of application. He described briefly a three-phase mine haulage system which is operating satisfactorily.

W. A. Thomas pointed out that every

precaution should be taken to see that high-voltage cables are outside of the range of pick points. Cables should preferably be armored. He thought the prejudice of mine operators against alternating current was unfounded although he favored direct-current haulage systems.

A. S. Biesecker, of Scranton, stated that 2,200-volt service was used in the anthracite district for pumping. Cables enter bore holes over pumps. He thought that jute-covered cables should be used because of the danger of the acid in the mine water destroying the insulation. He added that the main objection to alternating-current service in old mines was the cost of duplicating the direct-current network which already exists.

O. S. Newton, of Columbus, O., thought that much educational work must be done before alternating-current service would find favor with mine operators. Remarks along the same lines were made by H. R. Summerhays, A. M. Dudley, E. R. Spencer, V. G. Brehm, W. W. Miller and G. C. Hyde.

The paper by G. M. Eaton, of the Westinghouse Electric & Manufacturing Company, entitled, "The Development of the Electric Mine Locomotive," was presented at the opening of the session on Friday morning.

The Development of the Electric Mine Locomotive.

The paper traces, lagely by means of pictures, the course that has been followed in developing the mine locomotive to its present condition. The paper is limited to locomotives for operation in coal mines. The two main factors which have directed the development are, first, the demand for increased entry capacity, and second, the exploitation of thin seams. The early machines were high, and of irregular outline, whereas later machines are compact and strong, yet accessible, and easily inspected and overhauled. Various types of framing are illustrated. Locomotives with two and three axles in rigid wheel base, and also tandem locomotives are shown and described. Reference is made to various methods of connecting the motors by which the adhesive weight is used to full advantage. Gathering locomotives, with vertical and horizontal reels, both axle-driven and with independent electric drive, are illustrated, and some of the problems of gathering work are briefly discussed. There is also brief reference to various types of motors with different methods of lubrication, as well as some reference to sleeve vs. frictionless bearings. The paper closes with a few tendency curves, and attention is called to the lines of future development, which these curves apparently indicate.

C. W. Beers, of Wilkes-Barre, Pa., in opening the discussion, commented on some of the general principles that the Lehigh Coal Company observes in drawing specifications for locomotives. Bearing troubles are the most annoying and special attention is given this subject. Mr. Beers thought that the manufacturers should co-operate with the operators in designing machines if the best results are to be obtained. He thought it advisable for the Institute to collect data on operating performances of locomotives used in various parts of the country.

W. W. Miller, of Schenectady, called attention to what is considered the first electric mine locomotive, which was built in 1887 and still is used to a limited extent.

C. J. E. Waxbom, of Columbus, emphasized the importance of "safety first" in mine haulage. He advocated rolled-plate frames in preference to cast frames as being safer, and also ball bearings rather than sleeve-type bearings. Patching or repairing of locomotive frames should be avoided on the larger machines, as he considered this dangerous.

Grahm Bright, of Pittsburgh, discussed the relative merits of box-type and open steel-bar type frames for mine locomotives. He favored the latter because of the greater air space for motor ventilation. He also favored ball-bearings as compared with the sleeve type, although he thought the friction of the latter would not materially affect power consumption.

F. L. Stone, I. C. Ilsley, N. W. Storer, and W. A. Thomas entered into a discussion of the relative merits of ball and sleeve-type bearings and the effect of box and open-type frames on motor ventilation.

G. Shapter called attention to the merits of the storage-battery gathering locomotive. He stated that savings of 30 to 35 per cent over mule haulage could be effected by their use. The total operating cost of such equipment is four cents per ton-mile of which 60 per cent represents labor.

The two papers dealing with mine substations were then presented in abstract. These were "The Construction and Operation of Mining Substations," by H. Booker, of the Pittsburgh-Buffalo Company, and "Motor-Generator Sets Versus Synchronous Converters as Applied to Mine Work," by W. M. Hoen, of the Westinghouse Electric & Manufacturing Company.

Construction and Operation of Substations.

The use of electricity in mines has been making rapid progress throughout the United States. Steam and compressed air are being superseded largely by central-station power. Power from a central station requires a substation to supply direct current to operate locomotives, cutting machines, etc., and to transform high-voltage alternating-current to direct-current at 250 or 500 volts. Substations, when possible, should be located on the surface, because if located underground there is danger from fire, and dampness weakens insulation and causes corrosion of metallic parts. Construction of an underground substation is more costly than on the surface, as there is danger of the roof giving way. The roof should be arched, or built of heavy concrete and the whole station made fireproof. When substations are located underground it is necessary to carry a high-tension cable through bore-holes. When located on the surface a low-tension cable can be used. Many accidents occur because of incompetent men. Good salaries should be paid and competent men obtained. Danger warning should be posted and men taught to consider wires as being "live," thereby lessening accidents.

Motor-Generator Sets versus Synchronous Converters.

The number of mines which use electrical power supplied by transmission lines carrying high-voltage alternating current is constantly increasing. Low-voltage direct current is usually required for underground work in all coal mines. These conditions require the installation of motor-generators or synchronous converters. The extent and location of the mine workings will determine the voltage of the direct-current supply. Improper application of the transforming apparatus may result in great variation of voltage in the direct-current network, with its attendant disadvantages. The operating characteristics of the induction and synchronous motor-generator sets and synchronous converters are considered with regard to starting conditions, direct-current regulation and the effect on the alternating-current transmission lines, alternating-current voltage regulation, and power-factor correction. Mine conditions and the nature of the power supply will determine the type of transforming apparatus which will give the most efficient and satisfactory operating conditions. Each of the several types of apparatus has a field where the best results will be obtained.

These two papers were discussed briefly by W. A. Thomas, Paul Lincoln, O. S. Newton, N. Stahl and W. M. Hoen. Mr. Thomas pointed out that from the standpoint of economy the synchronous converter was to be preferred, although motor-generator sets were more desirable in the many cases where large corrective effects are required on the line, and over-compounding is necessary. Because of the purchase of power by many mines it is frequently desirable to use the synchronous motor-generator set because of the power-factor being under the control of the operator.

Mr. Lincoln said that the synchronous converter has many advantages and its only limitation for mine service lies in the difficulty in over-compounding.

Mr. Stahl favored the use of synchronous converters wherever possible. He said that power-factor correction could be obtained by adjusting the field of the motor. Where power is received at high voltages from transmission lines, the capacity effect may make it more desirable to have a lagging at light loads and leading at maximum loads. Under these conditions the synchronous converter will give the most desirable performance.

The final session, on Friday afternoon, was devoted entirely to the continuation of the discussion on mine regulations for electrical installations.

Construction of Apparatus.—H. H. Clark opened the discussion on this paragraph criticising the rules presented as being too general. This has a tendency to promote unnecessary controversy between inspectors and operators. Too specific rules are equally objectionable.

Portable Apparatus.—Graham Bright discussed this subject, commenting on the change which has come about in the purchase and use of mine machinery. Apparatus is now purchased on an engineering basis, and the tendency is towards simplicity and efficiency.

Rules for Installation.—L. C. Ilsley said that no temporary installations should be tolerated in a mine. Capable workmen should be employed and every installation made in a workmanlike manner. This will reduce the number of breakdowns and accidents. No rules governing installations can be made that will be applicable to all conditions.

W. M. Hoen advocated the use of armored cable for all main feeders and also separate circuits for the haulage system in all cases.

H. H. Clark thought that one of the most important requirements in connection with the installation of apparatus was to provide sufficient space and light around each piece of machinery. All contributary causes to accidents should be guarded against.

Lighting.—Graham Bright opened the discussion on this subject urging the location of lamps at all switches and cross-overs. All apparatus should be lighted to facilitate inspection.

W. A. Thomas suggested the wiring of two lamps in multiple at all important points so that light would still be available in case of a failure of one lamp.

W. M. Hoen said there was need for much more lighting in coal mines. These compare very unfavorably with metal mines where the lighting is much more extensive.

Shot Firing.—H. H. Clark thought there was a need for a simple and inexpensive device for ascertaining the capacity of shot-firing batteries. He explained a series of tests conducted by the Bureau to determine whether accidental explosions could be caused by induced current in the firing circuit. A coil of No. 18 copper wire, 1,400 feet long was wound around a length of steel rail and a standard No. 6 detonator connected across the terminals of the coil. A current of 220 amperes was passed through the rail, momentarily, several times and although the voltage across the terminals of the coil was found to reach a maximum of 8.5 volts, no explosion took place.

Grounding.—P. M. Lincoln opened the discussion on this subject advocating the grounding of every device possible. This affords not only protection to the workmen but to the apparatus as well.

W. A. Thomas recommended connecting the return circuit of the haulage system to the air and water pipes along the main passageways. He said this would compensate for defective or inefficient rail bonds. He thought the manner of making connections a field for scientific investigation by the Bureau of Mines.

L. C. Ilsley advocated wrapping the connecting wire around the pipe several turns and then soldering to the pipe. D. C. Hyde favored the use of a copper strap secured around the pipe to which the wire should be soldered. Graham Bright thought the type of ground connection for mine service should be standardized.

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Program of Washington Meeting.

The 294th meeting of the American Institute of Electrical Engineers will be held in Washington, D. C., on Friday and Saturday, April 24 and 25. This meeting will be under the auspices of the Electrophysics Committee and the Washington and Baltimore Sections, and will be a joint meeting with the American Physical Society.

The sessions will be held at the Bureau of Standards, where the new electrical laboratory will be open for inspection. A special feature of this meeting will be an exhibit of apparatus which has been arranged by the local committee of the American Physical Society. The exhibit will be participated in by more than 30 manufacturers, importers, industrial research laboratories, university laboratories and scientific bureaus of the Federal Government.

The American Physical Society will conduct the sessions on Friday and Saturday mornings, beginning at 9:30 o'clock. About 50 papers in all will be presented in abstract. On Friday afternoon at 3:30 o'clock there will be a lecture by Sir Ernest Rutherford on "X-Ray and Gamma-Ray Spectra." On Friday evening there will be a session conducted by the American Institute of Electrical Engineers, at which the following papers will be presented: "A Theory of Corona," by Bergen Davis; "Some Investigations of Lightning Protection for Buildings," by T. M. De Blois; "A Milliampere Current Transformer," by Edward Bennett; "Some Simple Examples of Transmission-Line Surges," by W. S. Franklin; "Solenoids," by C. R. Underhill.

This session will be followed by a smoker.

The Illumination of Railway Signals.

At a joint meeting held in Chicago by the Chicago Section, Illuminating Engineering Society, and the Railway Signal Association, on the evening of April 10, three papers dealing with illumination of signals and allied matters were presented and discussed.

The first of these papers was presented by Thomas S. Stevens, of the Santa Fe Railway, Topeka, Kans., the title of this paper being "Illumination of Railway Signals." In this paper Mr. Stevens pointed out that three types of lamps have been used for this purpose, namely, kerosene lamps, electric lamps and acetylene lamps. The first of these are still most extensively used and in their early stages were rather crude affairs. He traced the development of oil lamps, pointing out particularly how the so-called long-time burners permit a decided saving in maintenance and labor, since such lamps are given attention only twice weekly. Wherever practicable, electric lamps have been introduced. At first, lamps as large as 16 candlepower were employed, but it was found that a considerable reduction in the size of the lamp was permissible, since the important thing is to have the light source at the focus of the lens. One-candlepower electric lamps have given good results for signal purposes; in large signal installations they are supplied from dynamos but in small plants current is taken from storage batteries which are periodically charged from gasoline-engine-driven sets. The energy consumption of one-candlepower lamps is so small that a very small battery provides sufficient energy for lighting a fair-sized signal plant for two or three days. Recently extensive installations of alternating-current signals have been made in which two-candlepower lamps are lighted continuously day and night. The energy consumption of these lamps is so small that it is believed to be cheaper to operate the lamps continuously than to develop and use a complicated control equipment for extinguishing them during daylight hours. Mr. Stevens also called attention to an acetylene lamp developed by a Swedish firm; this is of the flashing type in which control is obtained by a magnetic valve. In concluding his paper, Mr. Stevens called attention to the rapid development in lenses, which have now been so perfected that they illuminate signals properly to make the different colors readily distinguishable in daylight at a distance of about 2,000 feet. There is being introduced the all-electric signal, in which semaphore arms with their complicated operating mechanism are entirely dispensed with. In this case two

25-watt lamps are used behind an eight-inch lens.

J. S. Hobson, Union Switch & Signal Company, opened the discussion by stating that 20-watt lamps have been used very successfully in the Pittsburgh district with 10-inch lenses. These are visible day or night in the smoky atmosphere prevailing there at distances of 4,000 to 5,000 feet. Use is made of a concentrated form of filament located at the focus of the lens.

G. L. Walters, Adams & Westlake Company, spoke of the importance of studying the character of the oil used with oil lamps; pure paraffin oils obtained from Pennsylvania give very little trouble, but as the source of the oil is obtained now very largely from other wells, notably Kansas, Texas and the western part of the country, impurities are more met with, which cause annoyance; these have necessitated a change in the design of the burner.

W. H. Elliott, New York Central Lines, said that the long-time oil burner requires but 40 per cent of the maintenance and labor costs which are chargeable to the one-day burner. He emphasized the need of having the source of light in the focus of the lens. On account of slight imperfections in the lenses the focus is not at a geometric point. This is really an advantage because flickering or slight displacement of the light from the true focus does not cause so much flickering of the signal. He said that it is much more important to have the filament of electric lamps placed at the focal zone than it is to have a very powerful lamp and showed how a 16-candlepower lamp of the old type did not give as good illumination of the signals as a much smaller lamp with a concentrated filament. Low-voltage lamps using thick filaments are being introduced and are giving very good results. They give longer life, are more rugged and are best run from the low-voltage side of a transformer.

A written communication was presented from W. N. Manuel, Grand Rapids & Indiana Railroad, in which he also spoke of the use of low-voltage lamps becoming more general. A. G. Shaver, Rock Island System, spoke of the necessity for having oil very carefully handled so as not to become contaminated. M. G. Lloyd called attention to the new helical-filament lamp as making an ideal source for signal work, since the filament can be placed at the exact focus of the lens. In reply to his question regarding the relative use of different light sources for signal purposes, Mr. Stevens said that oil lamps are still most generally used; electric lamps are used to the extent of about 4 or 5 per cent; acetylene lamps are being used on a few railroads only.

Nelson M. Black, Milwaukee, Wis., then presented a paper entitled "The Physiology of the Eye and Its Relation to Railway Signaling." In this paper Dr. Black pointed out that the observation of signals requires the recognition of position or color, or both position and color of a signal. With the aid of lantern slides, he then expounded the physiology of the eye and showed how form vision differs from color vision. Perception of the form of an object depends upon the size of the image received on the retina, the amount of light reflected from it and the contrast with the background. Observations have shown that a person with good normal vision can distinguish the form of an object if the angle subtended by it at the retina equals five minutes, or if the parts of the object, such as a letter, are wide enough to subtend a one-minute angle. Dr. Black explained the means of rectifying nearsightedness, farsightedness and astigmatism by means of appropriate lenses. Railway officials in conjunction with ophthalmic surgeons have adopted minimum standards of visual acuity, particularly for enginemen and firemen. This standard requires the ability to read letters which subtend a five-minute angle at a distance of 20 feet. Taking up color vision, Dr. Black explained the theory of color and showed that the average normal eye can differentiate six distinct colors in the visible solar spectrum. The ability to distinguish color depends upon the hue, the saturation and the intensity of the color. He showed a variety of glasses used as roundels in signal work and pointed out the characteristics of their various colors. He then discussed at some length subnormal color perception, commonly mistermed color-blindness. He showed the importance of railway men being free from this defect and explained at length the various tests made for determining even slight traces of color-blindness. Marine and railway service require the absolute elimination of all persons with subnormal color vision, since the trend of signal practice seems to be toward the use of colored signals illuminated by transmitted light by day as well as by night. He described the difficulties that an engineman meets with in correctly observing signals. He pointed out the effect of various atmospheric conditions upon the visual range of signals. All of these require that the engineman must have normal vision with both eyes and that he also must be capable of quick perception.

The discussion of Dr. Black's paper was opened by Dr. Harry Gradle, Chicago, who added regarding the physiology of the eye that the lens of the eye serves also to protect the retina from ultra-violet rays. He explained the process of accommodation and dwelt on the importance of having binocular or double-eye vision in order to be able to get a sense of depth or distance.

A written communication was presented from Dr. D. W. Weaver, Greensburg, Ind. He explained the work of what is known as the visual purple, which is the active chemical medium of the eye. Poor visual acuity is often due to fatigue, alcohol, nicotine or other poisons. He called attention to the difference in color values of different light sources as affecting the color of the transmitted light from signals.

M. G. Lloyd discussed the effect of atmospheric absorption on signals of different colors. Although experiments on a small scale show red to be most absorbed by fog, in practice it is discernable at a greater distance than light of shorter wave-length. He suggested that since persons completely color blind are sensitive only to intensity regardless of color, they might be of great value as photometrists in color photometry. Dr. Black stated that few if any persons are completely color blind, and little was known regarding their relative sensations from different intensities.

C. C. Anthony, Pennsylvania Railroad, spoke of the electrification of that system near Philadelphia. It was originally proposed to use overhead catenary construction in which the trolley wires would be supported by steel bridges. Since these bridges would obstruct the view of signals on the signal bridges it was proposed to abandon the use of semaphore signals and to install in place thereof and under the bridges electrically lighted signals which would be in service both day and night. Subsequently it was decided to use span-wire construction for supporting the catenary, but the advantage of using light signals instead of the semaphore was recognized as being so great that in all probability electric signals will be retained. Others who discussed this paper were Thomas S. Stevens, G. E. Marsh, W. H. Elliott and J. B. Jackson.

H. P. Gage, of the Corning Glass Works, Corning, N. Y., then presented the last paper of the evening, which was entitled "Signal Lenses." He described and illustrated the variety of lenses used in signal work, pointing out the difference between the so-called optical, inverted, wide-angle and spread-light lenses. He gave the results of many tests to show the various angular distances at which light could be observed through these various types of lenses. Dr. Gage explained methods that should be followed in the selection of types of lenses for different use.

The National Electric Light Association Convention, Philadelphia, June 1 to 5.

The general convention committee of the National Electric Light Association has issued its first general circular with regard to the thirty-seventh convention which will be held at Philadelphia, Pa., June 1 to 5. This circular gives considerable information relating to convention details, and is quoted from liberally herewith. It is 27 years since the Association visited Philadelphia. The first convention held there was in February, 1887, and was attended by about 500 persons. A conservative estimate of the attendance expected at the thirty-seventh convention places the attendance at 5,000. The thirty-seventh convention will also celebrate the thirtieth anniversary of the first International Electrical Congress held in America and the first American International Electrical Exhibition, both held in Philadelphia in 1884.

Bellevue-Stratford Hotel, Convention Headquarters.

The headquarters of the Association will be at the Bellevue-Stratford Hotel. This is claimed to be one of the largest and most perfectly equipped hotels in the country. All of the regular sessions will be held in three commodious meeting rooms on the ball room floor, one flight up, where more than 2,000 members can participate at one time and can within a minute go from one section to another. The Exhibition Committee, on behalf of the Class D members, has made arrangements for the occupancy of the entire roof garden of the hotel and the exhibit that has been planned will undoubtedly be one of rare beauty and interest. The setting will be of unusual artistic attractiveness. The roof garden where the exhibition will be held has a wide view over the whole city, and has also a separate restaurant of its own. Thus the entire convention will be housed in one building, while the facilities are such as to minimize any crowding or difficulty of circulation. The illustrations reproduced herewith will give a good idea first, of the remarkable panorama of Philadelphia which may be viewed from the roof garden, and again, of the unusual attractiveness of the other facilities which will be at the disposal of those in attendance at the convention. The offices of the secretary, the Hotel, Transportation and Local Registration and Information Committees, the Main Registration Bureau, and the bureaus for the distribution and deposit of convention reports and papers, will all be on the ballroom floor, within immediate access of every meeting hall. Telephonic bulletins will keep each room and the offices advised as to the progress of business in the various sections.

Work of the Convention.

The work of the convention will begin on Tuesday morning, June 2, and will close on Friday morning, June 5. A very full program has already been arranged in the general, executive, technical, commercial, accounting and hydroelectric sections and sessions, but it is proposed to limit mere reading of papers and reports as much as possible, and to develop discussion. There will be several parallel sessions during Tuesday, Wednesday and Thursday, culminating in a most important general and executive meeting on Friday morning.. The complete program will be published in the April *Bulletin* of the Association.

Entertainment.

The convention will open on Monday night, June 1, with the annual reception to the president in the grand ballroom. With this and the public policy meeting of Wednesday night, special features of interest will be associated. On Wednesday afternoon the annual baseball game will be played for a trophy cup, and there is already keen interest among the competing company section teams. At the time of the convention, a rejuvenation will be held by the Jovian Order, whose membership is very large in the ranks of the National Electric Light Association. Other general entertainment is being arranged for during the week by the Special Entertainment Committee of the Convention Committee, for ladies, of which announcement will be made in due course. Opportunities will also be provided for visiting the numerous historic spots in which Philadelphia is so rich.

Registration.

For some years past it has been the practice of the Association to issue, in advance, a set of separate registration cards for attendance, papers, hotel accommodation, transportation, etc. A change of method is being attempted this year, in combining these cards into a triplicate form, which the member fills up and returns, once for all, to the Association office, stating his plans, preferences, arrangements and other details. It is hoped that this plan will facilitate the convenience of all and lessen the immense amount of incidental work. The set of cards will be issued with a supplemental circular, in the near future. The registration of the large membership in the Philadelphia district will be in the hands of a local Registration Committee.

Roof-Garden Restaurant, Bellevue-Stratford.

South Side of Roof Garden, Bellevue-Stratford.

Ball Room of the Bellevue-Stratford.

Hotel Accommodations.

Very complete data have been prepared by the Hotel Committee, of which A. H. Manwaring is chairman. This committee will be pleased to answer all inquiries with respect to hotel accommodations. A Reception Committee will assist at the railway depots and hotels.

Transportation Arrangements.

The Transportation Committee has practically completed arrangements for the movement of members of the Association from all sections of the country to Philadelphia. This committee is under the direction of George W. Elliott, of the McGraw Publishing Company, New York, chairman.

There are still a few of the passenger associations that have not yet taken definite action on reduced fares, but it is quite probable that there will be very little change in what has been done in previous years. Special trains are being arranged for from Chicago, one over the Pennsylvania Railroad, leaving, probably, in the evening, and making the daylight run between Pittsburgh and Philadelphia, arriving at the convention city in the early afternoon. The committee is also trying to arrange for a special from Chicago over the Lake Shore Railroad, leaving in the morning and taking on, at Toledo, members from Detroit and other adjacent points, and also at Cleveland the large delegation that usually goes from that large electrical center, reaching Buffalo late in the evening and taking up Buffalo and Canadian travel. Another special is being arranged for the Southeastern Section, and much is expected for the success of this train, as all the members in that section are bending every effort to make it a representative movement. Definite decision has not yet been arrived at regarding the Pacific Coast members. It may be found necessary to run a special from San Francisco. The Kansas City and St. Louis contingents will move to Chicago and there feed the two specials from that point, as before described. This will also apply to St. Paul, Minneapolis and Northwestern points. On account of the short run between New York and Philadelphia, and the excellent train service between these two cities, it has been decided not to attempt to arrange for special trains. This will also apply to Boston, the New England delegates preferring to go to New York, and from there to Philadelphia. The Transportation Committee and the railroads between New York and Philadelphia will be in close touch all the time, to insure sufficient train equipment on the days when the members are going and returning from the convention.

The Philadelphia Committee.

President McCall has appointed a General Convention Committee under the chairmanship of W. C. L. Eglin, second vice-president of the Philadelphia Electric Company, to lay out and supervise the general arrangements for the convention. The committee will, of course, be increased from time to time, but as it now stands comprises the following officers of the Association and other well known members, many of whom are identified with the Philadelphia Electric Company and other leading local interests: W. C. L. Eglin, J. I. Ayer, P. H. Bartlett, John A. Britton, D. T. Campbell, E. C. Deal, A. J. DeCamp, J. J. Gibson, G. R. Green, J. D. Israel, A. B. Huey, W. H. Johnson, E. W. Lloyd, Herbert Lloyd, H. C. Lucas, A. H. Manwaring, J. T. Maxwell, H. K. Mohr, E. D. Mullen, R. B. Owens, Holton H. Scott, J. B. Seaman, Paul Spencer, H. Townsend and W. F. Wells.

Panorama From Roof Garden, Bellevue-Stratford Hotel, Philadelphia, Pa., Where Exhibits of the National Electric Light Association Convention Will be Installed, June 1-5.

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Francis Jehl Honored by Emperor Francis Joseph.

Emperor Francis Joseph of Austria-Hungary has conferred the "Ritter Kreuz des Franz Joseph Order" ("The Knights Cross of the Francis Joseph Order) upon Francis Jehl, electrical engineer of the General Electric Company of Budapest, Hungary.

Mr. Jehl has been connected with the work of the Budapest Company for the past 17 years and has been prominently identified with electric lighting and power developments in Europe and America ever since the early development of the Edison incandescent electric lamp at Menlo Park, N. J., he having been one of Mr. Edison's earliest and ablest assistants at his laboratory and taking part in the epoch-making experiments leading to the development and perfection of the Edison incandescent electric lamp, the Edison system of electrical distribution, the Edison electric railway, etc. Mr. Jehl was brought into intimate touch with the work of Mr. Edison and his ablest associates and partners, Charles F. Batchelor and Francis R. Upton and with those other early assistants and co-workers of Mr. Edison at his Menlo Park Laboratory, John Kreusi, Julius L. Horning, Dr. Haid, Charles L. Clarke, William J. Hammer, E. L. Nichols, E. G. Acheson, E. H. Johnson, W. S. Andrews, John Ott, L. K. Boehm, W. Holzer, Martin Force, Albelt Herrick, John W. Lawson, Samuel Insull, S. D. Mott and others.

In 1881 Mr. Jehl equipped and superintended the testing department of the Edison Machine Works in Goerck Street, New York, and from this school of practical experience, graduated many a young man into the pioneer electrical engineering work of this country and Europe.

Early in 1882 Mr. Edison sent Mr. Jehl to England to install the perfected Edison electrolytic meter in the Holborn Viaduct central station of 3,000 lights, which had been constructed for the English Edison Company by Edward H. Johnson, general manager, and William J. Hammer, chief engineer. This station started up January 12, 1882. After installing the meter department for the English company, Mr. Jehl went to France to undertake similar work for the French Edison Company and about this time he prepared the first work in the world ever written upon the electric meter.

As engineer of the French Edison Company, he assisted Mr. Edison's partner, Charles Batchelor (who had gone abroad in 1881 to establish the French Edison Company) and Etienne de Fodor (now at the head of the Budapest Company) and Nikola Tesla, E. G. Acheson and others in getting the electrical works, lamp factory, etc., of the French Edison Company started. He later traveled extensively in Europe, introducing the Edison electric lighting system, and installed the famous plant for lighting the Brünn Theater at Berlin, Austria, which theater was lighted throughout by electricity and did not contain a single gas jet.

Francis Jehl.

Mr. Jehl made a similar installation with the Edison system in Bucharest, Roumania, and in 1883 he had charge of the Edison Exhibit at the Vienna Electrical Exhibition, during which he had the honor of being presented at the Austrian Court. At one time Mr. Jehl was associated with the Hardtmuth Carbon Company of Austria and visited the United States in the company's interest. While in Vienna in 1899 he wrote the first complete work upon carbon manufacture, which was published by the London *Electrician*, and he took out a number of patents upon various inventions, such as carbon economizers, continuous furnace for carbon manufacture, electric meter and a Faraday disk type of dynamo, known as the Jehl-Ruppe disk dynamo.

While at Menlo Park, he invented a very simple type of mercury pump which was extensively used for exhausting incandescent lamps, and during his stay in Austria he established a small lamp factory in order to protect the Edison lamp patents in that country.

In addition to the publications already referred to, Mr. Jehl has been a frequent contributor to the electrotechnical press both here and abroad.

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Total exports of copper in March amounted to 45,973 tons, as compared with 41,702 tons last year.

New Electrical and Mechanical Appliances.

Schwarze Electric Horns.

The Schwarze Electric Company, Adrian, Mich., has added to its extensive line of electric bells, gongs and buzzers a number of electric horns for use on automobiles and motorcycles. These are of the direct-current type and are made in several forms having various sizes of diaphragm, style of megaphone, etc. In all of them the contact points are of pure platinum so as to render them nonarcing. The diaphragm construction is such that the plunger or striking pin is not fastened to the diaphragm, thus current consumption is reduced to a minimum and the life of the diaphragm prolonged. The best materials and expert workmanship are used in the manufacture of these horns. They produce a great volume of sound whose tone is deep, resonant and penetrating. The standard finish on these horns is of black enamel with nickel trimmings.

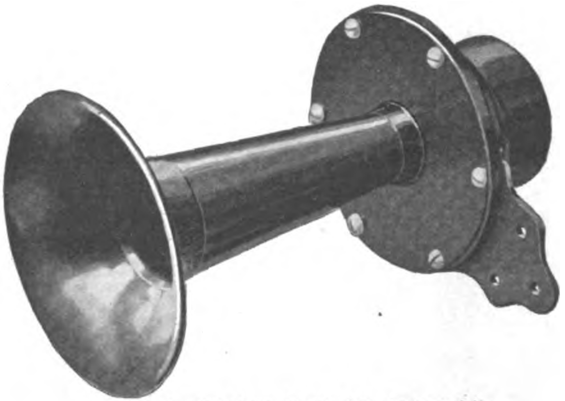

Fig. 1.—Electric Horn for Automobile.

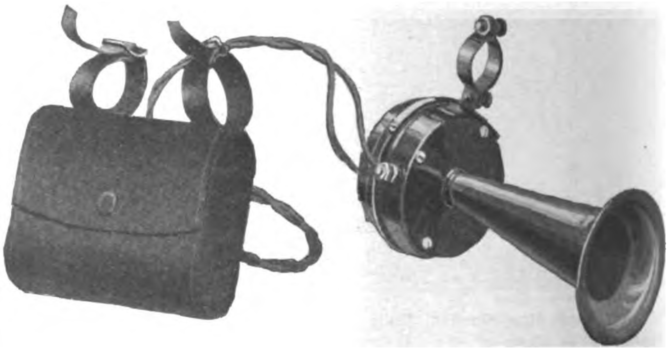

Fig. 2.—Electric Horn with Battery Case for Motorcycle.

One of these electric horns of the megaphone type is shown in Fig. 1 herewith. This has a diaphragm 5.5 inches in diameter and is arranged to be connected ordinarily to five dry cells or a six-volt storage battery, such as is standard for automobile ignition and lighting service. The outfit can be wound for a higher voltage, if desired. Each of these horns has a double twisted, insulated cord nine feet long and special push button.

An electric horn for motorcycle use is shown in Fig. 2. This has a special push button on the back cap of the horn. The construction of the horn has been so carefully worked out that its entire weight is only one pound. A steel battery case containing two dry cells is furnished with the outfit, the batteries being connected to the horn by a twisted rubber-insulated cord three feet long. Although this outfit is designed for use on two ordinary dry cells, it can also be wound to operate on six volts, if desired. Although this horn is very light in construction it gives a loud sound.

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Automatic Fire Alarm for Hotels and Clubs.

Louis H. Egan, general manager of the Kansas City Electric Light Company, has suggested, following the disastrous Missouri Athletic Club fire at St. Louis, that electricity be called into play to prevent repetitions of such holocausts. Mr. Egan's idea is to have a signal board installed on each floor of hotels, clubs and similar buildings. Loud gongs would be connected to the system and, on the principle utilized in automatic sprinkler systems, unusual heat would set off a thermostatic device so as to close a circuit and ring the bells in each room, thus effectively warning the occupants of the impending danger. Mr. Egan says there is no doubt as to the practicability of the plan.

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Electricity Used to Prevent Boiler Corrosion.

An electrical device for preventing boiler corrosion has recently been installed at the United States Navy Yard at Brooklyn. An electrode is fixed inside the boiler and direct current at from six to ten volts is supplied to this electrode and the boiler shell. In this way a film of hydrogen is formed which prevents the adhesion of scale and preserves the plates from corrosion.

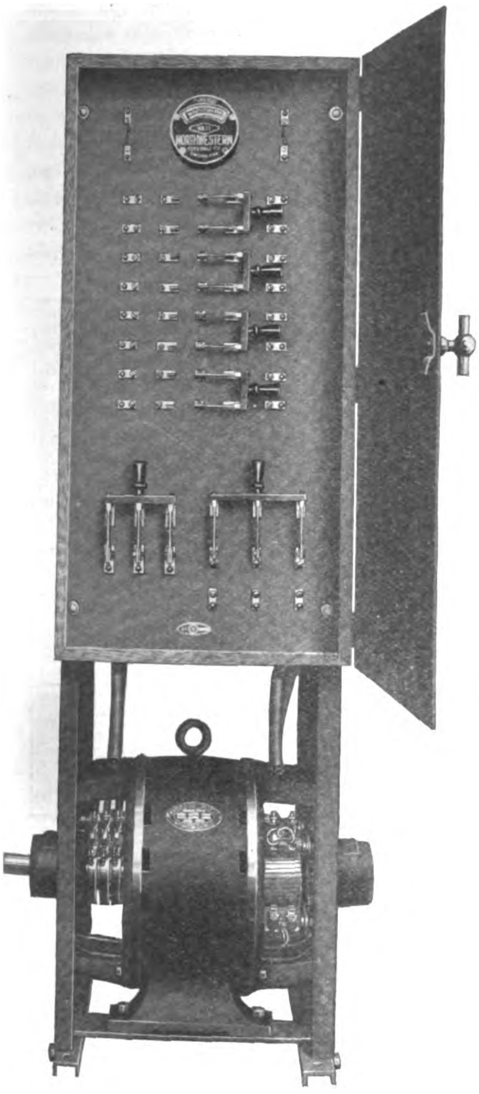
Control Panel with Emergency Feature for Motion-Picture Projecting Lamps.

It is generally known that, in order to get a clear and satisfactory presentation of motion pictures in a theater that aims to maintain its patronage, it is necessary to use direct-current projecting arc lamps which with their intense white light produce exceptional distinctness of the pictures. For getting direct current for this purpose from an alternating-current supply several rectifying equipments have been used, of which the rotary converter is generally conceded to give the highest efficiency and best general results.

In our issue of August 2, 1913, there was described the Martin rotary converter, which is being manufactured by the Northwestern Electric Company, 613 West Adams Street, Chicago. This machine, it will be recalled, is of rugged-construction and has among its good operating characteristics, high efficiency, self starting, good regulation and requires a minimum amount of attention to keep it in good running condition. This rotary has been found peculiarly suitable for supplying direct current for moving-picture lamps and a special panel has therefore been devised for use therewith to facilitate the control.

A view of this panel is shown herewith. It is mounted in a steel cabinet on an angle-iron framework directly over the rotary so that the entire outfit takes up a floor space of but 30 inches square; its total height is six feet. Directly behind the panel is mounted a step-down transformer with a number of secondary taps. A small steadying resistance is provided for each arc lamp circuit; these resistances are also mounted back of the panel. All of the connections between the alternating-current line terminals, transformer, rotary converter, lamp resistances and switches are already made, so that it is necessary to connect merely the line and lamp circuits.

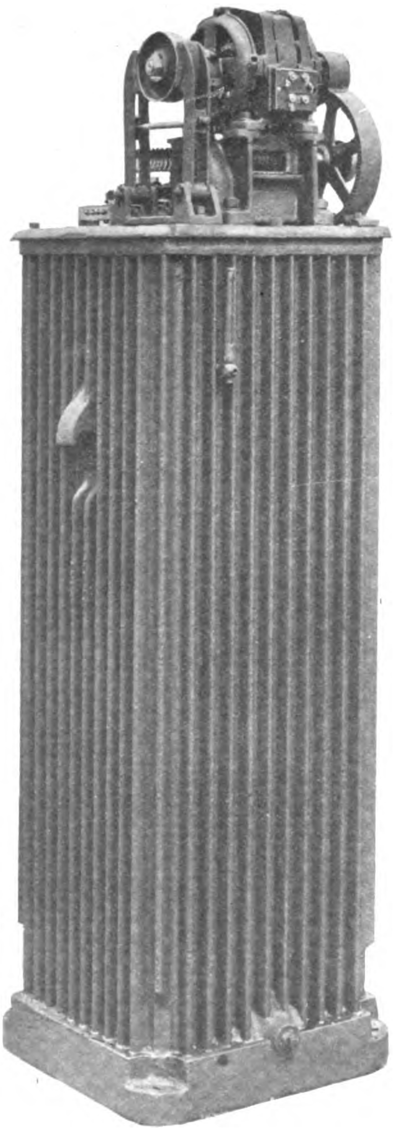
The right-hand three-pole fused switch on the front of the panel is the line switch; the three-pole switch to the left of it is the rotary converter switch. The lamp switches are placed above and are double-throw switches supplying to the lamps direct current from the rotary when thrown to the right and alternating current from the transformer when thrown to the left. A voltmeter is placed at the top and, if desired, an ammeter is mounted alongside of it.



Control Panel and Converter for Motion-Picture Projecting Lamps.

On closing the line switch the transformer is energized and on closing the converter switch the rotary starts. Should its polarity be wrong, as shown by the voltmeter, the converter switch is opened for a few moments until the machine slows down, then the switch is again closed to bring the polarity right; direct current is then immediately available for any one or more of the lamp circuits.

Although the probability of the rotary being out of commission is very remote, even this contingency is provided for by the emergency throw-over feature alluded to above. Thus it is possible to supply alternating current to the lamps direct from another set of taps on the transformer and no interruption in the performance is caused thereby. The transformer taps and resistances are so calculated as to eliminate the need for all adjustments. The entire outfit is self-contained and can be installed in a small room adjoining the operating room, so that there is introduced in the latter no fire hazard from fuses or hot resistances. These panels are made suitable for single-phase, two-phase or three-phase supply and for converter sizes ranging from 2.5 to 7.5 or even more kilowatts.



Automatic Feeder-Voltage Regulator.

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Electric railway construction in Canada aggregated 106 miles in 1912, and 204 miles in 1913.

Large Order for Automatic Feeder-Voltage Regulators.

What is said to be the largest order ever placed for feeder-voltage regulators has been given to the General Electric Company by the Commonwealth Edison Company, Chicago, Ill. It calls for 100 36-kilovolt-ampere, 60-cycle, 150-ampere, automatically operated induction regulators, designed for 2,400 volts primary and 240 volts secondary. This makes a total of approximately 400 regulators purchased by this company from the General Electric Company, Schenectady, N. Y. These 100 new regulators will maintain constant voltage on alternating-current feeders aggregating 36,000 kilovolt-amperes in capacity. A view of one of the new regulators is shown adjoining.

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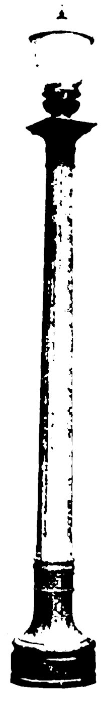
A New High-Efficiency Ornamental Street-Lighting Unit.

A strong tendency at the present time in street lighting is toward a single-light ornamental standard having a globe of ornate design. The lighting unit to meet these requirements, however, must also be of high efficiency.

Such a unit has recently been developed by the Holophane Works of General Electric Company, Cleveland, O., and is shown mounted on a standard in the accompanying illustration. The outer glassware of the unit consists of two pieces. The upper part is made of Pyro, a dense opal glass, and the lower part of a light-density opal glass or C. R. I. (crystal roughed inside) glass. As a result, the upper portion acts as a reflector, returning a considerable proportion of the upwardly directed light onto the street surface, where it becomes useful in performing its illuminating function. The lower part diffuses the intense light of the powerful lamp used. The unit is designed for use with the new high-efficiency nitrogen-filled Mazda tungsten lamps of either the multiple or series type. With a 750-watt multiple nitrogen lamp the maximum candlepower is 950 at an angle of about 65 degrees.



New Unit.

The appearance of this unit is ornamental and very pleasing. This, together with its high efficiency of light distribution, makes it ideal for business district and boulevard lighting.

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Large Electric Organ for Panama-Pacific Exposition.

One of the largest organs thus far erected in this country will be built for the Panama-Pacific International Exposition by the Austin Organ Company, of Hartford, Conn. The instrument will have 118 speaking stops and will be electrically controlled throughout. It will be installed in a festival hall on the exposition grounds in San Francisco and later will be erected for permanent service in a large auditorium in that city.

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Glass-Letter Sign for Department Store.

A new type of individual glass-letter sign has been placed on the market by the Federal Sign System (Electric), Chicago. The accompanying illustration shows one of these signs installed at the Wabash Avenue entrance of Charles A. Stevens & Brothers' store. This sign is made of the new six-inch miniature lamp letters and is one of the first signs of this type installed for outdoor use. Each letter is made in exactly the same manner as the 3.5-inch letter signs which have come into extensive use for indoor and window service. The new six-inch letters are made of slightly larger glass tubes and the filaments are arranged exactly like those in the well known smaller letters, but of course have greater candlepower and brilliancy.

CHAS. A. STEVENS & BROS.

Glass-Letter Sign for Chicago Department Store.

This sign is double-faced and is finished in natural bronze. Plate glass is used to cover the letters on each face, thus making the sign weatherproof.

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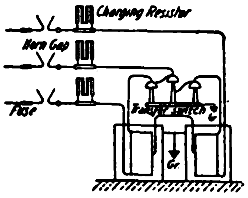
In Tokio, the capital of Japan, steel-taped lead-sheathed cables have been laid under the streets to connect urban substations with receiving stations located in the suburbs at the ends of high-tension transmission lines. These underground cables carry 12,000 volts.

A New Electrolytic Lightning Arrester.

For the protection of cable systems, motors and generators connected directly on a line without transformers, or transformers with weak insulation on their end turns, the Westinghouse Electric & Manufacturing Company has recently introduced a lightning arrester, known as the Type AK, with a charge-and-discharge resistor in series with the standard electrolytic element. This resistor serves to limit the charging current to a low value and to damp out any surges that might result in charging, particularly if the system contains enough capacity to produce resonance. The arrester is made for use on circuits up to 14,500 volts.

The electrolytic element consists of treated aluminum trays stacked one on another, separated and insulated from each other by porcelain spacers on the periphery of the trays, the number of trays in a stack depending upon the normal voltage of the line on which the arrester is to be used. The stacks of trays are suitably supported in frames, and each tray is filled with electrolyte. The stacks are then arranged in welded steel tanks and immersed in oil.



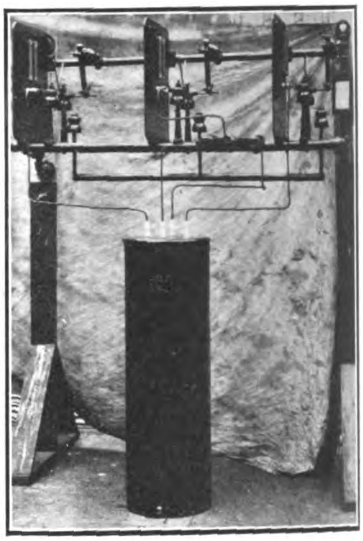
Connections of Lightning Arrester.

In actual operation a film of the electrolyte forms on the surface of each tray. This film has a high critical resistance at normal voltages, but the resistance becomes low at abnormal voltages. It therefore forms a free path for abnormal voltages or static charges, but upon cessation of the abnormal stress the film instantly regains its high resistance.

The arrangement of the trays and the electrolyte is such that the electrolytic element acts as an electrostatic condenser. The flow of current, due to the capacity of this condenser, varies inversely as the frequency of the circuit. Thus, at normal commercial frequencies the flow of current is small, but at the high frequencies of lightning discharges and static disturbances, considerable current flows through the element, increasing the action of discharging the static charges and preventing flow of current at normal frequency.

When an electrolytic arrester is being charged, surging currents are set up in the system. Under most conditions these are harmless, due to insulation of the apparatus connected in the same circuit. However, as above noted, there are cases in which these surges are dangerous and in order to remedy this danger a graphite resistor is used to damp out the surges and limit the charging current to a low and safe value.

This resistor is connected in series between the horn gap and the arrester in each phase. It is shunted, however, by a series of non-arcing metal spark gaps which are auxiliary to the main horn gap. In the operation of charging, the horn gap is short-circuited, as usual, and at the normal voltage of the circuit the charging current takes the resistance path rather than the shunt auxiliary gap path. On the occasion of a discharge due to lightning or static disturbances the auxiliary spark gap path is easily broken down, and the discharge passes through same rather than through the resistor, thereby assuring precisely the same freedom of discharge as in the case of an arrester which does not use the charging resistor. Upon the circuit being restored to normal voltage and frequency after the discharge, the auxiliary spark gaps cannot maintain the circuit and it is shunted to the resistance path. This action is very materially helped by the use of multiple gaps between non-arcing metal. The resistor limits the amount of dynamic current flowing, and thus helps in the final action of opening the circuit by the rise and final break of the arc on the horn gap.



New Electrolytic Lightning Arrester.

On each occasion of charging ungrounded-neutral arresters to rebuild these films, after once bridging the horn gaps, the leads connecting the two middle legs to the ground and to the center fuse, respectively, should be interchanged and the gaps again bridged, thus serving to charge all the legs of the arrester. To facilitate this charge, a transfer switch is provided as shown in the illustration. A handwheel is geared to this transfer switch in such a way that the switch can be reversed without the operator in any way coming in contact with live parts, the frame of the arrester being grounded.

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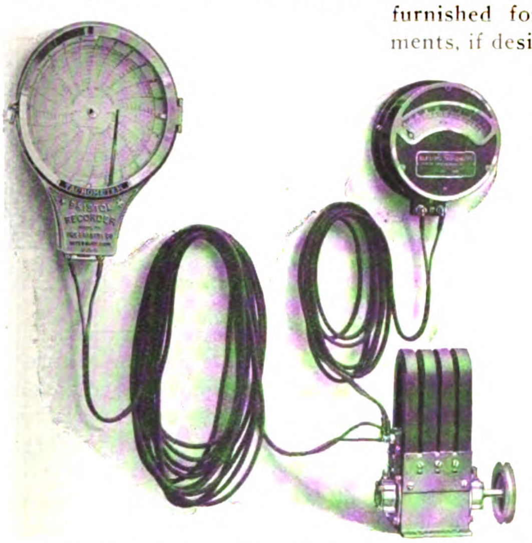
New Bristol Electric Tachometer of the Alternating-Current Type.

The field of usefulness for recording tachometers includes use in connection with all engines, machinery or revolving shafts wherever information is desired about the rate of speed at which shafting or any other devices are revolving. Some of the most important applications are in connection with engines, turbines, generators, paper machines, blast-furnace blowing engines, motors and pumps. Recording tachometers are usually required for continuous service under ordinary shop or mill conditions and for this reason must be made rugged and durable to be thoroughly successful.



Alternating-Current Recording and Indicating Tachometer.

A new Bristol's electric tachometer of the alternating-current type which is particularly well suited to rough operating conditions in mills, power plants or shops is being put on the market by the Bristol Company, Waterbury, Conn. Although this is an electric tachometer, no sliding contacts or brushes are used in it and no delicate millivoltmeter movements are required.

Two of the most important features of this electric tachometer which makes it particularly strong and durable are, the induction magneto and the voltmeter movement. The magneto, as shown in the accompanying illustration, is of the induction type without any sliding contacts or brushes. The indicating and recording instruments are voltmeters. The indicating instrument is equipped with a Weston pivot-jewel-bearing voltmeter movement. The recording instrument is equipped with an improved Bristol voltmeter movement so designed that there is plenty of power available for actuating the recording arm even though the recording pen is in continuous contact with the surface of the chart. In this recorder the movement is mounted on frictionless knife-edge bearings. This movement is equipped with a new patented supporting device for the moving elements designed to eliminate temperature error. This recorder can be furnished for use with either 12, 8 or 6-inch charts.

The illustration shows a combination indicating and recording unit, which provides an indicating instrument for the operator at his post of duty and a recording instrument for the superintendent or foreman in his office. Suitable lengths of leads can be furnished for locating either instrument at almost any desired point. Connections can be furnished for more than two instruments, if desired. A simple form of this tachometer can also be furnished either with the indicator alone or the recorder alone.

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Frink Banquet to H. W. Johns-Manville Company Branch Managers.

A very fitting close of the annual meeting of the managers of the electrical departments of the 47 branches of the H. W. Johns-Manville Company located in the principal cities throughout the United States and Canada, was the banquet recently given to those in attendance at the meeting by the management of I. P. Frink, for whom the H. W. Johns-Manville Company acts as sole selling agent. The details of the banquet which was given in the Gold Room of the Imperial Hotel, New York City, were planned and directed by W. H. Spencer.

G. F. Spencer, manager of I. P. Frink, gracefully performed the duties of toastmaster. J. W. Perry, W. H. Spencer, S. G. Meek, and many of the visiting branch electrical department managers added much to the pleasures of the evening and their responses had many touches of humorous and serious oratory. There was a splendid response by Bassett Jones, illuminating engineer, who was one of the guests.

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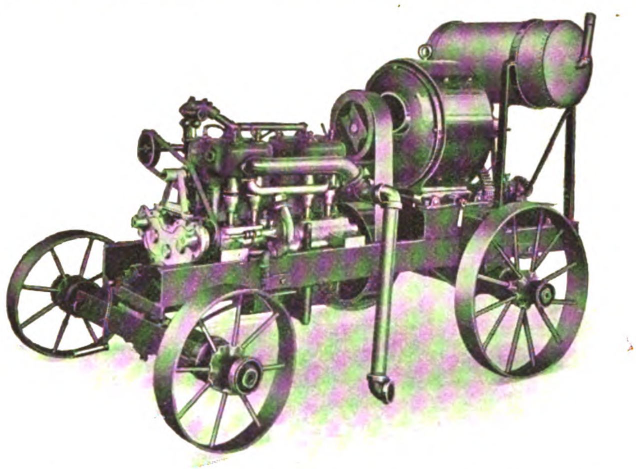
Generating Equipment for Lighting Amusement Devices.

The illustration herewith shows a portable generating equipment made up by C. W. Parker, manufacturer of amusement devices of all kinds. The outfit consists of a "Standard" 115-volt, compound-wound, direct-current generator made by the Robbins & Myers Company, Springfield, O., mounted with a gasoline engine on a steel-frame truck. The engine is of the automobile type and is connected to the generator by a short belt with idler-pulley attachment.

To meet the requirements of the various devices with which these generating outfits are used, five sizes are made, using Robbins & Myers generators of 2, 3, 5, 7.5 and 10 kilowatt capacity. The switchboard is mounted directly in front of the generator. It is equipped with the switch, fuses and a Ward Leonard wall-type rheostat.



Portable Gasoline-Engine-Driven Generating Equipment for Amusement Devices.

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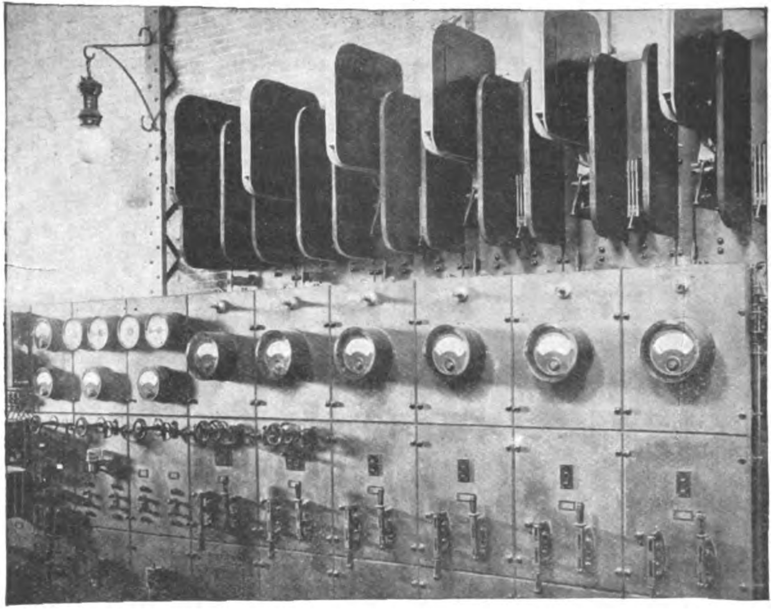
Low-Candlepower High-Efficiency Incandescent Lamps.

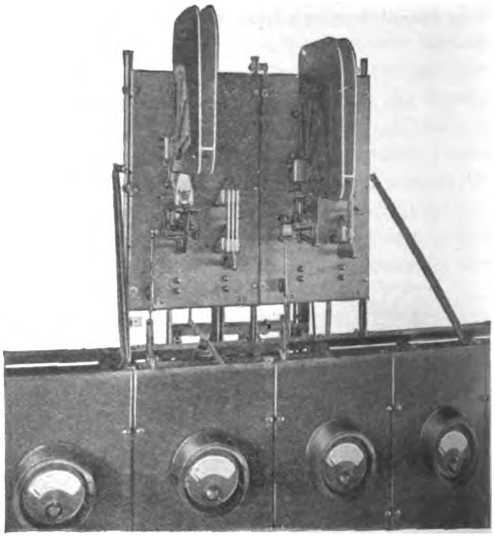
Nitrogen-filled lamps are now being supplied in Germany for automobile lighting in units as low as 45 candlepower for voltages between six and eight volts, and in 90-candlepower units for voltages between six and twelve volts. These lamps are said to consume 24 and 48 watts, respectively, thus having efficiencies of about 0.535 watt per candle. Spiral filaments are used. High-voltage units of low candlepower and high efficiency are being developed.

Switchboards for 2,400-Volt Direct-Current Railways.

The first 2,400-volt direct-current switchboards built in this country have been installed by the Butte, Anaconda & Pacific Railway Company in two substations supplying power to its 2,400-volt electric railway recently placed in operation. As described in the general article on this railway in our issue of March 14, 1914, in each station there are two 1,000-kilowatt motor-generator sets, each motor driving two 500-kilowatt 1,200-volt direct-current generators connected in series to give 2,400 volts, excitation current at a potential of 125 volts being furnished by separate exciters. The alternating-current control is along the usual lines for remote-control switching, but the control of the direct-current ends of the machines has several new and very interesting features.



2,400-Volt, Direct-Current Switchboard in Butte, Mont., Substation.



Enlarged View of Circuit-Breaker Panel.

The high-voltage direct-current generators are protected from injury in the case of overloads and short-circuits by a circuit-breaker of special design developed for use in 2,400-volt direct-current railway service. A remarkable feature of this circuit-breaker is the use of an arc chute provided with a magnetic blowout of great intensity, the pole pieces of the blowout coil being so designed as to distribute the magnetic flux uniformly over the whole arc chute, thus insuring that the direct-current arc will be ruptured when the circuit-breaker opens. This device has been subjected to a long series of short-circuit tests made under actual load conditions to insure absolute dependability.

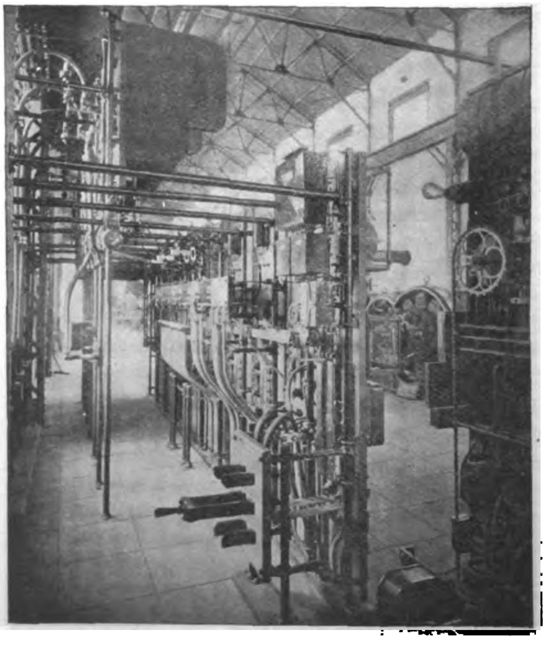
Low-voltage protection is secured by means of a low-voltage release coil, which, forming a part of the breaker and acting in conjunction with a speed-limiting device installed on the corresponding machine, prevents overspeeding by tripping out the breaker as soon as the speed for which it is set is passed.

Both the low-voltage release and a reverse-current relay are connected in the 2,400-volt circuit through high resistance and are insulated from the circuit-breaker so that the speed-limit device on the generator may be kept at ground potential. The low-voltage release must be set before the breaker will remain closed. This setting is accomplished by lifting the plunger by means of a wooden rod connected through a bell-crank mechanism to an operating handle on the front of the switchboard, the handle being pushed toward the switchboard. The breaker may be tripped manually by pulling the operating handle out to the limit of its travel. The circuit-breaker is also provided with a bell-alarm switch, which closes the bell circuit when the breaker opens, the circuit being opened again as soon as the main switch is closed.

The lever switches and circuit-breakers are mounted on insulators, thus providing effective insulation. Large clearances have been allowed for all current-carrying parts.

The main buses are located above and to the rear of the circuit-breaker panels—the latter being located back of the panels carrying the instrument and metering equipment—and are protected by an asbestos-lumber covering which inclines upward from the top of the circuit-breaker panels to the wall behind the switchboard, forming an effective barrier between the circuit-breakers and buses. This construction accomplishes a double purpose, both preventing circuit-breaker arcs from reaching the buses and also making it impossible for anything to fall on the buses from above.

All potential leads and buses are mounted on insulators, and the flexible shunt leads are carried in fiber tubes, also mounted on insulators. Every precaution has been taken to insure the safety of the operator. There are no high-voltage live parts exposed on the front of the panels, and the lever switches and circuit-breakers are mounted on separate panels back of the main switchboard, as stated above, and operated by handles on the front of the main panels, acting through wooden rods and suitable mechanism, thus insuring that the handles shall be perfectly insulated. The



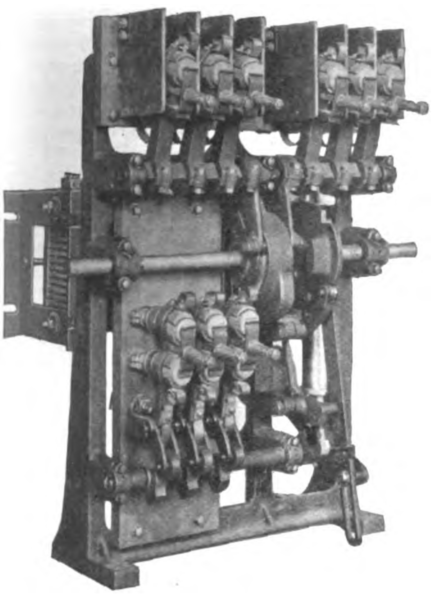
Rear View of 2,400-Volt Switchboard.

ammeters are incased in insulating covers, while the voltmeter, mounted on a swinging bracket, is connected to the circuit on the grounded side with the separate resistance on the positive side, thus making the potential from meter to ground a minimum.

These 2,400-volt switchboards were built by the General Electric Company, Schenectady, N. Y., and they have proved so satisfactory in operation that orders for others of the same general construction have followed.

Mechanical Elevator Controllers for Alternating-Current Equipments.

The new mechanical type elevator controller made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has been designed for use with polyphase motors. Because of the extensive use of central-station alternating-current service by factories, industrial plants, etc., a simple controller of the alternating-current type has been needed. The controller shown in the accompanying illustration has no electromagnets or sliding contacts; it is arranged to be operated from the car by means of a rope or lever. The operating shaft has an extension at each end so that the controller can be adapted for either right-hand or left-hand operation. This controller has the further advantage of operating satisfactorily on circuits having a very wide voltage variation.



Controller for Alternating-Current Elevators.

The primary circuit is controlled by two sets of switches, each set consisting of three single-pole switches, equipped with arcing shields. Each set of primary switches is operated by a special internal cam, arranged so as to give an absolute "knock out" to the switches when opening, and also an absolute "lock out" for the second set of switches, when the first set is thrown in.

The secondary resistance is cut out by three triple-pole cam-operated switches. Immediately after the primary switches are thrown in a catch is released, allowing a weight to drop, the motion of which is retarded by a suction dashpot. This weight in turn drives a shaft on which the necessary cams are mounted for throwing in the secondary switches. The secondary resistance is cut out simultaneously in all three phases of the rotor circuit, thus insuring a balanced condition at all times. The secondary resistance is reinserted upon the opening of the primary switches and a latching arrangement is also provided so as to prevent accidental operation of the controller.

The electrical butt-type contacts are of the same type throughout, thus simplifying renewal of parts subject to wear.

German Electrical Manufacturer Establishes Museum of Safety and Hygiene.

The Allegemeine Elektricitäts Gesellschaft, of Berlin, the largest German electrical manufacturing company, has established for its employees a museum of safety and hygiene. Several rooms are devoted to literature and objects explaining means of guarding against accidents from machinery, the giving of first aid to the injured, ventilation, physical culture, food and nutrition, with a special display warning against the abuse of alcoholic drinks.

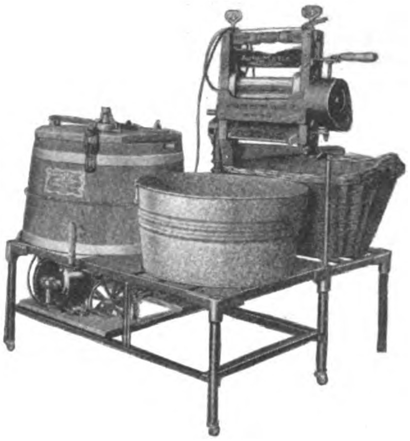
While Germany long has recognized the benefit of museums, this is the first case known there of a factory erecting a museum solely for its own workmen. However, the A. E. G., as the company is familiarly known, has long been actively interested in welfare work among its employees and only recently received a gold medal from the American Museum of Safety "in recognition of its very meritorious achievements in conserving life and limb in its great German establishments."

Electric Floating Crane.

A large floating crane of 150 tons capacity is being used at the Charleston Navy Yard. The entire mechanical equipment is electric-motor driven, the power being obtained from a generator direct connected to a Diesel oil engine and an Edison storage battery. The hoisting equipment consists of two main hoists each of 75 tons capacity, capable of operating simultaneously with a total capacity of 150 tons and an auxiliary trolley and hoist of 15 tons capacity. The total cost of the crane was over $294,000.

Automatic Electric Bench Washer.

A new type of electric washer has been placed on the market by the Automatic Electric Washer Company, Newton, Iowa. This outfit is designed for places where there is an exceptionally heavy washing to be done and where a machine of more than the customary capacity is needed. As shown in the illustration herewith, the machine has the regular Automatic washer tub and equipment and is mounted on an iron-framework bench with extension. In its extended form this bench can accommodate two additional tubs and a clothes basket. A swinging wringer is mounted on a post at the middle of the outfit and the wringer may be turned in any position about this central post. It can therefore be used in connection with any of the tubs; thus while the tub full of clothes is being washed in the electric washer another batch may be run through the rinsing or blueing water. It is also possible for two laundresses to work at the outfit at the same time. An advantage claimed for this type of washing outfit is that all of the washing, rinsing and blueing tubs can be mounted on one bench so that it is not necessary to lift these from place to place.



Automic Electric Bench Washer.

The main bench upon which the machine is mounted is 24 inches wide and 39 inches long. The extension table can be pulled out to increase the width by 20 inches. This extension or slide table is detachable and is readily moved. When the extension is pushed back into place the entire outfit occupies but small floor space and being mounted on castors can be moved about. The bench framework is constructed of gas pipe and angle irons and is exceptionally strong and yet not excessively heavy. The reversible wringer is of the ball-bearing pattern and has extra long coil springs to give a wide range of work of both light and heavy articles that can be wrung without changing the tension. The wringer has a safety release device.

Latest Approved Fittings

CONDUIT, Rigid. — National Enameling & Manufacturing Company, Youngstown, O.

"Enamelduct." Black enameled conduit.

"Armyduct." Galvanized exterior, black enameled interior.

"Alumaduct." Galvanized exterior, red-oxide baked enamel interior.

"Alumaduct Special." Red-oxide baked enamel interior, galvanized and red enamel exterior.

Conduit shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, has label attached to each length.

Approved March 6, 1914.

FLEXIBLE CORD.—Canada Wire & Cable Company, 1160-70 Dundas Street, Toronto, Canada.

Marking: One red and one black thread cabled with the copper strand.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 26, 1914.

FIXTURE WIRE.—Standard Underground Cable Company of Canada, Limited, Manufacturer, Hamilton, Ontario, Canada.

Marking: Green thread woven in braid in a clockwise direction.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 11, 1914.

INSULATING MATERIALS.—F. M. Williams, 1288 Prospect Avenue, Brooklyn, N. Y.

Red, white, brown and black insulating wax.

This wax has a melting point of approximately 215 degrees Fahrenheit, and may be used for sealing screw heads and live metal parts in electrical fittings where such sealing is required by rules of the National Electrical Code.

Approved March 19, 1914.

MUSICAL INSTRUMENTS.—The Rudolph Wurlitzer Company, Wurlitzer Station, Niagara County, N. Y.

Automatic pianos and orchestras operated pneumatically by a motor-driven bellows contained within the instrument cases. One-quarter horsepower and less, 110 and 220 volts, alternating current and direct current.

Approved March 19, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

PANELBOARDS.—Warder, Clark & Chaplin Electric Company, Incorporated, 406 East Main Street, Rochester, N. Y.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each panelboard.

Approved March 4, 1914.

RECEPTACLES, Standard. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Keyless, 660 watts, 250 volts.

Catalog No. 399, for use on metal ceilings.

Approved February 10, 1914.

SOCKETS, Standard. — The Arrow Electric Company, Hartford, Conn.

"Arrow E" brass shell sockets.

Key, 250 watts, 250 volts; catalog Nos. "Arrow Forty" 8,000, 8,001, 8,002, 8,006, 8,028, 8,033, 8,060, 8,062; "Arrow Twenty" 7,546, 7,548, 7,550, 7,552, 59,470, 59,481.

Key, 660 watts, 250 volts; catalog Nos. "Arrow Forty" 8,000W, 8,001W, 8,002W, 8,006W, 8,028W, 8,033W, 8,060W, 8,062W; "Arrow Twenty" 7,500W, 7,503W, 7,506W, 7,509W, 7,546W, 7,548W, 7,550W, 7,552W, 59,470W, 59,480W, 59,481W, 59,383W, 59,486W.

Keyless, 660 watts, 250 volts; catalog Nos. "Arrow Forty" 8,034, 8,061, 8,063; "Arrow Twenty" 7,547, 7,549, 7,551, 7,553, 59,471.

Pull, 250 watts, 250 volts; catalog Nos. "Arrow Forty" 8,513, 8,530, 8,531; "Arrow Twenty" 4,547, 4,549, 4,551, 4,553, 65,249.

Also above types with shadeholders attached; key type with composition or insulated metal key.

Approved March 19, 1914.

SOCKETS, Standard.—The Arrow Electric Company, Hartford, Conn.

"Arrow E" brass shell electrolier sockets.

Key, 250 watts, 250 volts; catalog Nos. 7,000, 7,002, 7,004, 7,010, 7,014, 7,017, 7,021, 7,024, 7,027, 7,030, 7,062, 7,068.

Keyless, 660 watts, 250 volts, short shell; catalog Nos. 7,003, 7,005, 7,061, 7,063, 7,066, 7,067, 7,069, 7,072-7,075 inclusive. Long shell: catalog Nos. 7,009, 7,011, 7,013, 7,015, 7,018, 7,020, 7,022, 7,025, 7,028, 7,031, 7,064, 7,070.

Pull, 250 watts, 250 volts; catalog Nos. 7,016, 7,019, 7,029, 7,032, 7,065, 7,071.

Keyless, 1,500 watts, 250 volts; catalog Nos. 5,000, 5,001.

Candle fixture socket, keyless, 660 watts, 250 volts; catalog No. 4,004, when installed with outer casing or "candle."

Also above type with shadeholder attached.

Approved March 18, 1914.

SWITCH BOXES.—Duncan Electric Company, Alton, N. H. "Gem." Cast-iron switch boxes for use with flexible tubing. Single, two and three-gang; catalog Nos. 14, 24 and 34. These boxes have lugs for supporting screws at one side and flanges for engaging laths at the other side.

Approved March 14, 1914.

SWITCHES, Push-Button Flush.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Push-button flush switches shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined and tested at factories and passed by Underwriters' Laboratories, have labels attached to each device.

Approved February 17, 1914.

TRANSFORMERS.—General Electric Company, Schenectady, N. Y.

"G. E." transformers, air-cooled for indoor and outdoor use with low-voltage incandescent lamps.

Type M. Sign-lighting transformers, 110 and 220 volts primary, 11 and 22 volts secondary, 250 to 2,000 watts.

Standard only when installed in accordance with Class C rules.

Approved March 19, 1914.

TUBING, Flexible.—The Insuladuct Manufacturing Company, St. Johns, P. Q., Canada.

Marking: "Insuladuct" stamped on the interior surfaces of the duck lining at intervals of 18 inches or less.

Flexible tubing shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, has label attached to tubing.

Approved February 21, 1914.

WIRES, Weatherproof.—National India Rubber Company, Wood Street, Bristol, R. I.

Tag on coil to read: "National Electrical Code Standard."

Approved March 12, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

PORTLAND, ME. — Carrabassett Light & Power Company has been incorporated for the purpose of owning, developing and operating water powers for general and special purposes. The capital stock is $50,000. G. H. Hinckley is president and J. F. Conner, treasurer.

ADAMS, MASS.—W. B. Plunket is to establish an electric power plant to light his summer home in Heartwellville, and it is understood that the capacity will be sufficient for the use of the village.

FARLEY, MASS.—A syndicate of Boston bankers allied with the house of C. D. Parker & Company, manager of a number of central stations in Massachusetts, has purchased real estate rights for the Franklin Power Company with the intention of developing hydroelectric power on Millers River at Farley, Mass. C. D. Parker, Bowen Tufts, Paul D. Webber and others are interested.

JERSEY CITY, N. J.—The City Centre Merchants' & Property Owners' Association has inaugurated a movement for the installation of a new brilliant electric street-lighting system along the business section of upper Newark Avenue. Michael Sexton is president. A.

NEWARK, N. J.—The Public Service Electric Company has been granted permission to install underground conduits in Park Place and Centre Street, from Broad to Mulberry Street. A.

SUMMIT, N. J.—The Commonwealth Water & Light Company is planning for the extension of its system at Florham Park; permission for the work has been asked. A.

TRENTON, N. J.—The Board of Public Utility Commissioners has approved an application of the Jersey Power Company for an issue of capital stock in an amount of $40,000. The company will devote the proceeds of the issue for the construction of a transmission line from Boonton *via* Fox Hills to Millbrook, from Millbrook to Dover, from Dover to Wharton, including a branch to Rockaway, a total line of 15.25 miles.

WHARTON, N. J.—The Jersey Corporation has acquired right of way for the erection of a new power-transmission line to Main Street. A.

SOUTH ATLANTIC STATES.

GREENVILLE, S. C.—A charter has been issued to the Buncomb Road Electric Light Company, with a capital of $500. The incorporators are H. Y. Thackston, president; W. M. Hamilton, vice-president; R. K. Taylor, secretary and treasurer. The company will operate an electric light plant.

CHIPLEY, FLA.—The Chipley Light & Power Company, will establish an electric light plant here at a cost of $10,000.

DAYTONA, FLA.—An electric-light plant will be established at Wilbur-by-the-Sea. Address J. W. Wilbur, Brookline, Mass., for desired information.

LEESBURG, FLA.—The Leesburg Ice Company, will enlarge its electric-light plant.

NORTH CENTRAL STATES.

BELLEFONTAINE, O.—Bellefontaine is preparing to equip its municipal light and water plant with turbine engines and continue to generate its own electric current and pump its own water. Address the village clerk for further information.

LOGAN, O.—The right of way for the high-tension transmission line of the Ohio Light & Power Company from this city to New Straitsville, a distance of 18 miles, has been secured, and construction work will begin shortly. J.

SEBRING, O.—A subscription list for raising funds to erect the proposed lights on Fifteenth Street is being circulated and it is meeting with success. Address the city clerk.

HUNTINGTON, IND.—A bond issue of $30,000 has been authorized for the purpose of reconstructing and enlarging the electric plant, which will furnish current for power and light.

MARTINSVILLE, IND.—The electric lighting system will be considerably extended, the improvements including an ornamental lighting system for the public square at an estimated cost of $1,000. G

LANSING, MICH.—April 15 bids will be received for the construction of a combined electric-lighting and water-supply system at the Hanson State Military Reservation, near Grayling, Mich. Address Walter G. Rogers, Q. M., for particulars.

SUTTON BAY, MICH.—Sutton Bay Telephone Company has been incorporated with a capital stock of $4,950.

OGEMA, WIS.—The Ogema Telephone Company has been incorporated with a capital stock ranging from $3,500 to $7,000.

SIREN, WIS.—Siren Telephone Company has been incorporated with a capital of $2,500 by Charles Short, John Thader, Fred Johnson, John A. Anderson and Emil Johnson.

CLARA CITY, MINN.—The Montevideo Light & Power Company will build a line here from Sacred Heart and furnish power from Minnesota Falls.

TRUMAN, MINN.—A meeting was held to discuss electric lighting and the majority favored a municipal plant to cost $4,000. Address the city clerk.

WACONIA, MINN.—The Norwood-Young America Telephone Company has been granted a franchise. Charles A. Reilm is village recorder.

CLARINDA, IOWA.—The Lee Light & Power Company has been incorporated with a capital stock of $500,000. The concern has the lighting franchises for Clarinda, Gravity, New Market, Corning, Blanchard, College Springs, Braddyville, Shambaugh and also for wholesale light and power to the Bradford Light & Power Company.

EARLHAM, IOWA.— Bonds have been voted and bids will be asked for electric equipment. Address Dr. E. S. Day, mayor, for further information.

MANILLA, IOWA.—A $20,000 electric light plant will be installed. Address the city clerk.

NEVADA, IOWA.—Contract has been signed by the Iowa Railway & Light Company, and the Lookingbill & Enfield Company, of Maxwell, for electric service between Nevada and Maxwell. A transmission line will be so constructed as to handle a load of electricity sufficient to supply the needs of Maxwell, Collins and Rhodes.

PATON, IOWA.—At a special election held here it was decided to bond the town for the purpose of installing an electric light system.

KANSAS CITY, MO.—A power plant will be erected in Kansas City by the Christian Church, in connection with a new hospital. J. W. Perry, of the Christian Church Hospital Association, is in charge of plans. M.

KANSAS CITY, MO.—The Automatic Electric Light Company has been incorporated to do business in Kansas City with a capitalization of $100,000. The incorporators are William F. Warner, who is the principal stockholder; F. H. Willmont and W. H. Maloney. The company will manufacture and deal in automatic individual light plants for both domestic and other use. M.

SENATH, MO.—Senath Light & Power Company, has been incorporated with a capital stock of $10,000. The incorporators are W. W. Watson, J. L. Davis and Alvin Chapman.

LARNED, KANS.—$90,000 will be expended for a municipal light and power plant. Address the city clerk.

MARYSVILLE, KANS. — A plan for the harnessing of the Big Blue River has been outlined by Charles O. Beardslee and E. G. Ward, who have established offices here. It is proposed to establish four dams, and to secure about 6,000 horsepower with which to provide light, heat and power within a radius of 100 miles.

PFEIFER, KANS.—The Farmers' Telephone Company has been incorporated for $5,000 to build an exchange and several lines. M.

WESKAN, KANS.—The Kansas State Irrigation Board will establish a power plant for irrigating purposes near here. R. P. Hines, of Topeka, is chairman of the Board. M.

SOUTH CENTRAL STATES.

FULTON, KY.—Plant extensions are planned by the Fulton Electric Light & Power Company, during the year. G.

LOUISVILLE, KY. — Scottsville Electric Light Company, has been incorporated with a capital of $5,000 by J. D. Read, J. B. Dodson and H. L. Hendrick.

WHITESBURG, KY.—Henry Day, Samuel Collins, Stephen Combs and others have organized a $5,000 stock company to build an electric light plant here.

JOHNSON CITY, TENN.—A project for the construction of an electric light plant is being pushed by the Commercial Club. A franchise will be offered for sale shortly, and it is understood that it will be taken up at once.

MEMPHIS, TENN.—The Memphis Automatic Telephone Company has been incorporated with a capital stock of $2,000,000 by C. W. Thompson, J. B. Goodbar and others.

NASHVILLE, TENN.—Powell Valley Telephone Company has been incorporated with a capital of $1,000 by Boyd Miller, W. R. Lewis, L. C. Mullens, R. R. Miller and W. E. Kincaid.

GADSDEN, ALA.—A joint committee of the City Council and Chamber of Commerce recommended that a municipal electric light plant be established. Address J. H. Holcombe, mayor, for particulars.

COLUMBUS, MISS.—The Mississippi Electric Railway Company has been incorporated to construct and operate an electric railway in Mississippi. The incorporators are Charles E. Sherrod, G. T. Banks and others.

CORINTH, MISS.—A new motion-picture theater is being built here. Address Edward Machette, 402 Waldron Street, regarding the electrical equipment.

HOMINY, OKLA.—Hominy Light, Ice & Power Company, has been incorporated with a capital of $15,000 by Harry Askin, D. Mason and F. M. Overlees.

ALPINE TEX.—Alpine Light & Ice Company has been incorporated with a capital of $20,000 by J. D. Jackson, S. D. Harmon and George Miller.

CARLSBAD, TEX.—The Texas Tuberculosis Sanitarium Company is having plans prepared for an electric light plant to cost $9,000. D.

DALLAS, TEX.—The Kelmont Electric Company has been organized here with a nominal capital of $5,000. Its purpose is to construct electric and belt railways in and near Dallas. J. A. Sanders is interested. D.

DAYTON, TEX.—J. B. Sterling and associates will construct an electric light and power plant here. D.

FORT WORTH, TEX.—The Fort Worth-Denton Interurban Railway Company contemplates the construction of an electric road between Fort Worth and Mineral Wells, Tex. Work probably will begin as soon as the Fort Worth-Denton line is completed. E. E. Baldridge, Fort Worth, is president. M.

FRANKLIN, TEX.—A bond issue of $17,500 has been voted here for the purpose of installing an electric light plant and waterworks plant to replace those recently destroyed by fire. D.

WESTERN STATES.

FORT BENTON, MONT.—Articles of incorporation of the Floweree Mutual Telephone Company have been filed, capitalized at $20,000. The incorporators are R. E. Baker, R. D. Lohr, M. Sinclair, and others of Floweree. The Company purposes establishing and carrying on a telephone business in Choteau and Cascade Counties, with headquarters in Floweree. O.

MISSOULA, MONT.—M. D. Flynn, of Potomac; W. L. Stockton, of Clearwater, and others recently filed articles of incorporation for the Big Blackfoot Telephone Company, capitalized at $10,000. The Company will build the telephone line from Missoula to Bonner, to Potomac, and from there to Ovando.

PHILLIPSBURG, MONT. — The Royal Basin Mining Company, operating at Maxville recently announced its intention of installing an electric power plant at the North Star Copper mines near here. O.

ALAMOGORDO, N. M.—The Alamogordo Light & Power Company has been organized here with a capital stock of $25,000. W. R. Eidson is interested. D.

POCATELLO, IDAHO. — Harry Schildhauer, M. J. Sweeley and H. A. Stroud recently filed articles of incorporation of the Idaho Pacific Railway. The Company purposes building 100 miles of interurban railway to connect Twin Fall County with the Haggerman Valley. The Company is capitalized at $250,000. For further information address Henry Schildhauer, treasurer. O.

NOGALES, ARIZ.—Announcement has been made that the Mountain States Telephone & Telegraph Company will begin in May the installation of a new telephone system in this city.

BUCKLEY, WASH.—The Buckley Electric Company has been granted a franchise for an electric system in this city.

SPOKANE, WASH.—The Salmon River Power & Light Company has been organized with a capital stock of $400,000 for the purpose of developing power near Shannon, in Idaho. H. M. Boomer, C. L. Mackenzie and Edward Rigg are among those interested in the proposition.

WILSON CREEK, WASH.—Grant County Power Company, has been incorporated with a capital of $40,000 by D. O. Friel, S. W. Roberts and Barton Morgan.

GLENDALE, ORE.—The California-Oregon Power Company has been granted a 50-year franchise to maintain an electric distributing system in this city.

GRANTS PASS, ORE.—The Rogue River Public Service Corporation recently filed an application with State Engineer John H. Lewis for a right to install the second largest power plant in the state of Oregon at Hells Gate, on the Rogue River, near this city. The project includes the construction of a dam 200 feet high. The proposed plant, it is understood, will develop 41,320 horsepower. O.

PORTLAND, ORE.—S. Carver, promoter of the Portland & Oregon City Railway Company, has outlined a system of new interurban electric car lines, connecting this city with Damascus *via* Happy Valley, and Stone and Logan *via* Harmony, Clackamas and Clear Lake.

CALISTOGA, CAL.—The Commission has granted authority to the Napa Valley Electric Company to serve consumers in Napa Valley from Bale station to the northerly limits of Napa County except the town of Calistoga, which is served by the Calistoga Electric Company.

FRESNO, CAL.—The San Joaquin Valley Telephone Company has been incorporated with a capital stock of $10,000 by Frank H. Edwards, James M. O'Brien and Luther P. Spalding, for the purpose of building a telephone line from Graham to Jameson.

HARBOR, WASH.—A. R. Byrd has been granted the franchise for an electric light system here.

LOMPOC, CAL.—Representatives of the San Joaquin Light & Power Company have been investigating conditions with a view of extending the company's lines into this valley.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed here for the Fresno Interurban Railway Company, with a capital stock of $250,000, by G. H. Bradner, J. B. Rogers and P. F. Fratessa.

SOUTH PASADENA, CAL.—Electricizing the Santa Fe Railroad from Pasadena to Los Angeles is the latest suggestion for solving the traffic problem between these two cities.

TERRA BELLA, CAL.—The Mt. Whitney Power Company will begin shortly the erection of substation one mile east of this city.

DAWSON, Y. T.—This city is preparing to install a municipal telephone, water, light and power plant, and the Civic League, comprising the leading citizens of the city, has taken up the matter of raising $200,000 to defray the cost of installation. O.

HOLLY, COLO.—The present telephone service given by the Holly Telephone Company is unsatisfactory and a new company will be organized. J. Habiger is interested

NEW PUBLICATIONS.

LONG-DISTANCE TELEPHONY. —The article in the *Electrician* by Bela Gati entitled "The Use of Telegraph Lines for Long-Distance Telephony" has been issued as a reprint.

LABORATOIRE CENTRAL.—Vol. III of the "Travaux du Laboratoire Central d'Électricité," covering the year 1912-1913, has been published by the director, P. Janet, under the auspices of the Société Internationale des Électriciens.

WISCONSIN ASSOCIATION PAPERS.—The papers presented at the sixth annual convention of the Wisconsin Electrical Association, held at Milwaukee, January 15 and 16, have been published in pamphlet form by the Association, of which the secretary is George Allison, of Milwaukee.

TELEPHONE POLES. — Bulletin No. 67 of the United States Department of Agriculture is entitled "Tests of Rocky Mountain Woods for Telephone Poles," by Norman D. Betts and A. L. Heim. This gives the results of a number of tests for mechanical strength upon poles of western red cedar lodgepole pine and Engelmann spruce. Results are also given of some tests by the Pacific Telephone & Telegraph Company.

NEW INCORPORATIONS.

NEW YORK, N. Y.—The Hamilton Electric Company has been incorporated, capitalized at $10,000, by J. G. Feldman, M. Goldman and I. Rottenberg.

ST. LOUIS, MO.—Shiras Electric Company has been incorporated with a capital stock ranging from $40,000 to $150,000.

BROOKLYN, N. Y.—Phoenix Electric Lamp Company, Incorporated, has been incorporated, capitalized at $1,000, by Charles O'Sullivan, Michael J. Villamena and F. I. Connolly, all of New York City.

HOUSTON, TEX.—Federal Sign System (Electric) of Texas has been granted articles of incorporation, capitalized at $10,000. The incorporators are James M. Gilchrist, P. G. Dedmon and F. B. Potter.

COVINGTON, KY.—Electrically-driven machinery will be used in the plant of the Liberty Cherry & Fruit Company, recently incorporated with a capital stock of $10,000 by Edgar Bettman and others. G.

WILMINGTON, DEL.—National Transportation & Electric Service Corporation has been incorporated with a capital stock of $2,500,000. The incorporators are Herbert E. Latter, W. J. Maloney, Oscar J. Reichard, all of this city.

PEORIA, ILL.—Kiso Electric Company has been incorporated to manufacture electric-lighting systems and accessories. The capital stock is $50,000 and the incorporators are W. K. Kiso, J. H. Lockwood and H. D. Clarke.

NEWARK, N. J.—Dennison & Buck Company has been incorporated to manufacture electrical goods. The capital stock is $50,000 and the incorporators are M. Cohen, Brooklyn, N. Y., I. Simon and B. Strauss, of New York City.

LUZERNE, N. Y.—The Riddell Electric Light Company, Incorporated, has been granted articles of incorporation, capitalized at $10,000. The incorporators are Edward E. Riddell, Myron B. Riddell and Edward J. Riddell, all of this place.

RANDOLPH, N. Y.—Randolph Light & Power Company, Incorporated, has been incorporated with a capitalization of $20,000. The incorporators are Albert J. Woodworth, Grace D. Woodworth and Joseph W. Grace, all of this place.

WORCESTER MASS.—American Model & Instrument Company has been incorporated with a capitalization of $50,000 to deal in electrical and mechanical devices. The incorporators are W. W. Johnson, J. V. Critchey, C. J. Rohland, Worcester.

ROCHESTER, N. Y.—The Rochester Electric Contracting Company, Incorporated, has been granted articles of incorporation. The capital stock of the company is $10,000 and the incorporators are Richard G. Finucane, Bernard E. Finucane and John J. Finucane, all of this city.

NEW YORK, N. Y.—Shotwell Electric Weather Vane Company, Incorporated, has been granted articles of incorporation, capitalized at $1,000. The incorporators are Willetts H. Shotwell, Glen Cove, of New York City, and Henry A. Ingraham and Edward M. Thomas, of Brooklyn, N. Y.

PROPOSALS.

ELECTRIC LIGHTING SYSTEM.—April 30 bids will be received for labor and materials required in the construction of an electric lighting system for Elk Point, S. D. Address A. Smythe, city auditor.

TURBOGENERATOR UNIT.—Bids will be received April 16 for furnishing and installing one turbogenerator unit and condenser for the city water and light plant, Columbia, Mo. Address John S. Bicknell, city clerk.

ELECTRICAL SUPPLIES.—Bids will be received April 20 for furnishing of supplies for the City Electric Light Plant, Indianola, Iowa, for the purposes of the city for the fiscal year ending April 1, 1915. Address W. A. Graves, city clerk.

DRY BATTERIES.—Sealed proposals will be received at the office of the Depot Quartermaster, United States Army, Jeffersonville, Ind., until May 1 for furnishing 36 dry batteries under Schedule 870. Joseph T. Davidson is Major of the Quartermaster Corps.

GENERATORS—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 5, for furnishing two 900-kilowatt 200-volt generators, as per Schedule 6603, for delivery at the Navy Yard, Brooklyn, N. Y.

MOTOR-DRIVEN MACHINERY.—Sealed proposals will be recieved by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 19 for furnishing various motor-driven machines, for delivery at the Navy Yard, Mare Island, Cal., as per Schedule 6638.

ELECTRICAL EQUIPMENT.—Bids will be received on April 20 for one 150-gallon electrically driven centrifugal pump; two 80-horsepower boilers, one feed pump and heater, one 90-horsepower high-speed automatic engine; one 60-horsepower generator and switchboard, etc. Address J. McR Bracy, mayor, Rowland, N. C.

SUBMARINE ELECTRIC CABLE.—Sealed proposals will be received at the office of the Lighthouse Inspector, Detroit, Mich., until April 21 for furnishing submarine electric cable for light and fog signal station at Ashland, Wis. Blank proposals, etc., may be obtained from the Lighthouse Inspector, Post Office Building, Detroit, Mich.

MOTOR-GENERATOR SETS.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until May 7 for furnishing two motor-generator sets, capacity 10 kilowatts, 115 volts direct current, together with necessary starting compensators and field rheostats. Joseph E. Kuhn is the Lieutenant Colonel of Engineers.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Purchasing Agent, Commissioners of the District of Columbia, Washington, D. C., until April 27 for furnishing one voltmeter, two ammeters and one millivoltmeter, and 10 battery jars, 10 pounds copper wire, 5 pounds magnet wire, 50 electric carbon lamps, 100 lamp receptacles, 3 plugs, 3 caps, 4 large primary and secondary coils and 4 dynamos for the Business High School. For further information address the Purchasing Agent at Washington, D. C.

FINANCIAL NOTES.

Directors of the American Light & Traction Company have re-elected officers. Secretary C. N. Jelliffe was also elected second vice-president.

At the annual meeting of the Cities Service Company, stockholders authorized an increase in the capital stock from $50,000,000 to $65,000,000. Paul R. Jones was elected a director to succeed W. F. Hoffman, deceased. Other directors were re-elected.

The Utah Power & Light Company has filed a trust deed with the Guaranty Trust Company and William C. Cox, trustee, to secure a $100,000,000 thirty-year five-per-cent bond issue, payable February 1, 1944. The issue will be used to take up $22,000,000 Utah Securities short notes, and $10,000,000 of the bonds have been sold.

The United States Light & Heating Company at a special stockholders' meeting held at Portland, Me., approved an issue of $1,500,000 fifteen-year six-per-cent first-mortgage serial bonds. The company has no outstanding bonds. It is proposed to use the proceeds of this issue for additions and betterments of the company's property.

Southern Canada Power Company, recently incorporated, has taken over the South Shore Power & Paper Company, the St. Johns Electric Light Company and the St. Hyacinthe Gas, Electric & Power Company. The new company also controls three water power sites on the St. Francis River. The new company has an authorized capitalization of $3,000,000 stock and $3,000,000 bonds, of which $2,600,000 of the stock and $572,500 bonds have been issued. Floating debt of the underlying companies has been provided for and bonds and common stock of the new company will be taken in exchange for a part of the securities of the old companies. It is estimated that the earnings will provide for all bond interest and leave a balance of $7,000.

The city of Chicago will receive $3,299,000 as its share of the net earnings for the last year of the surface railways, according to the annual reports of the companies just made public.

Under the terms of a franchise granted the surface lines eight years ago, the city receives 55 per cent of the net earnings. The traction fund which has accumulated amounts to about $14,000,000.

Dividends.

	Term.	Rate.	Payable.	Date. Record
*Am. Lt. & Trac.	Q	2.5 %	May 1	
Am. Lt. & Trac.pf.	Q	1.5	May 1	
Bklyn. City R. R..	Q	2.	April 15	April 8
Comnwlth Edison.	Q	2.	May 1	April 15
Edison. Bklyn..	S-A	$4.	May 1	April 18
Elec B & S Com.	Q	2.	April 15	April 14
Elec B & S pf....	Q	1.5	May 1	April 22
FtWorth P&Lt pf.	Q	1.75	May 1	April 22
Gd. Rapids Ry pf.	Q	1.25	May 1	April 15
Nat'l Carbon pf..	Q	1.75	May 15	April 15

*And 2.5 per cent.

Reports of Earnings.

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

The Public Service Corporation of New Jersey has issued its report for the year ended December 31, 1913. The combined income account of the Public Service Corporation and affiliated corporations compares as follows:

	1913.	1912.
Gross revenue	*$37,279,319	$34,593,808
Expense taxes and amortization	19,852,198	18,501,512
Net revenue	17,427,121	16,092,297
Charges, etc.	15,178,922	14,039,071
Surplus	†2,248,199	2,053,224

*Including miscellaneous income.

†Equal to 8.99 per cent on $25,000,000 capital stock against 8.21 per cent on same stock previous year.

MONTANA POWER COMPANY.

The Montana Power Company reports for the year ended December 31, 1913, as follows:

Gross	$3,532,162
Net after charges	2,414,388
Total income	2,421,424
Surplus after charges	1,516,869
Preferred dividend	677,026
Common dividend	536,635
Surplus	303,208

UTAH SECURITIES CORPORATION.

Utah Power & Light Company and Western Colorado Power Company subsidiaries of Utah Securities Corporation report combined earnings for February, 1914, and the six months and 12 months ended February 28 as follows:

	1914.	1913.
February gross	$ 168,445	$ 132,799
Net after taxes	92,552	79,211
Six months' gross	963,232	765,100
Net after taxes	556,716	420,659
Twelve months' gross	1,828,978	1,503,122
Net after taxes	1,086,560	809,972

AMERICAN POWER & LIGHT.

Two operating subsidiaries of American Power & Light Company report as follows for February and the twelve months ended February 28, 1914:

	1914.	1913.
Pacific Power & Light:		
February gross	$ 106,023	$ 99,021
Net after taxes	54,337	46,306
Surplus after charges	23,070	20,756
Twelve months' gross	1,301,763	1,258,208
Net after taxes	642,297	613,084
Surplus after charges	289,018	323,346
Balance after preferred dividends	44,018	84,596
Kansas Gas & Electric:		
February gross	$ 115,461	$ 100,693
Net after taxes	41,855	34,638
Surplus after charges	27,129	20,581
Twelve months' gross	1,063,671	957,411
Net after taxes	387,353	327,997
Surplus after charges	210,600	168,228
Balance after preferred dividends	105,600	63,228

WASHINGTON RAILWAY & ELECTRIC.

The Washington Railway & Electric Company reports for the year ended December 31, 1913, compared as follows:

	1913.	1912.
Gross earnings	$4,943,315	$4,648,328
Expense and taxes	2,669,972	2,528,224
Net	2,273,343	2,120,104
Other income	10,222	13,233
Total income	2,283,565	2,133,337
Fixed charges	1,126,916	1,107,607
Surplus	1,156,649	1,025,730
Preferred dividends	425,000	425,000
Surplus	*731,649	600,730
Common dividends	422,500	260,000
Surplus	309,149	340,730

*Equal to 11.25 per cent on $6,500,000 common stock, as compared with 9.24 per cent earned on same stock in previous year.

CANADIAN GENERAL ELECTRIC COMPANY.

The report of the Canadian General Electric Company for the year ended December 31, 1913, shows gross profits of $2,029,898, an increase of $18,180. The income account compares as follows:

	1913	Increase
Gross profits	$2,029,898	$ 18,180
Depreciation	470,933	14,575
Balance	$1,558,966	$ 3,605
Interest	222,655	63,778

CITIES SERVICE PROFITS UP.

The report of the Cities Service Company for the fiscal year ended February 28, 1914, shows net earnings of $2,571,241, against $1,218,367 the preceding year. The income account compares as follows:

	1914.	1913.
Gross	$2,657,931	$1,284,868
Net	2,571,241	1,218,367
Surplus after charges	2,389,845	1,218,367
Preferred dividend	1,055,510	636,564
Surplus	1,334,335	581,803
Common dividend	556,408	250,166
Balance	777,927	331,637

President Henry L. Doherty, in his remarks to the stockholders, says: "Although general business conditions throughout the country have been below normal, it is gratifying to note the continued increase in the company's earnings, thus bearing out the oft-repeated statement that public utilities' earnings are not seriously affected by periods of business inactivity.

"Since the last report the earnings of the company, after deducting expenses and interest charges, have increased from 1.91 to 2.25 times the dividends on the preferred stock and the percentage of earnings to common stock has increased from 9.82 to 11.06 per cent."

WESTERN ELECTRIC COMPANY.

The Western Electric Company has issued its report for the year ended December 31, 1913. The income account compares as follows:

	1913	1912	1911
Gross sales	$77,532,860	$71,727,329	$66,211,975
Other income	720,556	1,194,010	337,293
Total income	78,253,416	72,921,339	66,549,268
Manufacturing costs, expenses, etc.	71,689,555	67,211,339	62,414,067
Net earnings	6,563,861	5,710,000	4,135,201
Charges	892,166	856,735	854,909
Surplus	*5,671,695	4,853,265	3,280,292
Dividends	1,500,000	1,500,000	1,500,000
Reserve	2,500,000	2,000,000	800,000
Employes' benefit	....	285,855	....
Surplus	1,671,695	1,067,410	980,292

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*Equal to 37.81 per cent earned on $15,000,000 capital stock compared with 32.36 per cent earned on same stock previous year.

President H. B. Thayer says:

"In view of the prospect of a smaller business in our own products in 1914, and some changes in types, it has seemed advisable to apply more than the usual depreciation to our valuation of completed merchandise.

"We have hitherto merged in our accounts our foreign investments in plant. merchandise and accounts receivable. This year we have segregated these items, and the item "sundry investments" includes all investments outside of the United States. This change in accounting has necessarily decreased other accounts, particularly plant and merchandise accounts, and has correspondingly increased the "sundry investments" account.

"A large part of our manufacturing plant is of recent construction and, therefore, the standard rates of depreciation reserve have not sufficed to produce a net valuation as low as conservative accounting would dictate on a highly specialized plant, nor as low as the valuations of other manufacturing plants comparable with ours. We have, therefore, applied this year an extra depreciation to our plant accounts which we have charged to reserve for contingencies."

AMERICAN GAS & ELECTRIC.

Five subsidiaries of the American Gas & Electric Co. report for the twelve months ended February 28, 1914, as follows:

	1914.	1913.
Canton Electric:		
Gross earnings	$441,064	$351,027
Net after taxes	217,021	176,016
Surplus after charges	153,536	119,348
Muncie Electric Light:		
Gross earnings	458,749	404,366
Net after taxes	193,985	168,129
Surplus after charges	107,583	85,406
Rockford Electric:		
Gross earnings	471,315	422,744
Net after taxes	253,766	214,919
Surplus after charges	156,734	120,352
Scranton Electric:		
Gross earnings	990,643	810,191
Net after taxes	613,833	464,099
Surplus after charges	403,414	309,635
Wheeling Electric:		
Gross earnings	318,275	265,869
Net after taxes	152,379	119,894
Surplus after charges	83,735	55,955

CANADIAN WESTINGHOUSE COMPANY.

The report of the Canadian Westinghouse Company, Ltd., for the year ended December 31, 1913, shows net earnings of $1,022,619, against $1,050,124 the previous year. The balance available for dividends was $923,919, equal to 18.5 per cent on the capital stock, as compared with 21.23 per cent earned in 1912. The income account compares as follows:

	1913.	1912.
Net earnings	$1,002,619	$1,050,124
Deposits and revenues	50,000	50,000
Interest	28,700	.....
Balance	$ 923,919	$1,000,124
Dividends	445,027	399,762
Surplus	$ 478,892	$ 600,362
Previous surplus	1,302,599	1,050,845
Total surplus	$1,781,491	$1,651,207
Written off property and plant	250,000	348,606
P. and L. surplus	$1,531,491	$1,302,601

Vice-president H. H. Westinghouse, in his remarks to the stockholders, says:

"The year opened with a good volume of orders brought forward from 1912, and with a satisfactory influx of new business during the earlier months, which together carried this year's shipments to a new maximum notwithstanding a falling off in activity during the closing months. This later reduced rate of activity was the company's share in the widespread and cumulative curtailment of trade which, starting in the West, had by the year's end made its influence felt by practically every industry in Canada. Consequent reduced forces and shortened hours of manufacture have operated to reduce somewhat the ratio of profit. The diminution in receipt of orders has been accompanied by little if any cessation in activity of those departments having to do with inquiry and quotation, and this with the growing tendency to easier money conditions is the present favorable feature."

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 13.	April 6.
American Tel. & Tel. (New York)	120	122
Commonwealth Edison (Chicago)	137	139
Edison Electric Illuminating (Boston)	255	256
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	145	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric common (Boston)	11	11
Massachusetts Electric preferred (Boston)	61	61¼
National Carbon common (Chicago)	109½	108½
National Carbon preferred (Chicago)	119	117½
New England Telephone (Boston)	135	136
Philadelphia Electric (Philadelphia)	27	26⅝
Postal Telegraph and Cables common (New York)	82	82½
Postal Telegraph and Cables preferred (New York)	69	69
Western Union (New York)	62¼	62½
Westinghouse common (New York)	73½	74
Westinghouse preferred (New York)	117	118

PERSONAL MENTION.

MR. H. F. HOLLAND, western representative of the Simplex Electric Heating Company, has returned to Salt Lake City, Utah, after a month's time spent in California looking over the field there.

MR. FRANK H. SOMMER, Newark, N. J., counsel to the Board of Public Utility Commissioners, gave an address on "The Public Utilities Law" before the Union County Bar Association, at Elizabeth, N. J., on April 9.

MR. MORT H. DODGE, district manager of the Standard Electric Time Company, with headquarters at Seattle, Wash., supervised the recent installation of time service clocks for his company in Salt Lake City.

MR. VICTOR E. THURMAN, formerly with the Richfield (Utah) Light & Power Company is developing an invention of his own consisting of an electric illuminating sign to be attached to an incandescent or arc-lamp post on business streets for advertising purposes.

MR. GEORGE THEIS, JR., has taken over the general management of the Interurban Construction Company of Wichita, Kans., and will push the proposed electric road from Wichita to Hutchinson. Mr. Theis, who succeeds MR. O. A. DOYLE as general manager, hopes also to build to Salina by way of McPherson.

MR. BERNARD E. SUNNY, president of the Chicago Telephone Company has been elected president of the Commercial Club of Chicago. Associated with Mr. Sunny on the Executive Committee are Messrs. Alexander H. Revell, Thomas E. Donnelley, Joy Morton, Louis A. Ferguson and Frederick W. Upham.

MR. A. E. CARPENTER has been appointed general manager of the Lomira (Wis.) lighting plant and will take charge of the establishment April 15. Mr. Carpenter has been identified with the Eastern Wisconsin Railway & Light Company for the past seven years as meter tester and general trouble man.

MR. J. L. WHITE, for several years manager of the Dallas Division of the Oregon Power Company, has been transferred to Albany, Ore., as manager of the company's interests there, succeeding MR. H. E. MORTON, resigned. Mr. A. L. MARTIN, formerly manager of the company's property at Corvallis, will succeed Mr. White at Dallas and Mr. R. U. STEELQUIST has been appointed manager in Mr. White's place at Corvallis.

MR. FREDERIC P. VOSE, the well known attorney and secretary of the Electrical Credit Association, delivered a very interesting and instructive address before the Jovian Electrical League of Southern California, on Wednesday, April 8. The subject was "Electrical Credits." As usual, "Fred" convinced his hearers that what he did not know about the credit proposition was hardly worth knowing at all. A great deal of valuable information was absorbed by all present.

MR. A. L. POWELL, illuminating engineer of the General Electric Company, Newark, N. J., tendered an address on "Good Lighting as a Factor in the Safety First Movement" before the local Traffic Club, April 6. The lecture was illustrated with pictures showing methods of lighting factories, stores, streets, trolley cars, trains, etc.

MR. HARRY DEGOULIER KING, electrical engineer, has been appointed by the Common Council, Hoboken, N. J., to prepare new lighting specifications for a contract with the Public Service Electric Company.

MR. GEORGE A. HUGHES, president of the Hughes Electric Heating Company, accompanied by MR. W. L. OVERMAN, western representative of the same company, were in Salt Lake City last week opening up the electric-range business for their company, the Western Electric Company having arranged to carry a stock of their stoves. Mr. Hughes is enthusiastic over the prospects for electric heating, particularly in western states where so many electric companies have established special heating and cooking rates, which place the cost of cooking with electricity on a par with gas.

MR. A. G. MACKENZIE, of Salt Lake City, who for five years held a position with the Mountain States Telephone & Telegraph Company in its Public Relations Department, has been appointed secretary of the Utah-California Expositions Commission. Prior to entering the electrical field, Mr. Mackenzie was engaged in newspaper work for several years. He left the telephone company to become assistant secretary and publicity director of the Salt Lake Commercial Club, where he remained a year, at the end of which time he established a publicity and advertising agency which he now conducts. He is a member of the Utah Electric Club and the Jovian Order, and takes an active interest in all things electrical.

MR. E. W. P. SMITH has been appointed city electrician of Cleveland, O. Mr. Smith was graduated in electrical engineering from Colorado College, Colorado Springs, in 1908. After a year of operating experience in the West he entered the employ of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, in the railway engineering department. An article on single-phase commutator motors by Mr. R. H. Hellmund and Mr. Smith, was published in the *Electric Journal* in 1912. Mr. Smith was later employed by the city of Cleveland, in the Smoke Prevention Division, where a preliminary report on the electrification of steam railroads in the city of Cleveland was prepared. During the latter part of 1913 he was in the mechanical department of the Lake Shore & Michigan Southern Railroad. Mr. Smith is an associate of the American Institute Electrical Engineers, a member of the American Electric Railway Association, and a member of the Cleveland Engineering Society.

MR. STEPHEN L. COLES has resigned the secretary-treasurership of The Society for Electrical Development, effective April 15. As of the same date he has joined the engineering staff of M. W. Thompson, 111 Broadway, New York City, specialist in litigated engineering matters and in reports on railroad and other large properties. Mr. Coles will devote his attention principally to electrical public utilities having problems of service, policy and competition to solve. He has grown up with the electrical industry, his first work having been with the old New England Wiring & Construction Company, of Boston, in installing an isolated electric lighting plant at Springfield, Mass., in 1889, for the Boston & Albany Railroad. Since August 1 last, Mr. Coles has been acting secretary-treasurer and secretary-treasurer of The Society for Electrical Development and has concentrated his well known energies on doing his share toward making the Society an accomplished fact and actual reality. One of his latest efforts in behalf of the Society was an article under his signature in the Public Utilities Number of *The Evening Post*, New York, March 30, giving data regarding the objects and formation of the Society and the educational work it expects to do.

MR. HENRY HINE, of Colorado Springs, Colo., a pioneer in electrical work, formerly with the United States Electric Lighting Company, of New York; afterward at the head of the Stanley Electric Manufacturing Company, Pittsfield, Mass., and now representing large interests in hydroelectric development in the United States and Mexico, is now visiting in New York City. Mr. Hine entertained at the Hotel Biltmore the former Committee on Membership of the old Electric Club of New York, and in addition to the Committee, the former secretary and treasurer of that Club. The party consisted of the following-named gentlemen: Mr. Henry Hine, chairman of the Electric Club Membership Committee; Mr. Henry D. Lyman, member of the Committee; Lieut. F. W. Toppan U. S. N., member of the Committee; Mr. Geo. T. Manson, member of the Committee; Capt. Willard L. Candee, former treasurer of the Electric Club; and Mr. Charles W. Price, former secretary of the Club. The autographed menus of the occasion carried the following inscription: "At the Biltmore, on April 7, 1914, the following officers of the Electric Club met for the first time in 26 years—1888-1914." The occasion was a particularly enjoyable one, the menu one of the best ever provided by the new Biltmore, and the reminiscences were many, varied, and particularly interesting. The only absent member of the Committee was George Worthington, who died in 1892, and who was one of the founders of the Electric Club.

OBITUARY.

MR. R. C. BLISS, a pioneer telegrapher and at one time manager of the Cincinnati district for the Western Union Telegraph Company, died at his home in Cincinnati, on March 11.

MR. HANFORD C. ADAMS, vice-president of the Southern Utilities Company of Florida, died in Jacksonville, Fla., on March 11. At one time he was a Methodist minister in Lenox, Mass., where his father, the Rev. Lucius C. H. Adams, now of Nyack, N. Y., occupied a pulpit for many years. Mr. Adams was 28 years old.

MR. JOHN McNAMEE, builder of subways and elevated railroads, banker and philanthropist, died in his home in Brooklyn, N. Y., on April 7. He was 72 years old and is survived by his wife, a son and a daughter. After serving as an engineer in the Department of Public Works of Brooklyn for many years Mr. McNamee participated in the construction of the Brooklyn elevated railroads. He built the water works at Portsmouth, Va., and Montclair, N. J., and as a member of the firm of Cranford & McNamee built the existing Interborough subway in Brooklyn and that section of the Centre Street subway in Manhattan between Canal and Broome Streets. Mr. McNamee served from 1880 to 1902 on the Brooklyn and New York City Boards of Education. He was for three years a member of the Prison Commission and for many years had been a leading member of the Society for the Prevention of Cruelty to Children. He gave liberally to many charities. He was a director of the Kings County Trust Company, Brooklyn Trust Company, the Brevoort Savings Bank and the National Water Meter Company. He also was president of the Eagle Warehouse Company.

MR. FRANK B. KNIGHT, special agent of the Southwestern Telephone and Telegraph Company, one of the best known and most highly esteemed men in the electrical fraternity, a pioneer in the industry, died at Dallas, Tex., on April 1. Mr. Knight was born at Canandaigua, N. Y., December, 1848. He learned to telegraph at the age of 14, on the line of the old New York, Albany & Buffalo Telegraph, at Geneva, N. Y. Shortly after this he was employed in the Syracuse office of the New York Central Railroad. After a short service there he was seized with the war fever and entered the United States Military Telegraph Corps, and was assigned to Burke's Station, on the Orange & Alexandria Railroad, and later transferred to Newport News, Va., at which place was an extensive war supply depot, afterwards designated and used as a prison for captured Confederates. Some time before the close of the war he was stationed at Fortress Monroe, as operator for the chief quartermaster of the Army of the James. At the close of the war Mr. Knight went to Rochester, N. Y., and entered the service of the Western Union Telegraph Company, continuing at various points until the beginning of 1870, when he was appointed chief operator of telegraphs of the Union Pacific Railroad Company at Omaha, which position he gave up in 1872, and became chief operator and afterwards manager of the Western Union Telegraph office at Omaha. It was at Omaha that he formed the acquaintance of Theodore N. Vail, which led to his employment in the Bell service. In the early part of 1880 he resigned to accept the position of special agent of the National Bell Telephone Company, but later left this company and engaged with the Palmer Wire Company. This company ultimately went out of business. Then he joined forces with Messrs. Beetle, Lytle and Down, in the general electric promoting business, finally reentering the service of the American Bell Telephone Company as special agent, eventually being located at Dallas, where he remained until the day of his death. In 1895 Mr. Knight was transferred to the Southwestern company as special agent, which position he held until his retirement on a pension a few months ago. He was married a second time in June last and had planned to take his bride for a visit to his daughter in Paris this summer. He leaves a son in the employ of the Southwestern company and a married daughter residing abroad. Mr. Knight's early employment in the telephone service necessitated much traveling and led to a wide acquaintance. He was a member of the Old Time Telegraphers' Association and the telephone Pioneers. He was a popular and greatly beloved member of both organizations, whose death will be greatly regretted by all who knew him.

DATES AHEAD.

Empire State Gas and Electric Association. Spring meeting, Alert Club, Medina, N. Y., April 22. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Iowa Electrical Contractors' Association. First annual convention, Cedar Rapids, April 22-23. Secretary, M. T. Humphrey, Waterloo, Iowa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Electrical Supply Jobbers' Association. May meeting, Chalfonte Hotel, Atlantic City, N. J., May 12-14. General secretary, Franklyn Overbagh, 411 South Clinton Street, Chicago, Ill.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit, June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has removed its Atlanta, Ga., office to 1104-5-6 Healy Building.

Berkeley Electric Cooker Company, Berkeley, Cal., has undergone a change of management, L. C. Bishop now having charge of the business.

Berkeley Electric Cooker Company, port, Conn., has sent out new folders calling attention to some of the more important properties of its Phono-Electric trolley wire.

Dearborn Chemical Company, Chicago, Ill., has transferred its southeastern branch office from Birmingham, Ala., to 1407 Candler Building, Atlanta, Ga., where C. H. Everett and J. F. Boutelle, representing the Dearborn Company in that territory, will have their headquarters.

Wagner Electric Manufacturing Company, of St. Louis, Mo., announces the opening of a branch office in suite 524, Syracuse University Block, Syracuse, New York, in charge of J. W. Bryant, resident agent.

A. F. Daum Company, Pittsburgh, Pa., has issued bulletin No. J14 describing its ideal fuse strips. These fuse strips are made in a number of sizes, each size being ruled for various current-carrying capacities when desired.

Maxwell Electrical Company, 236 Fulton Street, New York City, announces that it has become manufacturing agent for National adjustable ground clamps, "BX" connectors, switch plates, service cutout boxes, wall cases for old or new work and porcelain material.

Naugle Pole & Tie Company, Chicago, Ill., has issued a pamphlet containing the Northwestern Cedarmen's Association specifications for white-cedar telephone poles. In addition to these specifications the pamphlet shows several views of the company's yards, and contains instructions and data for ordering poles.

Northern Electric Company, Limited, Montreal, Canada, announces that it has acquired the entire business and undertakings of the **Imperial Wire & Cable Company, Limited,** and of the **Northern Electric & Manufacturing Company, Limited.** The new company will continue to operate the entire business without change in management.

Waterhouse Welding Company, Boston, Mass., has recently issued a pamphlet, entitled, "Welding and Cutting Plants." This pamphlet describes its acetylene welding and cutting outfits. These sets and their applications are fully described, numerous illustrations being used for this purpose. The company is offering these sets on a two-weeks' approval basis.

The Lunkenheimer Company, Cincinnati, O., has issued a new catalog devoted to motor accessories. The Lunkenheimer Company is a large manufacturer of high-grade engineering specialties. The new catalog is complete in detail both with respect to technical and practical information and descriptive matter, and also with respect to the illustrations of the specialties listed.

Sociètè Anonyme Industries Chimiques, Chiasso, Switzerland, has issued a pamphlet dealing with its insulating cement which is sold under the trade name Isolit. This product is a cement for binding porcelain insulators to iron pins. The pamphlet sets forth the properties of this material and gives various tests showing these and also other advantages which it possesses.

The High-Tension Electric Company, 321-325 Susquehanna Street, Indianapolis, Ind., has been organized to make and repair automobile ignition apparatus. A. H. Wagner, the manager, has had twenty years of experience in high-tension work, half of this time having been spent on automobile ignition. A. P. Robertson, the treasurer, has sold and handled cars almost since the beginning of the automobile industry.

The National Electric Specialty Company, Toledo, O., has issued catalog No. 11 on the Vac-M lightning arrester. The construction of this device is explained with the aid of numerous illustrations, and the various forms of it as designed for use in railway block-signal work, fire-alarm, police and telephone circuits, and other similar purposes are described. The catalog includes also full data of each of the types.

The Robbins & Myers Company, Springfield, O., is distributing an illuminated portfolio of its advertising plans for 1914. This portfolio includes a number of newspaper and magazine advertisements, lantern slides, street car and window cards, and miscellaneous booklets and folders. An ordering blank for electrotypes, cuts, lantern slides, window and car cards, window transfer signs and imprinted booklets accompanies this portfolio, all such material being furnished free of charge.

The Ideal Electric & Manufacturing Company, Mansfield, O., takes justifiable pride in the receipt of an order which it has recently been given by the Duluth, Messaba & Northern Railway Company, Duluth, Minn. This railroad is a subsidiary of the United States Steel Corporation. The order calls for 32 25-horsepower, 440-volt, three-phase, 25-cycle squirrel-cage induction motors. These motors will be used for the electrical equipment of the new No. 5 iron-ore docks which are now near completion and are reported as being the largest iron-ore docks in the world. Each motor will operate a bank of 25 chutes.

W. A. Blonck & Company, Fisher Building, Chicago, have issued bulletin No. 6 dealing with the Blonck boiler-efficiency meter. This instrument is now made in three principal types, two of which are indicating instruments used for natural-draft and forced-draft boiler operation; the third type of instrument is a recording instrument used for either natural or forced-draft service. The bulletin describes these instruments and gives numerous illustrations, together with discussion, of the performance of the instruments during a variety of tests under different operating conditions. The advantages of the instruments are set forth and a long list of users is also given.

Current Electric Company, Chicago, Ill., is marketing an electric furnace for heating soldering irons which, it is claimed, is the best known method. Central stations and contractors have shown great interest in this furnace and orders have been received from all parts of the country. The furnace is adapted for delicate or heavy work and is a means of materially increasing the day load of central stations. The Current Company is making a special trial proposition the particulars of which will be furnished on request.

Sangamo Electric Company, Springfield, Ill., has recently issued an attractive bulletin on mercury-type direct-current watthour meters. This 32-page bulletin gives with much detail the theory, mechanical construction and advantages of these meters. The first few pages are devoted to a discussion of the various types of wathour meters. The principle and details of the mercury-type meter are then discussed, followed by about 10 pages devoted to a discussion of the performance, characteristics and to diagrams of connections, price lists, etc. One of the valuable features of this bulletin is the large number of cuts showing in detail the construction of all parts of the meters. About 40 illustrations are included, many of which are special drawings showing with much detail the entire construction of these meters.

Western Electric Company, Chicago, and New York City, has begun the distribution of the fifth edition of its copyrighted bulletin, "How to Figure Illumination—Also a Complete Catalog of Sunbeam Mazda Lamps," which is just off the press. This bulletin gives complete information for planning the illumination of interiors. Numerical tables necessary in laying out lighting installations for different classes of business are given in this bulletin, as well as other illumination data, such as figures giving efficiencies of lamps and comparative efficiencies of various types of reflectors, both glass and steel. A copy of this booklet will be mailed to anyone gratis, if request is made to the Western Electric Company at any of its branches.

Record of Electrical Patents.

Issued by the United States Patent Office, April 7, 1914.

1,092,141. Electropneumatic Brake Apparatus. E. H. Dewson and W. V. Turner, assignors to Westinghouse Air Brake Co. Includes electrically controlled means for effecting a reduction in the pressure at the triple valve.

1,092,151. Telegraphic Receiving Organism. I. Kitsee, assignor to American Telephone & Telegraph Co. A relay device including a relay, an inductorium and a polarized relay.

1,092,153. Cartridge Fuse. E. B. Mallory, assignor to Economy Fuse & Mfg. Co., Chicago, Ill. A refillable cartridge fuse.

1,092,154. Rewinding Mechanism. I. F. Manny, assignor to Selective Signal Co., Milwaukee, Wis. An electromagnetic spring-winding device.

1,092,178. Cathode for Electrolytic Furnaces. G. O. Seward and F. von Kügelgen, assignors to Virginia Laboratory Co., New York, N. Y. Has parallel portions in which the direction of the electric flow is opposite.

1,092,245. Electric Switch. G. W. Cravens, assignor to Delta-Star Electric Co., Chicago, Ill. A box-inclosed knife switch with external operating means.

1,092,252. Method of Constructing Secondary or Storage Batteries. G. Fuller, L. Fuller and G. J. A. Fuller, London, England. A mold for forming electrodes of trianguloid form having a central core.

1,092,253. Secondary or Storage Battery. G. Fuller, L. Fuller, and G. J. A. Fuller. An electrode constructed as described in 1,092,252.

1,092,255. Spark-Adjuster for Explosive-Engines. J. P. Gering, Schrag, Wash. Includes synchronous control of engine and ignition means.

1,092,266. Electric Signal Mechanism. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. A motor-operated signal having a normal danger position.

1,092,267. Process of Making Storage-Battery Electrodes. H. C. Hubbell, Newark, N. J. Briquet of nickel oxide reduced by heat and alkali solution, ground, dried and rebriqueted.

1,092,281. Combined Motor-Starter and Circuit-Breaker. A. C. McWilliams, Chicago, Ill. A combined motor-starter and automatic circuit-breaker.

1,092,283. Relay. M. S. Morse, Oakland, Cal. Includes use of two electromagnets.

1,092,294. Receiving Apparatus for Alternative Wireless Telegraphy and Telephony. J. Schiessler, Baden, Austria-Hungary. Receiving circuit includes a resistance heated to incandescence.

1,092,307. Dental Instrument. J. L. Talbott and W. S. Wright, Lompoc, Cal. Contains an electric heating element.

1,092,322. Spark Plug. W. S. Witter, Toledo, Iowa. For electric ignition.

1,092,323. Electric Recorder. J. L. Zander, assignor to C. O. Sander, Irvington, N. J. Includes use of electric motor.

1,092,333. Refillable Fuse. F. D. Bryan, Middletown, Pa. A refillable cartridge fuse.

1,092,354. Fortune-Telling Apparatus. W. M. Hamilton, Philadelphia, Pa. An electrically operated device.

1,092,370. Electric Ignition Generator. B. Lawrence, Leyton, England. A starting trip including means for maintaining high speed upon reduction of engine speed.

1,092,383. Safety and Signaling Device for Railroads. D. C. Newton, Owego, N. Y., assignor of one-half to M. Lindeman. A track-operated electric signal system for engine cabs.

1,092,388. Water-Level Indicator. N. Podgursky, St. Petersburg, Russia. Submerged float-switch having a pendulum for making electrical contact.

1,092,398. High-Tension Discharge Apparatus. G. D. Rogers, Cleveland, O. For therapeutical purposes.

1,092,401. Sheet-Music Perforating Device. A. D. Saumell, New York, N. Y. Includes electromagnetic control of punching device.

1,092,404. Reversing Device for Combustion Engines. W. Seck, assignor to Robert Bosch, Stuttgart, Germany. Ignition system for a reversible engine.

1,092,410. Means for Rating Incandescent Lamps. A. J. Sweet, assignor to Westinghouse Lamp Co. Includes use of special photometer, voltmeter, and wattmeter or ammeter.

1,092,411. Electric Railway and Signaling System Therefor. L. H. Thullen, assignor to Union Switch & Signal Co. Danger signal operated upon unbalancing of rail resistance.

1,092,415. Automatic Service Switch. R. E. Wetter, Dallas, Tex. A solenoid-operated abnormal-voltage trip.

1,092,417. Ignition Apparatus. J. A. Williams, Cleveland, O. An induction coil for electric ignition.

1,092,420 Dynamo-Electric Machine. E. F. W. Alexanderson, assignor to General Electric Co. Includes use of auxiliary winding on pole faces.

1,092,450. Rear-End Searchlight. J. D. Perkins, Washington, D. C. Means for directing rays of electric searchlight obliquely upwards.

1,092,452. Device for Measuring Speed. W. H. Pratt, assignor to General Electric Co. Includes an alternating-current generator and a frequency indicator.

1,092,453. Device for Amplifying Variations in Electrical Currents. P. M. Rainey, assignor to Western Electric Co. A telephone repeater including the use of a microphone.

1,092,459. Railway Signaling. J. B. Struble, assignor to Union Switch & Signal Co. An alternating-current signaling system necessitating the sectionalizing of only one rail.

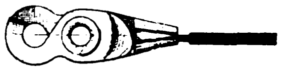
1,092,460. Railway Signaling. J. B. Struble, assignor to Union Switch & Signal Co. A modification of 1,092,459.

1,092,472. Connecting-Clip for Electrical Conductors. J. H. Breaznell, New York, N. Y. One wire is encircled by hook members, the other being held between extensions of the hook members. (See cut.)

1,092,489. X-Ray Tube. H. M. Kesselring, Chicago, Ill. A double wall provided for supporting one electrode.

1,092,498. Refillable Cartridge-Fuse. E. B. Mallory, assignor to Economy Fuse & Mfg. Co. Ends of fusible material clamped between washers and threaded ends of shell. (See cut.)

1,092,510 Lightning-Arrester. A. Allendorf, Harvard, Ill. A telephone arrester having fuses mounted on rotatable drum.



1,092,472.—Connecting Clip.

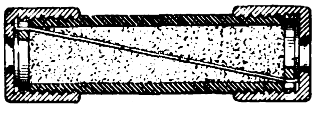
1,092,523. Submerged Electric Heater. B. Falkenberg, assignor to Pacific Electric Heating Co., Ontario, Cal. Resistance coil mounted in drum inside of main receptacle.

1,092,600. Primary Battery. C. B. Schoenmehl, Waterbury, Conn. Both elements mounted on insulated frame held by hangers engaging edge of jar.

1,092,627. Locking Device for Electric Lamps, etc. A. D. Bartlett, Washington, D. C. An electromagnetic locking device.

1,092,637. Telephone-Receiver Holder. S. Dusak, Seanor, Pa. An extension arm for a telephone receiver.

1,092,687. Spark Plug. J. De L. Barmore, Apalachicola, Fla. Center contact insulated by mica sleeve and disks, an asbestos filling being used at one end.



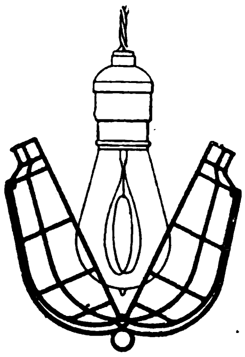
1,092,498.—Refillable Fuse.

1,092,708. Lamp-Guard, J. Gray, Jr., New Orleans, La. A wire-guard having two hinged sections. (See cut.)

1,092,724. Motor-Starter for Rectifier Systems. M. Kushlan, Boston, Mass. A motor for utilizing current in excess of that required by battery being charged.

1,092,732. Signal Device. J. H. McCarthy, Stafford Springs, Conn. A bell circuit energized by contact on rope caused to move upon the energizing of a magnet.

1,092,736. Automatic Time Contact-Switch. H. B. Meier, Port Chester, N. Y. Covers arrangement of mechanism in master clock.



1,092,708.—Lamp Guard.

1,092,754. Thermostatic Circuit-Closer. R. L. Shannon, Ripley, Miss. Includes means for making temperature adjustments.

1,092,764. Electric Furnace for Metallurgical Purposes. H. H. Buckman, Jr., Indianapolis, Ind. Has a number of electrodes on horizontal rotatable support.

1,092,790. Electric Heat Unit. P. C. Garrison and R. Boomer, Detroit, Mich. Heating coil imbedded in cement.

1,092,795. Shade-Holder Coupling. J. Jeczalik, assignor to W. Hegenscheidt, Worth, Ill. Has a circular collar.

1,092,797. Electric Speed-Controlling Means. H. A. Mayor, Glasgow, Scotland. A combination of induction motors.

1,092,803. Trolley-Wheel Mount. R. C. Showalter, Altoona, Pa., assignor of one-half to F. K. Thieme and one-fourth to J. P. Reilly. Permits of axial movement of wheel.

1,092,805. Electric Safety-Fuse. E. Weissberg, Cassel, Germany. Contains an insulating liquid filling.

1,092,810. Lamp Socket and Shade Holder. G. M. Dewar, Indianapolis, Ind., assignor of one-half to A. Thompson. A combined lamp socket and shade holder.

Patents Expired.

The following United States electrical patents expired April 13, 1914.

580,380 and 580,381. Supporting Means for Electric-Railway Supply-Conductors. H. P. Davis, Pittsburgh, Pa.

580,384. Electrical Indicating Wattmeter. T. Duncan, Fort Wayne, Ind.

580,428. Electrode for Secondary Batteries. F. W. Schneider, Triberg, Germany.

580,434. Telephone Transmitter. A. Stromberg and A. Carlson, Chicago, Ill.

580,457. Electric Hoist. J. A. Lounsbury, Chicago, Ill.

580,475. Electric Riveting Apparatus. E. Thomson, Lynn, Mass.

580,490. System of Constant-Current Generation and Regulation. T. H. Hicks, Detroit, Mich.

580,497. Galvanic-Battery Element. G. Laura, Turin, Italy.

580,519. Circuit-Controlling Apparatus. F. M. Brinckerhoff, Matteawan, N. Y.

580,523. Galvanic Battery. R. W. Gordon, Boston, Mass.

580,552. Burglar-Alarm System. D. M. Munro, Gaithersburg, Md.

580,557. Electric Headlight. R. P. Schwerin, San Francisco, Cal.

580,584. Art of Insulating Electric Conductors. A. J. Robertson, Chicago, Ill.

580,598. Electric Locomotive. W. S. Elliott, Pittsburgh, Pa.

580,617. Printing Telegraph. H. Kreusler, Kreischerville, N. Y.

580,628. Insulator and Insulating Conduit or Tubing for Electrical Purposes. F. G. Treharne, Llanishen, England.

580,657. Non-Inductive Adjustable Carbon Resistance. S. P. Blackmore, Johannesburg, South African Republic.

580,663. Means for Controlling Electric Currents. E. Ellicott, Chicago, Ill.

580,678. Electric Switch. T. H. Brady, New Britain, Conn.

580,680. Alarm Lock. J. H. Doscher, Brooklyn, N. Y.

580,734. Electric Arc Lamp. A. C. Seibold, Mount Vernon, N. Y.

580,820. Electromagnetic Locking Device. E. J. M. Scheren, Denver, Colo.

580,836. Electric Searchlight. R. M. Hunter, Philadelphia, Pa.

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RELATION OF DEPRECIATION ALLOWANCE TO INTEREST ON INVESTMENT.

While the necessity for a proper consideration of depreciation in determining costs and in properly handling the accounts of any business has always existed, it has received much more attention of late years, especially among public utilities since they have been subjected to the regulatory powers of state commissions. The subject is not merely one of proper business accounting, but is of fundamental concern in the problem of determining rates. It enters here both as an element of the cost of running the business and in its relation to the determination of the valuation of the property upon which interest charges are to be figured.

There is wide disagreement among different authorities not only as to the proper amounts to be allowed for depreciation—that is to say, the rate at which equipment loses value—but also as to the method by which this loss should be made up in order that the original outlay shall not be impaired at the end of the useful life of the equipment. We wish here to contrast merely two of the most common methods of making allowance for depreciation. One of these consists in dividing the total amount involved by the number of years representing the known or estimated life of the equipment, and setting aside anually the resulting quotients. The other method is that of setting aside annually such an amount in a sinking fund, that when invested and yielding compound interest at the market rate, the total sum at the end of the same life period will equal the invested capital which has disappeared. It is evident that the annual installments in these two cases are different, and, consequently, will produce different totals for the cost of running the business. We will refer to the two as the straight-line method and the sinking-fund method.

With the straight-line method the capital account should be reduced each year by the amount of the allowance for depreciation. Since this amount is made for other purposes, or might even be withdrawn from the business, interest should not be figured upon it as a part of the original capital, but only in case of reinvestment in other equipment, which would then carry its own interest charge. In the sinking-fund method the earnings of this money, which is presumed to be invested in some way, covers a part of the total depreciation cost and does not earn any interest which may be regarded as taking care of the fixed charge upon that portion of the original investment. The capital account should, therefore, be retained intact and a yearly return upon it computed upon the basis of the original investment.

The distinction of the difference in status of both capital and depreciation accounts in these two cases is frequently overlooked and as a result two errors commonly arise. One of these is to use the straight-line method for figuring the amount to be set aside for depreciation and to continue to charge interest upon the original capital investment. An example of this is seen in the article on page 823 entitled, "How Many Contractors Lose Money," where interest upon the total cost of an automobile is included, although a straight-line allowance for depreciation is made.

A realization of this relation has given rise to one of the common methods of determining the present value of an investment, namely, by subtracting from the reproduction value the amount of accrued depreciation.

The other error is to use the sinking-fund method in making allowances for depreciation and then, without realizing the fundamental distinction between this and the former method, to similarly deduct the accrued depreciation from the capital account or from a valuation for rate-making purposes. The latter is an injustice to the investors in a utility property, since the entire capital representing original or reproduction cost is still tied up in the business, and the amount representing accrued depreciation is not earning separate interest, but must form a part of the depreciation fund.

It was pointed out above that the annual allowance for depreciation will depend upon the method used. This forms one element in rate-making. Unless a corresponding distinction is made in the capital account upon which fixed charges must be figured, it is evident that a different result must be reached as to the proper value for a rate. This of itself is sufficient evidence that a distinction should be made in figuring fixed charges in the two cases, since two methods can both be correct only when they give the same results.

THE BUREAU OF STANDARDS.

Since its inception nearly 13 years ago the work of the Bureau of Standards has gradually been increasing in both scope and quantity, until today it probably ranks foremost among the national standardizing laboratories of the world with respect to number of employees, amount of annual expenditure, and output as measured in tests carried on, research work and investigations undertaken, as also in scientific and technical material published. The equipment of the Bureau has been steadily increased and this year we see placed in service a new laboratory to be devoted exclusively to electrical and allied work. A description of the new laboratory will be found elsewhere in this issue. In recognition of its completion, the American Institute of Electrical Engineers and the American Physical Society are holding a joint meeting at the Bureau this week, and at the same time there has been arranged an exhibit of physical apparatus, which might well be made an annual event and would, no doubt, take its place with the similar exhibits held each year in London and Paris, in giving publicity to the latest developments in this field.

The importance of the work of the Bureau of Standards in connection with the maintenance of electrical units, of the investigations which have been carried on there, and of the facilities which it offers for the assistance of manufacturers and others in working out the problems which arise in electrical engineering, are widely appreciated, and the liberal policy which has been shown by Congress heretofore in making provision for the work will, it is to be hoped, be continued in the future. The experience of Germany is ample demonstration of the usefulness of such an institution in building up the industry of the nation and examples of its similar effect here are becoming evident and are frequently attested by our manufacturers. The increased facilities which will be provided by the new laboratory should still further enhance the worth of the work done by this section of the Bureau and render it of ever growing importance and value to the electrical industry.

FLEXIBILITY IN RESIDENCE LIGHTING.

Nothing popularizes electric service more than its flexibility, provided reasonable rates are offered the public. This is peculiarly true in the house-lighting field, and the selection of different lamp sizes for various rooms is an all but universal practice. Less has been made, however, of the opportunity afforded by the subdivision of lamp sizes within a single room to give the consumer a service of the maximum convenience and which at the same time encourages long-hour burning.

An example may be cited in a six-room apartment whose small parlor, perhaps 12 feet square, was equipped with a chandelier in the center of the room having three outlets. The old-time plan would have been to provide the same sized lamp for each outlet; but in this case three sizes were put in, and with admirable results. The outlet nearest the inside wall, and consequently nearest the piano, was fitted with a 40-watt tungsten lamp; that nearest the hallway door was provided with a 10-watt lamp, and a 25-watt lamp was installed in the intermediate outlet. The largest lamp provides a first-class illumination for musical purposes; the intermediate size suffices for conversation with callers, and the 10-watt lamp serves as a "pilot light" and is kept burning nearly all of every evening, whether the room is in use or not, partly to let passers-by know that the family is in town and partly to provide a cheerful atmosphere at the front of the house.

If a 25-watt lamp or larger were used in each outlet, the service would be turned off every time the room was vacated, but the cost of service with the 10-watt lamp is so small on a 10-cent per kilowatt-hour rate that it is seldom turned off, even if the family is away for the evening. There is not the slightest doubt that the local central station obtains more revenue from the subdivided lamps in this room than from a uniform installation, and while there is nothing remarkable about so simple a subdivision, it is worth studying in hundreds of installations which in the past have been equipped with orthodox uniform sizes for similar rooms.

A REFERENDUM ON THE INTERSTATE TRADE COMMISSION.

The Bill recently reported into the House of Representatives by the Committee on Interstate and Foreign Commerce, relative to the proposed Interstate Trade Commission, is being made the subject of a referendum before the 543 commercial organizations in 47 states, constituent members of the Chamber of Commerce of the United States of America. Shortly after the annual meeting of the National Chamber, which was held in February, a special committee was appointed to ascertain the significance of the proposed legislation affecting corporations. This committee has completed its report and the Chamber is now asking the business men of the country to study the proposed features of the Bill and to vote one way or the other upon certain definite recommendations.

The committee recommends that an interstate trade commission of at least five members be appointed. It is considered that a commission composed of three members would not be general enough in character, would lend itself to domination by one particularly strong character, and would not allow of the widest latitude in the selection of the personnel. It is also proposed that not more than a mere majority of the members of the commission shall be of the same political party. It is recommended that the jurisdiction of the commission in conducting an investigation, extend to all corporations engaged in either state or foreign commerce, except such as are amenable to the Interstate Commerce Commission. The committee recommends that the commission should not be given authority at this time to advise applicants concerning the legality of proposed contracts, combinations and other business exigencies under the Sherman Act. It is the opinion of a majority of the committee that extending the jurisdiction of the commission to this extent would bring about an interminable delay in the conduct of business of every character, and would lead to indecision and indefiniteness that would work harm.

With respect to what might be disclosed in the annual reports the committee strongly recommends that corporations ought not be required to disclose their processes, shop costs, classifications of sales and profits among particular articles, names of customers, or similar kinds of private information. In other words, if investigation be necessary for the protection of the public and for prescribing means for the safe conduct of business it should be along lines which will not reveal those factors which courage, initiative and aggressiveness develop. The function of government should never be to expose to those unable to think and work for themselves that which intelligence and daring bring to the advantage of those of higher mental and physical equipment.

So far as the publication of facts obtained by the commission is concerned, the committee recommends that this be confined to such matters as are to the public interest. Foreign relations and expanded opportunities for doing a foreign business are considered in the recommendation that Congress should direct the commission to investigate and report to Congress at the earliest practicable date on the advisability of amending the Sherman Act to allow a greater degree of co-operation in the conduct and for the protection of the foreign trade. With respect to the latter recommendation it is made clear that home industries are at present under severe handicap in foreign markets.

A large number of organizations, constituent members of the National Chamber, have already appointed committees to pass upon this referendum, and it is expected that the votes will be promptly returned. An analysis of the expressions of opinion coincident with the vote on the referendum will help materially to create at least a reasonable approach to, first, the necessity, if it exists, for the development of the Interstate Trade Commission, and second, an indication of those features which should form the basis of the Bill creating the commission.

ALLOWANCE FOR OVERHEAD EXPENSE.

The necessity in any business of making the proper allowance for overhead expense when determining the prices to be charged is a fundamental one, but unless this situation is properly understood and handled, the concern which is negligent is likely sooner or later to go to the wall. Deficiencies along this line have been common in the electrical contracting business and the various contractors' associations have been doing an important work in educating their members to the necessity of properly handling this element of the business.

There is nothing, perhaps, so impressive in teaching a lesson as a concrete example, which is based upon the principle involved. Having this in mind a California supply house has been distributing among the electrical contractors of that territory a definite monthly statement for two typical contracting businesses, showing how a proper allowance for overhead in one case results in a net profit and an insufficient allowance in the other case results in a net loss. A study of these figures should be of value to any contractor who has not already placed his business upon a sound basis.

International Electrical Congress.

Arrangements are being perfected for the International Electrical Congress to be held during the Panama-Pacific International Exposition in San Francisco during the week beginning September 13, 1915. Charles P. Steinmetz is honorary president of the Congress and Edward B. Rosa is honorary secretary. This congress will be the eleventh electrical congress of international scope, three of which have been previously held in the United States.

The meetings of the congress will be divided into 12 sections and the proceedings will be published in 13 volumes, one for each of the sections and one containing the general proceedings of the congress. These sections are as follows: 1. Generation, Transmission and Distribution. 2. Apparatus Design. 3. Electric Traction and Transportation. 4. Electric Power for Industrial and Domestic Use. 5. Lighting and Illumination. 6. Protective Devices; Transients. 7. Electrochemistry and Electrometallurgy. 8. Telegraphy and Telephony. 9. Electrical Instruments and Electrical Measurements. 10. Central-Station Economics. 11. Electrophysics. 12. Miscellaneous Subjects.

It is the desire of the committee making arrangements to secure as early as possible some idea of the number of persons who wish to be enrolled as members of the congress, in order that some definite figures may be available respecting the number of copies of the transactions of the congress that are to be published, and also so as to know approximately what funds will be available for meeting the expenditures. The published transactions will contain all of the papers accepted for presentation; these papers will be printed in English, French, German, Spanish and Italian as they are received; all papers printed in languages other than English will be accompanied by English abstracts.

The membership fee in the Congress is $5, which entitles a member to the privileges of the congress, to the general index and to a choice of any four of the section volumes of its printed transactions. By the payment of $1 the volume ordered will be delivered to the member without further expense, and by the additional payment of 50 cents per volume they will be bound in cloth. Additional volumes may be had at $1 each when bound in paper and $1.50 each when bound in cloth. The entire set, which will comprise probably 13 volumes, will be delivered for $11, if bound in paper, or for $16, if bound in cloth; the latter fees include membership in the congress. All those wishing to be identified with the congress should early notify the secretary-treasurer, Preston S. Millar, Eightieth Street and East End Avenue, New York City. Remittances for the fees should accompany the applications.

Municipal Hydroelectric Plant Development Condemned at Springfield, Mass.

Prof. Harry E. Clifford of Harvard University, consulting engineer in street lighting for the city of Springfield, Mass., stated in an interview recently that the development of a hydroelectric plant by the city for municipal lighting in connection with the Little River watershed would be a serious mistake. He urged the municipality to make the best terms possible with the United Electric Light Company in renewing its street lighting contract and also condemned the proposition that the city establish isolated plant service for the lighting and power requirements of the new municipal building group. Professor Clifford said that municipal ownership is a will-o'-the-wisp on account of its labor and political possibilities and pointed out that even if the city should develop a hydroelectric plant on the Little River watershed, there would be a loss of 15 to 18 per cent in the electrical transmission of 14 miles involved and that the cost of a duplicate system of underground ducts to compete with those of the existing central station would hit the taxpayers to the extent of about $3,000,000. Regarding the proposed isolated plant scheme for the municipal group, Professor Clifford said that the bids presented by various manufacturers of generating equipment are unduly low for the requirements and he pointed out that no auxiliary machinery is provided in the tenders and that the present boiler installation could not be expected to meet the demands of the power and lighting service.

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Chicago Electric Vehicle Men to Meet at Jovian League Luncheons.

At the luncheon of the Chicago Section, Electric Vehicle Association of America, on Tuesday, April 21, in the Rose Room, Hotel Sherman, it was decided to discontinue the weekly luncheons of the section, substituting therefor monthly meetings in the evening and Vehicle-Association tables at the luncheons of the Chicago Jovian League at Hotel Sherman every Monday noon. This change was made in order to reduce the number of luncheons that many attend each week.

W. H. Metcalf, of the Philadelphia, Pa., section, told of the activities in that section. Monthly meetings are held at which many owners of cars are present. It is the aim of the Philadelphia section to obtain a good representation from car owners, and thus far their efforts have been very successful. About 640 electric trucks are now in use in Philadelphia.

New Officers for Institution of Electrical Engineers.

J. F. C. Snell has been nominated for president of the Institution of Electrical Engineers, to succeed William Duddell, who shortly closes his second year in the chair. Mr. Snell is pre-eminently an electric supply authority. For years he stood high in the councils of the municipal electrical officials as city electrical engineer and manager at Sunderland. He went to London when the London County Council was beginning to interest itself several years ago in the question of a comprehensive scheme for the future supply of the whole London district. He is a partner in the consulting engineering house founded by the late Sir William Preece—Preece, Cardew & Snell.

The new vice-president will be J. S. Highfield, also a leader in the electric supply field, and C. H. Wordingham, electrical engineer to the British Admiralty.

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Meeting of Society for Electrical Development.

The Society for Electrical Development announces that its annual meeting will be held at the Bellevue-Stratford Hotel, Philadelphia, Pa., on Monday, June 1, at 10:00 a. m. The object of calling this meeting at this time is to enable those who are attending the Nation Electric Light Association's convention to also attend the annual meeting of the Society. At the annual meeting of the Society, new directors will be elected. Immediately following that meeting the annual meeting of the board of directors will be held for the purpose of electing officers for the coming year.

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The Pageant and Masque of St. Louis.

A huge pageant and masque will be staged near Art Hill, St. Louis, Mo., from May 28 to 30 inclusive, to celebrate the 150th anniversary of the founding of the city. The pageant will reproduce the romantic history of St. Louis from the time of the mound builders to the celebration at the close of the Civil War. This will be followed by a masque in two parts, symbolic of the history of St. Louis. About 7,500 persons will be included in the cast and many unique electrical features will aid in making the celebration a success.

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Chicago Jovian League.

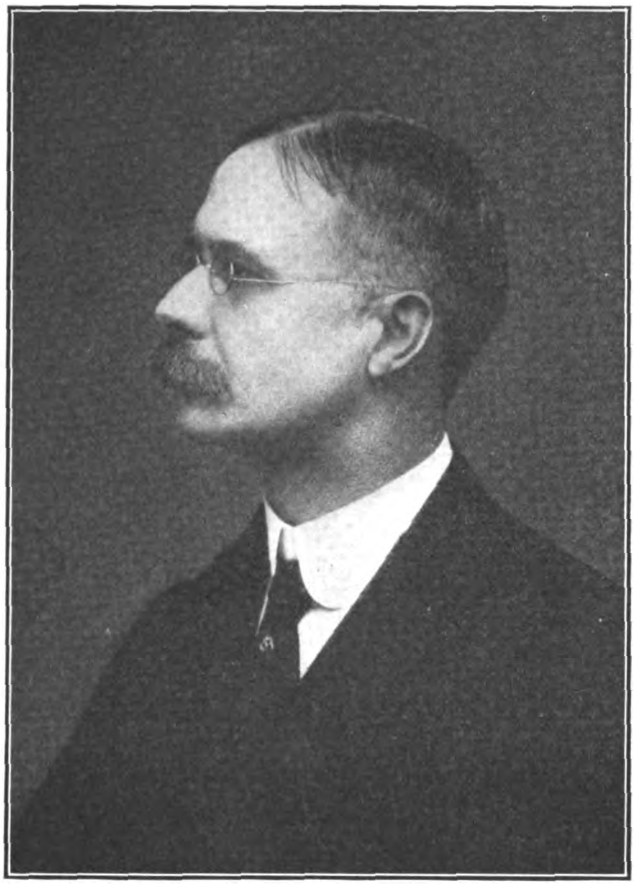
At the meeting of the Jovian League of Chicago, on April 20, F. P. Wilbur, superintendent of telegraph, Illinois Central Railroad, delivered a very interesting address on the subject of "Telephone Train Dispatching." Elbert Hubbard also delivered an amusing talk.

Edward B. Rosa.

One of the important elements in any industry is the establishment of suitable standards of measurement. In this country the Federal Government has sole power through Congress to fix all standards of weights and measures. In the case of the electrical units, Congress adopted the definitions which were laid down by the International Electrical Congress meeting at Chicago in 1893. For many years there existed in the Coast and Geodetic Survey an Office of Weights and Measures which had custody of the fundamental standards for measurements involving length and mass. When the necessity finally arose, this bureau also instituted work along the line of maintaining standards for electrical measurements as well as a few standards in other fields. It was not, however, until 1901 that Congress created the Bureau of Standards to take over the functions of the previous Office of Weights and Measures, and at the same time enlarged these functions so as to place in operation a national standardizing laboratory.

As director of this newly created Bureau of Standards there was appointed Samuel W. Stratton, who still continues in that office. In organizing the work of the Bureau, Dr. Stratton sought a man to place at the head of its electrical work who would combine a sound knowledge of mathematical and experimental physics with a familiarity of the problems and requirements of electrical engineering and the electrical industry. His choice fell upon Edward B. Rosa, who was called to Washington in 1901 to take charge of this work. His title at that time was physicist, but has since been changed to chief physicist, and his rank is next to that of the director of the Bureau. Under Dr. Rosa's direction the electrical work of the Bureau has been extensively developed and has already achieved much, both from the point of view of electrical standards and in the solving of problems connected with practical electrical work.

From the first it was the idea of its founders to provide a separate building for the electrical work, but the accomplishment of this was a matter of time. When the Bureau of Standards first moved to its present location on Pierce Mill Road in the District of Columbia, its housing consisted of a physical laboratory and a mechanical laboratory. To these were afterwards added a cryogenic laboratory and a building to house the sections dealing with heat and with engineering measurements. About three years ago an appropriation was made by Congress for building a separate electrical laboratory and the building itself was completed nearly a year ago. It has taken some time, however, to properly equip it and it is not until the present week that it has been thrown open to public inspection, in connection with the meeting held there by the American Institute of Electrical Engineers and the American Physical Society, conjointly. A description of the new laboratory will be found elsewhere in this issue. Its work will be directed by Dr. Rosa.



Edward B. Rosa,
Chief Physicist, Bureau of Standards.

Edward Bennett Rosa was born in Rogersville, N. Y., on October 4, 1861, the son of Edward David and Sarah G. (Rowland) Rosa. He attended Wesleyan University, being awarded a bachelor's degree in 1886. He later went to Johns Hopkins University, taking the degree of Ph. D. in 1891. In 1906 Wesleyan conferred upon him the honorary degree of Doctor of Science. After spending a year as instructor in physics at the University of Wisconsin, Dr. Rosa was made associate professor of the same subject at Wesleyan University, and afterwards professor. He remained here in this capacity until 1902. Among his early work was a determination of the ratio existing between the electrostatic and electromagnetic units; the investigation of the wave form of alternating currents, for which purpose he devised a curve tracer; and the measurement of the dielectric constants of electrolytes and the dielectric losses in condensers. In connection with the physiological investigations of F. G. Benedict he designed a respiration calorimeter.

Since taking up his work at the Bureau, Dr. Rosa's attention has been largely devoted to absolute measurements of electrical quantities. In conjunction with his assistants he has made a new determination of the ratio of the electrical units; has determined the electrochemical equivalent of silver in absolute measure by means of the current balance; has discovered the cause of former discrepancies in measurements of this constant; has devised methods for the measurement of capacity and inductance and worked out formulas for the computation of the self and mutual inductances of coils from their linear measurements. The photometric work of the Bureau has also been under his direction and he has given considerable attention to the problems involved in this work.

Dr. Rosa is a Fellow of the American Institute of Electrical Engineers and of the American Association for the Advancement of Science. He is a member of the American Physical Society, the Illuminating Engineering Society, the Société Francaise de Physique, the Washington Academy of Sciences and the Washington Philosophical Society. He has served as vice-president and as secretary of Section B of the American Association and as president of the Washington Philosophical Society. He has taken a prominent part in the international negotiations for determining specifications for the electrical units and for the international candle. He is a member of the International Electrotechnical Commission and has been made Honorary Secretary of the International Electrical Congress to be held in San Francisco next year. He is now serving upon the Standards Committee of the American Institute of Electrical Engineers and upon the Committee on Nomenclature and Standards of the Illuminating Engineering Society.

Dr. Rosa is a member of the Cosmos Club in Washington and makes his home in a beautiful suburb of Washington known as Cleveland Park.

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Toledo Jovians Hold Big Rally.

On Friday evening, April 17, Toledo Jovians, under the leadership of Statesman Charles Felker, held an imposing rally in Zenobia Hall, Toledo, O., between 300 and 400 Jovians being in attendance. The "get-together" co-operative spirit was never better exemplified than in the ready response and marked enthusiasm that greeted each speaker. Toledo has always been active in Jovianism and it is expected that as a result of this rally a luncheon league will be formed and the work carried forward locally more energetically than ever. The chairman of the entertainment committee and master of ceremonies was Harry Adams, of the W. G. Nagel Electric Company. He introduced Sam A. Hobson, western advertising manager of the *Electrical World,* who made an interesting address on the early days of the Jovian Order, relating the ideals of the founders of the organization, and commented upon the fine way in which the hopes of the pioneers were being more than realized in the progressive spirit engendering harmonious relations between all elements of the electrical industry through the work of the present-day Jovians.

H. H. Cudmore, of the Board of Arbitration of the National Lamp Works of the General Electric Company, made his usual witty address, directing his remarks particularly to the work of the Society for Electrical Development, Incorporated, and what it will mean to the electrical industry.

Mr. Cudmore was followed by A. A. Gray, of Chicago, who spoke of the benefits that the utilization of electrical energy and current-consuming devices was bringing to the community where these services were made available. Mr. Gray emphasized particularly the necessity for the electrical salesman having a very thorough understanding of the materials he was handling and their utilization for every form of domestic and industrial application. He also made the statement that electrical utilities and current-consuming devices were available to the public today at a lower cost than practically any other commodity with which the public is familiar when the advantages ensuing and the cost of producing these advantages were considered. Mr. Gray also pointed out that the community that encouraged the development of the service-rendering public-utility corporation derived far greater advantages than it conferred in the way of profits to the corporation. Incidentally, the record was very plain that where the community had throttled the opportunity of the public-utility corporation and had reduced its facilities through a niggardly and unwise policy of strained economy, that that community had inevitably fallen into a degenerated spirit where industry found it impossible to survive, workers found living conditions hardly tenable and investment was driven, possibly never to return, from its commercial enterprises.

S. E. Doane, chief engineer of the National Electric Lamp Association, pointed out that our greatest civilization was being accomplished largely through our present-day appreciation of scientific advances. He said that the present supremacy of the American people was due to their ready acceptance and utilization of those developments which the protection and promotion of the sciences had made possible. The development of the electrical industry and the utilization of electrical energy and current-consuming devices had done more to enlarge and improve our civilization than any other development of the sciences and arts within the present knowledge of man.

Thomas E. Valentine, president of the Valentine Electric Sign Company, Atlantic City, N. J., the designer of the great slogan sign installed by the Consolidated Railways & Light Company at Toledo, related briefly some Jovian experiences and commented upon the value of the friendships made and the co-operation developed in the carrying on of the business of the electrical industry through the spirit of the Jovian Order.

Homer E. Niesz, secretary of the Budget and Expense Committee of the Commonwealth Edison Company of Chicago, was introduced by Mr. Adams as the candidate for the office of Reigning Jupiter of the Jovian Order. Mr. Niesz made a happy address discussing the opportunities for both social advancement and practical business advantage through the work of the Jovian Order. He outlined the very practical work that was now being accomplished by the commercial division of the Order, and suggested a number of advanced ideas whereby this development may be enlarged.

Henry L. Doherty, president of H. L. Doherty & Company, and chairman of the Board of Directors of the Society for Electrical Development, Incorporated, received an ovation upon being called to the platform. It was some minutes before the tumult of applause made it possible for Mr. Doherty to make a few well-chosen remarks relating to the spirit and enterprise back of the Society for Electrical Development, and in fact back of the men who were responsible for the development of the electrical industry as we know it today. He had no patience, he said, with that attitude of mind that demanded something for nothing, and he said for himself he was convinced that the American people appreciated good service and in the long run would pay for it generously.

Mr. Doherty was followed by E. H. Haughton, general manager of the Bryan-Marsh Division of the National Lamp Works of the General Electric Company, and chairman of the Investing Committee of the National Electric Lamp Association. Mr. Haughton said that statistics show that 90 per cent of the men in this country over 60 years of age either had to work for a living or be dependent upon their families for support. He described the plan of the Nela investing committee where 7,000 employees of the National Electric Lamp Works had invested nearly $1,000,000 in securities in the companies owned or controlled by the Doherty interests, and said that there was being returned to these wage-earners a thoroughly satisfactory dividend upon their savings.

The last speaker of the evening was Elbert Hubbard, the brilliant writer, publisher of the *Phillistine* and the *Fra,* who delivered a remarkable address upon Benjamin Franklin, the original Jovian in spirit.

During the evening several of the speakers make allusions to the street railway controversy which is agitating Toledo at the present time, and concerned with which Mr. Doherty is the central figure. Judging by the tribute of applause evoked by Mr. Doherty's appearance and remarks, the rank and file of electrical men of Toledo are proud to show their confidence in his ability to cope with the situation and are enthusiastic for his success.

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Subscriptions to Bulletin of Bureau of Standards.

The scientific and technical papers of the Bureau of Standards are published as separate articles which may be obtained by anyone free upon application. These articles are also collected into issues of the periodical known as the *Bulletin of the Bureau of Standards,* each volume of which contains four numbers. The *Bulletin* is now in its tenth volume. Heretofore it has been sent mainly to libraries, public institutions and such other places as would find complete sets of the papers of value.

Additional arrangements have now been completed by which private individuals may secure complete sets through the payment of a subscription, which has been fixed at $1.00 per volume for the separate issues as they appear, or $1.50 per volume complete, bound in cloth. Subscriptions should be sent to the Superintendent of Documents, Washington, D. C.

The New Electrical Laboratory of the Bureau of Standards.

This article gives a brief general description of the new electrical laboratory of the Bureau of Standards and its equipment. Space does not permit a recital of all the details of this building, but some of the more important features are described and illustrated. Some interesting features of the construction work will be found in another article on page 820.

The electrical work of the Bureau of Standards has recently been moved into a new laboratory building. It is the fifth and largest of the group of buildings housing the work of the Bureau. The Bureau is located on an elevated tract of land in a suburban district of Washington, D. C., well away from other buildings of any kind, and from heavy traffic. Conforming to the general architectural plan of the group, the building is a stone-trimmed brick structure of fireproof construction. It is 64 by 196 feet in ground area and four stories in height, but as the basement is fully finished, there are five full floors, giving a useful floor space of approximately 36,000 square feet, besides an attic giving ample storage space. The cost of the building was $200,000, which figures out to be $5.50 per square foot of useful floor space or 27 cents per cubic foot.

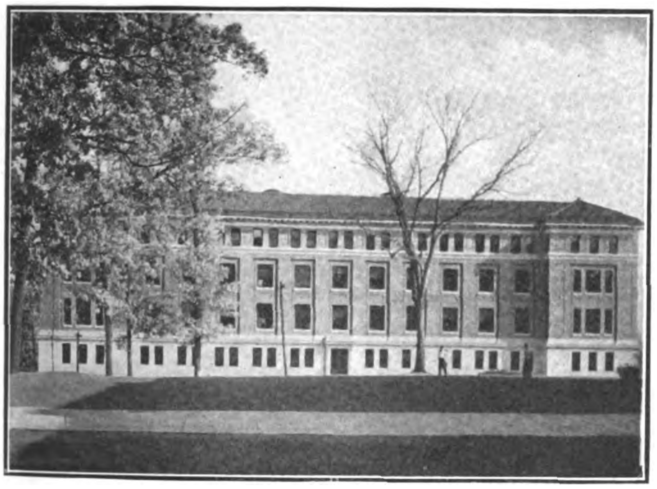

Fig. 1.—The New Laboratory Building.

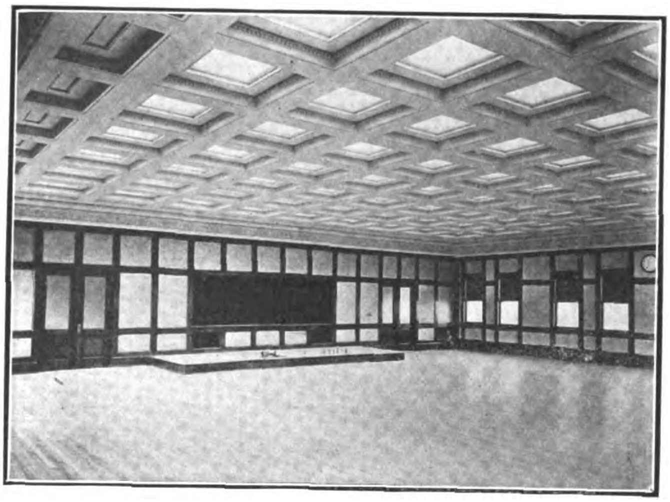

Fig. 2.—Lecture Room, Showing Method of Lighting.

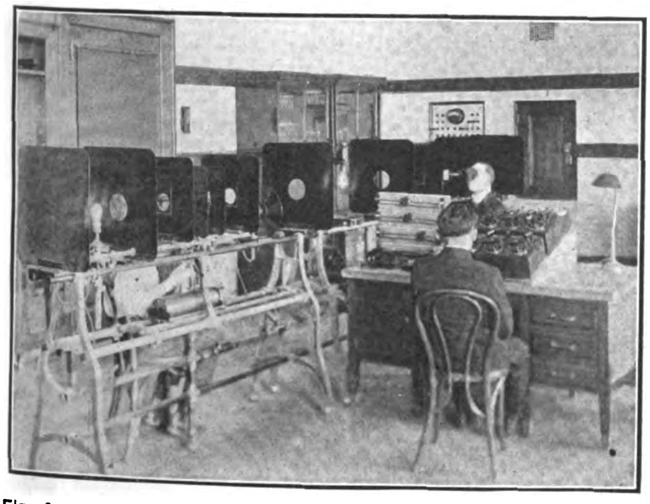

Fig. 3.—Standard Double Photometer, Showing Potentiometers, Automatic Recorder, Lamp Rotator, Sectored Disk, Etc.

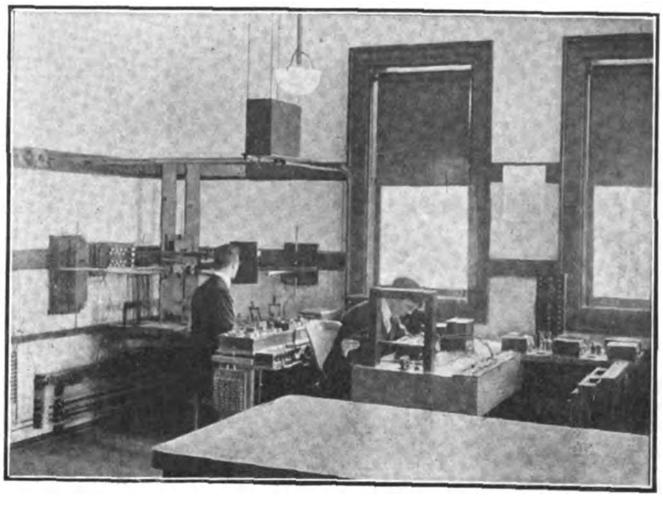

Fig. 4.—Apparatus Set Up for Testing Ammeters, Wattmeters and Watt-hour Meters.

The flooring is of oak, with the exception of a few rooms which have a special composition floor, and the corridors which have terazzo; and there is a wainscot of gray brick.

For the accommodation of scientific and technical meetings of societies and conventions held at the Bureau from time to time, and for periodic meetings of the staff of the Bureau, a lecture room is provided, capable of seating 300 persons.

Lighting.

The lighting is on the semi-indirect system. Contrary to general custom the bowls, which accommodate but a single unit each, are placed at a constant floor height rather than at a constant ceiling distance. Except in special cases requiring more illumination, 60-watt tungsten lamps are used, and the spacing is such as to require about 0.6 watt per square foot of floor area. The average resultant illumination in a horizontal plane 30 inches from the floor is from 2.5 to 2.75 foot-candles on the basis of new lamps.

The lighting of the lecture room of the new laboratory is carried out on a different plan, and is shown in Fig. 2. Light is diffused from 81 square panes of glass arranged in a square in the ceiling. Above each pane of glass is a lamp and a reflector. The resultant illumination is from 4 to 6.5 foot-candles over the seated area, and averages about 4.5 foot-candles over the whole when 40-watt lamps are used. This means an expenditure of about 1.2 watts per square foot, the efficiency being about 4 lumens per watt.

Organization of Work.

It may be well, before describing the equipment of the building, to indicate in a general way the subdivision of the work of the electrical division of the Bureau, especially as some of it is not strictly electrical. In nearly every case the work includes both testing and investigation. The various sections deal with electromotive force; resistance; inductance and capacity; absolute electrical measurements; radiotelegraphy; radioactivity; electrical measuring instruments, meters, and instrument transformers; magnetic measurements; flame photometric standards; electric photometric standards, including inspection and life test; regulations for illuminating gas; high-voltage safety appliances and regulation; electrolysis investigations (street railways); co-operation with public service commissions in standardizing regulations for meters, etc.

General Equipment.

Practically all the laboratories in the building are supplied with alternating and direct current (usually brought to Hubbell outlets placed at convenient intervals), gas, compressed air, and hot and cold water. In addition, steam, vacuum, acetylene, and refrigerating brine pipes are run to some of the laboratories as the special nature of the work requires. Brine coils are brought to four refrigerating closets on each floor, but the cooling coils will be installed only as needed for the particular requirements of the work.

Besides having access to the facilities of the power plant supplying the other buildings, the new laboratory has a dynamo room which at present contains seven motor-generator sets. Two of these are direct-current sets used primarily for charging storage batteries. The other five are alternator sets, there being from two to eight alternators on a single motor shaft, making a total of seventeen alternators, ranging in frequency from 12.5 to 3,000 cycles. Several of these have special features such as phase-shifting devices, arrangements for building up complicated wave forms, etc. In addition there are five smaller motor-generator sets installed in the various laboratories. All the motors driving alternators are usually supplied from storage batteries in order to secure steadiness of operation.

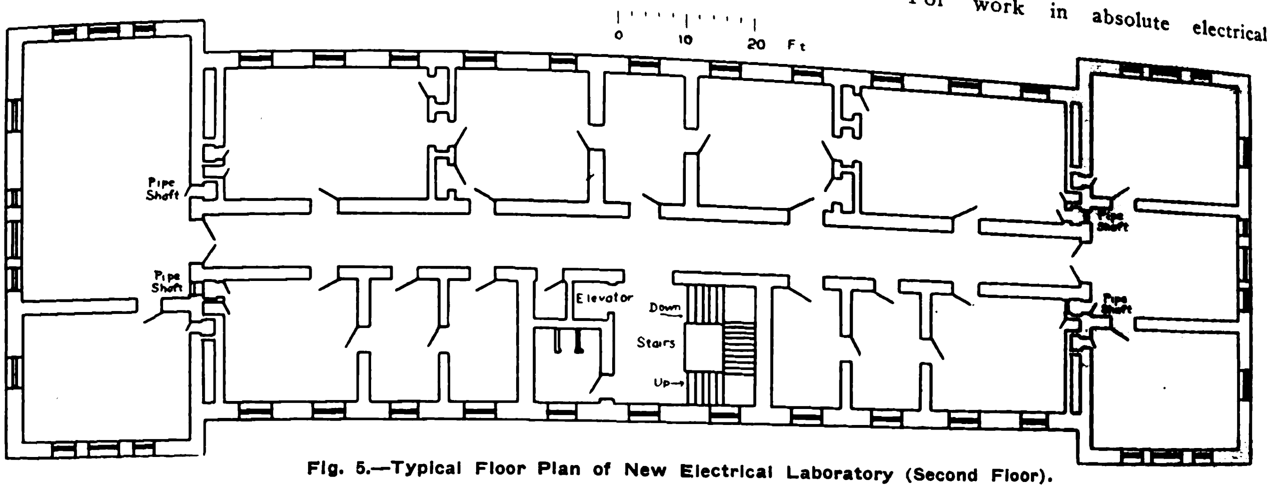

Fig. 5.—Typical Floor Plan of New Electrical Laboratory (Second Floor).

It may be of interest to list the storage-battery equipment, totalling nearly 800 cells. All are lead cells, but several types are represented.

Number of cells.	Ampere-hours.	Purpose.
128	400	Driving motor-generators, etc.
128	200	Driving motor-generators, etc.
64	120	Photometric testing.
64	120	Photometric testing.
15	120	Photometric testing.
60	120	Magneto testing.
45	24	Magneto testing.
15	120	Miscellaneous use.
4	4800	Instrument testing.
4	800	Instrument testing.
4	200	Instrument testing.
240	40	Instrument testing.

This list does not include portable cells for miscellaneous use. Recourse may also be had if necessary to four 130-cell batteries of 200 and 400 ampere-hours capacity, which are located in the power plant.

The distributing system is necessarily somewhat elaborate. Two panels of the main switchboard in the dynamo room are plug panels from which trunk lines lead to ten small panels distributed about the laboratories, each small board serving a small group of rooms, and also to a good sized board supplying the electrical-instrument laboratory.

One of the basement rooms is fitted for shop work with a lathe, drill press, grinder, etc., for the use of the laboratory men. This is in addition to the regular instrument shop of the Bureau, which has a staff of fifteen mechanicians.

Remote Control of Generators.

A motor-operated remote-control system has been installed by means of which the complete control of any of the larger motor-generator sets may be obtained directly in any room where its output is to be used, by merely plugging in a jack for the given machine. Five levers of a small controller then enable one to adjust frequency, current or voltage, phase, and an auxiliary direct-current voltage, to an accuracy of about 0.02 per cent or better over the working range. Fine and coarse adjustments are obtained by operating the motor at two widely different speeds.[1]

Special Equipment.

The nature of the work requires many very special pieces of apparatus and equipment. Only a few of these can be mentioned here.

For the heavy-current testing, four large storage cells already mentioned serve as a direct-current source. Built into the busbar system leading from them is a water-cooled tubular rheostat capable of carrying 10,000 amperes, a special mercury reversing switch, and a heavy electrodynamometer serving as a transfer instrument for alternating current. The rheostat is motor-operated.

For work in absolute electrical measurements of the highest precision special provision is made in one end of the basement. Manganese steel beams are used in the concrete structure in order to minimize magnetic disturbances. There is a special balance room with piers, double walls minimizing the variations of temperature, etc. A dark room is also provided.

Below the sub-basement is a vault for the standard cells which serve for the ultimate standard of electromotive force. The temperature of the room as well as that of the bath in which the cells are kept will be thermostatically controlled. It is probable that the humidity will also have to be controlled.

Three rooms have been very thoroughly equipped as chemical laboratories, one serving as a pure-materials laboratory for the work on the standard cell and the silver coulometer, the other two rooms being occupied by the work in gas investigations.

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[1] This arrangement is described more in detail on page 821 of this issue.

Life Test of Incandescent Lamps.

Since the Bureau is charged with the entire technical supervision of the purchase of incandescent lamps for the Government, amounting now to more than a million lamps per year, a very complete equipment for life test has been installed. In an adjacent room is a photometer bench used entirely for the life-test work. A small integrating sphere has been installed to facilitate the study of the variations of the reduction factor, or the ratio of mean spherical to mean horizontal candlepower, during the life of the lamp under test.

Some Laboratory Details.

Instead of heavy fixed tables for laboratory work, heavy maple-top portable tables have been adopted. They are all 31 inches high and 34 inches wide and are of three standard lengths, 72, 60 and 24 inches. This allows arrangement in L's, T's, U's, etc., to suit any particular class of work. The two smaller sizes are used in much larger numbers. A considerable number of special "bench units" 34 by 60 inches are also used. They are much like an ordinary flat-top desk, but have heavy maple tops, and a cupboard in one pedestal.

A 2-by-3-inch bench-rail is attached edgewise to the walls of the room at table height, forming a support for permanent fixtures such as gas, water and air cocks, Hubbell outlets, etc., as can be seen in Fig. 6.

The laboratory wiring is carried around the outside walls of the room in a wooden conduit with removable cover, to provide easy access for changes.

Two dadoes, each about 6 inches wide, are carried around the outside walls at heights of 52 and 80 inches respectively. These are very convenient for mounting galvanometers and other instruments, as may be seen in some of the accompanying illustrations.

The shades at all east, west and south windows are provided with a device for adjusting the whole shade to any desired height. This is a great convenience in adjusting the light for many laboratory purposes. All window frames are so constructed that special dark shades may also be installed with very little trouble. The windows in some rooms, including, of course, the lecture room, have been equipped with these shades.

High-Voltage Laboratory.

A separate small building has been erected for the high-voltage work, and two 5,000-volt, two 25,000-volt, and two 100,000-volt transformers installed, having capacities of 2, 3 and 10 kilowatts respectively. They were installed in pairs for use in the precise determination of the ratio and phase angle of voltage transformers by a standard transformer method. Some insulation testing will also be done with them. The system of distant control has also been extended to this building, allowing a practically continuous adjustment of voltage over wide ranges from the laboratory.

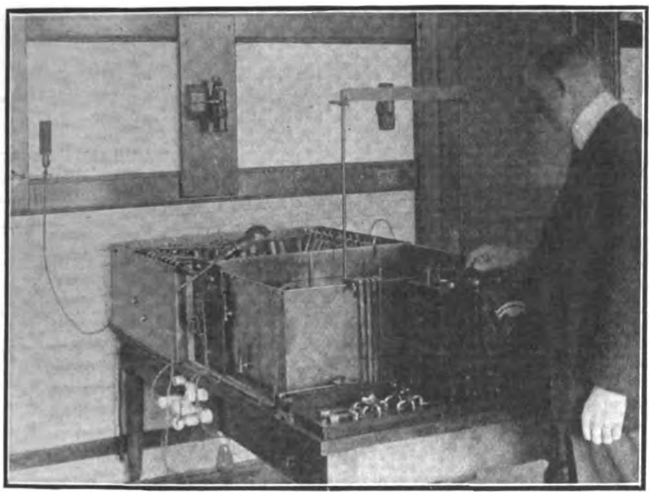


Fig. 6.—Apparatus for Precision Measurement of Resistance Standards. The Temperature of the Bath Is Thermostatically Controlled.

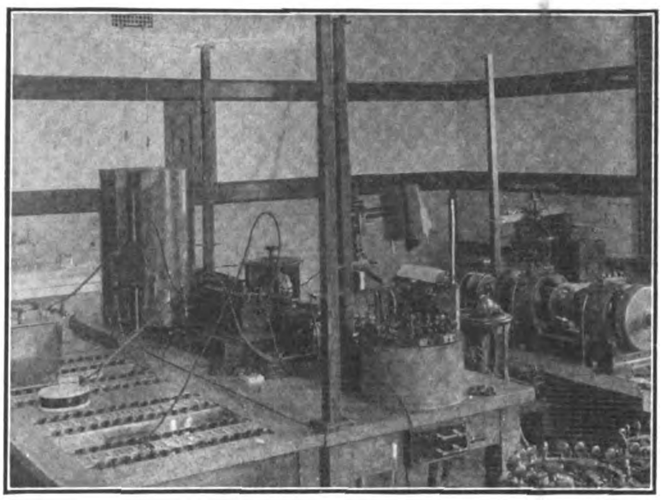


Fig. 7.—Apparatus for Measuring Inductance and Capacity. Standard Condensers at Left are Kept at Constant Temperature and Humidity.

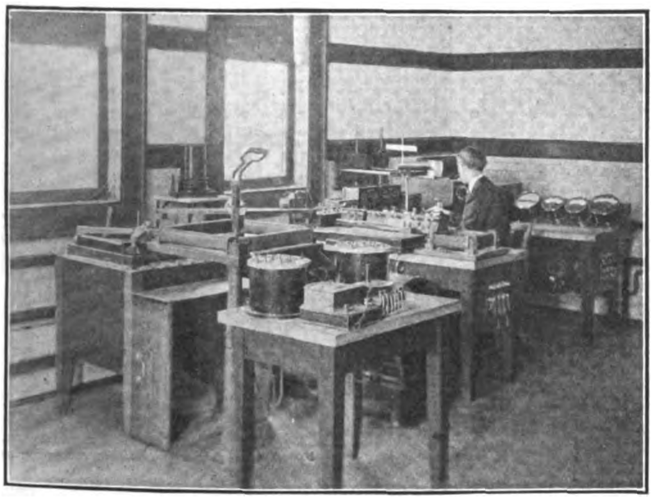


Fig. 8.—Two Modifications of Epstein Apparatus for Testing of Sheet Iron.

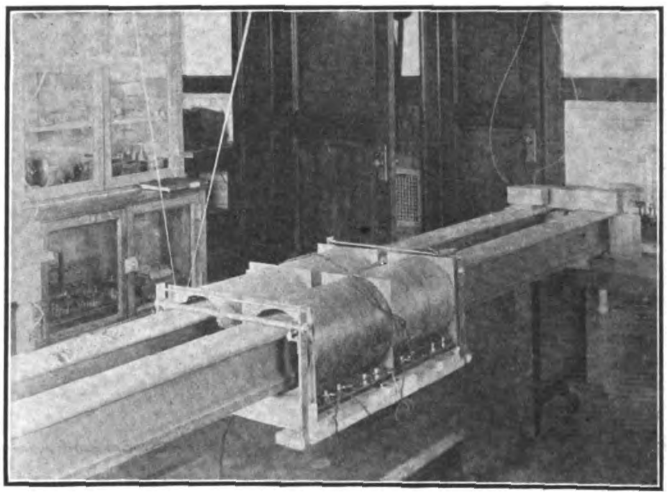


Fig. 9.—Apparatus for Investigating Feasibility of Flaw Detection in Steel Rails Magnetically.

Commercial Practice Management, Rates, New Business

Convention of Commercial Men of Ohio Central Stations.

Approximately 50 delegates representing new-business departments of Ohio central stations, electrical contractors and manufacturers in the state, convened at the Dayton Club in Dayton, O., on April 15 to interchange ideas on central-station commercial methods. The meeting was the second of its kind held under the auspices of the Committee on New Business Co-operations of the Ohio Electric Light Association. This committee has established a precedent in association work by these meetings, at which the representatives of the small towns are specially invited to participate. The committee under the leadership of Thomas F. Kelly, sales manager of the Dayton Power & Light Company, has made every effort to find out the problems that are confronting the commercial men in the smaller towns and the programs of the two meetings so far held have been prepared with this in view.

The morning session was called to order by Chairman Kelly and Fred Rike, the personal representative of the mayor of Dayton, introduced. Mr. Rike cordially welcomed the visitors to the city and explained some of the civic conditions which had made Dayton famous. He referred particularly to the commission form of government which the city has adopted; to the flood-prevention measure which is at present being agitated locally and nationally, and which is receiving the hearty support of the citizens of Dayton; and lastly to the Greater Dayton Association, composed of the business men and others who are making every effort to increase the prosperity of the city and improve civic and political conditions.

Following this address a very instructive paper entitled "A Successful House Wiring Campaign," by E. L. Callahan of H. M. Byllesby & Company, of Chicago, was presented by Robert Montgomery, commercial manager of the Louisville Gas & Electric Company. This paper describes in detail the very successful campaign which has been conducted in Louisville during the past two months and is presented in full elsewhere in this section.

A rather complete but informal discussion followed the presentation of this paper, particularly concerning the point of who should do the wiring. It was the concensus of opinion that the best results can be obtained by turning all wiring contracts over to the local electrical contractors and in this way gain their support and co-operation.

The advisability of including fixtures in a house-wiring campaign was discussed and it was thought by many that if the central-station company attempted to specify certain fixtures which should be used, the field of the campaign would be limited; and on the other hand, if sufficient varieties were embodied in the plans to please all tastes the multiplicity of fixtures necessary to display would cause considerable annoyance.

Thomas F. Kelly,
Sales Manager, Dayton Power & Lighting Company, and Chairman, Committee on New Business, Ohio Electric Light Association.

The subject of "Handling of the Chronic Kicker" was then briefly discussed. Parker Kemble, of Cincinnati, voiced the opinion of those taking part in his statement that extreme courtesy on the part of employees is the best manner of meeting kicks. It was also pointed out that every central-station office should be equipped with a private room where persons complaining could be interviewed, as this should not be done in the general offices where the conversation, often heated, could be overheard by customers.

The meeting then adjourned to the dining room, where an excellent luncheon was served. During this Charles Wuichet, of Dayton, delivered a very humorous and entertaining address on the subject of "Hot Air." Following this, Frank M. Tait, president of the Dayton Power & Light Company, spoke briefly of the development in the electrical industry and gave statistics showing that the volume of business doubled every five years. He commented also on the importance of the sales department work and the prominence that this is receiving at present.

R. H. Grant, sales manager of the National Cash Register Company, then gave a very inspiring and convincing talk on sales methods, pointing out that selling is a broad and dignified occupation, where the article sold has merit. He said that if the product is a good one then the only thing necessary to create a desire on the part of the purchaser is education, and this is one of the most important features of sales work. Salesmen to be successful must be observing, must be good listeners, must keep well informed and must be thinkers.

At the opening of the afternoon session, Chairman Kelly reiterated his statements made at previous meetings that the committee is particularly desirous of assisting the smaller companies. He stated that one small company had written to him expressing their need for a competent power salesman, whom they could afford to employ for only a short time. He thought that if this situation existed in a number of localities the committee could well afford to employ a high-class salesman and have him sent from company to company, as his services were desired, the companies to reimburse the committee for the time the salesman was used.

Speaking of this co-operative work, Parker Kemble, of Cincinnati, thought there was a hesitancy on the part of the small companies to ask questions of the committee, and he thought that the best results could be obtained by urging these companies to appeal directly, either through personal correspondence or by a visit, to their neighboring larger central stations. In this connection, A. L. Steele thought that the committee should furnish the small companies with a list of the new-business representatives of all companies in the state so that personal correspondence could be directed to them.

S. F. Messer, of Kent, thought that the managers of small companies should make it a point to cultivate the acquaintance of the managers of the larger central stations and make personal visits to them when information is desired. It is also advisable to take prospective customers to visit successful plants in the larger cities, as these visits will tend to impress upon him the desirability of obtaining service.

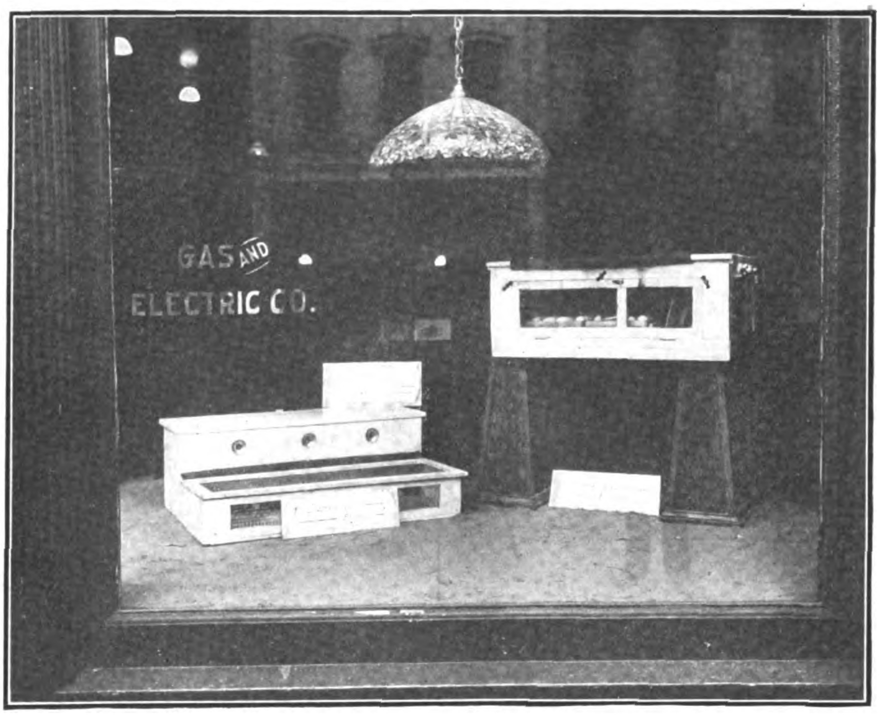
The subject of "How the Nitrogen Lamp Can Be Used to Displace Gas Arcs for Exterior Illumination," was then taken up. Parker Kemble, of Cincinnati, referred to the experience of the Union Company in this connection, there being at present about 400 nitrogen lamps on the lines of the company. He described a unit comprising a weatherproof fixture with a 12-inch globe and a 750-watt nitrogen-filled lamp, which the Union Company is placing on a rental basis. The same fixture with 500-watt Mazda lamps are also placed in the same manner and are widely used in Cincinnati. He spoke of the importance of using a proper fixture and reflector in connection with the nitrogen lamp, because of its peculiar characteristics. The company renews lamps without cost but no data are as yet available on the life of the new lamps.

"What Benefits May Be Derived From Commercial Application of Electrical Heating Devices," was the next subject brought up for discussion. It was pointed out by one representative that the revenue from domestic appliances is less than commonly thought and he questioned the advisability of spending money or of having employees devote time to securing this class of business.

Otto Wessel, of Columbus, explained that his company employs a man who devotes his entire time to heating devices. The company considers this profitable both in point of profit from sales and additional revenue from appliances connected. He added that if the householder is educated to the use of numerous electrical devices there is less chance of such a customer ever moving into an unwired house.

Parker Kemble, of Cincinnati, stated that the Union Company employs women solicitors who devote their entire time to this business. The salary is $65 per month and car fare, and they are required to sell devices aggregating $250 per month. They also receive a commission of 10 per cent on all sales above this amount. He added that the appliance department of the Cincinnati company is a profitable one and this would be true generally if price cutting were eliminated. He referred to this as a harmful practice.

The question "What Has Been Done to Develop the Electric Range Load?" was then briefly discussed. It was the general concensus of opinion that with the competition of natural gas in most Ohio cities, the sale of electric ranges even at a low rate for energy was a difficult proposition. Mention was made, however, of the success that is being had in numerous localities outside of the range of natural gas. A particularly good field for this business is in summer-resort districts and along the lake, where there are a great number of summer homes. It was generally agreed, however, that cooking business is not being given the consideration that it deserves. It was also pointed out that while a low cooking rate is necessary to secure the business, it should preferably be a sliding scale rate, as a low flat rate would be hard to justify in case of commission investigation.



Electric Incubator and Brooder in Show Window of La Crosse Central Station.

The third and last meeting previous to the annual convention of the Ohio Electric Light Association at Cedar Point in July, will be held in Cleveland on Friday, May 22, on "Ohio Electric Light Association Day" of the Cleveland Electrical Exposition.

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Electric Incubator Makes Striking Window Display for Central Station.

A window display of unique character and which has attracted a great deal of attention is that at the office of the LaCrosse Gas & Electric Company, LaCrosse, Wis. The display, as shown in the illustration herewith, consists of an electric incubator and electric brooder designed and constructed by Anton Anderson, of the LaCrosse Gas & Electric Company. The incubator, loaded with 100 eggs, was placed in the show window and connected to the circuit. At about Easter the chicks appropriately began to make their appearance. As soon as they were hatched they were transferred to the electric brooder to rejoice in their downy bed of cotton, while in their waking hours they ran around in the wire coop in front of the brooder. Thus they afforded wonder and amusement for both children and adults.

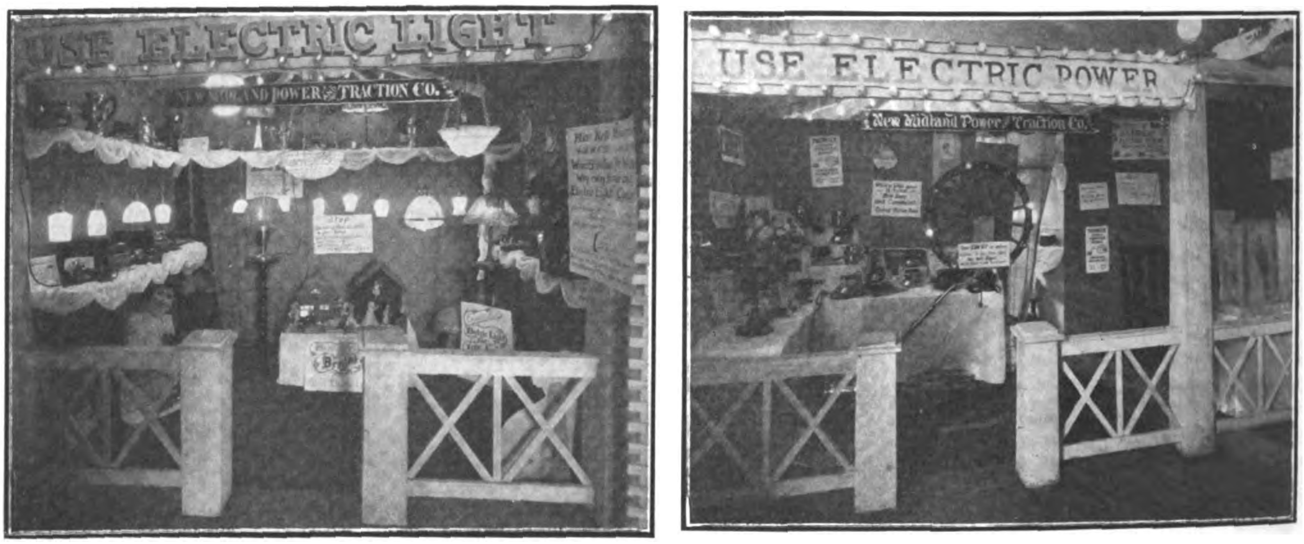
The construction of the incubator is as follows: The dimensions of the box are 14 inches high, 35 inches long and 25 deep. This box contains another box therein, which is separated by an air chamber from the outer box. It has four regulating air tubes, two for fresh air, one for regulating foul air and one for ventilating the air in the egg chamber. The fresh-air tubes are on the inside of the box, directly underneath the two lamps, the air coming in passes over the lamps and becomes heated. It then passes over a sheet of steel, lined with asbestos on both sides and formed in a half circle, the upper side of the circle being within two inches of the top of box and being separated by six inches from the lamps. The hot air then passes over the eggs and passes out through the ventilating tubes. These tubes, when once set for the hatch, remain so until the hatch is completed.

The heating apparatus consists of two 10-candlepower lamps, which are controlled by an electric thermostat, which was also designed by Mr. Anderson and controls the heat up to 102 degrees. When it reaches that point, the lamps are cut out automatically. The lamps have been colored a very dull red so that the light will not affect the eggs in any way. There is absolutely no waste of current as the lamps are on approximately 30 per cent of the time. The eggs are turned twice a day.

The brooder to be used in connection with Mr. Anderson's electric incubator is constructed as follows: It is 16 inches wide, 48 inches long and 12 inches high and the yard is directly in front of the brooder and is 16 inches wide, 48 inches long and 6 inches high. The brooder is partitioned off into two compartments, the heating and the warming chambers. The heating chamber is seven inches high and the warming chamber is five inches high and lined with canvas and 1-5 inch of cotton batting. This cotton batting is placed on the top side of the warming chamber so that the chicks can warm themselves in the same way as they do when being warmed under a hen.

Heating of the brooder is done electrically by three 10-candlepower lamps controlled by a thermostat. The lamps are directly above the warming chamber and the heat is kept practically at 100 degrees. The yard is separated from the warming chamber by a woolen curtain cut into fine strips so that the chicks can go from one compartment to the other, that is to say, from the warming chamber into the yard, or vice versa, without materially affecting the temperature in the warming chamber.

The front part of the brooder has three three-inch circular windows inclosed in the heating chamber so that the electric lighting effect may be seen. This is for ornamental purposes.


USE ELECTRIC LIGHT
NEW MIDLAND POWER & TRACTION CO.
USE ELECTRIC POWER
New Midland Power & Traction Co.

Central-Station Exhibits at "Made in Cambridge" Exposition.

Central-Station Exhibition in Cambridge, O.

The New Midland Power & Traction Company, of Cambridge, O., was largely responsible for the success of the second annual "Made In Cambridge" exposition which was held the week of April 13, and the results that have accrued have more than justified the company's efforts. Over 16,000 people visited the show during the week and the company secured many inquiries which are developing into live lighting and power prospects.

One of the features of the company's exhibit was a large electric sign announcing the name of the winner of the $5 gold piece offered by the company to the school child making the most accurate estimate of the company's gross receipts for the month of January. The contest also included an essay of 500 words dealing with the economy of residence electric lighting.

Commenting on the show, W. S. Hays, superintendent of the Cambridge companys says:

"The show was largely the result of our own personal efforts and as a matter of information, we wish to advise as result since the first show a year ago we have increased the horsepower of central-station motors on our lines by nearly 100 per cent and the number of our consumers by 25 per cent, proving that anything that boosts the town comes back directly and indirectly to the central station and should be pushed aggressively by us all.

"One of the novel features brought out during the show, was using an electric light frozen in a block of ice (which is a by-product of our business) operated by a flasher which attracted a great deal of attention and clearly showed that electric light is as cool as ice.

"Only manufacturing plants were shown in exhibits. A banquet was given on Friday evening to which came men from commercial bodies of Wheeling, Zanesville, Coshocton, Columbus, Pittsburgh, etc. A large electric sign reading "Boost Cambridge" was the center of decorations behind speakers' table."

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Utilities Company Maintains Electric Cottage.

What is proving a most effective method of demonstrating the great variety of uses to which electricity may be put in the home, is in use by the Utilities Company, of Lexington, Ky. This company is maintaining what is termed an "Electric Cottage." The dwelling, which was furnished by the various house furnishers of the city, is complete in every respect, from the kitchen to the bathroom and contains all the electrical conveniences that are possible in a residence. The company, in announcing the opening of the cottage, issued an invitation to Lexington people to avail themselves of the convenience of the house, as a meeting place, as a rest room, as a place to obtain refreshments, and as a place to see what electricity can do to make life easier and pleasanter. Demonstrations are conducted daily by girl graduates of the Harrison school of applied electricity, assisted by members of the junior class of the Department of Domestic Science of the Kentucky State University. All the numerous cooking appliances are shown in operation, as are all the electrical contrivances which are useful in the home. One thing in particular which is graphically demonstrated is the electric burglar alarm set up in the bedroom of the cottage.

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Telephone communication will soon be opened between the European cities Berlin and Milan.

A SUCCESSFUL HOUSE-WIRING CAMPAIGN.

By E. L. Callahan.

Comparatively few cities in this country have as many as 50 per cent of the houses wired for electric light out of the total in the city which could reasonably be expected to use electric light. In Eastern cities this percentage is probably as low as 25 per cent, therefore, the outline of a practical house-wiring campaign, that has been tried and found successful will, without doubt, be of interest to all central-station companies.

A house-wiring campaign was started in Louisville, Ky. (population 250,000), about two months ago, with the result that the Louisville Gas & Electric Company is now adding to its lines an average of 70 old houses per week, from the campaign proper, with a total result of approximately 150 new residence consumers each week, as the direct and indirect result of the house-wiring campaign. The average cost of the wiring, including fixtures and 40-watt Mazda lamps, is $36.43 per house. In starting this campaign in Louisville, the residence portion of the city was divided into five districts, with one house-wiring salesman being assigned to each district. It is estimated that there are approximately 40,000 residences in Louisville and that, of these, there are 15,000, at present, connected to the company's lines. Assuming that 50 per cent of the remainder is prospective, at this time, we have approximately 12,500 old unwired houses which are considered prospective lighting consumers. It is the intention, in Louisville, to keep this campaign going for at least a year, or until practically every home in Louisville is wired or connected to the company's lines should it be found that some of these houses are already wired but are not connected. If a thorough canvass were made, in any city in the United States, to ascertain the number of houses wired, but not connected to the lighting company's lines, the result would be surprising. In one large city such a canvass showed that there were as many houses wired, but not connected, as there were of residences taking service from the lighting company.

Difficulties Encountered in Launching a Campaign:

Many central-station companies have discontinued the practice of selling appliances and doing house wiring, and not desiring to enter into this business, even temporarily, they are often confronted by difficulties which seem almost unsurmountable, especially when it is a question of making satisfactory arrangements with the electric contractors to do the work. This difficulty was experienced in Louisville since the Louisville Gas & Electric Company do no piping or wiring, nor do they sell appliances or any kind, this being the policy at all Byllesby properties. Therefore, with a view of enlisting the necessary assistance to carry out such a campaign, the contractors were invited to attend a noonday luncheon for a conference. The entire matter was laid before them. They were given figures showing the large field of operation. The campaign was carefully outlined and the number of unwired houses in Louisville calculated. The contractors were given to understand that the company would spend a large amount of money in advertising the campaign in the daily newspaper, through hand bills, and, through its five salesmen, would be able to hand them a large volume of business which would warrant their making prices that would be satisfactory to carry on a successful campaign. It was pointed out to the contractors that they could pool their interests, purchase materials, as a single jobber, and effect economies in taking care of the business handed over to them by the lighting company, to say nothing of other business which would come directly to them at a much lower cost than they have ever been able to do heretofore. These contractors were requested, at this meeting, to submit specifications and quotations, on a flat-rate basis, making a price, per outlet, for the wiring, also a flat price for each fixture, hung complete, ready to burn, including 40-watt Mazda lamps, figures based on the Tungstolier line of fixtures. The Louisville Gas & Electric Company proposed to bear all expense of a vigorous advertising campaign and to have five of their salesmen, referred to above, secure the house-wiring contracts, contracts to be taken between the consumer and the contractor, the company not being a party to the contract, but merely acting as a sales agent. The above plan, it will be seen, does not necessitate the contractor spending any time in obtaining the business. In view of these facts, and considering that contractors would be relieved of all advertising and selling expense, as well as the cost of making estimates, it was reasonable to expect some very attractive prices from them.

Contractors' Prices High.

After due deliberation, the contractors submitted specifications and quotations, which were rejected by the company, because they were too high to make the campaign a success, in fact, the prices were no lower than the average price regularly charged.

An application blank was then compiled by the company which constituted a form of contract between the contractor and consumer, in which the contractor agreed to do the work, on a time payment plan of 25 per cent cash, on completion of the work, the balance to be paid in twelve equal monthly payments, the entire charge subject to a discount of 10 per cent in the event the consumer desired to pay cash within ten days after the work was completed. The contract blank was prepared in such a way that it was a very easy matter for the consumer and salesmen to select the fixtures and the kind of wiring, location of switches, etc., best suited for the particular residence and ranging in price from $10 to $150, as best suits the pocketbook of the consumer. On the second page of the application was the schedule of fixture prices, which prices were revised upon the announcement of the General Electric Company that the manufacture of Tungstolier fixtures would be discontinued. The wiring specifications and schedule of prices are shown herewith. As soon as this application had been compiled, it was submitted to the contractors. They considered the prices entirely too low and, in a body, refused to take up the work at the prices named.

One Contractor Accepts Company's Schedule.

Fortunately, a few days later, one contractor voluntarily accepted the company's schedule of prices and contract, providing the company turned over to him all of the work. After the company had satisfied itself as to the ability of this contractor to finance such a large business, on the time payment plan, the campaign was launched.

In addition to the large number of contracts that the company is turning over to the contractor, he is now receiving practically an equal volume of house-wiring business which comes to him without solicitation, induced, no doubt, by the advertising of the company's campaign.

All Electric Contractors Benefited.

All the other contractors are apparently doing a much larger business, since the campaign was started, than they had been doing before. Also the sale of portables, electric irons and other appliances has increased materially, at all supply houses and dealers. The contractor, to whom the company turns over the house-wiring business, found it necessary to perfect an organization capable of handling such a large business efficiently and included in his new organization is a credit man, who passes on all accounts; a trained fixture salesman in charge of fixture room, who takes care of the many customers who prefer to call and see the fixtures, rather than select them from a salesman's catalog, and an outside superintendent in charge of 42 wiremen.

The capital required by the contractor to carry on the business, as outlined above, is approximately $25,000 and, to be successful, a contractor must carry on and watch his business as carefully as any successful merchant would.

Cash Prizes to Salesmen.

As evidence of the contractor's satisfaction with the prices adopted in Louisville, it should be noted that he voluntarily furnishes to the commercial department of the Louisville Gas & Electric Company $10 per week, which is given as prizes to the two salesmen securing the largest number of house-wiring contracts each week, $6.00 to the highest man and $4.00 to the next highest. In addition to these prizes, the company gives a cash prize of $10 to the salesman showing the highest efficiency each month, a certain percentage being added for every kilowatt contracted for and connected, also for working overtime, turning power prospects over to power and gas salesmen, taking care of complaints, etc., a deduction being made for tardiness, carelessness and for other similar reasons. The relative standing of each man is posted daily on a blackboard in the commercial department which has resulted in a keen rivalry for first place. The entire commercial department of the Louisville Gas & Electric Company hold a meeting every Saturday afternoon, presided over by Mr. Montgomery. At this meeting a paper is read on some subject of general interest, a lively discussion following. These papers and discussions have proven very attractive and beneficial to the department and to each of the salesmen individually.

It was decided that, while public interest is aroused because of general publicity and the special advertising by the company, that the sale of electric irons could, at this time, be stimulated effectively. A large retail tea and coffee company in Louisville, that sells about two dozen staple groceries, on the premium plan, purposes to add to its premium list the choice of two standard electric irons, the premiums being distributed upon delivery of the first pound of tea or coffee, after signing an agreement to take a certain quantity which entitles the purchaser to the premium. It is thought that, through this medium, this aggressive concern, with seven delivery wagons in Louisville, will be able to place a large number of irons on the lines of the company within the next few months.

Any campaign for business can be made successful if planned along the right line and then carried out with the necessary steam back of the efforts exerted.

The reason many house-wiring campaigns "peter out" is not because the plan was wrong but because the one in charge or responsible is asleep at the switch. All effective advertising must have a punch. The efforts of a department manager, to be successful, must be stimulated by the determination to win. A house-wiring campaign, or other campaign, in the hands of such a man will be successful because it will not be launched until he knows the plan is right and that he can put it into successful execution.

Plowing by Electricity in Italy.

Consul L. J. Keena, Florence, Italy, reports that some experiments have recently been made near Florence on plowing by electricity, following the example set by landowners in the department of Emilia. The stationary apparatus drawing energy from some commercial electric line consists of transformers, motors from 25 to 50 horsepower, motor-driven capstan, and hauling cable. The running apparatus is made up of a leading truck and wheeled plows. It is stated that 89 acres can be plowed without shifting the stationary plant.

At Gazzo Veronese the following estimates of the cost per acre of plowing were made; Plowing with animals, $5.30 to $5.75; steam power, $4.30; electric power, $3.00. The plowing was done to a depth of 13.78 to 15.75 inches, and the foregoing cost of electric plowing is figured on the basis of 200-days' work per year with electric power at the rate of three cents per kilowatt-hour. In the same district for 100-days' work in the year with the price of electric power at four cents per kilowatt-hour, the comparative costs per acre of steam and electric plowing were: Steam plowing, $5.07; electric plowing, $3.35. Other plants in the same district are said to have reduced the cost of electric plowing to $2.83 per acre.

Near Piacenza on a two-acre tract the expense for plowing to a depth of 17.72 to 19.68 inches with electric power, was $4.00 per acre. The plowing was somewhat deeper, the cost of electric current was five cents per kilowatt hour, and the land was cut by a highway running through it.

Calculations made at Reggio Emilia on 741 acres plowed by electric power showed the total cost to be $4,324, with power at 1.6 cents per kilowatt-hour. For other systems using a moving engine the costs of plowing a similar parcel of land figured on the same basis, were: Plowing with steam power, $4,360; gas engine, $4,368; oil burning engine, $4.285.

The cost of fuel in this district is approximately as follows: Coal, per long ton, $12.20; wood, per 220 pounds, $0.80; gasoline, per five-gallon tin, $1.80; kerosene, per 200 pounds, $7.00.

Bristol Company Utilizes Show Windows for Manufacturer's Display.

In Bristol, which lies on both sides of the Tennessee-Virginia line, the Bristol Gas & Electric Company is using the latest and most up-to-date plan for the popularization of electricity as power. The company is one of the enterprises of Henry L. Doherty & Company, of New York, and the power and current it distributes comes from the power dam and plant of the Watauga Power Company, situated on the Watauga River about nineteen miles from Bristol. The Doherty Company purchased this property some time ago, and is in position to make a most liberal offer to the manufacturers and people of Bristol. In many of the manufacturing establishments of Bristol, which is a thriving city of 20,000 people, electricity has already supplanted steam as power and the low rate has resulted in making the city what its inhabitants boast the "best lighted city of its size in the South."

By way of encouraging the manufacturers who have become converts to the electric motor power and to impress upon any others the desirability of making the change, the Bristol Gas & Electric Company has for the last six or seven weeks maintained a series of displays in the show windows of its office building. Each week the show windows are devoted ot the display of a manufacturer using electric power. One of the company's two big windows serves to display samples of the company's finished product while the other shows the actual process in the making of the whole or a part of the finished article. This moving display is, of course, operated by electricity, the power for the purpose being furnished by the company free to the exhibitor.

Convention of Doherty Managers.

The operating heads of utility properties controlled by H. L. Doherty and Company, to the number of 148, met in convention at New York City recently. The companies represented are distributed over 24 states.

F. W. Frueauff and George Williams presided at the sessions, which totalled ten in number, and were devoted to commission relations, auditing, gas, public relations, new business, welfare and safety, statistics, and electric vehicles.

Electric Sign Data

Electric Signs and Moving Pictures.

In a recent issue of *Electric City*, published by the Commonwealth Edison Company, the following editorial relative to electric signs appeared:

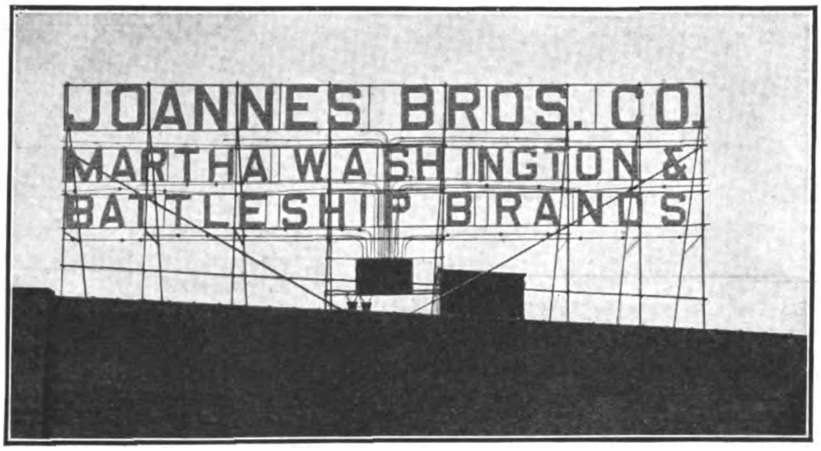
Under the title of "Electrical Movies" Ivan Heald, a clever special writer on the London *Express* describes a novel form that refers to the spectacular signs which every live town can now boast. Many of these are elaborate enough to fully warrant such a title; some show electric interurban trains, some show steam locomotives in motion with the operation of the semaphores or block signal systems, others show automobiles traveling apparently over smooth roads, the wheels revolving rapidly, the veils of the lady occupants blowing gayly in the breeze, and perhaps even include, as one such sign in Chicago did, the representation of a dog running near the hind wheel.

It is not too much to say that there is hardly any motion picture requirement which is beyond the resources of the builder of the electric sign and the builder of flashers, as developed today, to produce with such a degree of realism and such complete illusion that even the most sophisticated must needs stop, if not to wonder, at least to approve. For a long time past one of the most noted moving effects in electric signs has been the chariot race scene from Ben Hur, which was the distinguishing feature and the principal attraction of a very large electric advertising display in New York City. Its proportions were enormous, the expense of construction and erection was very heavy, and yet it is probable that the investment was extremely profitable, as it was really one of the sights in New York, which is saying a good deal for an "ad."

Colored lights in large signs used to be more of a problem than they are now. In the old days if a man wanted colored lights in his sign he had to either buy colored glass lamps, which were very expensive, or else go to almost equally great expense to maintain the colors on the lamps by means of dipping them, and they had to be removed and redipped frequently on account of the weather, which disintegrated and washed off the coloring matter. Now, colored tips with little wire springs holding them to the lamp bulbs, may be had in any shade. They are very cheap to buy and last indefinitely, being quickly applied to a new lamp if the old one burns out and has to be renewed.

There is no more wonderful development in the art of advertising than the development of the flashing electric sign. It is far more remarkable than billboards or any kind of street advertising, because it is there in living light against the background of the night sky. Yet many a merchant is overlooking a golden opportunity by not erecting a roof sign on his own premises, and this is probably due to the fact that it takes a little thinking to figure out just what is best to be done in the circumstances. There is no doubt that an unique, distinctive, individuality is of great value in such a sign, especially as they are increasing in number. Such a sign becomes a trade mark, indicating that particular advertiser to the public as far as it can be seen, and these roof signs may be seen literally miles away. But it is a matter that is worthy of the attention of every business man who deals directly with the public, or indirectly through retail dealers handling his product.

The prominent thoroughfares of any town at night are now the theaters at which the "free electrical movies" are regularly displayed. They are free if anyone cares to travel on foot, but seats are charged for at the rate of five or ten cents. However, one can ride many miles, taking in the numerous signs en route.



Electric sign manufactured by the Federal Sign System (Electric), Chicago, Ill., and sold to a wholesale grocer of Green Bay, Wis., through the Wisconsin Public Service Company.

Sign is 56 feet long and 30 feet high and contains approximately 800 five-watt tungsten lamps.

The top line showing the firm's name is in four-foot letters and is fastened to the framework permanently. In the two lower lines the letters are interchangeable and an extra stock of letters is carried so that the various brands carried by the company can be spelled.

A flasher flashes one letter at a time until all are lighted, then all are cut off and the cycle repeated.

The approximate cost of this sign is $1,200.

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Novel Electric Sign of the State of Utah.

The Manufacturers' Association of Utah has recently installed a unique slogan sign in front of the Chamber of Commerce Building, Salt Lake City. The sign was first used at the exhibition of Utah products held in the Keith Building on Main Street, Salt Lake City, April 2 to 9.

The sign represents a map of the state of Utah with its principal geographical features, including counties, lakes, rivers, mountains and principal cities painted on the background. The borders of the state are marked by a border of incandescent lamps and the words, "I am for Utah" are outlined in raised letters on the face of the sign. The state emblem, a beehive, is depicted in incandescent lamps in the upper right-hand corner of this attractive sign.

Electrical Construction

SOME INSTALLATION FEATURES OF THE NEW ELECTRICAL LABORATORY OF THE BUREAU OF STANDARDS.

By P. G. Agnew.

In a separate article on page 811 a brief description is given of the general laboratory features of the new electrical building of the Bureau of Standards in Washington, D. C. Some of the constructional features of the installation and equipment are described in this article.

The new electrical building of the Bureau of Standards is connected with the power plant of the Bureau by a tunnel carrying all piping and wiring, and large enough to serve as a convenient passageway. The piping and wiring for the laboratory work is carried through the sub-basement to the bottoms of four shafts, from which the various rooms are supplied.

The wires for laboratory use are carried around the walls of the rooms, chiefly on the outside walls, in a special form of oak conduit. This somewhat unusual method was adopted in order to secure flexibility, as experience has shown that it is very desirable that the wiring be accessible so that changes and additions may be readily made, particularly where research forms a very considerable part of the work. The conduit was given a fireproofing treatment by the application of a solution of 22 ounces each of ammonium phosphate and ammonium sulphate to a gallon of water.

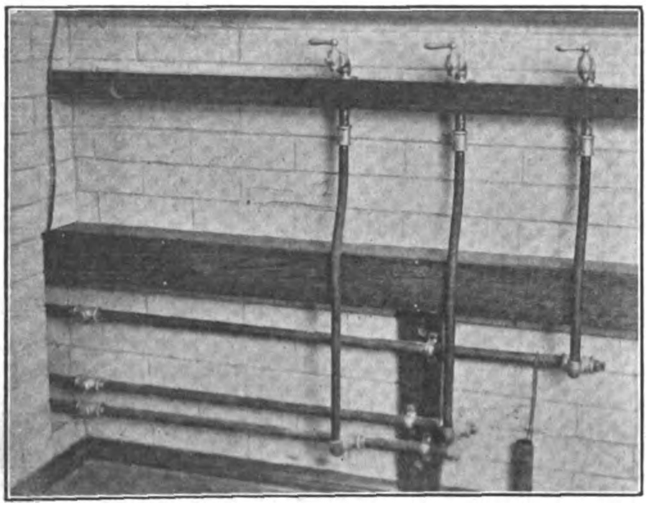

Fig. 1.—Wall Slot, Oak Conduit, Piping and Bench Rail.

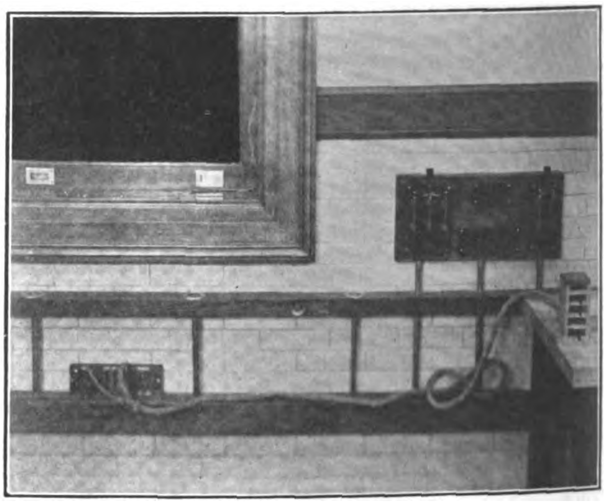

Fig. 2.—Remote-Control Jack and Controller.

For convenience in carrying the conduit and the piping for water, gas, compressed air and vacuum from room to room continuously, vertical slots 4 by 16 inches were left in the partition walls where they join the outside walls. The arrangement is shown in Fig. 1. The pipes are carried on the walls just below the conduit.

Lighting and power circuits are kept separate throughout, and both alternating and direct-current power are available in the laboratory conduit, usually being brought to Hubbell outlets, in order to avoid the inconvenience and unsightliness of connecting laboratory devices to lamp sockets. The lighting circuit is supplied by the power plant of the Bureau, but may be connected to the city alternating-current mains when necessary.

The switchboard panels in the dynamo room, which is entirely distinct from the general power plant, are all of special design, as unusually great flexibility is required. The main switchboard rests on a base of gray brick, to match the wainscot of the room. Plug panels form a most important part of the board. Fig. 3 shows the construction of the plugs and sockets used. There are 10 small boards scattered throughout the building, but placed at openings into the four pipe shafts. These small boards are connected to the main board in the dynamo room by trunk line, and each of them serves a group of rooms. One of them is shown in Fig. 4.

Motor-Generators.

The dynamo room at present contains seven motor-generator sets for various kinds of special work. They are all special machines, the wiring on some of them being quite complicated. For example, one set has eight three-phase alternators on the same shaft, and all leads are brought out so that each machine may be connected either star or with completely separate phases, and as many of the generators as may be desired can be connected in series for building up different wave-forms: In addition, the stator armature of any generator may be mechanically rotated in reference to the others, for adjustment of phase relations.

The machines are all mounted on a single massive concrete slab, which rests on sand and is mechanically distinct from the floor and walls of the room. Fig. 6 shows the construction of this slab. The waterproofing was put in primarily to prevent water from the cement reaching the dry sand while the cement was being poured.

The larger motor-generator sets are connected so as to run from five-wire circuits, so that when being run from storage battery the fields are put across the whole battery while the armatures are connected to the end-cell switches. This gives a better speed regulation, and at the same time is better for the end cells of the battery. Three of the machines are operated from the laboratory where they are most used, instead of from the dynamo room.

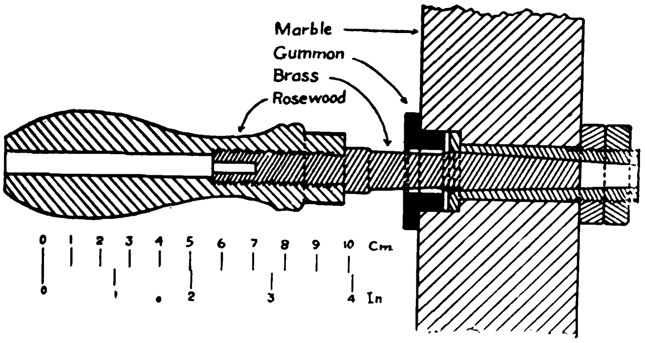

Fig. 3.—Details of Plug and Socket for Plug-Boards.

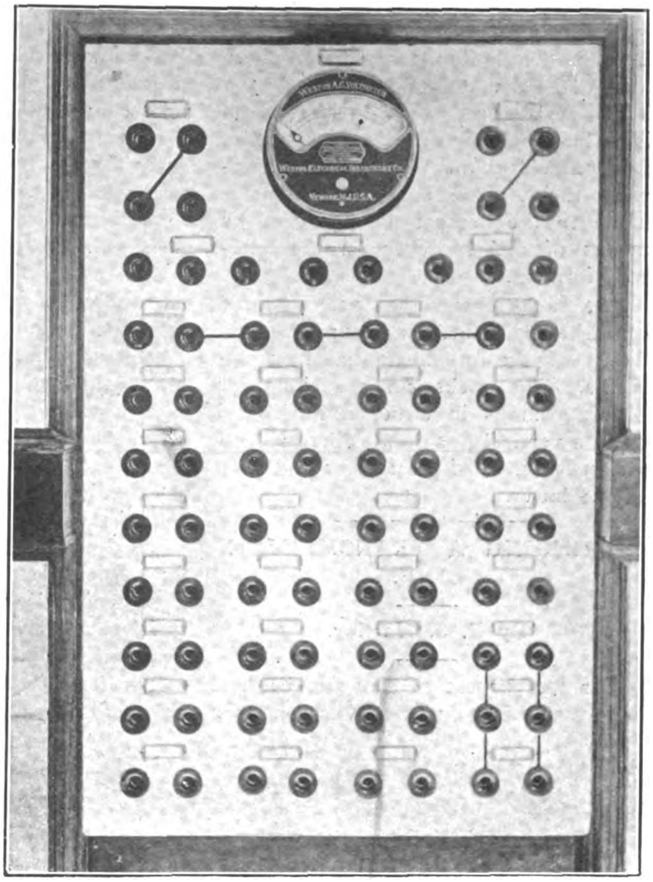

Fig. 4.—Small Plug-Board.

Remote-Control System.

A somewhat complicated system of remote control for the motor-generator sets has been installed. The arrangement is such that by merely plugging in a special jack one may have complete control of the speed and generator voltages of a motor-generator set in any one of eight rooms. The phase relation between voltages is included in the control, as well as a rheostat for the control of direct-current voltage. A single five-lever controller is used. Each lever has two speeds ahead and two reversed, the high speed for rough, quick adjustment and the low speed for accurate setting.

The field rheostats are made of 1.25-inch brass tubes insulated and wound with a large number of turns of resistance wire, up to as high as 12,000 turns on the longest tubes, which are cooled by water circulating through them. Contact is made by means of a traveling brush which is operated by a worm-geared motor and cord. The tubes are from 18 to 38 feet in length. By attaching one terminal of each motor armature to the neutral of the supply mains the wiring is so simplified that only one wire from each motor is carried to the laboratory in addition to the power wires. Two 10-volt batteries are connected to the neutral of the three-wire power system, giving a five-wire arrangement by which the two-direction, two-speed drive is secured. A simplified diagrammatic wiring scheme is shown in Fig. 5. Switches are placed at the ends of the tubes to automatically stop the traveling brush at the limits of its travel. The gain in ease and flexibility of control and in the general efficiency of operation is most marked, as compared with methods formerly used.

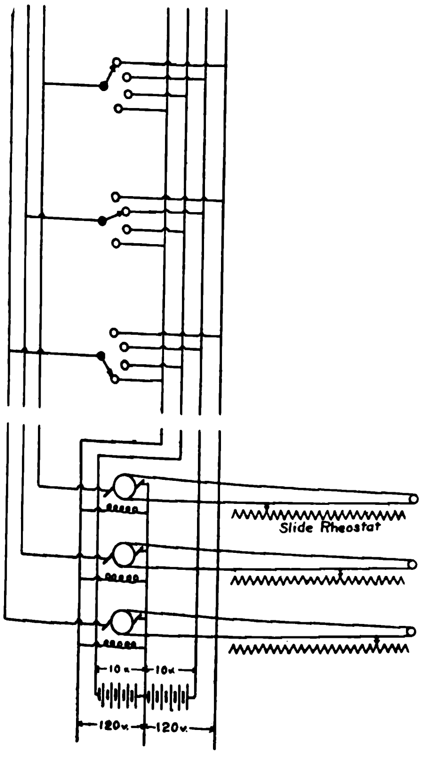

Fig. 5.—Remote Control Circuits with Two-Direction and Two-Speed Adjustment.

Heavy-Current Apparatus.

Four large storage cells allow direct-current testing to be carried up to about 10,000 amperes. They are arranged for connection in series-parallel groupings for discharge at 2, 4, 6, or 8 volts by means of single-pole double-throw switches. As the chief consideration is to keep down the drop in conductors, the busbars leading from the battery are 1 by 8-inch copper slabs. Connected into the busbars is a large oil-immersed water-cooled resistance standard and a control rheostat. The resistance material in the latter is in the form of flattened tubes through which water circulates for cooling. Heavy laminated copper brushes, similar in construction to those used on large circuit-breakers, bear directly on the resistance tubes. The brushes are operated in pairs by small motors connected according to the remote-control system described above.

An interesting detail of the design is a 10,000-ampere mercury reversing switch which is really a part of the busbar. The 1 by 8-inch slabs merely overlap for a few inches, and one-eighth-inch spaces or pockets provided between them are so arranged that mercury may be flowed between them, forming an electrical connection. The mercury is covered by a thick layer of kerosene to prevent deterioration of the amalgamated surfaces.

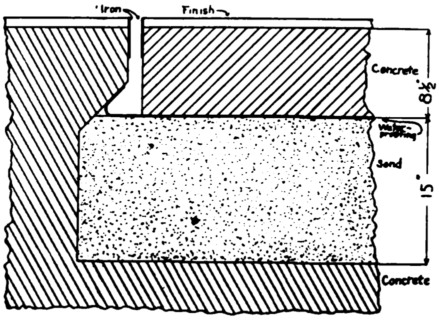

Fig. 6.—Concrete Machine Foundation.

Life Test of Incandescent Lamps.

A 40-kilowatt, 60-cycle alternator direct-connected to a high-speed engine supplies the power for the life test of incandescent lamps. This unit, which is in another building, carries no other load, and the voltage is controlled by a Tirrill regulator. In the life-test room is a large group of autotransformers for controlling the voltage on the various racks. The final adjustment is made to the nearest 0.2 per cent by means of dial switches on the autotransformers.

The racks themselves are mounted on asbestos board and supported in banks of six on substantial iron uprights. The racks carry sockets for burning lamps in either a horizontal or in a vertical position. There is provision for 1,296 of the former and 1,200 of the latter.

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STRINGING A TRANSMISSION LINE.

By R. S. Hartley.

For the purpose of stringing out and stretching wires on a small transmission line, or for instance a three-phase line, or a rural telephone line, the method which I have used with the best success is to rig up a farm, or other ordinary wagon (even a light spring wagon will do for light lines) in somewhat the manner shown in Fig. 1. The wagon should preferably have a good brake, as shown at *D*, with its attachments. Where such a wagon is not available a log or timber from eight to twelve inches in diameter may be hung from the axle and dragged behind the wheels, as shown at *E*, or arranged to be dropped behind the wheels wherever it is desired to stretch the wires. Either of these devices will be found efficient in providing a stationary anchor.

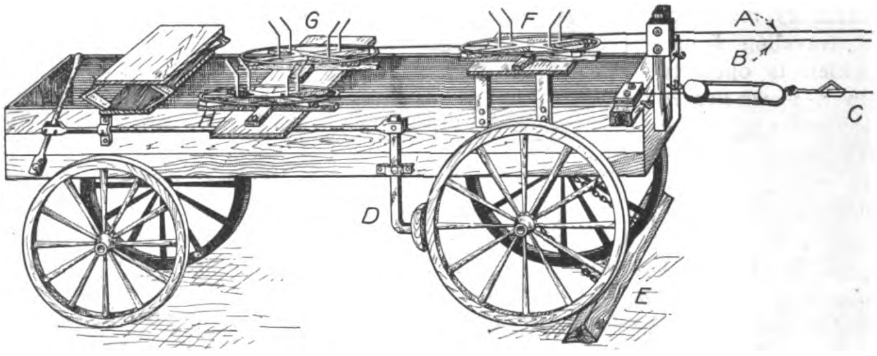


Fig. 1.—Method of Mounting Wire Reels on Wagon.

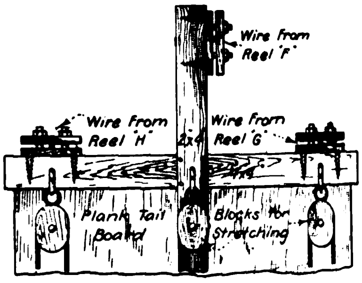


Fig. 2.—Construction of Friction Device.

The reels, whether one, two, or three, are bolted to a plank in a secure manner and the plank secured to the wagon box, so as to leave no chance for play. There are several types of reels on the market, some having a device which prevents the wires from paying out too rapidly. Personally I use the plain pay-out reel and arrange a friction on the rear of the wagon, by means of blocks of wood bolted to the wagon box, in such manner that the tension can readily be adjusted. The reels must be mounted so that they will not interfere with each other, and must be free from the wheels of the wagon and the box. Where three are used, the rear one should be mounted about eight inches higher than the others; this I usually set on a two-inch plank fastened to the box.

The coils of wire are set on the reels in such a way that the wires in paying out will come from the outside of the two reels in front so as to escape any interference with the rear reel, and then are passed through the frictions located on a piece of four-by-four spiked to the wagon box. Fig. 2 will show the kind of friction we use. Hardwood blocks about 3 by 8 by 1.5 inches make good bolts, having the heads countersunk underneath to use for adjusting the friction; the tension should not be great enough to burn the blocks—the lightest touch is sufficient to prevent too much slack running back in the line.

I prefer to stretch the wires at each pole and let the lineman put on the brackets, or insulators, take up the wires, and tie them in with one trip up the poles, where small wires are being used.

When the lineman has the wires on the brackets, or over the cross-arms, and is ready to tie them in, the wagon man brakes his wagon or drops the log behind it, attaches the two or three come-alongs and blocks to two or three wires of the circuit, stretching them so that the strain on all is about the same; the lineman then ties them onto the glass insulator with a good firm tie, and the line work to that pole is complete.

The splices that must be made between the ends of the coils and the line that has been paid out, should be either soldered or made with some form of sleeve so that there will be no chance of pulling them apart in stretching, or of poor electrical conductivity; this can be done best at the rear of the wagon on the ground, and if the man on the wagon be somewhat of an electrician he can do this without needing the help of the lineman, so as to minimize the amount of delay, which is usually quite important.

I have found that wires can be strung on poles with some variations of the above plan, and with less detail, but the time spent on building a substantial suitable rig, and the small outlay for materials needed for the above will all come back many times over in the time it will take to get the wires up and the line finished.

One wagon man, if he be somewhat of an electrician, should be able to take care of, and keep ahead of two or three linemen, or a line can be put up in good time with only one lineman.

The ordinary tie wire, of the same quality as the line wire, is used. If clinched tight with pliers after the line has been stretched it will prevent practically all slip. At the end of the line the wires should be carefully dead-ended, and the end poles well guyed, as the end pole must sustain all the pull on the entire line. When stretching from pole to pole the tendency is for the pole to bend back after the strain is taken off, and this must be overcome, by very rigid guying and heavy pull at the end span. Also it is good practice to install an occasional head guy from the head of one pole to a place on the next pole about eight feet from the ground; this will relieve some of the strain on the end poles and prevent undue sag should the line become broken somewhere along its length.

When unreeling from the wagon it is no difficult matter to arrange the transpositions that are ordinarily placed in the lines about every half mile; this change in the position of the wires on the pole reduces the induction and consequently the noise, if on a telephone line, and helps to balance the phases on a transmission line.

Naming the pins or brackets on the pole 1, 2 and 3, the wire that has been run on 1 is shifted on the transposition pole to position 2, 2 is shifted to 3, and 3 to position 1.

Where running all wires on one cross-arm, as is done on a telephone line and on some transmission lines where the voltage is not too high, I prefer the duplex pin as a means of changing the position and keeping the wires well spread in passing each other; the right-hand wire goes to the top of the pin, the left to the end of the pin below the arm; on the next pole the wire from the top goes to the left pin, and the bottom wire to the right.

Where the voltage to be used on the circuit is over 5,000, the usual method is to string the wires on two cross-arms, one wire on the upper arm next to the pole and the other two of a three-phase circuit on the outer pins of a four-pin arm, thus giving wide spacing; where this method is used no transposition pins are needed.

How Many Contractors Lose Money.

The Gibson Electrical Supply Company, of Oakland, Cal., has been distributing among its customers two sets of figures which go to illustrate how a contractor may lose money by not making a sufficient allowance for overhead expenses. These two tabulations are given below. One represents the monthly account of a contractor who is doing a business of $1,000 per month and who finds his overhead expense to amount to 22.4 per cent. The other is a contractor doing a business amounting to $300 a month, who finds his overhead expense amounting to 24.2 per cent. The latter had been figuring prices at 30 per cent above the cost of labor and material and it turns out that he is losing money.

The following figures apply to a man doing a business amounting to $1,000 per month, and allowing himself a salary of $100:

Liability insurance	$ 4.00
Fire	1.00
Electricity or gas	2.00
Water	1.50
Telephone	3.00
Entertainment (cigars, etc.)	5.00
Carfare and express	10.00
Stationery (printing, stamps, books, etc.)	2.50
Losses—	
Bad accounts, attorneys' fees, allowances on bills, etc., 2.5 per cent.	25.00
Breakage on materials and goods not charged up but used, 0.5 per cent.	5.00
Auto (original cost $850)—	
Depreciation, 20 per cent per year	14.00
Upkeep—tires, gasoline, oil, repairs	25.00
Interest on investment, 8 per cent per year	6.00
Interest on capital invested ($1,500) otherwise than auto	10.00
Rent of store	35.00
Boy's wages	25.00
Half of owner's time	50.00
	$224.00

The total overhead expense is 22.4 per cent of total volume of business. If all work was figured at 40 per cent above cost of labor and materials, the gross profit would be $286. The net profit is $286 less $224, or $62.

Next consider the case of a man carrying on a business of $300 per month without the use of a store or office, doing most of his own work, but employing one man.

Liability insurance	$ 1.90
Carfare	9.00
Stationery and postage	2.80
Six per cent allowance on bills and bad accounts	18.00
Expense for tools	1.00
40 per cent of own time spending soliciting, collecting, getting material, etc.	40.00
	$72.70

The total overhead expense is 24.2 per cent of business done. If prices are figured at 30 per cent above the cost of labor and material, the latter amounts to $231. Adding to this the overhead expense gives $303.70, so that the contractor is losing $3.70 per month. If he used 40 per cent instead of 30 per cent in figuring prices, his returns would be $323, giving a net profit of $19.30.

Licensing Electrical Contractors in Chicago.

In our issue of April 4 we published extracts from the report of the Committee on Legislation of the National Electrical Contractors' Association. This report dwelt on the laws and city ordinances now in effect in the United States concerning the licensing or registration of electrical contractors. One of the extracts from the report that was published on page 673 referred to the Chicago ordinance as follows:

The recent Chicago ordinance is not satisfactory as it does not provide for an examination, and anyone can secure a license by paying the required fee, and being vouched for by two citizens. Under this ordinance they have issued licenses to sign manufacturers, real-estate dealers, piano manufacturers, hardware dealers, plumbers, etc.

This paragraph came to the attention of Ray Palmer, commissioner of gas and electricity of the city of Chicago, who has written concerning it to Paul H. Jaehnig, Newark, N. J., chairman of the committee, whose report was quoted. The body of Mr. Palmer's letter follows:

"The impression obtained from a reading of the paragraph above cited is that the Chicago ordinance on the registration of electricians is not satisfactory, and that licenses are being promiscuously given to sign manufacturers, real estate dealers, etc. This, however, is absolutely incorrect, at least insofar as the impression conveyed to the reading public is concerned. Licenses are issued to sign manufacturers, real estate dealers, etc., but in every case such sign manufacturer or real estate dealer must have in his employ an electrician who must show to the satisfaction of this department that he has had the necessary experience and is competent to act in such capacity. In all cases the qualifications of these supervising electricians are very closely investigated and every effort is made by the department to assure the work being done under such supervision.

"I would call your attention to the fact that this ordinance is the result of five or six years' work on the part of those interested, and would further call your attention to the fact that in the drawing up of this ordinance the Chicago Electrical Contractors' Association took a very important part, and the ordinance as submitted and passed met with their approval.

"While it is possible that the Chicago ordinance is not all that might be desired from a 'contractor's' point of view, still as it is the result of work on the part of the Chicago electrical contractors' associations and was acceptable to them, it would appear to me that no published report made by a committee of the contractors' associations should attempt to criticise the same without there being very good grounds for such criticism.

"From the standpoint of inspection and the interest to the general public the ordinance is working out to the very best satisfaction.

"If the present ordinance is not satisfactory to the contractors, I should be pleased to have the contractors from the Chicago Contractors' Association submit any suggested changes that they think advisable and that they believe could be obtained; or if any case is known where this department has issued certificates to electricians who are not competent to receive the same I should be pleased to have this called to my attention."

Among the Contractors.

The Pacific Fire Extinguisher Company, of Portland, Ore., is completing the electrical installation, including wiring and switchboard, in the Pacific Telephone & Telegraph Company's new building at Portland. This company has recently completed the wiring of the Northwestern Bank Building, Portland.

The Ralston Electric Supply Company, electrical contractors and dealers of Albany, Ore., has recently completed the electrical installation, including fixtures, in the new First National Bank Building, of Albany. This installation is in conduit throughout. Another installation under way and nearing completion, is that in the new Carnegie Public Library in Albany, the contract covering wiring and fixtures. The company is adding a complete line of automobile accessories to its present stock, and is also increasing the floor space of its fixture display room.

The contract for the lighting and power installation of the new Child's restaurant, which is being built on Fourth Avenue, Louisville, Ky., was awarded to the Harry I. Wood Company of that city. The wiring will be installed in iron conduit throughout and will include the circuits for 15 semi-indirect lighting fixtures, ceiling and bracket fan, and about 12 motors.

The Bradshaw Electric Company, comprised of William Bernhardt and W. F. Marten, has taken over the business of R. H. Bradshaw in Berkeley, Cal.

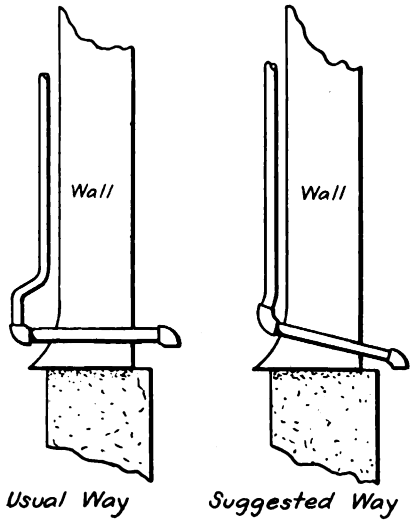
The Neal Electric Company has just been established at 209 South Sixth Street, Louisville, Ky., by Joe Neal, formerly with the Harry I. Wood Company, and his brother, Marshall Neal, who has been in the electrical contracting business in Los Angeles, Cal. The company is handling the Sterling Mazda lamps.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Installing Service Pipe.

A great many houses that are being built have a slight curve outward at the point just above the foundation where the shingles start. In putting a service pipe into a house of this kind, it is hard to do a neat piece of work unless the hole is bored at an angle below the horizontal and the pipe bent as shown in the sketch. If the hole is bored horizontally, it is necessary to make an off-set in the pipe which does not look well. E. W. Dullea.

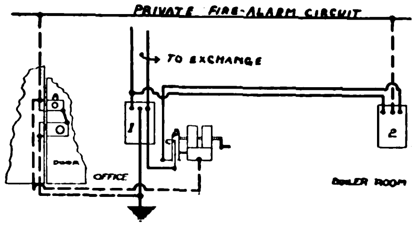


Service Entrance.

Ringing Circuits for Party-Line Telephone Service.

We have central-energy telephone service to our power plant consisting of one metallic circuit with grounded ringing. There are two instruments on the line, one, No. *1*, in the chief engineer's office, and the other, No. *2*, in the boiler room. It is desirable that the bell of No. *2* shall not ring when there is anyone in the office to answer at No. *1*; but that when the office is closed, which is all night and frequent intervals during the day, that the bell on No. *2* shall ring in order that the call may be answered. It is also desirable to have some method for signalling No. *2* in case some one wishes to converse with an employee in the boiler room but is answered from the office. The sketch below shows the result of an effort to meet the above conditions without the expense of running another line to the boiler room from the office, or the use of switches which would depend upon some one remembering to close them at certain times or under certain conditions. The only extra wiring necessary is shown by dotted lines.

The two locks on the door at *A* are arranged so that when the spring-lock is closed the private fire-alarm line is grounded. As the ground wire has been taken off No. *2* and a tap from the fire-alarm substituted, No. *2* telephone will ring only when lock *A* is closed, that is, when there is no one in the office. When the office is occupied and a call comes for someone in the boiler room, only the office bell rings, in which case the party answering turns the magneto in the office. This magneto is one that was taken from an old telephone. When the crank of the magneto is turned it moves to the left, thereby closing contacts *B* and opening *C*, thus disconnecting the right-hand wire of instrument *2* from the rest of the line and throwing the ringing current to the two right-hand binding posts of No. *2*, which are the proper ones for ringing. When the crank is released the contacts resume their normal position, thus disconnecting the magneto entirely from the line and completing the telephone circuit through *C*.



Telephone Circuits.

At first I anticipated trouble on account of having to ground the private fire-alarm wire, but it has proved to be an advantage as now whenever another ground occurs on the line, an indicator bell rings when the line is grounded for telephone purposes.

Roy W. Eves.

Fishing Wires in Difficult Places.

When running wires in old houses, especially when fishing outlets in a porch ceiling that extends beyond the walls of the building, it is often difficult to hook the wire onto the fish hook because of obstructions. By connecting a bell and a battery in series with the wire to be fished and to the fish hook, the bell will ring when the hook makes contact with the wire, provided the wire to be fished is bared for a short distance from its free end. This arrangement prevents hooking on obstructions, and enables one man to do work that in many cases requires two men. Robert Oster.

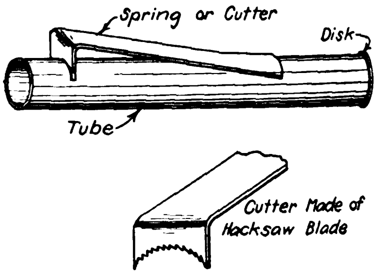
Cleaning Fixtures.

In many cases I have found when wiring a fixture with an iron stem that rust and dirt had collected on the inside. A quick and good way to clean it out is to take an old knockout from an outlet box, punch a small hole in the center and file it down until it will fit closely in the stem. Then it is a simple matter to string some bare wire through the stem and through the hole in the knockout. The latter can then be pulled through the stem and the dirt will be scraped out.

Melville Fischer.

Cutting Arc-Lamp Carbons.

An inexpensive arrangement for cutting arc-lamp carbons to length can be made by taking a piece of chandelier tubing of a diameter to easily slip over the carbons and about seven inches long. One end of this is closed by soldering on a disk of the same size as the tube. Near the other end, saw a slot in the tubing wide enough to take a piece of hacksaw blade, making the distance between disk and slot the desired length for the carbons.. Heat and bend a piece of hacksaw blade, as shown in the illustration, and solder the end of it to the tubing, after teeth have been filed in the end.



Cutter for Arc-Lamp Carbons.

To use this cutter the carbon is placed in the tubing; the hacksaw blade is pressed down and the carbon turned around. It will break very easily where it has thus been scratched.

Battle Creek.

Making the Wires Tight.

In wiring old dwellings by taking up flooring I have found the best method of drawing the wires tight is as follows. When boring holes with brace and extension bit through the floor joists they are of course bored at an angle. The wires are threaded in, leaving the tubes on the wires between the joists. The wires are pulled up snug and fastened to knobs at each end, then when the tubes are pushed into place in their respective holes, the wires are drawn up as tight as a fiddle string. Ernest C. Jones.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

Jurisdiction of the Commission. The Supreme Court has rendered a decision holding that the Railroad Commission did not have jurisdiction to refuse to allow the Oro Electric Corporation to operate in the city of Stockton. The Oro company held a franchise from the city granting it the right to furnish service within the city. The Commission held that the service could be furnished more economically by the Western States Company operating in the city exclusively, and refused in decisions issued April 29, and August 16, 1913, to allow the competitive service. The Oro company appealed from this decision. The court says that the people, voting for the law under which the Railroad Commission was created, believed that the cities would retain their powers of regulating the operations of public utilities until they chose to surrender them. The amendment allows the cities to decide whether they shall keep or relinquish such powers, and the courts cannot take away this right. The city of Stockton has not so delegated its powers to the state commission. The Court held that in denying a corporation holding a franchise from the city the right to exercise such franchise, the State Railroad Commission acted in excess of its authority and jurisdiction in Stockton. The Court also held that the cities have control of their utilities regardless of whether or not they were in operation when the Commission was created.

The Supreme Court has reversed the decision of the Commission in the case involving the Del Mar Water, Light & Power Company. The Commission had ordered the company to furnish a certain man with water service after the company had refused to do so on the ground that it was not a public utility but simply the incorporated water department of the South Coast Land Company. The Commission, from the company's articles of incorporation, defined it to be a public utility. The Court held that the Commission has no power to compel a corporation which owns property in private right and has not dedicated it to any public use, to apply it to a public use.

Changes in Public Utility Rates. The Commission has made a formal ruling to the effect that public utilities desiring to correct discriminatory rates may do so on their own initiative without authority from the Commission, providing that they do so by lowering a rate. If rates are to be raised to eliminate discrimination, the permission of the Commission must be secured. The rule was set forth in a decision rendered by the Commission in the case of the Pacific Telephone & Telegraph Company, which was found by the Board to have discriminated in rates for farm-line service in connection with the operation of its Modesto exchange. The rates varied between $3 and $7.20 per year, and the Commission gave the company 30 days in which to establish a uniform rate of $3 with the alternative of applying to the Commission for authority to enforce a higher rate.

DISTRICT OF COLUMBIA.

The Washington Railway & Electric Company was authorized by the Public Utilities Commission of the District of Columbia to issue bonds of the par value of $1,000,000. The proceeds are to be used for the retirement of the Company's bonds.

GEORGIA.

Power Over Contracts. A petition for an injunction against the Georgia Public Service Corporation has been filed in the Superior Court to restrain the company from abrogating any of the terms of written contracts for furnishing electric service. The Commission's decision in the Macon case, cited in the ELECTRIC REVIEW AND WESTERN ELECTRICIAN, of March 7, 1914, fixed new rates for electric service and ordered that the new rates be uniformly enforced disregarding the old contract rates which had been offered during a severe rate war in Macon. In appealing to the court, the petitioners allege that the Commission does not have jurisdiction over such contracts. It is also contended that the action of the light company in taking over the stock of the other public utility companies in Macon was in violation of certain provisions of the state constitution and it is asked that the competitive conditions be restored.

ILLINOIS.

Conference Ruling. The Commission held that under Section 16 of the Public Utilities Law, each public utility operating within the state must have an office in one of the cities, villages or incorporated towns in this state in which its property or some part thereof, is located, and that it shall keep in such office all its books, accounts, papers, records, and memoranda, pertaining to the business of the utility transacted within the state.

The Springfield Gas & Electric Company. The Commission has begun the investigation on the complaint of the city of Springfield asking that the company's rate for gas be reduced from $1.00, the present rate, to 70 cents. The case will be followed with considerable interest as it is the first important case involving public utility valuation and rate making to come before this Commission.

MARYLAND.

Extension of Line. The Commission held that the proposed extensions of the Curtis Bay line to Arundel Cave would be a "great convenience to the petitioners and others similarly situated" but that it would not be a "public necessity" of sufficient importance to justify the loss to the railway company. The company has an old franchise giving it the right to extend its lines in Anne Arundel County for 30 miles in any direction and the petitioners asked that the company be compelled either to build the extension to Arundel Cave or forfeit the franchise. The Commission issued an order dismissing the case.

NEW JERSEY.

The Public Service Electric Company has instituted certiorari proceedings in the Supreme Court to review an order of the Board of Public Utility commissioners. The Board ordered the company to comply with the terms of an ordinance of the city of Plainfield under which it agreed to furnish service to the municipal buildings without charge. (The opinion of the Commission was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, April 11, 1914.) The company in its appeal to the court contends that the contract in question was abrogated by the Public Utilities Law and that the Board is without jurisdiction to make the order which would require the company to continue an illegal practice.

PENNSYLVANIA.

Filing Rate Schedules. The Public Service Commission has issued an order that all utility companies doing business in Pennsylvania must file at the office of the Commission by June 1, copies of all tariffs issued by them in effect on January 1. In addition there must be filed all supplements and amendments so that the Commission will have a record of all prices, rates, etc., for service rendered.

Street Lighting Contracts. The Commission has approved the contracts for street lighting of the Manor Electric Company in Manor, of the Venango Valley Electric Company in Sharon, and the Sharpsville Electric Company in Sharpsville.

WISCONSIN.

Stevens Point Lighting Company. The utility applied for a revision in rates and the Commission on its own motion made an investigation of the service of the company. The company was found to be delinquent in matters conforming to the service rules and regulations prescribed by the Commission. Certain improvements were made by the company and certain additional improvements were specified in the Commission's order.

The Commission reviewed the relation existing between the Stevens Point Lighting Company and the Stevens Point Power Company. The latter company generates by water power exclusively for the lighting company. The Commission found that the price per kilowatt-hour under this arrangement was about 1 cent per kilowatt-hour while under steam generation the cost would have been about 2.3 cents in cities of about the size of Stevens Point. This saving in expense the Commission points out, should be shared by the public and the company. An additional amount was accordingly added to the generation costs of the lighting company.

It was found that lower rates should be prescribed for general lighting and that higher rates are warranted for power service. New rates were ordered for lighting and power following the Commission's usual form of schedule. The rate for street arc lamps was reduced from $78 to $54 per year.

McGowan Water, Light & Power Company. The Commission ruled favorably upon the application of the company for authority to place in effect a minimum charge to be paid monthly by consumers. The application was for a minimum of $1.00 but the Commission decided that local conditions did not warrant a minimum charge in excess of 75 cents. The company was found to be losing money in both its water and light departments.

The Mattoon Telephone Company applied for authority to build a line from Mattoon into Phlox. The Commission dismissed the application, holding that where one company is already giving toll service between two localities, a certificate of convenience and necessity will not be issued to a second company to build a line between these points for the purpose of enabling subscribers along the proposed line to have connections with the villages at regular subscribers' rates.

The Commission stated that the company's subscribers at Mattoon can receive service to Phlox through the Antigo Telephone Company, the toll company, and that such subscribers have their remedy, in the matter of rates for such service, before the Commission in the form of a complaint involving the reasonableness of the Antigo company's toll charges.

Committees of Missouri Association Submit Reports to Public Utilities Commission.

The three committees on Depreciation, Historical Matters and Classification of Small Companies appointed by the Missouri Electric, Gas, Street Railway and Water Works Association at a meeting in St. Louis on April 1, reported to the Association on April 14 in the same city and submitted their reports to the Missouri Public Utilities Commission at Jefferson City on April 15. The meeting at Jefferson City was at the call of the Missouri Public Utilities Commission, which is endeavoring to formulate a uniform system of accounting for all public utilities in Missouri. The report of each committee was accepted by the Missouri Association but the Public Utilities Commission, while it thanked the Electric, Gas, Street Railway and Water Works Association for its initiative, did not look favorably on its recommendations.

The result of the hearing, which took place in the senate chamber, because of the unusually large attendance, was the appointment of a joint body to work out the problem of classification of public utilities and to hold frequent meetings for this purpose. P. J. Kealy, of the Kansas City Railway & Light Company, was appointed chairman of this joint committee. Other members are as follows: E. Gruhl, H. Wurdack, F. B. Saunders, J. C. Adams, R. C. Russum, J. M. Scott, H. H. Gansloser, W. J. Achelpohl and J. N. Chester. In addition to these men, the municipal light plants at St. Louis and Kansas City will have one representative each on the committee, the personnel of which was concluded by the appointment of J. C. McShane, statistician for the Missouri Public Utilities Commission.

Of the reports made to the Missouri Electric, Gas, Street Railway and Water Works Association and later to the public utilities commission, that of the Committee on Depreciation, of which P. J. Kealy is chairman, is regarded as of most importance. This committee's report considered the deduction of depreciation reserve from the fixed capital account and the seeming intention, as set forth in the tentative classification, to consider the depreciation reserve as a fund on which interest must be annually set aside. The Committee recommended that the Commission be petitioned to consider the depreciation reserve as a reserve account. This is done in the state of New York, the New York state commission, when first establishing a uniform system of accounts for public utility companies having taken the same position as the Missouri commission is now considering, but after several years' experience it now considers depreciation as a reserve account, and companies are not required to write down the plant account upon their books each year by the amount of the depreciation reserve. The Committee enumerated several objections to considering the depreciation reserve as a fund on which interest must be annually set aside. The adoption of this measure, it was claimed, would increase the cost of service to the rate payer as only a low rate of interest can be obtained on securities of immediate market value, and would be an impossible requirement considering the financial conditions of some companies. In concluding its report, the Committee asked to be continued until after it should be advised by the Commission as to its intentions in these matters.

In reporting on the tentative requirements of the Commission in relation to historical data, the Committee on Historical Data declared that a company should not be required to meet the expense necessary to furnish such historical data as would be of little or no value to the Commission. The report of the Committee on Classification of Small Companies went into considerable detail pointing out that some important items had been omitted from the tentative classification of the Commission. It was suggested that companies having gross earnings of less than $25,000 be considered as small companies under the classification.

While the matter in hand affected directly only utilities of Missouri, it created widespread interest and the meeting in Jefferson City was attended by many indirectly concerned.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 213.—ELECTRIC MOTORCYCLE.—Is there on the market at the present time an electrically propelled motorcycle or quick-delivery car? If so please describe same briefly and give manufacturer's address.—A. J. L., Hazelton, Pa.

No. 215.—SUCTION STREET SWEEPER.—Has the use of electrically operated suction street sweepers ever been tried out by any street-railway company to keep its tracks free from dust and dirt? The kind I have in mind would be operated from the trolley line just like a snow sweeper, but instead of throwing the dirt over the rest of the street would suck it up into a dust compartment.—V. B., Milwaukee, Wis.

No. 217.—TELEPHONE GENERATORS.—Why will a 2,000-ohm telephone generator when turned 120 revolutions per minute make a 10-volt 15-watt Mazda lamp burn up to about two-thirds candlepower while it will not make a six-volt Mazda lamp of any candlepower that I have turn even red? It will also make the low of a 110-volt Hylo lamp burn up to and over candlepower.—C. M., East Las Vegas, N. M.

No. 218.—PANAMA CANAL LOCOMOTIVES.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

Answers.

No. 200.—ELECTRICALLY OPERATED PHONOGRAPH.—Is any phonograph on the market in which winding of the spring is automatically done by a silent electric motor whenever the spring tension gets down to a certain point? I believe several patents have been issued on electromagnetic release for a brake that stops the disk when the record has been played; has any device of this kind been applied to any phonograph on the market?—M. P. C., Jackson, Mich.

The writer has developed and has now in process of being patented a device which will wind a phonograph upon the touch of a button. This device can be attached to any phonograph and adjusted to any spring tension in a very short time. When a record has been placed on the machine, the operator, at the same time that he stops the machine, touches the button, and before he has had time to change the record, the phonograph is rewound ready for the next performance. The device is such that, when the spring is wound to the tension at which the device has been set to stop, the motor will not start again when the button is pressed. Only after the spring has unwound a bit will the motor start again when the button is pressed, and run only so long as is necessary to bring the spring back to the set maximum tension. Under this principle there is no need for having a high-class expensive silent motor. Our device avoids the two big difficulties which have heretofore interfered with the successful operation of phonographs with electrical motors, namely the effect of the noise and vibration as well as the fluctuation in the speed due to variation in the line voltage.—R. M., Milwaukee, Wis.

No. 204.—HIGHEST VOLTAGE.—What is the highest known voltage ever developed in any electrical apparatus?—M. L., Oak Park, Ill.

A 500-kilovolt-ampere transformer has been built by the General Electric Company designed for a high-tension voltage of 750,000 volts and is in present use for testing purposes at its Pittsfield Works. Although this transformer is built for 750,000 volts, approximately 1,000,000 volts has been measured across its highest tension terminals. This is believed to be the highest measured voltage ever developed in any single electrical apparatus. Several transformers of about 200-kilovolt-ampere capacity have been built for 500,000 volts and are in commercial use for insulator testing. It is proposed in one case to connect two of these in series on the high-tension side so as to get 1,000,000 volts.—H. C. C., New York, N. Y.

No. 214.—ALLOWABLE LOAD ON LIGHTING CIRCUITS.—On account of the practically universal use of tungsten lamps, would it not be advisable to alter the present rule in the National Electrical Code so as to allow the use of 750 watts on a circuit, which would allow three 250-watt, five 150-watt, seven 100-watt, twelve 60-watt, eighteen 40-watt, or thirty 25-watt tungsten lamps on each circuit? At the present time the Code's limit is 660 watts on a circuit, based on the use of 55-watt carbon lamps. Since the introduction of tungsten lamps it has been a matter of local interpretation of the individual inspectors regarding the number of lamps per circuit; in some localities three 250-watt lamps are allowed, in other localities two only can be placed on a circuit; the same applies to 150-watt lamps, some inspectors allowing four and others five, and yet all inspectors will pass twelve 60-watt tungsten lamps on a circuit. If this matter could be definitely settled it would do away with a great deal of argument and at the same time bring the Code up to date. The slight additional amount of current over six amperes will in no way affect the circuit wiring nor the question of danger from fuses, as it is quite universal to use the N. E. C. cartridge fuse which does not explode upon a short-circuit.—G. E. D., Newark, N. J.

The party asking this question is evidently not aware that the 1913 National Electrical Code has taken into consideration the almost universal use of tungsten lamps and a number of the rules have been changed to meet the requirements of these lamps. A higher amperage has not been allowed on a branch two-wire circuit as commonly used, due to the fact that this rule is for the protection of the rubber insulation of the small wires used in fixtures and for drop and extension cords. Rule 23*d* of the 1913 Code provides that no set of lamps, small motors, etc., requiring more than 660 watts, nor more than 16 sockets or receptacles, will be dependent upon one cutout. Previous to this only 12 sockets or receptacles were allowed on one branch circuit, this number being based upon the use of 55-watt carbon lamps while the new rule is based on the use of 40-watt tungsten lamps. The larger tungsten lamps can be installed under the same section where in the next paragraph it states that: "By special permission, in cases where wiring equal in size and insulation to No. 14 B. & S. gauge approved rubber-covered wire is carried direct into keyless sockets or receptacles, and where the location of sockets and receptacles is such as to render unlikely the attachment of flexible cords thereto, the circuits may be so arranged that not more than 1,320 watts (or 32 sockets or receptacles) will be dependent upon the final cutout." The large tungsten lamps can be installed under this latter rule which should reduce the cost of the installation considerably.—C. T. P., San Francisco, Cal.

I believe in doing away with the allowable wattage rating on circuits and keeping the outlets per circuit to a maximum of 12. Another method should be used to limit the maximum loading. The weakest part of the present practice is the use of the key socket; abolish the use of it, or limit the maximum fuse capacity to such a value that the key can break safely. The next weak point is the small fixture wire. Prohibit the use of heating appliances on lighting circuits where the device consumes more than 250 watts (except in special cases where permission is granted). If the above limits were set the safe current value would not be exceeded. If the present types of Code fuse blocks were made in a greater number of the smaller sizes, say 5, 10, 15, 20, 25, and 30-ampere capacity, and fuses of the heavier type so dimensioned as not to fit any of the smaller blocks, much could be done to prevent the overloading of circuits. The number of outlets might then even be increased to 20. I would also require the use in every case of a double-pole switch, of a capacity rating sufficient to break the maximum possible current flow, with the largest fuse capable of being placed in the block in use.—H. E. W., Chicago, Ill.

No. 216.—Frosted Nitrogen-Filled Tungsten Lamps.—The new nitrogen-filled tungsten lamps produce an intense, concentrated light so that looking into the exposed lamp causes very harmful glare. Is frosting of the bulb recommended for reducing this difficulty, or does frosting cause the lamps to run too hot? What effect has frosting on the life and efficiency of these lamps?—D. A. T., Albany, N. Y.

The new high-candlepower Mazda lamps on account of their intense brilliancy should be used with diffusing glassware and, on account of the large amount of heat, should be used in fixtures that are properly ventilated. Frosting the bulb will not diffuse the light as well as diffusing glassware. Frosting these lamps has a tendency to make them run slightly hotter, which tends to shorten the life and blacken the lamps.—H. S., Harrison, N. J.

Nitrogen-filled lamps are at present manufactured with clear glass bulbs in all sizes; frosted lamps are not made of this type and frosting is not recommended. The glare may be relieved by an opal outer globe. The filament is concentrated in a series of closely wound spiral coils of drawn tungsten wire operating in nitrogen gas at high temperatures. Owing to this high temperature, it is recommended that lamps of 400 candlepower and above operate in special ventilated fixtures, and with outer globes to protect the lamp from moisture and atmospheric changes. The concentration of the filament produces intense brilliancy and glare unless some method is used to conceal the light source and distribute the light rays. This can be relieved in all sizes by the use of a properly designed opal diffusing globe. The actual mean hemispherical candlepower may be reduced by this globe some 15 or 20 per cent but the use of a concentric reflector above and a globe of opal prismatic glass surrounding the lamp will increase the useful candlepower, with a resultant increase in actual efficiency.—H. C. C., New York City.

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A Transportation Record.

The Interborough Rapid Transit subway system in New York City has carried about 2,198,000,000 passengers in the last nine years without a fatal accident to a single passenger.

Nitrogen-Filled Tungsten Lamps To Be Used in Chicago Street Lighting.

Arrangements have practically been completed for an initial order for 2,000 nitrogen-filled tungsten lamps for use in the municipal street-lighting system of the city of Chicago. These lamps will be supplied in place of about 1,000 flaming-arc lamps, and are but part of the new equipment still to be provided under the amended contract between the Sanitary District of Chicago and the city, under which a total of 23,000 flaming-arc lamps or their equivalents are being installed. This contract and the municipal street-lighting system of Chicago in general were described by us in the issue of September 6, 1913.

The new nitrogen lamps will be 300-watt lamps, taking 20 amperes, although used on 10-ampere circuits. Each lamp will be equipped with an autotransformer or compensator to supply the lamp with the requisite current. It is expected that the lamps will give an average life of 1,350 hours. Each lamp will be housed in a casing practically the same as that now in use for the flaming-arc lamps; this will be so arranged that either flaming-arc or nitrogen lamps can be used in the housing, the condenser in the former case being displaced by the flat reflector. Surrounding the lamp itself will be a double prismatic reflector with the prisms on the inner surface of the hollow space between the two smooth outer surfaces. About this will be an opal diffusing globe of similar size and design to that now used in the flaming-arc lamps. The use of the prismatic reflector will be to give a very wide lateral distribution of the light; in fact, it is proposed to try out a special design of prismatic reflector to give what might be termed an eliptical distribution in a horizontal plane, with the major axis in the line of the street and the short axis at right angles to the direction of the street.

If these lamps give the performance that is expected, the probability is that the additional new lamps needed by the city to bring up the electric-lamp equipment to a total of 23,000 flaming-arc lamps, or their equivalent, under the old contract, and also the lamps under additional contracts for street lighting, will probably be supplied with the new types of nitrogen lamp.

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Women's Club Recommends Improved Lighting in Salt Lake City Schools.

A special committee consisting of 22 prominent club women representing the Association of City Clubs, and headed by Mrs. B. F. Forbes, have been investigating conditions obtaining in Salt Lake City school buildings with reference to their health and sanitation, and have made numerous recommendations to the Board of Education with reference to the improvement of this feature of the public school system.

Among these recommendations is included the suggestion that many class rooms are inadequately lighted, and that the Board of Education either provide an adequate system of illumination for these rooms, or that they be abandoned for class purposes. They recommend that a vacuum-cleaner system be installed in the new high-school building and in all other school buildings as soon as needs will warrant. Furthermore, that more attention be paid to the ventilation of school buildings, and that adequate systems of forced ventilation be installed wherever necessary to correct this condition.

It is interesting to note that in most of the recommendations of this committee, electricity offers a solution of the difficulties encountered, which it is desired to remove.

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Students' Electrical Show at Columbus, O.

Some half-dozen of the leading electrical concerns of Columbus, O., had displays at the exhibition of the student branch of the American Institute of Electrical Engineers held at Ohio State University, Columbus, O., for three days, beginning with April 16. Popular demonstrations for the purpose of educating the public in the use of electrical cooking devices and such things as are used in the home were a leading feature. Instruction was given householders in the reading of electric current meters. The faculty and students of the University's electrical department had the co-operation of the contractors in such a way as to make the exhibition highly valuable to the general public. Entertainment features were provided in the way of freak electrical demonstrations and the serving of cookery that had been prepared by electricity. The exhibition was open daily from noon until 11 o'clock at night. It was financed by the Institute, and no admission was charged visitors.

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Electrical Equipment of East River Tube Being Changed.

Actual work has been begun on changing the trolley system of the Steinway tunnel under the East River, from Manhattan to Long Island City, to a third-rail system so as to permit the operation of railway trains. When the tunnel was completed nearly eight years ago it was designed only for light-weight overhead trolley cars. It will now be necessary to remove the trolley wires together with the present rail ballast and install a complete third rail system.

AMERICAN ELECTROCHEMICAL SOCIETY.

General Meeting, New York City, April 16-18.

The twenty-fifth general meeting of the American Electrochemical Society was held in New York City on the last three days of last week. The meeting was the most successful and best attended yet held by the Society, there being something like 300 members and guests in attendance. On Thursday, technical sessions were held both morning and afternoon at the Chemists' Building. An evening meeting followed by a smoker was also held. Friday was devoted entirely to a combined excursion and inspection trip, on which many stops were made at metallurgical and electrolytic plants in the lower part of New York City, Staten Island and adjacent points in New Jersey. The technical sessions were resumed on Saturday, when the meetings were held in Earl Hall, Columbia University.

The first session opened, with President E. F. Roeber in the chair, at 9:15 o'clock Thursday morning. Following a short business meeting, the technical program was opened up with a symposium devoted to power problems in electrochemistry.

Power for Electrochemical Industries.

The first paper presented was that by P. Sothman entitled "Efficiency of Power Transmission versus Utilization in Local Electrochemical Industries." Mr. Sothman's paper showed in what respects the transmission of electric power is applicable for electrical processes by setting forth an outline of the costs of power as generated by different classes of prime movers. The four principal prime movers are steam plants, water falls, gas-producer plants, and oil engines. While the latter two have not been used to any great extent for large installations, Mr. Sothman believes that these will soon come to play an important part in the production of power on a large scale, and constitute active competitors to steam and hydraulic powers. A table of costs was given showing the price per kilowatt-hour at which electrical energy may be generated by the four methods. This showed that the cost of power generated by the gas producer plant is less than that of the modern steam plant and within comparison of that for hydraulic power. A second table was given comparing the amounts of power used per employee in different industries. Paper mills and like industries utilize as much as 20 horsepower per employee. While no figures are available on chemical industries, it is believed that the power used per employee is still higher. On the other hand, some industries require even less than one horsepower per employee, and to these the cost of power at whatever rate is a comparatively unimportant item of production expense. The industries using large amounts of power must be in a position to obtain it at a very low rate, and under such conditions that they can have reasonable assurance that the power will not be diverted later to other industries which can afford to pay a higher rate.

Referring to the transmission of power, Mr. Sothman said that it is possible to transmit power at least as far as 500 miles in large quantities under the existing state of the art, although the losses in transmission will amount to a considerable percentage of the whole. There are several lines already in operation up to 240 miles in length, which are commercially economical. Whether or not power may be transmitted distances such as these is almost entirely dependent upon the power markets it is intended to reach. The majority of these lines are in locations where the market for power is high. In other locations, such as the East, where large coal fields are easily available, it would not be economical to transmit to such distances, the limit being in the neighborhood of 175 miles, for at this point modern steam plants would come into active competition with hydroelectric power. With the use of modern gas producers, burning coal costing $2 per ton, the economical transmission distance of water power is reduced to approximately 100 miles. The choice of voltages for high-tension transmission lines was discussed and voltage limitations shown. Cost of construction rises quite rapidly on very-high-voltage lines, and corona effects limit transmission voltages to 135,000 or 150,000 volts, unless large conductors and wide clearances are used. The suspension type insulator calls for considerable care in connection with line design. Costs of transmission lines were given based on typical types of construction for 12,000, 30,000, 60,000 and 110,000 volts.

In conclusion, Mr. Sothman said that the peat fields distributed all over the country are probably far more valuable to our power supply market than our water powers. Since the latter depend upon many features that are liable to interruption, we may find that the utilization of peat as a base material is worthy of serious consideration. We may reach a point where the use of peat will work very well in conjunction with hydroelectric power.

Charles P. Steinmetz then delivered an address entitled "Characteristics of Electrical Energy as Affecting Chemical Industries." Dr. Steinmetz opened his address by pointing out that industrial operations require materials, energy and labor. While the economical supply of energy is important for most industries, it is especially so for the chemical industries. In the supply of energy we have to rely upon nature's stores, of which only two are sufficiently large to come into serious consideration, that is, the chemical energy of fuel, mostly coal, and the hydraulic energy of water powers, made available by electrical transmission. Considered merely as the raw material, as bulk source of energy, the chemical energy of fuel is very much cheaper. Hydroelectric energy can compete with the chemical energy of fuel only in those cases where compensating advantages occur. There are two such cases. First, where electrical energy can accomplish chemical results which cannot be accomplished by the chemical energy of fuel; such processes are aluminum reduction, carbide production and fixation of nitrogen. Second, where the economic losses in efficiency and in cost of installation, and economic losses of making the chemical energy of fuel available by converting it to the form in which it is used, are such as to make the cost of the energy required by the industry when derived from the chemical energy of fuel higher than the electrical energy derived from hydraulic power. The most typical illustration of this is the mechanical energy supply. While the chemical energy of fuel costs about 0.1 of what the electrical energy from the water power costs, when we convert the chemical energy of fuel into mechanical energy by steam plant, considering the interest on the investment, the inefficiency of the thermodynamic process as a whole, from the chemical energy of the fuel to the mechanical energy at the flywheel, we find that almost always the cost of the mechanical energy derived from chemical energy of fuel is higher than that when derived from the electrical energy transmitted from the water power, other things being the same.

One of the characteristics which makes electrical energy specially suitable for chemical industries is the possibility of concentration to an almost unlimited energy density, which means that by electrical energy we can bring about chemical actions which cannot be brought about by the relatively low energy density available by combustion of fuel. In electric furnace processes we can reach temperatures two or more times as high as the highest temperature possible by the combustion of fuel, even with hot blasts and other auxiliaries. In those fields where a higher energy density is required electrical energy stands without a rival, irrespective of the cost, and the economy of energy supply merely determines the utility of the product in the industry.

The second characteristic of electrical energy is its control. We can control it very much more closely than the chemical energy of fuel, produced by chemical combustion. We can produce electrical energy without surrounding foreign materials which may enter as contamination. Therefore, electrical energy finds an application in producing chemical action, or other industrial processes, where a very close control of the energy is called for, and where the exclusion of contamination by foreign materials, which is practically unavoidable when fuel is used as the source of energy, can be insured. Another characteristic that electrical energy possesses is its ease and economy of transmission to great distances and its economical distribution, but its predominating advantage is its economical efficiency of conversion into others forms of energy.

There is, however, one characteristic of electrical energy which is a very serious disadvantage, and that is that electrical energy cannot be economically stored on a gigantic scale, but must be consumed at the same rate at which it is produced from other forms of energy. This makes the cost of electric energy dependent on the rate of its consumption, in the same manner as the cost of energy is dependent on the rate of its production. The cost of electrical energy generated in the same big power station may vary in a range of more than 1 to 200; that is, power may be sold economically and profitably at one-half cent, or less, per kilowatt-hour, while power generated at the few hours of the annual peak of the load may cost the station more than one dollar per kilowatt-hour. Dr. Steinmetz analyzed the cost of electrical energy production, showing the great importance of proper consideration of fixed charges of the plant. This is particularly true of hydroelectric plants. The station load-factor dominates the cost of energy production.

This imposes the requirement that to secure electrical energy at the lowest possible cost for chemical work it must be used at constant load and continuously day and night throughout the entire year, in other words, at unity load-factor at the consumer's premises. This emphasizes continuity and maximum demand. In electric-furnace work a reactance can be used to intentionally limit the maximum demand. While this would lower the power-factor, this is of less importance in most cases than to exceed a certain maximum demand, because poor power-factor can be corrected by synchronous condensers at relatively less cost than additional generating capacity can be secured to carry peak loads.

As most water powers are subject to limitation of output by low flow of water due to periodic drought, any industry that can afford to shut down entirely or at least partly for several weeks or even months during the drought can reduce the cost of its electrical energy supply. This means that conditions may require an annual shutdown, even with employees receiving full pay, to produce more economical operation than absolute continuous operation. Another item in reduction of power cost is the possibility of sudden shutdown, from a minute or so to possibly several hours, on account of failure of transmission lines. This eliminates the need for a steam reserve plant. The very lowest rate for power is possible to those industries that can utilize intermittent and distinctively off-peak power in proportion that it will fill the valley in the station's load curve and bring the station load-factor nearly to unity. The rate for such a load should be considerably lower than for one taking continuous power throughout the year. If electrochemists can build up such a load, they will get the electric power at the very lowest rates.

The paper entitled "Some Economies in the Use of Electric Furnaces" was then presented by F. A. J. FitzGerald. This paper pointed out the general direction in which the quest for economy should go and gave a warning about certain ideals which are apt to be exaggerated with uneconomical results. The typical power contract emphasizes that the most important point to be kept in view is the use of 100 per cent of the power 24 hours every day in the year. The desire for continuous processes is apt to be harmful, due to exaggeration of its importance. This has retarded the development of processes for the utilization of off-peak power. Such development has encouraging possibilities, but this problem should be taken up by those having power to sell rather than those using the power. Methods for securing suitable regulation of the current supply usually pay for themselves, because they give 100-per-cent load-factor. Power-factor is not really a troublesome problem, but where it becomes serious the use of synchronous condensers is desirable. It is possible to provide some type of furnace to absorb any power which might otherwise be wasted for one cause or another.

A paper was then presented entitled "Electric Furnace Regulation by Electric Furnace Regulators," by Robert Turnbull. Following this there was a paper entitled "Power for Electric Furnace Work," by W. S. Horry. The latter pointed out that hydroelectric power cannot produce all the energy needed by the increasing use of electric furnaces, and that coal will have to be utilized more and more. Three other papers were presented by title only, since they had been formerly presented at meetings of the New York Section of the Society. These papers were as follows: two papers by L. Addicks and H. E. Longwell entitled "The Power Problem in the Electrolytic Deposition of Metals;" a paper by F. D. Newbury entitled "Sources of Direct Current for Electrochemical Processes."

After all these papers had been presented a general discussion followed. Robert Turnbull asked what should be paid for off-peak power in comparison with power used continuously 24 hours per day. M. Petinot referred to the Thury automatic furnace regulator, and said its operation was as nearly perfect as could be desired. It was possible to secure a regulation of load-factor as high as 97 or 98 per cent by the use of this regulator. F. A. Lidbury stated that the different speakers had taken up the subject from their own points of view, and the papers showed that the point of view is an important factor in the consideration of any individual power problem. All speakers had shown, further, how complicated the consideration of their own particular phases of that problem may be in the majority of cases. This, of course, has something to do with the very varied nature of electrochemical operations. This varied nature is a somewhat startling one, in certain respects, in respect to size, the relative importance of power costs, and the importance of other considerations that may enter into the problem. The matter is somewhat complicated in regard to the electrical installation for electrochemical plants by the tendency of the electrical engineer to shove in all the electrical stuff he can possibly sell to the poor electrochemist. C. A. Hansen called attention to the fact that in general in furnaces having an arc, such as the steel furnace, the ferrosilicon furnace, and the calcium-carbide furnace that low loads mean a considerable wave distortion. As the current increases the wave distortion becomes less and less important, and when commercial energy densities are reached the wave distortion is really not serious.

C. P. Steinmetz said that wave distortion had been studied very thoroughly 20 years ago in the case of the series arc-lighting system. The effect of reactance on wave-shape distortion was then definitely observed. The best that can be said of the most desirable form of wave-shape distortion in the electric furnace is to get rid of it as soon as possible. The most important factor in reducing wave-shape distortion is reactance. If you lower the power-factor by reactance, you lower the wave-shape distortion and thereby eliminate the reduction of power-factor due to wave shape. That means that where attempts are made to get as high power-factor as possible by cutting down all the reactance in the furnace the results have very often been disappointing. In his opinion the mistake made in most furnace operations is to attempt to get a low reactance. He did not think it good practice to attempt to operate at less than 80 to 85 per cent power-factor as calculated by the reactance of the system.

P. M. Lincoln said that the power-factor as calculated from the oscillograph record is a truer power-factor than the one measured by the power-factor meter. If the current wave is of the same shape as the voltage wave, the power-factor meter gives the true power-factor, but if the current wave and the voltage wave are not of the same shape, the power-factor meter does not give the true power-factor, and the latter must be determined in some other way. Wherever there is an arc present, the current wave is not the same as the voltage wave. The arc induces electromotive force in the circuit, so that the current wave departs very considerably from the voltage wave that produces the current. Mr. Lincoln referred to some of the ideal costs of power as mentioned in some of the papers. He said such costs could be realized only by the use of the very largest amounts of power under the very highest load-factors. If anyone was willing to make a contract with a power company for a matter, say, of 50,000 kilowatts, and guarantee a load-factor of 100, for 24-hour power, 365 days a year, and will guarantee that the load will remain on the power house for the next 20 years, it might be possible to get power at the ideal figures referred to in some of the papers.

Mr. Sothman thought it was agreed that the question of power is one of the most important in the electrochemical industry. He knew of contracts for power where the basic rate was $28.50 for power 24 hours a day for 365 days a year. If the consumer will waive the 80-per-cent power-factor, during the four winter months in the year, for one and one-half hours per day, that power could be had for $24, which is a reduction on the total power bill of about 22 per cent. Other contracts have been made where the reduction was as high as 34 per cent, if it was off-peak power. If the amount of power per employee is relatively very large, and of considerable value in the cost of production, it pays to buy off-peak power. If there are ten men working on a certain process and 1,000 horsepower is being used, and off-peak power can be purchased 25 per cent cheaper, it would be more economical to buy the off-peak power, and lay the men off for an hour or two, provided the process is not in any way interfered with as to the final results.

Carl Hering remarked that it is difficult to convince the power stations that it is to their interest to sell valley power quite cheaply. They do not seem to realize that, and their general rule seems to be the rule which exists in so many other busnesses and that is to charge all the traffic will bear.

The afternoon session opened with an illustrated lecture by Dr. W. D. Bancroft entitled "Electrolytic Flames." Some startling results were produced in this demonstration.

Electric Furnaces.

A paper was then presented by C. A. Hansen entitled "Electric Steel Castings." This paper described the results obtained with a two-ton three-phase arc furnace in a modern foundry at Easton, Pa. This furnace has been operating since the summer of 1911. It is supplied through step-down transformers with a furnace voltage of 85. The cost of the melted metal from the electric furnace was found to be less than one-half that with an old crucible furnace formerly used, the oil used for the latter being figured at 2.5 cents per gallon; since that time an advance in the price of oil has given still a greater margin of advantage to the electric furnace. Auxiliary fuel burning apparatus for the purpose of heating the furnace and charge to a good red heat by means of oil burners before the electric current is turned on was found to increase the cost about $1.00 per ton over all-electric heating. It was not found particularly advantageous to keep the furnace hot over night. Although continuous day and night operation of the electric furnace produces from 10 to 15 per cent saving over intermittent operation, the lower efficiency of the night shift is usually not taken into account. The furnace is operated on the one-heat per day basis and it requires from 7 to 7.5 hours to turn out its charge from the cold furnace; power consumption averages 1,050 kilowatt-hours per ton of steel. The load curve of the furnace has been found to be quite smooth and of higher power-factor than that of a load of similar magnitude in the machine shops of the foundry company.

A paper entitled "Electric Furnaces for Steel Making," was presented by E. B. Clarke. The paper discusses first the comparative value of the electric furnace compared with other types of furnace for producing or refining steel. The electric furnace will produce steel of the same degree of purity as the crucible furnace and since refining can also be carried on at the same time, it is possible with the electric furnace to use less pure materials. Mr. Clarke also compared the electric with the small Bessemer converter and with the open-hearth furnace, his conclusions being that for the alloying of steels the electric furnace offers nothing that the crucible furnace does not; for the production of very hot steel it offers nothing that the Bessemer converter does not, and from the metallurgical standpoint it offers nothing that the open-hearth furnace does not. However, it combines in itself certain advantages of all three of the other processes mentioned. Aside from the element of cheap power, which has sometimes been exaggerated, other factors of importance must be considered.

Henry D. Hibbard said that the increased cost when oil was used for preheating the electric furnace, as described by Mr. Hansen, and bringing it to redness, raised the question as to whether the electric current actually used was paid for, or whether it was paid for by the time it was available whether used or not. It seemed as if the economical arrangement would be to have two furnaces, or multiples of two, each equipped for oil heating and with one source of electricity. Then the current would be used continuously, that is, for the latter half of each heat, which would greatly diminish the current cost. With one furnace and the current used but half the time the cost of keeping the generator idle but ready to run is a very large part of that when it is actually running.

Ernest P. Humbert said he thought Mr. Clarke should tell the prospective user of an electric furnace wherein the statements of the men exploiting electric furnaces have differed from what he has found in practice. In his experience with the Heroult furnace, covering some 60 furnaces in the United States, France, Sweden, England and Canada, the furnaces have quite generally borne out the claims made by Dr. Heroult and his associates. One would infer from Mr. Clarke's statement that there was really not much difference between the electric furnace, the crucible furnace, the open-hearth furnace, or the Tropenas converter, as regards results. The electric furnace has one characteristic which he believed appealed more strongly to the metallurgist than any characteristic of any other process of making steel. This was that in the arc furnace there is a strong reducing action due to the exclusion from the melting chamber of the atmospheric air, and the fact that carbon, which is one of the strongest reducing agents, is used in connection with the slag. This action is so striking that not only is calcium carbide normally present in the slag, but such elements as silicon, manganese, vanadium, tungsten, etc., are readily reduced from their oxides in the slag to the metallic condition in the bath.

Karl G. Frank said he wanted to emphasize that apparently in Germany the experience with the electric steel furnace has been more satisfactory than in the United States. In Germany in the year 1912 about 75,000 tons of electric steel was produced, and in the year 1913 about 100,000 tons, a very large percentage of which had been used for making steel castings. About 38 to 40 per cent in Austria-Hungary was made in the induction furnace. He believed if the electric steel manufacturers would go more thoroughly into the problem in this country the results would be more satisfactory.

Henry Hess declared that the statement that the roof of the Stassano furnace was short-lived was incorrect. He had a Stassano furnace in operation for several months and the roof had not shown any signs of distress when it was necessary to reline the basin or the side walls.

Joseph W. Richards said that a little study of the question would enable one to replace the silica roof with a basic roof, or a more refractory product, such as aluminum nitrite, so as to overcome the difficulties of the silica and its fluxing. He agreed with Dr. Frank that European practice in electric furnace work, for some reason difficult to understand, is not reproduced in this country with the same patience and same mastery of details as is accomplished abroad.

E. L. Crosby stated that he did not think the central stations generally were asleep as to the opportunities in the electrometallurgical and electrochemical fields. The Detroit Edison Company is not. The only difficulty in Detroit is that no one had been found who will come in and for a specified sum sell a man a furnace. The company had made a rate on electric furnace work of three-fourths cent or less.

Wm. D. Mainwaring said it was necessary to mix steel properly and the time factor must be taken into consideration. He had about 15 years' experience in steel making, which included about every type of furnace made, and he had seen some of the poorest steel made in electric furnaces and had seen some of the best made in that furnace. It is necessary to work steel right in all furnaces.

E. F. Cone called attention to the point that if you compare the electric furnace for steel castings with any other method of making steel castings consideration should be given to the refining power of the electric furnace as compared with any other furnace for making steel castings, whether open-hearth, or the crucible, or the converter. It reduces the sulphur and also makes a quality of metal which, so far as composition is concerned, is way ahead of anything to be obtained by other processes.

The afternoon meeting was concluded with the presentation by title of three papers. These were: "Improvements in the Metallurgy of Zinc," by G. C. Stone; "Electric Zinc Smelting," by W. R. Ingalls; "Advantages of Southeastern Alaska for Hydro-electrochemical Industries," by W. P. Lass.

The evening meeting was opened by the delivery of the annual presidential address by E. F. Roeber. This was entitled "Some Economic and Esthetic Aspects of Electrochemistry." Dr. Roeber's discussion was based first on the well known classification of Knies of economic values into place value, time value, and form value. The products of electrochemical industries have always high form value, and a long series of these products has also place value and time value, due to the fact that they have a very high energy content. By transporting electrochemical products to some other place where their energy content may be needed, they get place value. By getting the energy content out of them when it is needed they get time value. This is the foundation of "chemical power transmission." It differs from electric power transmission in two essentials. It is not bound to fixed route, it needs no line wires, as electrochemical products can be transported anywhere by the ordinary transportation facilities, and it is not bound in its utilization to a fixed time.

The electrochemical industries affect modern civilization in its most various phases. What was waste before, what was nuisance, becomes valuable; and in chemical power transmission electrochemistry has brought into modern civilization an absolutely new element by which what is now waste power is being scattered all over the world, to build up industries, to further agriculture with fertilizers, to aid public health with bleaching powder and to affect civilization in general in its most heterogeneous aspects.

Taking the esthetic side of the subject, Dr. Roeber concentrated his remarks on the subject that is uppermost in this connection in the minds of American electrochemists—the question of the power development of Niagara Falls. The beauty of Niagara Falls, like all beauty, is subjective in the onlooker. If we stand as modern men at the Falls with a free attitude of mind, we don't see simply water; we see power. We see the possibilities of using this power for electric power transmission for lighting, traction and industrial purposes on a wider area. We see the even greater possibility of storing this power in electrochemical products and utilizing them all over the land in all walks of life. If we look at the Falls with this attitude of mind, which is the natural one for modern men, all of the unutilized water appeals to us as waste.

At the two sessions on Saturday a large number of papers were presented, but there was relatively little discussion. These papers were as follows: "Progress in Leaching and Electrolytic Treatment of Copper Ores in South America," by E. A. C. Smith; "Hydroelectric Treatment of Copper Ores," by R. R. Goodrich; "Leaching of Copper Tailings," by R. Gahl; "Metal Inventory in an Electrolytic Copper Refinery," by R. W. Deacon; "Electrolytic Zinc," by J. W. Richards; "Addition Agents in the Deposition of Zinc From a Solution of Zinc Sulphate," by O. P. Watts and A. C. Shape; "Electrodeposition of Cadmium," by F. C. Mathers and H. M. Marble; "Electrodeposition of Nickel," by C. W. Bennett, H. C. Kenny and R. P. Dugliss; "Electrolytic Deposition of Brass on a Rotating Cathode," by C. W. Bennett and A. W. Davison; "A New Method for the Determination of Free Cyanide in Electroplating Solutions," by G. E. F. Lundell; "Electric Conduction at High Temperatures and Methods of Measurement," by E. F. Northrup; "Laboratory Notes on Some Electrical properties of Silver Sulphide," by F. A. J. FitzGerald; "Polarization Single Potentials," by C. N. Hitchcock; "New Cell Arrangements for Direct Determination of the Free Energy," by R. Beutner; "A New Railway Track Cell," by E. L. Marshall; "Experiments on White Lead," by R. S. Owens; "A Microscopic Study of Electrolytic Iron," by O. W. Storey; "The Effect of Addition Agents in the Electrodeposition of Iron," by O. P. Watts and M. H. Li.

Election of Officers.

At the business meeting held on Thursday morning, announcement of the election of officers was made. The successful candidates were F. A. Lidbury, Niagara Falls, N. Y., president; Carl Hering, W. D. Bancroft, William Brady, vice-presidents; Howard C. Parmelee, W. R. Whiting, C. G. Fink, managers; P. G. Salom, treasurer; Joseph W. Richards, secretary.

LETTER TO THE EDITOR.

Load Curves.

To the Editor:

It is often desirable to compare the "load curves" of one public utility with those of another, although the comparison is not always satisfactory because the various public utilities use the "load curve" to represent different kinds of loads. This difficulty would be obviated to a great extent by using the "production curve" and the "consumption curve" defined in the following:

The production curve is derived by plotting the amount of service or commodity produced, at the place of production, as ordinate, and the hour or date as abscissa.

The consumption curve is derived by plotting the amount of service or commodity consumed, at the place of consumption, as ordinate, and the hour or date as abscissa.

From the above definitions it can readily be seen that there may be two consumption curves, one for the individual consumer and the other for the supply plant. The second is the sum of all the individual consumer's consumption curves. This curve may or may not correspond to the production curve of the supply system.

In the case of a water-supply system which pumps water at a nearly uniform rate into an ample storage reservoir from which the consumers draw it as needed, the production curve will be almost a straight line extending over the whole of the period of time, and the consumption curve will have valleys and peaks of varying magnitudes. But a water-supply system that pumps the water as consumed will have a production curve that is similar to its consumption curve, disregarding leakage of the distributing system.

A system supplying artificial gas, on account of its ample storage capacity and method of manufacture, has as nearly uniform a production curve as the owners may think most profitable in the operation of the plant, while its consumption curve will have valleys and peaks. But a system supplying natural gas that regulates the pressure on the distributing system by means of pumps has a consumption curve similar to the production curve except for losses.

In the case of the telephone, street railway and electrical industries the consumption curve is always very similar to the production curve of the supply system, because these three public utilities have no efficient means of storing the service.

The difference between the integrated production curve and the integrated consumption curve is the sum total of the various losses occurring during that period.

L. C. TOMLINSON.

Atlantic, Mass., April 15, 1914.

Jovian Activities at Columbus, O.

Columbus, O., Jovians had an active day on April 17. At noon they met for luncheon at the Virginia Hotel, with a fine attendance, where they were addressed by John Kelly, secretary of the Columbus Chamber of Commerce. This was preliminary to taking part in Jovian night at the electrical exhibition in progress during several days at Robinson Hall, Ohio State University. The matter of attendance on this particular evening had been worked up vigorously, with the result that some 300 local electrical men were present, many of them with their wives or lady friends. There were no formalities, the time being spent in viewing the exhibits and witnessing the demonstrations in the adjoining auditorium.

A booth was maintained at the hall by the Jovians during the entire exhibition. Following were among concerns taking part in the affair: Avery-Loeb Electric Company, Erner-Hopkins Electric Company, McKeever Electric Company, National Cash Register Company, Sackett Mine Supply Company, Columbus Railway, Power & Light Company, Haynes Automobile Company, Dictating Machine Company, Brashear Motor Car Company, Haynes Motor Car Company, Lincoln Electric Company, Jeffrey Manufacturing Company, Landerferry & Clark Company, Hotpoint Electric Heating Company, Automatic Telephone Company, Diehl Manufacturing Company, Banner Electric Company, Westinghouse Electric & Manufacturing Company, General Electric Company, Judd Laundry Machine Company, Western Electric Company, American Telephone & Telegraph Company, Central Union Telephone Company, Simplex Electric Company, American Electrical Heater Company, Conlon Electric Washer Company, Premium Vacuum Cleaner Company, Lindstrom-Smith Company, Macbeth-Evans Glass Company, Eclipse Machine Company, Dayton Fan & Motor Company, Frantz Electric Suction Cleaner Company, and Invincible Manufacturing Company.

Meeting of Duquesne Electric Light Section.

The Duquesne Light Company Section of the National Electric Light Association, held a brilliant banquet recently in Kaufmann's banquet hall, Duquesne, Pa. An elaborate menu was served and this was followed by a general electrical discussion. President E. C. Stone, of the section, presided and introduced the speakers. A stereopticon was used to illustrate the talks on electrical equipment, which were delivered by F. E. Harper, who analyzed the installation of the electrical system in the Kaufmann store of that city; W. I. Bickford, who took part in the installation of the system, and E. D. Dreyfus, of the West Penn. Power Company, who spoke on "Electrical Service, Prospective and Retrospective."

Civil Service Examinations.

The United States Civil Service Commission announces open competitive examinations at the usual places on May 20 for junior electrical engineer (male) and junior railway signal engineer (male). An examination will also be held directly after May 11 for associate physicist; competitors for this position will not be assembled for examination but will be rated on general education and scientific training, practical experience and fitness, and publications or thesis. An educational training equivalent to that required for an engineering degree from an institution of recognized standing, and at least three years' experience in the construction and operation of furnaces, kilns, etc., in the manufacture of fireproof structural materials (clay products, cement, etc.), as well as in practical pyrometry, or three years experience in work relating to the testing and use of structural materials, the fire-resisting properties of structural materials, fireproof building construction, building codes, etc., are prerequisites for consideration for this position. If a thesis is submitted it must represent the results of original work on the part of the applicant on some phase of the subjects named above. Statements as to training, experience and fitness are accepted, subject to verification. Applicants must be between 30 and 40 years in age and should secure application Form 304. From the register of eligibles appointments will be made to fill vacancies in the Bureau of Standards, Pittsburgh, Pa., at a salary ranging from $2,200 to $2,700 per year; and in Washington, D. C., at a salary ranging from $2,200 to $3,500 per year.

Applicants for the positions of junior railway signal engineer and junior electrical engineer must have had three years' practical experience in railway engineering and must be younger than 36 years of age. Appointments will be made to fill vacancies as they may occur in this position in the Interstate Commerce Commission at salaries ranging from $1,080 to $1,500 per annum and will be principally for duty in the field. Application Form 2039 should be secured.

SOME NOTES REGARDING SWITCHBOARD DESIGN AND CONSTRUCTION.

By S. W. Mauger.

It is gratifying to one who has spent many years on switchboard design to note the increased respect paid by electrical men in general to the once almost despised switchboard. Not only are the manufacturers of switchboards paying more attention to the details as well as the general design, but the users of switchboards are more critical, appreciating the importance of a properly designed and constructed switchboard.

It is understood nowadays that the switchboard means more than a few panels on which are mounted switches and instruments, and that it covers the whole system of connections with its layout of switching apparatus, busbars, etc.

Not only have great strides been made in connection with high-tension installations, but even the low-tension switchboards show a decided improvement over those built several years ago.

It is the writer's intention in the following notes to point out to prospective purchasers and designers of switchboards the important features that should have careful consideration. The low-tension switchboards will be mentioned first and the main features that are essential to a good low-tension board, enumerated as follows:

(1) The apparatus on front of board should be mounted to give the best results from an operating standpoint and not merely with regard to appearance. For instance, circuit-breakers should be so mounted that an arc from them will not involve the switchboard attendant or devices mounted near the circuit-breakers.

(2) The back of board should be laid out so that all parts which need periodical or occasional attention will be accessible. This would include fuses for instrument and main circuits and nuts and bolts which affect current-carrying parts.

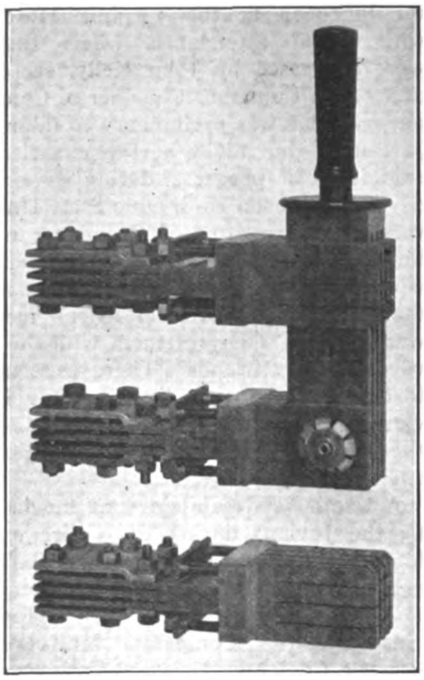


Fig. 1.—Switch With Laminated Studs.

(3) The minimum number of bolted and sweated joints should be used. Where complicated bends in connection bars are required, sweated and bolted joints have often been resorted to to facilitate manufacture, but this is not now necessary for those having the necessary machinery for making workmanlike twists and edgewise bends.

(4) The above principle should also apply to the switches and other current-carrying parts, and in comparing switchboards, should be carefully considered. This is especially true of switch and circuit-breaker studs which for proper operation should be integral with the contact blocks, that is, each block and its stud should be formed out of one piece of metal.

(5) In the case of large capacities, laminated terminal bars instead of round studs give the best results, in that they allow simpler design of connections, greater accessibility for tightening joints, and, therefore, less occasion for trouble from heating. (See Fig. 1.)

(6) Attention must be given in design toward making it easy for men installing a switchboard to connect the generator and feeder cables to the switchboard. This is a point that is sometimes overlooked in large direct-current and alternating-current low-voltage switchboards and has a large influence on the ultimate cost of the installed switchboard. The price quoted f. o. b. manufacturers' works is not the only thing to consider. See Figs. 2 to 9 inclusive, showing good types of boards.

In designing the back of direct-current switchboards better results can often be obtained by mounting the bus of one polarity near the top of board and the bus of the other polarity say two to four feet from floor, according to layout. This gives greater accessibility to terminals and studs with the usual arrangement of switches and circuit-breakers. It also has the advan-

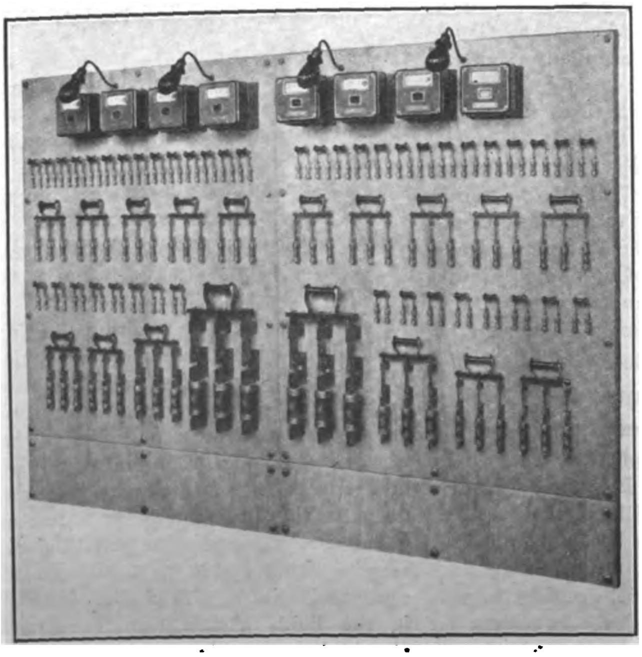


Fig. 2.—Switchboard for Small Office Building.

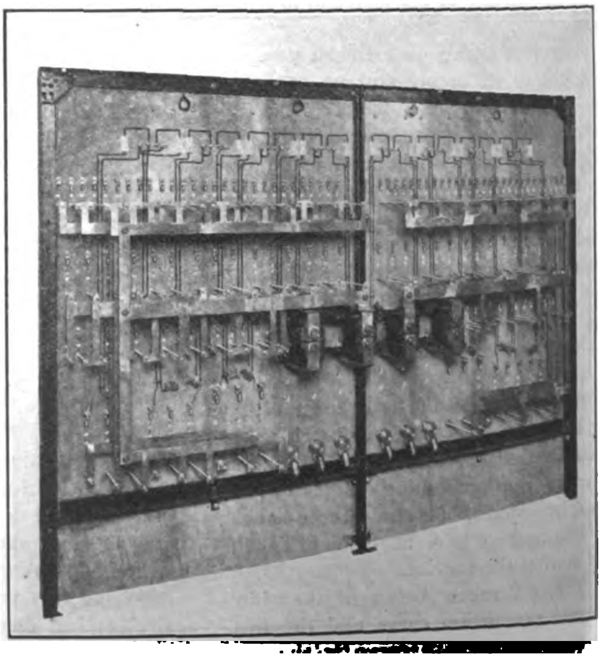


Fig. 3.—Rear View of Same Board.

tage of giving less liability to accidental short-circuits between buses. See Fig. 10.

On alternating-current low-tension boards involving heavy current, say 2,500 amperes and above, especially at 60 cycles, it is not feasible to follow the ordinary direct-current practice regarding arrangement, mounting and current density of bars, on account of the heating that would result. It is necessary to go to much lower densities, depending upon ventilation. Iron work, including bolts and supports in close proximity to bars, will become hot, the safe distance depending upon amount of current carried in the bars. There is an erroneous idea that the iron will not be overheated when near bars carrying heavy alternating current unless the iron forms a complete magnetic ring. This is not so, as anyone can prove by hanging an iron bolt in a very strong field caused by alternating current.

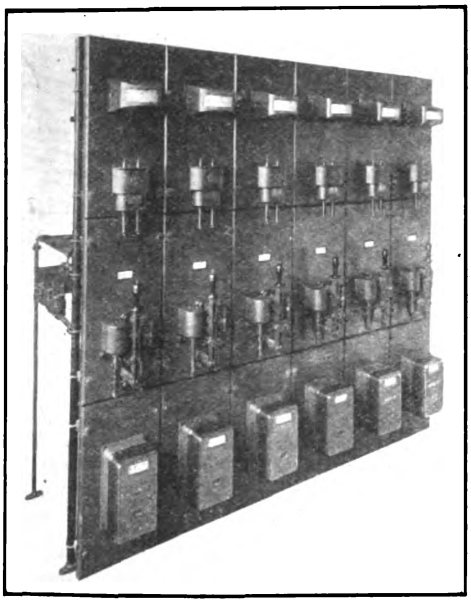


Fig. 4.—Moderate Size of 600-Volt Alternating-Current Switchboard.

When considering a switchboard involving very heavy current, which is now quite common for 250 and 600 volt direct current and 600 volts alternating current, remote-controlled switches and circuit-breakers will usually be found to work out advantageously from a standpoint of first cost as well as operation. With remote-controlled devices the control switchboard can be made more compact, and the main switches and circuit-breakers can be located to obtain the greatest economy in cable, as well as station design. See Fig. 11.

Another point to consider when dealing with heavy currents is the matter of stray-field effects on instruments. Some instruments are more susceptible than others, and some are affected differently from others, that is, some are affected by a field from a vertical bar more than from a horizontal bar and vice versa. Most permanent-magnet instruments are more or less affected. It is not, of course, merely the normal current that is to be considered, but the current developed on overloads or short-circuits, which when bars are in a certain relation to the instruments permanently affect the accuracy of an instrument. Knowing this, it is possible to select the most suitable instrument and design the connection and busbars to give the minimum trouble from stray fields. The use of remote-controlled switches obviates all such trouble, the main current-carrying parts being sufficiently distant from the instruments.

High voltage direct-current railways are now becoming quite common and designs for 1,200-volt switchboards are standardized and a few 2,400-volt boards have been built. Fig. 12 shows a 1,200-volt panel. In general, 600-volt railway practice has been followed, except that the circuit-breaker and switch are mounted higher and are operated by handles near the bottom of the panel, through levers and bell cranks. The ammeter cover is insulated so as to be safe to touch. For 2,400 volts it seemed advisable after tests to go a step further and mount the circuit-breaker and switch back three or four feet from the panels and provide the circuit-breaker with powerful magnetic-blowout shutes. Otherwise the design of the 2,400-volt panels follows that of the 1,200-volt panels.

When it comes to alternating-current switchboards for 2,300 volts and over, the considerations brought out in the foregoing apply in more or less degree, but the question of insulation and safety must be more carefully considered. A number of disastrous accidents to life and apparatus have resulted from a false idea of economy in first cost or by lack of experience as to what is adequate. Sometimes the practical man of a power company, having had some sad experiences, has asked for an appropriation to cover a suitable switchboard equipment, but the directors ever on the alert to keep down expenses have made the practical man get along with something less suitable. This happily is now mostly a matter of history. Then again, a purchaser is sometimes misled by exaggerated statements.

There is no need of going astray if the subject is gone into cautiously and with the firm conviction that the switchboard should be the strongest link in the chain of system operation. On this last point an illustration of poor engineering would be a case of, say, a 11,000-volt overhead system having insulators that arc over at 50,000 volts with switching apparatus controlling the circuits arcing over at 25,000 volts. In the case of heavy voltage surge, there will be a "spill-over" at the weakest point. Another illustration would be where a generator could deliver without dangerous heating, 1,000 amperes and the switch controlling the generator could carry safely only 800 amperes. The normal rating of generator and switch may be the same, but the generator, while not being able to continuously carry more than the switch, may be able to carry, for one hour, more than the switch. A switch may reach its ultimate temperature in one hour or less, whereas a generator takes a much longer time.

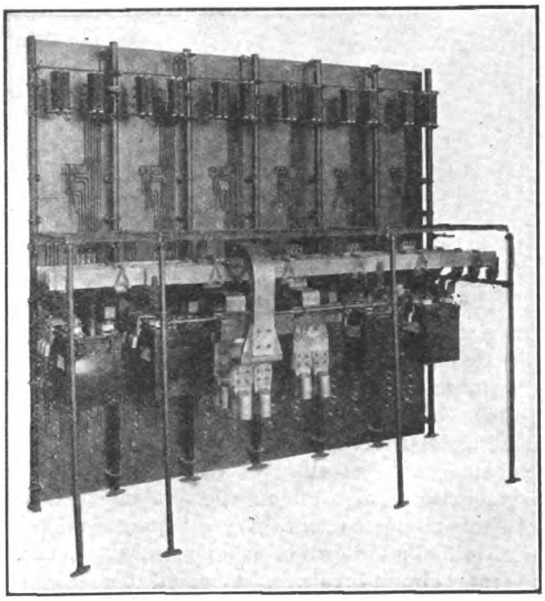


Fig. 5.—Rear View of Same Board.
[Note protecting screen over busbars and convenient location of cable terminals.

Rupturing capacity is another question that engineers are beginning to talk about, but comparatively few have an adequate perception of what it means or how to apply the term. It has been usually defined to mean the bus capacity to which a circuit-breaker is connected and is supposed to give the safe limit for the use of the circuit-breaker for the protection of machines and circuits under short-circuit conditions, the bus capacity being the kilowatt-amperes (including the one or two-hour overloads) supplied to the buses. It is obviously impossible to give a definite "rupturing capacity"

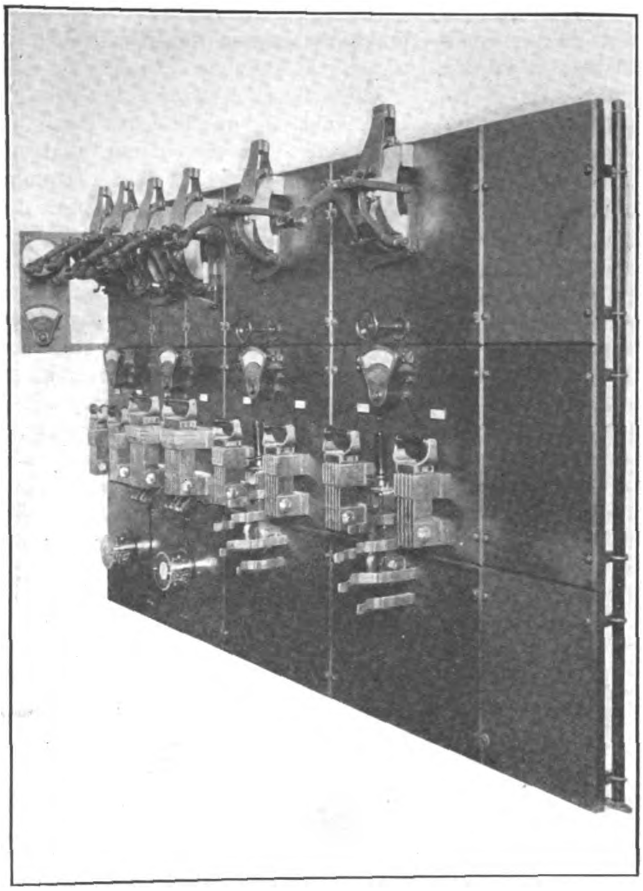


Fig. 6.—Direct-Current Switchboard With Heavy Switches and Circuit-Breakers.

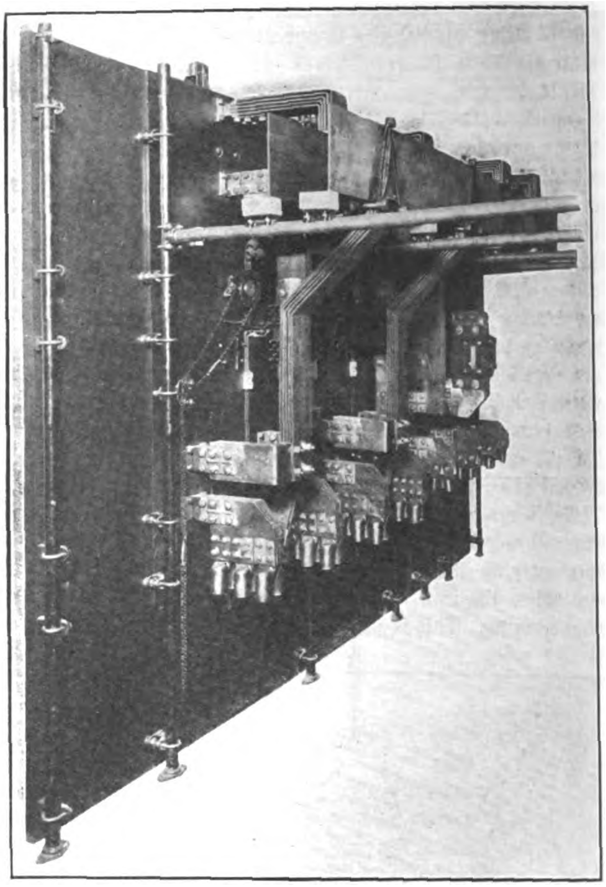


Fig. 7.—Rear View of Same Board. Note laminated studs.

for a circuit-breaker which is applicable to all conditions, as reactance or resistance in a circuit determines the amount of current that can be developed under short-circuit. The inherent reactance of generating or transforming apparatus also affects the amount of short-circuit current. Were it practical to find a uniform basis upon which to rate circuit-breakers, it would be better to define rupturing capacity as the maximum current which can be ruptured without rendering the circuit-breaker incapable of being again placed in service without repair. Several variables come in, however, to make such a method of rating difficult. Whatever definition is given, a rating can only apply to one exact condition, which must always be stated. At the present time the power companies, in taking the manufacturers' ratings, should, of course, be influenced by results of actual experience, and by a careful consideration of all conditions to be met.

Fig. 13 shows the disastrous results of failure to install heavier-duty oil switches as the generating capacity was increased. In this particular case the damage could probably have been confined to one oil switch if isolating compartments of masonry had been used instead of having everything mounted on the backs of the panels.

Fig. 14 shows a good design of small 2,300-volt switchboard which is suitable for stations of small generating capacity. Fig. 15 shows an example of a poor installation.

In laying out any alternating-current switchboard involving voltages above

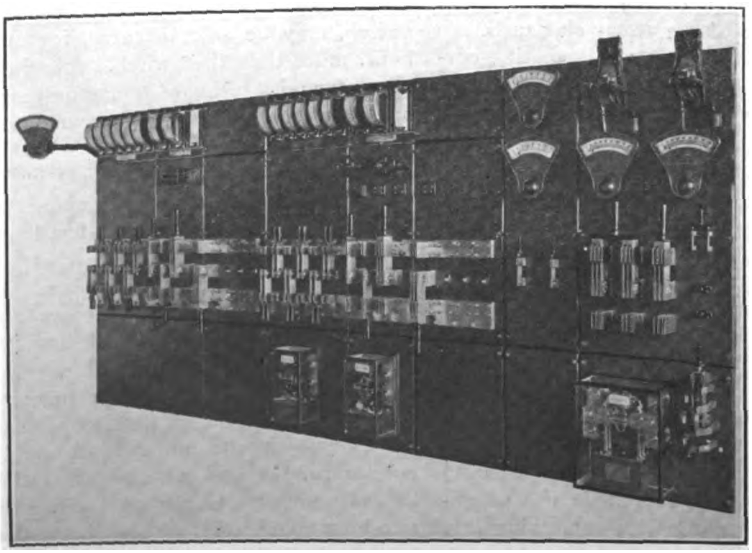


Fig. 8.—Direct-Current Three-Wire Board With Busbars on Front.

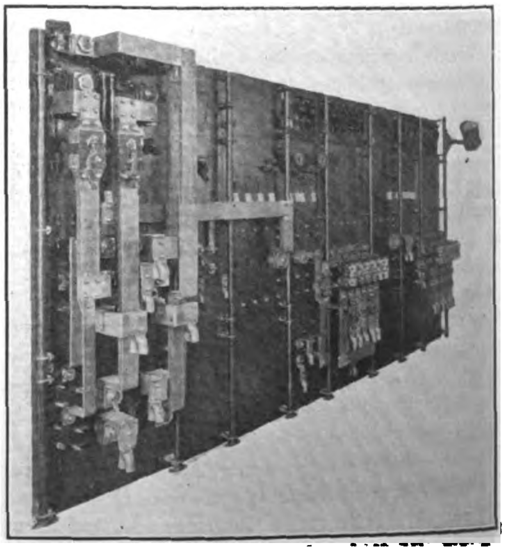


Fig. 9.—Rear View of Same Board.

3,300 volts or any voltage above 600 where the amount of power to be controlled is over 1,500 kilowatt, it is advisable to consider remote-controlled oil switches. Where the switches are not too large or where the space for the switches can conveniently be allowed within 10 or 15 feet of the switchboard, hand-operated mechanism with rods, levers and bell cranks may be properly used. In other cases solenoid, motor and air mechanisms may be better employed. In the case of electrically operated switches, it is recommended to always use knife switches for isolating the oil switches from bus or other live source to facilitate inspection and repair. Where continuity of service is essential, it is always advisable to use isolating switches even for hand-operated oil switches. Isolating barriers or compartments should always be used for remote-controlled oil switches for voltages from 6,000 to 15,000 where the total kilowatt capacity is above 2,500 kilowatt, and on the lower voltages about 7,500 kilowatts. These figures are not absolute, but represent what has been found to be good practice for average conditions. Conditions more or less severe than the average should be met according as they warrant.

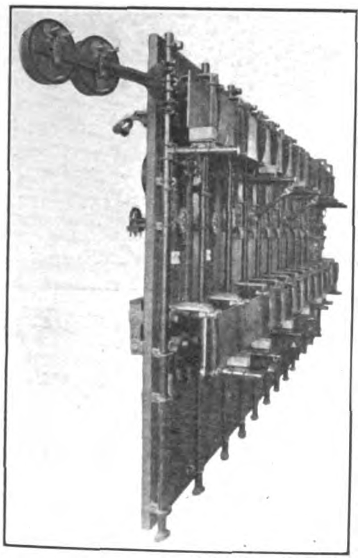


Fig. 10.—Buses Widely Separated.

Figs. 16 and 17 represent good types of control boards. Fig. 18 shows a neat installation making good use of pipe framework. Fig. 19 covers a good installation for 6,600 volts and moderate capacity. The oil switches, which are in compartments on gallery, are hand-operated from handles on panels on main floor. Buses are protected by slate slabs on which are mounted the potential transformers. Fig. 20 shows a large electrically operated installation (view before completion).

Busbars should be separated by barriers or placed in compartments when otherwise protect the bare live parts to prevent accident contact. Some- oil switches are installed with each pole isolated, but where oil switches are used with all poles in the same compartment, it is inconsistent to place the busbars in compartments. In such cases it is well to tape or

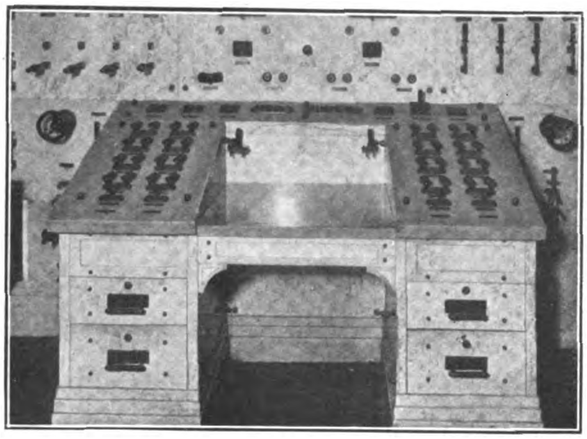


Fig. 11.—Control Bench.

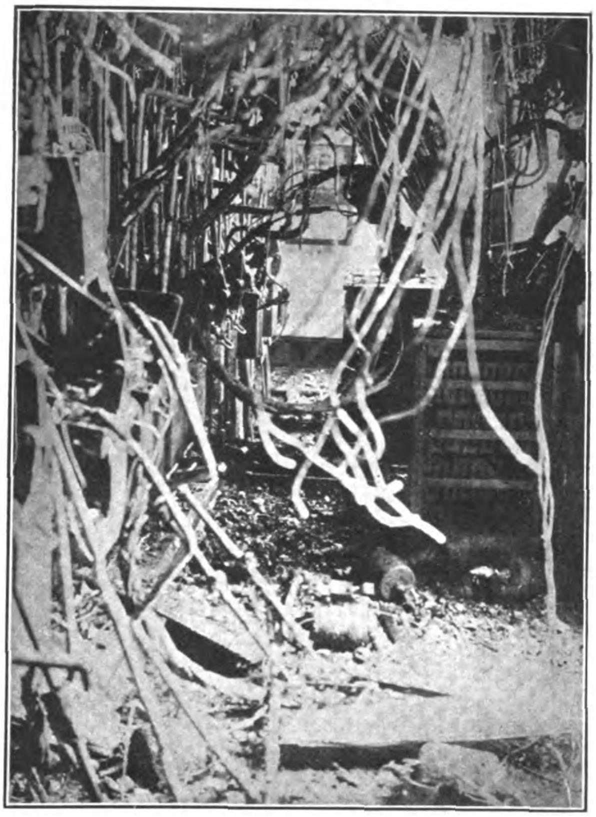


Fig. 13.—Disastrous Results of Poor Design.

otherwise protect the bare live parts to prevent accidental contact. Sometimes a protecting metal cage is placed around the buses to prevent anything getting across them, the bars being far enough apart so that insulating is unnecessary.

For voltages above 15,000 volts compartments are used only in very high power stations where bottom or back-connected electrically operated oil switches or circuit-breakers are used. When using top-connected switches with heavy boiler-room oil tanks they can be spaced so that barriers or compartments are unnecessary.

For circuits above 15,000 volts, all live parts are usually left bare, being placed out of reach of accidental contact and with sufficient distance between the parts of opposite polarity to preclude chances of short-circuit.

The subject of safety to operators is one which is now occupying a great deal of attention on account of the fact that several states have passed laws making employers' responsibility for accidents more far-reaching than heretofore. For self-protection against heavy liabilities, it is wise to spend a little money on safety. This applies more or less to switchboards, although the more responsible manufacturers of switchboards have for some time and to a certain extent included features of safety in their designs. The point is that all buyers of switchboards should have in mind safety to life when drawing specifications for switchboards and when deciding on the comparative merits of designs.

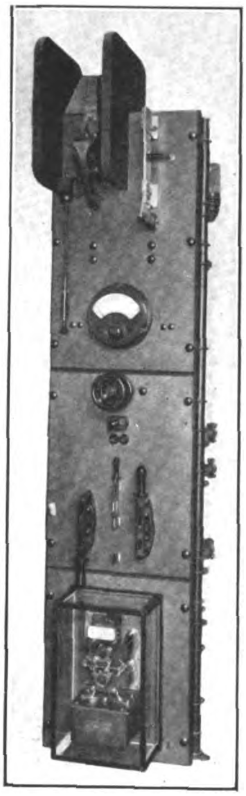


Fig. 12.—Direct-Current 1,200-Volt Panel.

The following table of spacing has been found to be good practice.

On the circuit-breakers, fuses, etc.,

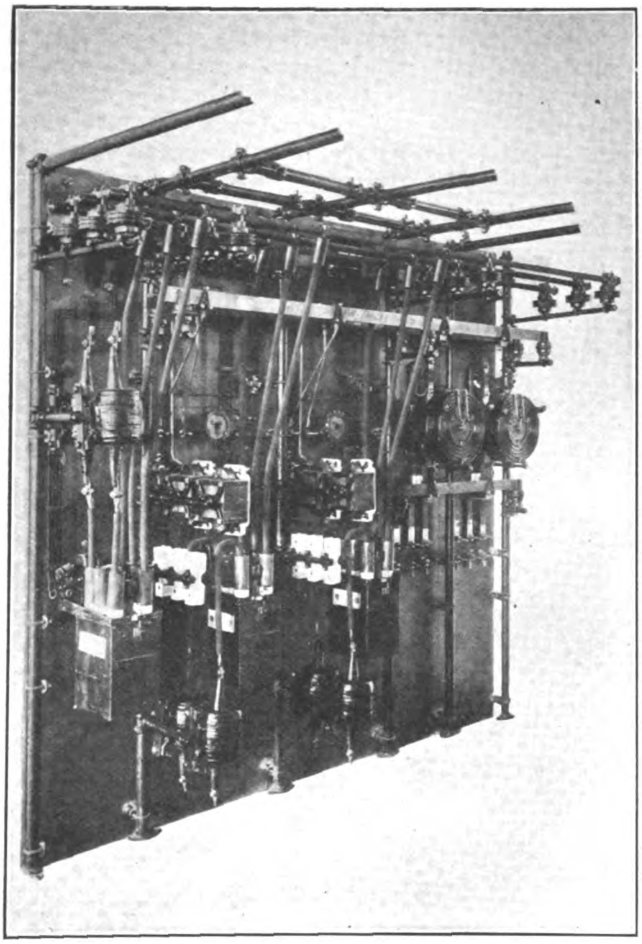


Fig. 14.—Good Design for Small 2,300-Volt Switchboard.

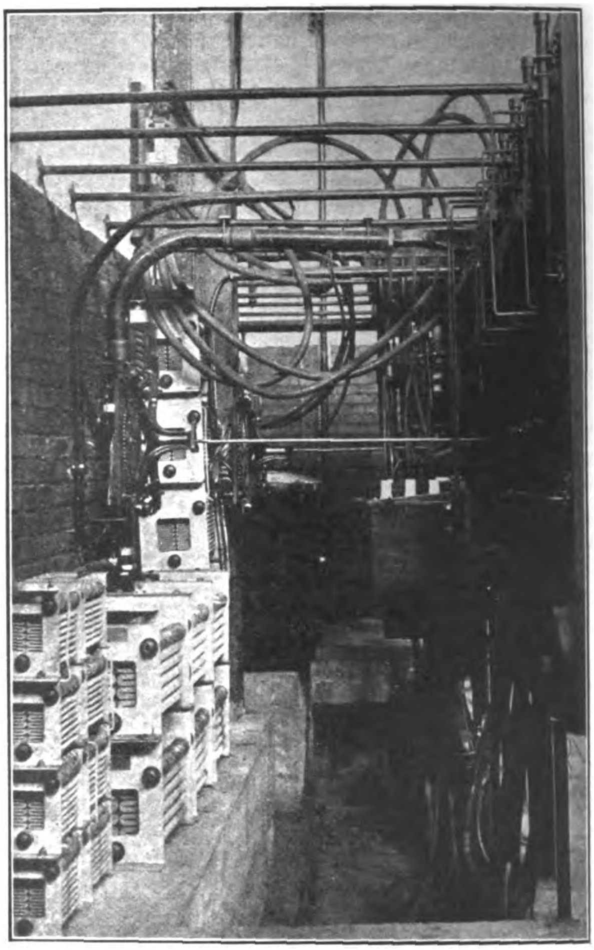


Fig. 15.—Poor Design for 2,300-Volt Switchboard.

where bars of the same polarity may obtain different polarity, when apparatus opens, figures given in the table should be used.

Supporting bolts for panels and other bolts connected to iron framework should be considered as grounded whether the framework is grounded or not.

Coming back to the actual switchboard panels, it may be said in general that the material best suited is natural black slate, which is not easily marred or stained, and can be readily matched when making extensions. An

ALLOWABLE DISTANCES BETWEEN LIVE PARTS OF OPPOSITE POLARITY AND TO GROUND

Voltage of Circuit	Distance Between Centers of Conductors of Opposite Polarity (Buses) in Inches	Minimum Distance Between Live Parts of Opposite Polarity in Inches				Minimum Distance Between Parts and Ground
		In Air		On Surface		
		Rigid	Not Rigid	Rigid	Not Rigid	Rigid
125		0.5	1	0.75	1.25	Same as between opposite polarities
250		0.75	1.75	1	1.5	
600		1	1.5	1.5	2	
1200		1.5	2	2	2.5	
2400		2	2.5	2.5	...	...
3300	6	2.5	4	3	...	2
7500	9	4	...	...	...	3
15000	9	5	...	...	...	3.5
22000	12	7.5	...	...	...	6
35000	18	12	...	...	...	10
45000	24	16	...	...	...	14
70000	36	24	...	...	...	24
90000	48	32	...	...	...	27
110000	60	38	...	...	...	33

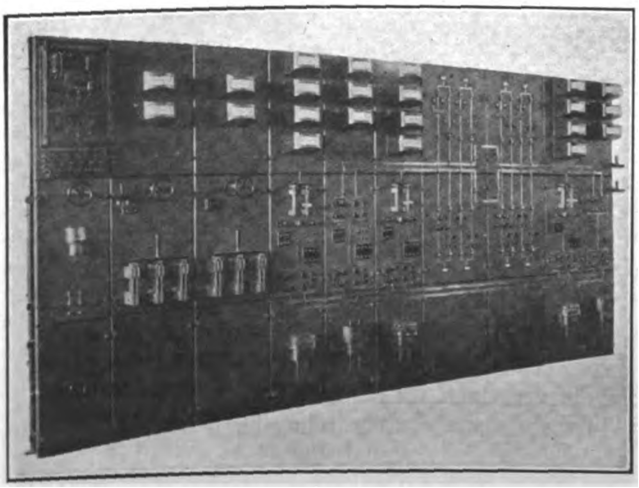


Fig. 16.—Vertical Control Board.

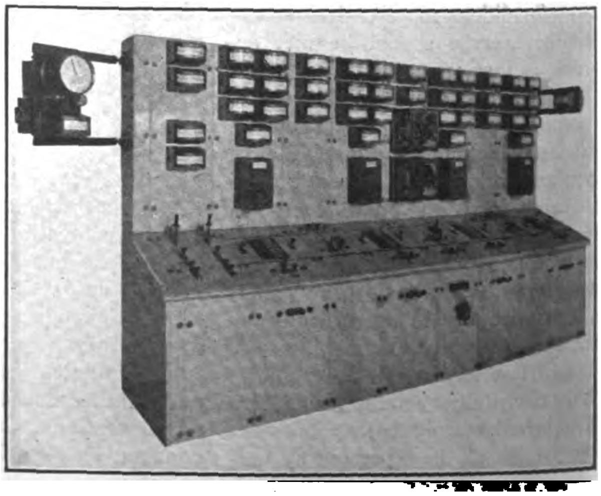


Fig. 17.—Bench Type of Control Board.

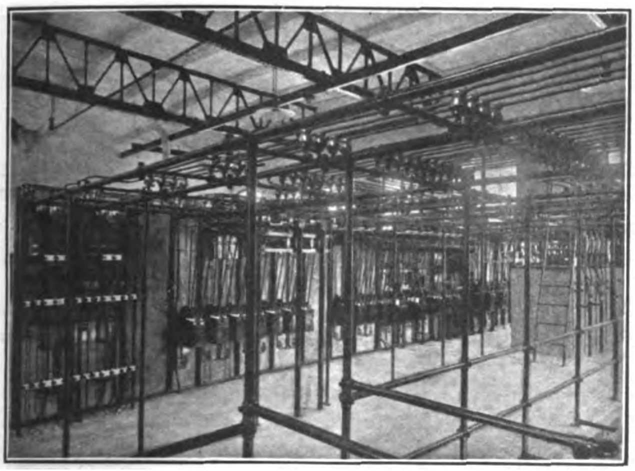


Fig. 18.—An Installation of Pipe Framework.

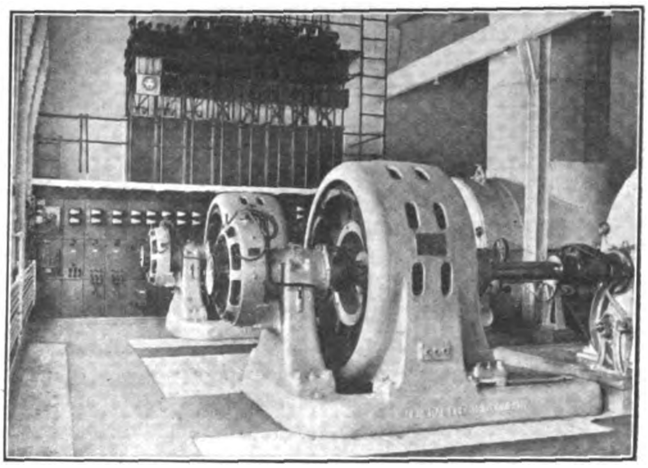


Fig. 19.—A Switchboard for 6,600 Volts.

exception to this would be where live parts connected to circuits whose voltage is above 1,200 volts are to be mounted directly on the panels, in which case marble should be used up to about 3,300 volts. Above 3,300 volts no live parts should be mounted directly on panels, and for the safety of the operator, it is best not to mount on front of the panel within easy reach, any parts directly connected to circuits of over 600 volts. When instruments are of the primary type in circuits of over 500 volts alternating-current the cases of the instruments should be connected to ground.

When the instruments are of the secondary type it is not difficult to provide suitable terminals and switches to make it easy to check the calibration of instruments and relays and to test out the various control circuits, and this provision should be insisted upon for all switchboards, except those for small plants. The small wiring on back of panel should be done neatly and regularly to facilitate tracing of connections and should be arranged in a manner best suited for connecting to the wires coming to the board.

A few words on illumination of switchboards might not be amiss. Some people still insist on lamp brackets placed directly on the switchboards, although there is nothing so unsuitable for good illumination, and these brackets are only justified on small isolated panels on account of cost. A horizontal reflector such as illustrated in Fig. 21 gives good results, but the most effective and satisfactory switchboard illumination can be had from indirect or semi-indirect lighting fixtures mounted away from the switchboard. If the general illumination of the station is correct, that is, gives sufficient light without shadows and glare on polished surfaces, no special illumination for the switchboard is required. One advantage of not having lighting fixtures mounted on the panel is the saving of the extra wiring that would otherwise be required. Good lighting makes it easier for the operator to make accurate instrument readings and saves strain on the eyes. It has been proven that eye strain is often the cause of nervous breakdown. A switchboard operator should be able to "keep his head" under all emergencies.

While on this subject it would be well to call attention to the need of some arrangement whereby provision is made for at least a few lights in case of general shutdown cutting off the main station lighting. This is usually accomplished by having a small storage battery (which may also be used for operating switches and circuit-breakers) to which a few lights are automatically connected the moment the main lighting circuit "goes off." A simple double or triple-pole, double-throw switch is provided with a strong spring which tends to throw the switch into the position which connects the lights to the storage battery. A low-voltage release mechanism latches the switch in the other position, holding it there as long as the main source of lighting is alive. If this source is shut off the low-voltage coil is de-energized, the latch releases, and the spring carries the switch to the position connecting to the storage battery. When service from the main source is restored, it is necessary to throw the switch back by hand or a more elaborate device can be made to be automatic in both directions.

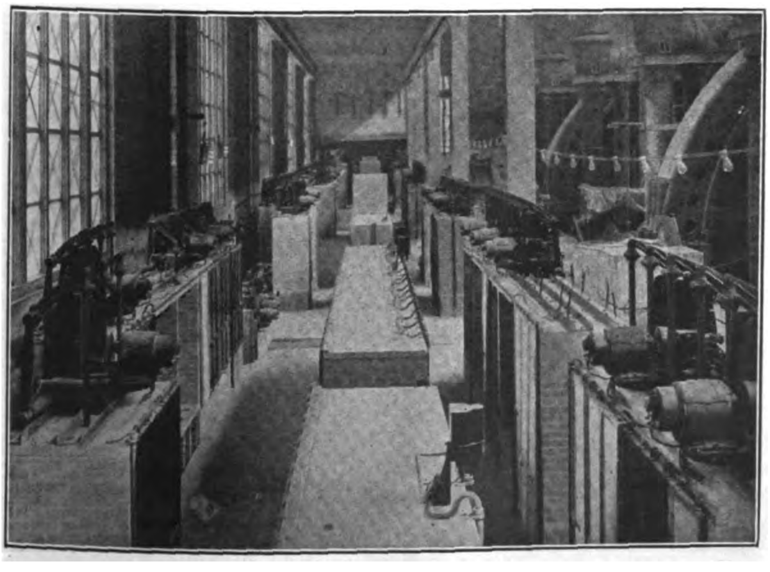


Fig. 20.—Incomplete Installation of Electrically Operated Switches.

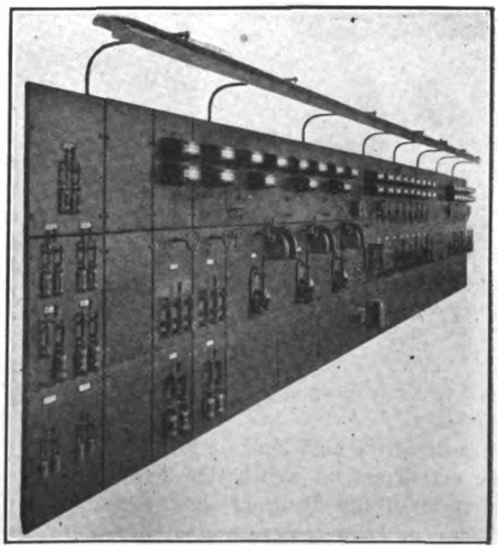


Fig. 21.—Switchboard With Horizontal Reflector for Lamps.

New Electrical and Mechanical Appliances

Reflectors for New Nitrogen-Filled Tungsten Lamps.

To meet the rapidly growing demand for lighting units to accommodate new high-efficiency nitrogen-filled 750 and 1,000-watt Mazda tungsten lamps, the Holophane Works of General Electric Company, Cleveland, O., has just completed the development of a line of reflecting and diffusing units for this service.

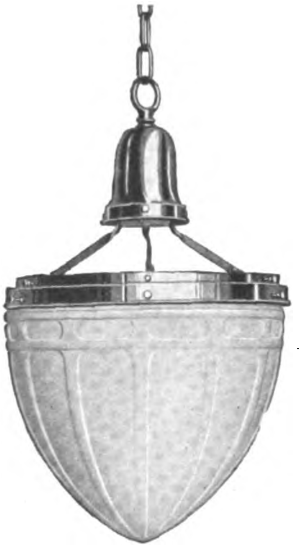


Fig. 1.

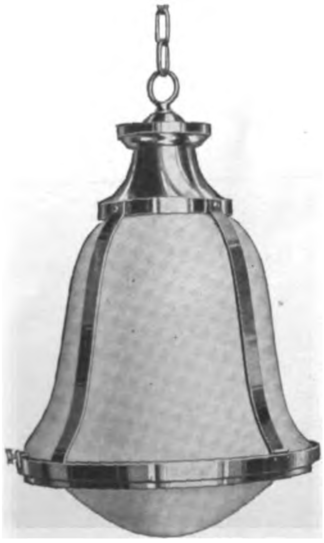


Fig. 2.

Because of the high intrinsic brilliancy of the new lamps, as well as the high temperature of the filaments and necessary change in lamp construction, it has become necessary to develop this entirely new line of lighting units to accommodate the new lamp.

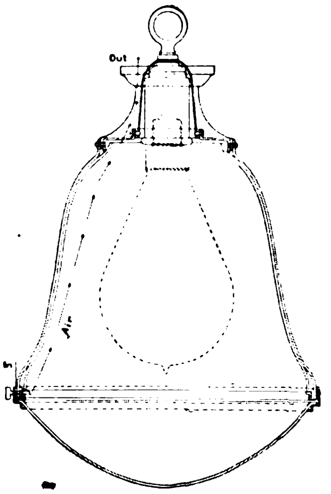


Fig. 3.

These units, as shown in the accompanying illustrations, include enameled steel, prismatic and diffusing types. The designs here illustrated are typical of each class.

The semi-indirect unit shown in Fig. 1 consists of a Druid glass outer envelope within which is suspended a Holophane prismatic glass reflector; this latter directs the light upward toward the ceiling. Air passes downward between the reflector and envelope and upward through the center of the reflector, passing between the lamp and reflector.

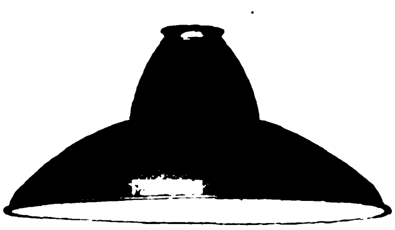


Fig. 4.

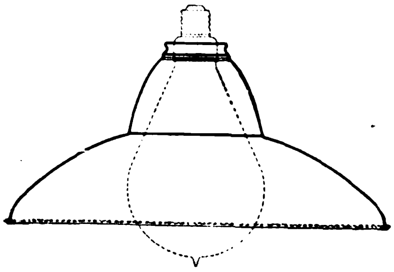
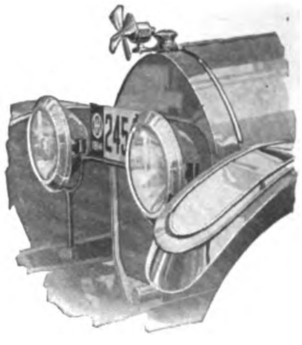


Fig. 5.

The diffusing unit shown in Fig. 2 consists of an outer envelope of heavy-density opal with a bowl at the bottom made of crystal roughed glass. Air enters around the lower band of the fixture and escapes through the hood above, as shown in Fig. 3.

For the illumination of platforms, shops, yards, etc., two types of enameled-steel reflectors have been designed, the deep-bowl and the shallow-bowl units. The screening angle of the shallow-bowl unit, shown in Fig. 4, is 85 degrees, while that of the deep-bowl unit is approximately 70 degrees.



Novelty Fan on Automobile.

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Robbins & Myers Automobile Novelty Fan.

As a feature of its advertising helps for electrical dealers and contractors, the Robbins & Myers Company, Springfield, O., has made up a small novelty fan which can be mounted on the radiator of a motor car as shown by the illustration herewith.

Enlarged View of Fan.

The fan spins by the air current created by the motion of the car even when the car is running slowly. Being symbolical of the electrical trade, it makes a dignified advertisement which appeals to every electrical dealer or contractor who has a motor car.

The base of the fan is taped for a stud bolt, and the usual method of mounting it on the car is to tap the cap which covers the opening to the radiator and mount the fan directly on this cap. Another method which can be followed is to mount the fan on an iron strap which is clamped around the cap, as shown in the illustration.

The fan can be furnished with either nickel or burnished-brass finish. This novelty fan was designed especially as an advertising help for dealers who handle Robbins & Myers "Standard" fans and is sold at a nominal price.

◆

The Monarch Refillable Fuse.

The cost of renewal of cartridge fuses has proved very vexatious to all users that must employ them in either considerable quantity or in large capacities. This condition has developed a demand for a type of cartridge fuse that can be readily refilled at low cost and without disturbing the usefulness of the fiber containing shell or of the caps or other terminals. One of the manufacturers that has developed a fuse to suit this condition is the Monarch Refillable Fuse Company, 1048 Jefferson Street, Buffalo, N. Y.

Fig. 1.—Ferrule Type Fuse.

Monarch refillable fuses are made in several types, of which Fig. 1 shows the ordinary ferrule-contact type; the internal construction of this is shown in Fig. 2. The construction of this fuse is very simple. The fuse wire is passed through a hole in the inside washer and curled on the surface of this washer to give ample carrying capacity. It is then clamped between the washer and the cap by means of the end screws; this forms a good electrical contact. In the larger sizes, such as the one shown in Fig. 2, side screws are employed for preventing twisting of the cap. The washer has a projection which fits into a notch of the fiber tube and keeps it from turning when the screw is inserted.

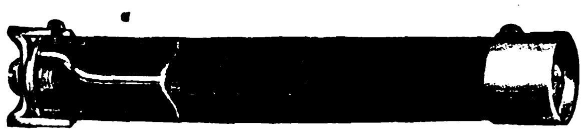

Fig. 2.—Internal Arrangement of Fuse.

In Fig. 3 is shown the knife blade type of Monarch fuse, the illustration showing one end of the tube in section. The fuse element is in the form of a ribbon clamped between a pair of copper clips of spring copper and V-shaped; the clips have their inner ends shaped to hold the fuse ribbon and the outer ends bent to enter the grooved end caps. The knife-blade contacts are kept in perfect alinement by means of the grooved caps. To refill a fuse of this kind it is necessary merely to remove the side screws and then the end caps; the contact clips are thus made free and the powder filler can be shaken out of the tube. A new fuse ribbon is then inserted in one pair of clips and the fiber tube placed over and firmly pushed into the cap. The tube is then filled with the powder filler and the other contact clips, grooved cap and side screws are then secured in place.

The Monarch Company also makes fuses with screw-clamp contacts and a special type of refillable fuse has been developed to meet the severe requirements of steel plants.

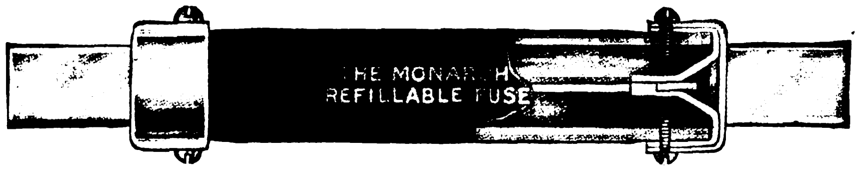

Fig. 3.—Knife-Blade Type Fuse.

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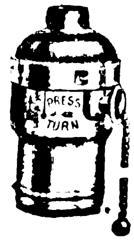
Ostrander Pull-Chain Socket.

There has been considerable demand for a pull-chain socket in which the chain itself is completely isolated from the live parts of the device by being so connected as not to touch any current-carrying part of the socket.



Pull Socket.

There has also been need for a socket of this type that can carry something over its rated current without heating.

To meet these needs, W. R. Ostrander & Company, 22 Dey Street, New York City, have placed on the market a new pull-chain socket, an illustration of which is shown herewith. This socket has been developed as the result of much study in the design of devices of this type and possesses a number of interesting features that are said to be unique and exclusive. One of these is that the chain touches no current-carrying part of the socket; whereas in all other chain sockets the chain must be individually insulated. This feature eliminates all liability to shock and accident. Another feature is in having a double make and break mechanism, which is so designed and proportioned as to insure liberal current-carrying capacity for even a maximum overload without appreciable heating of the contacts. Another feature possessed by this socket is in the ingenious means for joining the cap and shell. This connection forms so firm and permanent a contact that the socket shell can easily bear the weight of the heaviest shade or reflector.

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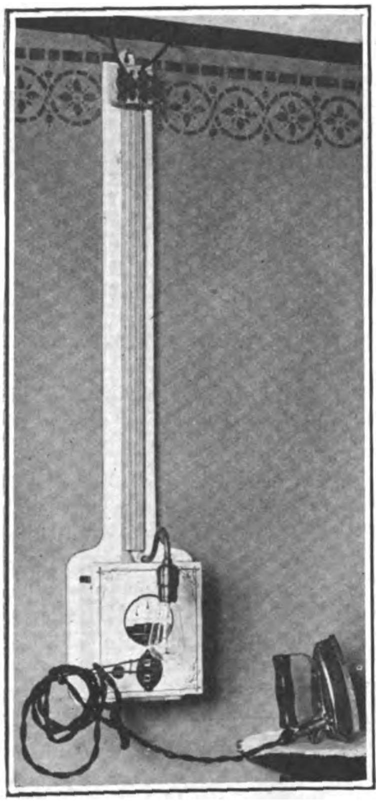
The Clement Electric Wall Cabinet.

In many of the older cities in this country it has been very difficult to secure the wiring of old houses and, therefore, in these places central-station companies have not had great success in extending their service to residences or apartments on a large scale. These conditions exist particularly in the older cities in the East and South. They have given rise to a demand for a low-cost and convenient means of securing some sort of electric service connection to such premises. This matter has been given great thought by W. E. Clement, commercial agent of the New Orleans Railway & Light Company, who has developed two devices to meet these needs. One of these is the Clement electric service table, which was described in our issue of August 31, 1912. Recently Mr. Clement has brought out an electric wall cabinet, an illustration of which is shown herewith.

This cabinet is designed for mounting on the wall and is a complete unit. It is hung upon the wall in any apartment or residence which is most accessible to the overhead distribution circuits of the central-station companies. The service wires are brought through insulating tubes through the wall and connected directly to a fuse block at the top of the cabinet. This block is connected by wood molding to the cabinet proper. The latter contains an electric meter, two push-button switches on opposite sides and two receptacles at the bottom. There is also provided a bracket for a tungsten lamp and a swinging bracket for supporting a cord which is to be used for a flatiron. The receptacle on the left is the flatiron outlet and directly above it is a small pilot lamp to serve as an indication of whether the flatiron circuit is closed or not. The receptacle to the right of the iron outlet is for use in connecting any portable device.

The entire outfit is all wired up complete and requires merely the mounting of the cabinet with its molding and wood mat upon the wall and the connection of the service wires to the fuse block as described above. Thus the installation can be made at a minimum cost both of labor and of material. The meter in the cabinet is tested and connected at the motor department of the central-station company before the cabinet is sent out.

These cabinets have been furnished at an extraordinarily low cost including the flatiron, which forms one of the most attractive inducements for the use of electric current, especially during the summer. It has been found that with this outfit as an entering wedge the conservatism of the customer gradually gives way and he becomes desirous of using other electrical conveniences, such as a fan, portable lamp, toaster, etc. As the enthusiasm for things electrical increases, it has been found that in many cases the entire house has been ordered to be wired. In many cases they have been installed for tenants where the owner of the house would not meet the expense of complete wiring. This wall cabinet is being manufactured by the Electrical Development Company, 928 LaFayette Street, New Orleans, La.



Clement Electric Wall Cabinet.

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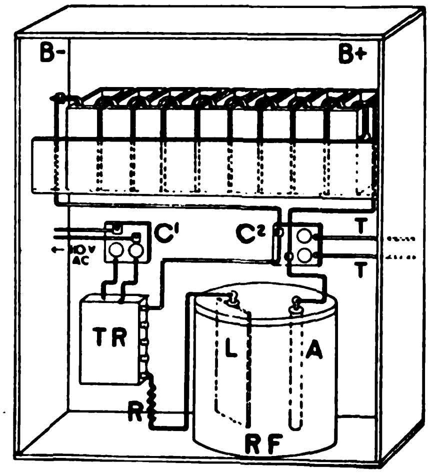
Storage Rectifying Unit.

For some time there has been a demand for an economical and convenient means for operating electric clocks, time stamps, private telephone systems, etc., from standard alternating-current supply circuits, such as are commonly in use by central-station companies. Since most of these uses require direct current at low voltage, there has been evident need for a means of obtaining such current from the alternating current supplied at low initial and maintenance cost.

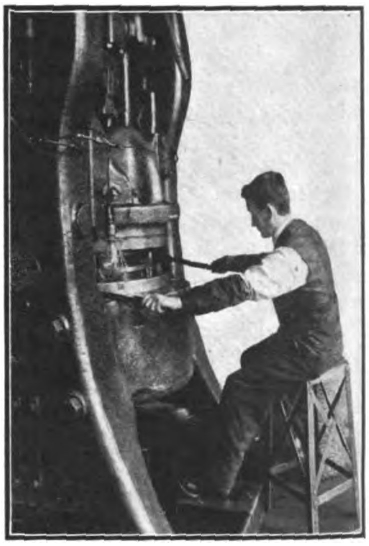
The Electric Economy Company, Hyde Park, Mass., has anticipated these needs by the development of a compact and combined rectifying and storage unit. As shown in the accompanying illustration, this consists of a step-down transformer, which is connected to the alternating-current supply circuit through the cutout block *C'*. A number of secondary taps are arranged on this transformer so that the secondary voltage may be adjusted through a range of values. Connected into one side of the secondary circuit is a regulating resistance *R* and the electrolytic rectifying cell *R F*. This latter consists of a special electrolyte in which are immersed a graphite or lead anode *L* and an aluminum cathode *A*. This arrangement permits a flow of current from the anode to the cathode but not in the reverse direction. The terminals of the secondary circuit pass through a cutout block C^2, across which is connected a storage battery of as many cells as are needed for the particular requirements to be met. Connected to the same coutout block are the wires *T T* to which the clock or telephone circuit is connected. The arrangement is such that the storage battery is connected across the secondary circuit at all times and receives a slow continuous charge. This is so proportioned by adjustment of the voltage of the secondary circuit and by the number of cells connected into the storage battery that it keeps the battery in good working condition at all times and supplies slightly more energy to the battery than is actually needed for the operation of the low-voltage direct-current circuits in the building.



Arrangement of Storage Rectifying Outfit.

The manufacturer of this equipment states that it requires the minimum of attention. Pure water must be added to the rectifying cell and to the storage-battery cells several times a year to replace evaporation. Depending upon the load connected with the low voltage direct-current circuit, there must be renewal of the electrolyte and of the electrodes of the rectifier at intervals ranging from one to four or five years. The storage batteries commonly supplied have a capacity of six ampere-hours, which has been found amply sufficient to ring a small bell more than 100,000 times. Since the battery is maintained continually in excellent charged condition, its life is indefinite and, unless subjected to violent abuse, should be more than 10 years at least. The elements used in the battery are of the simple couple type and the liability for short-circuit or other troubles is practically eliminated.

In a typical installation of this type there were operated 24 clocks in multiple, each requiring 0.1 ampere for about one-third second each minute. The voltage was 24 volts, so that 12 cells constituted the battery. There was also connected a relay and a winding magnet for the master clock; these drew 0.1 ampere each minute for about one-third second; 24 small bells each drawing about one-fourth ampere and ringing about 20 times per day were also connected. The current supplied was 110 volts, 60 cycles. The equipment for this purpose has been in use for a considerable time without any appreciable evidence of deterioration.



Safety Device for Punch Press.

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Safety Suction Devices for Punch Presses.

For some time the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa., tried mechanical safety devices of various kinds for the punch shop but with unsatisfactory results. The operators found them unsuited because of the fact that they tended to retard the production and consequently their earnings while the management also objected to them because they afforded only partial protection, as the operator had to place his hand under the press in every instance in order to remove the scrap.

The suction device illustrated herewith was developed with the idea of preventing the necessity of the operator approaching the danger point at any time during the operation, as he feeds and clears the press with the same tool. Another advantageous feature is that the operator does not take hold of the material with his hands (this applies principally to the smaller sizes) and thereby escapes the numerous small cuts to which he was subjected when inserting the blanks with his fingers.

The double handle device used on large work and shown herewith is absolutely safe, the operator being compelled to use the device owing to the size of the sheets handled, it being impossible to get hold of the sheets in any other way.

Before adopting this method a man was placed at the back of the press to feed in the sheets and he was the man who most frequently was injured because his fingers were entirely at the mercy of the operator.

Since the adoption of the suction device there has not been an amputation on the large presses and up to the present time no finger has been amputated in the punch shop. This freedom has been due to the operation of the devices and the rigid enforcement of the rules by the management of the shop.

The suction device was exhibited and received the grand prize at the recent International Exposition of Safety and Sanitation and is now on exhibition in the America Museum of Safety in New York City.

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Enlarged Field for Storage-Battery Manufacturer.

An interesting event in the storage-battery industry is the change in the name and the location of the company which has heretofore done business as the Baltimore Electric Storage Battery Company with factory and offices in Baltimore, Md.

Henceforth the company will be known as the Titan Storage Battery Company. Extensive new quarters have been secured in Newark, N. J., at Chapel Street and Lister Avenue, at which point the offices of the company have been established for some time and the manufacturing equipment is now in operation so that Titan vehicle batteries, Plante batteries, lighting and sparking batteries and self-starter batteries are being shipped from the new location.

The removal was brought about by the necessity for increased facilities and the fact that the Newark location possesses advantages over what could be procured in Baltimore. The change in the name is a move in the direction of simplification and is made possible through the fact that it is no longer desirable to identify the company name with the location.

The officers of the Titan Storage Battery Company are: Henry M. Keith, president; Daniel C. Spruance, vice-president; Edward S. Hyde, treasurer; Henry M. Hanson, secretary. These gentlemen with Minor C. Keith and John G. Gray constitute the board of directors. Dr. W. E. Winship is general manager, A. H. Mustard is sales manager, and Eugene Handler is superintendent. No change in the policy of the former company, beyond that of enlargement and expansion of operations, is indicated by the change in name and location. The control continues in the hands of Minor C. Keith, vice-president of the United Fruit Company and president of the International Railways of Central America.

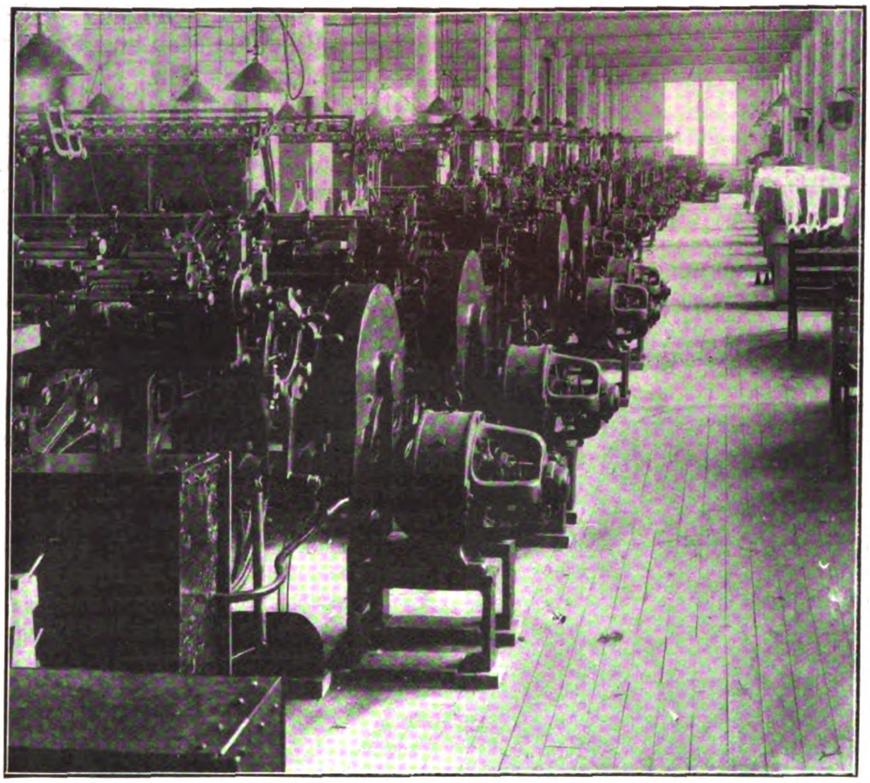
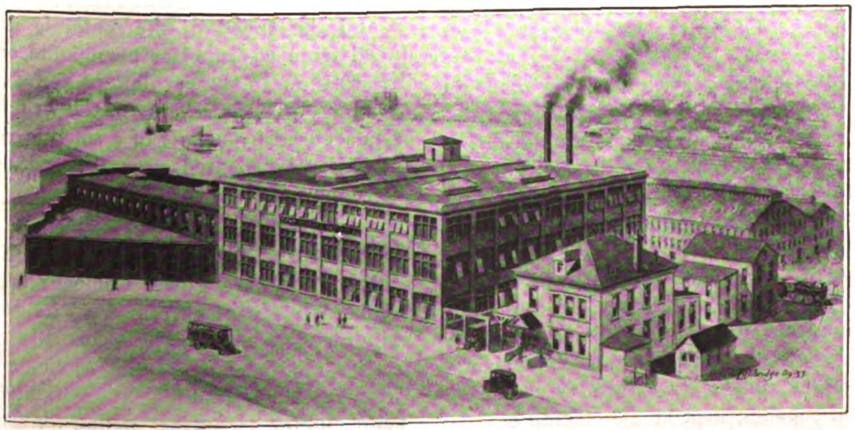


Fig. 1.—View in Hosiery Mill, Showing Motor Drive.


New Factory of Titan Storage Battery Company.

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Adjustable-Speed Motor Drive for Hosiery Machines Results in Increased Production.

Above is shown the interior of one of the mills engaged in manufacturing "Onyx" hosiery and illustrates many of the advantages of motor drive, such as the absence of belts, good lighting, freedom in arrangement of machines, cleanliness, etc. This installation is especially interesting, however, on account of the automatic control used to adjust the speed of the motors, thereby securing a considerable increase of production over a constant-speed drive.

In the knitting of full-fashioned hosiery a slower speed is required when fashioning (that is, shaping) than is necessary when knitting the straight part. If constant speed is used, the limit of output is determined by the maximum speed which can be satisfactorily used when fashioning. But with an adjustable-speed system where the speed of the machine can be increased while knitting the straight and reduced when fashioning, it is evident that production can be materially increased, especially since the time required for fashioning is only a small percentage of the time required for the entire operation.

In the factory shown in the illustration, there are over 200 automatic stocking machines imported from Saxony. Each machine makes nine pair of hose at a time and is driven by a 1.5-horsepower Westinghouse adjustable-speed direct-current motor.

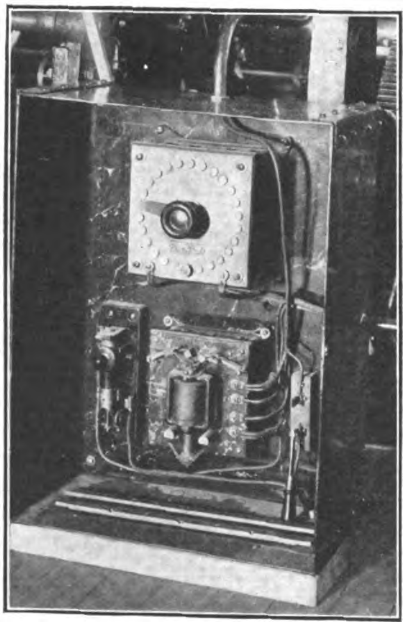

Fig. 2.—Near View of Control Panel.

The control consists of a Westinghouse textile oil switch, operated by the shipper rod, a speed controller and an automatic self-starter—the last two being mounted in a sheet-metal cabinet together with a main-line knife switch and a circuit-breaker, as shown in Fig. 2. When starting the machine, the operator moves the shipper rod and closes the oil switch, which causes the self-starter to operate and automatically starts the motor. In case of accident or trouble with the machinery overloading the motor, the circuit-breaker opens and stops the machine.

By adjusting the controller the operator sets the motor speed at the desired maximum value for knitting the straight. When fashioning takes place, the endwise movement of the main drive shaft of the machine is used to automatically reduce the motor speed. As soon as the fashioning strokes are completed, the machine resumes knitting at the higher speed until fashioning again takes place. This method of reducing the speed is also frequently used nonautomatically for plating, or reinforcing the soles and heels of silk hosiery with cotton.

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Central Electric Company Publishes Valuable Map and Record of Mexico Situation.

The Central Electric Company, 320 South Fifth Avenue, Chicago, with its usual enterprise and aggressiveness, has prepared for distribution a 14-inch by 21-inch map of Mexico showing the position of the contesting armies in Mexico as well as the location of the United States forts along the border and the position of the United States battleships will have assumed during the week. The map is claimed to be absolutely authoritative, is printed in colors and will give at a glance an idea of the size of Mexico and the amount of territory covered by the army and navy of both Mexico and the United States. It will be sent free to readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN making request for it on business letterheads.

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Standardization of Electrical Supplies in China.

The Engineering Association of China, having headquarters at Shanghai, has undertaken the standardization of electrical supplies throughout China. This is proving a rather difficult undertaking because of the great variety of supplies now shipped into China from various parts of the world. It is recognized, however, that far-reaching benefits would result from the proposed standardization, and as a result the consuming public is encouraging the movement. The officers and directors of the Engineering Association of China are as follows: J. S. S. Cooper, chairman; R. A. Williams, secretary; T. H. U. Aldredge, H. H. Arnold, N. G. Beale, J. E. Burgess, L. Junginger, E. Kocher, L. Laforest, and S. S. Sellick.

In case it is possible to bring about the desired standardization it is believed that the following advantages would be secured: (1) buyers of electrical plant will receive tenders on a comparable basis; (2) the possibility in interconnecting different systems and the consequent use of large bulk supplies which is almost impossible in many of the larger European cities; (3) minimizing the variety of electrical stock, such as lamps, meters, motors, transformers, and general supplies, kept at the trading centers; (4) the interchangeability of appliances.

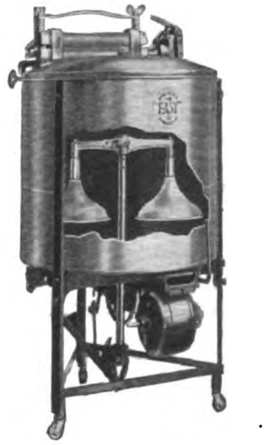
New Electric Washing Machine.

The illustration herewith shows a new type of washing machine manufactured by Dodge & Zuill, Syracuse, N. Y. The distinguishing feature of this machine is that it washes by air pressure and suction instead of by friction. It is said by the makers that this principle not only cleanses thoroughly but is also especially desirable because it is harmless to the fabric.

The washer is provided with two suction basins which work up and down forcing the water through the clothes and sucking it back again, turning automatically at the top of each revolution for a new position on the downward movement. This produces a strong agitation of the water through the clothing without subjecting the clothing to rubbing.

The tub is made of cold-rolled copper, securely double-seamed to the bottom and soldered. The tub is 24 inches in diameter and 18.5 inches deep.

The machine is driven by a one-eighth-horsepower "Standard" motor made by the Robbins & Myers Company, Springfield, O. The motor is attached to the supporting plate by two thumb-screws, making it easily detachable for operating other machinery if this is desired.



Electric Pressure and Suction Washer.

By pulling a lever the motor drive is shifted from the washer to the wringer and the speed of the motor is reduced from 60 impulses per minute on the washer to 42 revolutions for the wringer. Instant reverse of the wringer is secured by means of a small lever conveniently located near the end of the upper roll.

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Aluminum Company Buys Power.

The Tennessee Power Company has begun delivery of current from its development No. 2, on the Ocoee River, to the initial plant of the Aluminum Company of America at Maryville, Tenn., under a contract calling for the supply of about 20,000 horsepower.

Current Electrical News

NORTH ATLANTIC STATES.

BANGOR, ME.—As soon as weather conditions will permit, the Bar Harbor & Union River Power Company will begin the building of a transmission line from its great power station at Ellsworth, 18 miles along the county road, to Bluehill and the Brooklin town line.

BRANDON, VT.—The Hortonia Power Company has been incorporated for the purpose of developing hydroelectric power in the neighborhood of Hortonville. The capital stock is $50,000 and the incorporators are Edward D. Blackwell, Frank E. Chandler, Tom W. Ray, of Brandon; A. G. Stone, of Sudbury; A. W. Hyde, of Rutland, and W. H. Horton, W. A. Jennings and David L. Wells, of Orwell. An extensive water power plant is to be built and equipped by the company at Hortonville in Rutland County to harness the water power of Lake Hortonia and Huff, Buff and Hinkun ponds for the purpose of manufacturing electric current. The office of the company will be at Brandon.

NEW YORK, N. Y.—A syndicate of New York capitalists is said to have a scheme to construct a $2,000,000 power plant on the west bank of the river near the north end of Maplewood Park. It hopes to induce the state to allow it to draw water from the Barge Canal at the western widewaters and to grant it the right to take property by condemnation proceedings when necessary for the construction of a canal or conduit from the widewaters to the river bank. Richard B. Hayden, who is actively interested, believes that they will be able to develop about 20,000 horsepower.

HOBOKEN, N. J.—An individual power plant comprising boiler and engine room will be installed in the new furniture factory to be erected by the Ferguson Brothers Manufacturing Company, it is reported.

MORRISTOWN, N, J.—The Morris County Traction Company has contracted with the Morris & Somerset Electric Company for electric power for the operation of its line from Chatham to Danville, the service to be supplied from the company's Morristown plant. The Traction company will install new rotary transformers at its various stations. A.

TRENTON, N. J.—The Public Service Company has completed the installation of a new street-lighting system at Trenton Junction. The company is also planning to supply local resident service throughout this section. A.

SOUTH ATLANTIC STATES.

DOVER, DEL.—Electrical Power Company of Western States of America has been incorporated with a capital stock of $3,000,000 to furnish electrical power of all kinds for generating plants; also to hold, own and use bonds, debentures and other securities. The incorporators are Herbert E. Latter, W. J. Maloney and Oscar J. Reichard, of Wilmington, Del.

LOGAN, W. VA.—The Logan & Eastern Telephone Company has been organized here with a capital stock of $25,000 by B. E. Chatfield, L. Epperly and others.

VALDOSTA, GA.—The South Georgia Power Company has been organized with a capitalization of $2,500,000 to erect a hydroelectric plant on the Withlacooshee River near here. The company plans a distributing system covering the territory about Valdosta.

NORTH CENTRAL STATES.

COLUMBUS, O.—J. W. & W. J. Dusenbury, the new lessees of the Grand Opera House, will expend $100,000 on the same, including new electrical equipment. J.

HOWENSTINE, O.—The O. C. Barner Mining & Fertilizer Company announces plans to construct an electrical power plant that will cost over $1,000,000. The company will seek contracts to supply numerous towns in the vicinity with electricity. J.

MANSFIELD, O.—The new system of electric lighting recommended for this city by H. Whitford Jones, consulting engineer of Cleveland, calls for an outlay of $250,000, including a new power plant. Nitrogen tungsten lights are specified. J.

SULLIVAN, O.—The Council is planning ways and means to secure electric lighting. Address the village clerk.

EAST GARY, IND.—The Council plans to establish a $9,000 municipal lighting plant. Address the city clerk.

MARENGO, IND.—The taxpayers have just voted favorably on a proposition for the installation of an electric light plant in this town. Details of the improvement have not been agreed upon as yet. G.

MOONEY, IND.—Jackson County Mutual Telephone Company has been incorporated with a capital of $3,000, by K. E. Tanner, Harry Doods, K. W. Lockmann.

SPRINGFIELD, ILL.—The Pekin Streets Railway Company has been incorporated with $15,000 capital stock. The incorporators are W. E. Lautz, D. D. Velde and W. P. Herget.

UNIONVILLE, MICH.—An $8,000 municipal light plant will be established. Address the village clerk for further information.

WHITE PIEGON, MICH.—The Council is planning ways and means to establish electric lighting. Address the village clerk.

NEW RICHARD, WIS.—The River Falls Power Company has voted to build another electric power transmission plant and a 90-foot reinforced-concrete dam across the Kinnickinnic at a point about a mile and a half above the present power plant at Clifton.

COMFREY, MINN.—W. C. Buck, of Minneapolis, has been engaged to prepare plans and specifications for an electric light plant.

DEER RIVER, MINN.—The Farmers Telephone Company has been organized and will build a line north of Ball Club Lake. T. Ruff is president.

EMBARRASS, MINN.—The Embarrass Farmers Co-operative Telephone Company has been incorporated by Oscar Salminen, John Koski, and others.

MADELIA, MINN.—A company has been organized here by business men to establish a "White Way" lighting system. C. S. Christiansen is chairman.

EARLVILLE, IOWA.—The Mayor and Council are forming plans for a new lighting plant. Address Mayor Van Fleet for information.

FORT DOGDE, IOWA.—Homer Lorring, president of the Ft. Dodge electric line, which also owns the Crooked Creek Railroad extending from Webster City to Lehigh, has told the Webster City and Lehigh people that he will rebuild the line and electrify it and carry it west about four or five miles if the people in the towns and territory traversed will give him a bonus of $30,000.

IOWA FALLS, IOWA.—It has been decided to grant a franchise for a new heat, light and power company. The present plant is owned by Oscar F. Peterson of Des Moines.

NEVADA, IOWA.—The Iowa Railway & Light Company, Cedar Rapids, will install a line between here and Maxwell. J. C. Young, Cedar Rapids, is the representative of the company.

KANSAS CITY, MO.—At a recent meeting of the City Council of Kansas City, 12 ordinances providing for the installation of tungsten lamps on certain streets were passed. The electric illumination replaces gas in most cases. M.

KANSAS CITY, MO.—The Board of Park Commissioners is contemplating two propositions calling for overhead wire work in Swope Park. An offer has been made to install a trackless trolley system in the park. The Board will choose between this method and the granting of a franchise to the Metropolitan Street Railway Company, which would allow the latter to extend its lines into the park. Cusil Lechtman is chairman of the board. Mayor Henry L. Jost and others are also interested. M.

AVON, S. D.—The Town Council has granted to John Burbeck a franchise to install a plant to supply electric light, heat and power.

BEATRICE, NEB.—W. C. Ross, receiver of the Nebraska Public Service Company, will rebuild the power house and lines here.

WAKEFIELD, NEB.—A 15-year franchise has been granted to Gust Wendt, of Winside, who will install an electric light plant for the town.

ATCHISON, KANS.—A power plant is to be built at Atchison by the McKinley interests at a cost of $200,000. The plant will provide light and power for a number of small towns between Atchison and Topeka, and Achison and St. Joseph, Mo. A. M. Patten, of Topeka, Kans., is assistant general manager of the company. M.

EFFINGHAM, KANS.—The Council plans to install a $12,000 municipal lighting plant.

FORT SCOTT, KANS.—The Fort Scott & Pittsburg Railway Company, which proposes to construct an electric road 35 miles in length between those two cities, has been granted permission to issue bonds in the sum of $950,000 by the Kansas Public Utilities Commission. A. B. Dickman, of Fort Scott, is president of the Road. M.

GARDEN CITY, KANS.—The Garden City Irrigation Power Company has been given permission to do business in Kansas as a public utility and will build transmission lines for 40 or 50 miles up and down the Arkansas Valley from the power plant of the Garden City Sugar & Land Company, which company it controls. M.

HORTON, KANS.—Scott Brothers, of Concordia, have secured a contract for the erection of a new city hall, which includes a lighting plant. M.

OTTAWA, KANS.—The Home Telephone Company is contemplating the expenditure of $75,000 on a new plant at Ottawa, provided proper inducements are extended. C. F. Adams, of Kansas City, is vice-president of the company. M.

PLATTSMOUTH, NEB.—The Omaha-Lincoln Railway & Light Company, of which William McKinley is president, will extend the electric road to Plattsmouth. H. B. Chubbuck and William Mattis, of Omaha, are vice-presidents of the company. M.

WELLSVILLE, KANS.—C. A. Smith, a retired capitalist of Wellsville, will install an electric light plant in this city at a cost of $25,000. M.

SOUTH CENTRAL STATES.

MACKVILLE, KY.—The Thompson Telephone Company has been incorporated by J. W. Russell, J. E. Carpenter and others.

MAYSVILLE, KY.—The city is planning to construct an electric light system here to cost $22,000. Address the mayor.

ELKMONT, TENN.—The Appalachian Club will enlarge the electric-light and waterworks system. Address the secretary of the club at Knoxville.

JAMESTOWN, TENN.—The Home Telephone Company has been incorported with a capital stock of $1,000, by D. A. Todd, J. F. Cross and others.

PARIS, TENN.—The city is considering plans for rebuilding the electric light plant, changing the system from three-wire direct-current to 60 cycles, alternating current.

GREENVILLE, MISS.—The Delta Light & Traction Company has been incorporated with a capital stock of $200,000, by E. J. Lenz, F. N. Robert Shaw and others.

ASHDOWN, ARK.—The Southwestern Telegraph & Telephone Company plans to erect a new plant here soon. It is reported that $10,000 will be spent.

HARRISON, ARK.—The Harrison electric plant will be rebuilt. Address George D. Locke, Rogers, Ark., who is president.

HORATIO, ARK.—The DeQueen Ice & Light Company has secured a municipal franchise to furnish electric lighting.

CEMENT, OKLA.—The High View Telephone Company has been incorporated by C. H. Mabrary, E. E. Swinney, of Cement, and others.

MEHAN, OKLA.—Stillwater Valley Telephone Company has been incorporated with a capital of $2,000 by C. A. McKenzie, Wm. Varley and V. Confry.

ALPINE, TEX.—The Alpine Light & Ice Company has been organized here with a capital stock of $20,000. J. D. Jackson is interested. D.

DALLAS, TEX.—The Northern Texas Utilities Company has been organized with a capital stock of $500,000 with headquarters at Dallas. The purposes are the manufacture and sale of gas, electric current and power; the manufacture and sale of ice, and the supplying of water for power, municipal and other purposes. The incorporators are Hiram Grosman, W. C. Woodlief and W. T. Heninger, all of Dallas. D.

FRANKLIN, TEX.—Bonds have been voted for a light and water system. Address the mayor for information.

GRAHAM, TEX.—The Graham Independent Telephone Company has been organized here with a capital stock of $15,000 and will build an exchange and system. W. H. Mayes, J. P. Hamilton and Robert Bower are the incorporators. D.

HICO, TEX.—The Hico Electric Light & Power Company is planning to construct 22 miles of transmission lines, also to install additional turbine and boiler and tub transformer for incandescent lamps.

SHERMAN, TEX.—The Texas Light & Power Company will expend $18,000 in improving its plant and system here. D.

WESTERN STATES.

ANTELOPE, MONT.—A local telephone exchange will be built here, and rural lines constructed. Address F. D. Morck, secretary, for desired information.

BLOOMFIELD, MONT.—Work will soon commence on lines of the Farmers Telephone Company recently organized here, with L. I. Brown, secretary.

REED POINT, MONT.—The Reed Point Telephone Company will install a central station and connect with White Beaver Line.

NEZ PERCE, IDAHO.—The Grangeville Electric Light & Power Company, operating in this city, recently announced its intentions of making needed extensions and improvements to the local system. The improvements include new transformers, repoling electric line in town, reconstruction of the line to the LO-LO Power site and the installation of some new generating machinery. Address the company here for further information. O.

LEWISTON, IDAHO.—A committee including F. W. Emery and A. M. Roberts, of this city, has been appointed by the Mayor and City Council to investigate the securing of a suitable site on the Clearwater River for a municipal power plant. In all likelihood, the matter of building this utility will be placed before the voters of Lewiston at a special election. O.

NOGALES, ARIZ.—The Mountain States Telephone Company has been ordered by the Corporation Commission to reconstruct and rebuild its telephone system here. D.

PRESCOTT, ARIZ.—The Pacific Water Company has started surveys for the establishment of two power plants on Verde River, below Fossil Creek, and another 12 miles below Camp Verde. The new plants will supply Globe and Miami districts.

MT. VERNON, WASH.—The County Commissioners of Skagit County at a recent meeting granted the Stone & Webster Interests a franchise for the extension of light and power lines along certain roads in the county. It is understood active construction will be started during the month of May. O.

REPUBLIC, WASH.—Z. E. Merril and A. L. Capers recently purchased the property of The Republic Light & Power Company and announced their intentions of making a considerable number of changes and new installations among which will be a new turbine, generating system, flume, etc. Address the company, here. O.

SEATTLE, WASH.—Wilkeson Power, Light & Fuel Company has been incorporated with a capital of $500,000 by F. L. Van Nice, J. L. Teig and Thomas M. Tennent.

SPOKANE, WASH.—The Spokane & Inland Railway Company will install a rotary convertor to cost $15,000 in a new substation to be built at McGuire's, on the Coeur d'alene Division of the road, the work to be in charge of the Electrical Department. O.

SPOKANE, WASH.—The Spokane Valley Power Company will increase its capital stock from $200,000 to $2,000,000 to furnish funds for the development of an electric power site below Fort Wright, near this city. The plant to be constructed will have a 20,000-horsepower capacity. For further information address W. W. Corey, Finch Investment Company, Spokane. O.

BAKER, ORE.—The South Baker Power plant of the Eastern Oregon Light & Power Company, here, was recently destroyed by fire. The loss is estimated at $75,000. According to all reports the demolished plant will be rebuilt in the immediate future. O.

GOLD HILL, ORE.—A well authenticated rumor is prevalent in this city to the effect that the Rogue River Public Service Corporation, George E. Sanders, president, plans the construction of a $500,000 power plant, capable of developing 5,000 horsepower, near this city. It is also rumored that a plant similar to the one to be built here will be constructed between Gold Hill and Grants Pass during the coming summer. O.

THE DALLES, ORE.—Fire recently destroyed the U. S. Government machine shop and electric light plant on the Dalles-Celilo Canal Project, at Big Eddy. The loss is estimated at $40,000. O.

WALLOWA, ORE.—This city is contemplating the construction of a municipal light plant at a probable cost of $34,000, which includes diversion dam, pipe, distributing system, etc. Address the city clerk. O.

DRAIN, ORE.—An ordinance has been passed authorizing the construction of an electric light plant, and for issuance of $15,000 in bonds to pay for the same.

FRESNO, CAL.—The Board of Supervisors has given notice that on May 5 a

50-year franchise will be sold to the highest bidder for an electric railroad along the county road on Fresno Avenue, applied for by the Fresno Interurban Railroad Company.

FRESNO, CAL.—Negotiations are under way between property owners southeast of Fresno and the Fresno Traction Company for the construction of an interurban line to Calwa, a distance of about three miles.

SAN BERNARDINO, CAL.—The Rialto Light, Power & Water Company has been granted a franchise in this city.

PROPOSALS.

ELECTRIC CABLE.—Sealed proposals will be received at the office of the General Purchasing Officer, Panama Canal, Washington, D. C., until May 8 for furnishing motors, electric cable, etc., under Panama Circular 845.

ELECTRICAL APPARATUS.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, Cal., until May 11 for furnishing electrical apparatus for the Okanogan Project, Wash. Further information can be obtained from the above-named department in Los Angeles or Washington.

INTERIOR LIGHTING FIXTURES, ETC.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., for furnishing interior lighting fixtures until May 14 for the postoffice at New Orleans, La.; until May 16 of a two-story building for the postoffice at New Rochelle, N. Y.; until May 18 of a one-story building for the postoffice at La Fayette, La.; until May 27 of a one-story building for the postoffice at Pulaski, Tenn.; until May 28 of a one-story building for the postoffice at Canton, O.; until May 29 of a one-story building for the postoffice at Casper, Wyo., and a two-story building for the postoffice at Rocky Mount, N. C. Drawings and specifications may be obtained from the office of the Supervising Architect or the custodians of the sites named.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing the following electrical equipment for the Navy Yards names in each case: Until May 5 for three one-ton and three half-ton self-contained electric hoists, as per Schedule 6663, Norfolk, Va.; 8,000 feet solid weatherproof triplex-covered copper wire, 52,600 centimeters, Norfolk, Va., and 1,500 feet single and duplex rubber-insulated wire, 2,300 centimeters, lead-covered, Brooklyn, N. Y., both as per Schedule 6664; 6,200 feet insulated and lead-covered cable, 500,000 centimeters and 212,000 centimeters, and 3,000 feet lead-covered insulated-paper telephone cable, 50-pair and 25-pair, as per Schedule 6665, Newport, R. I.; 1,400 feet 2,400-volt four-conductor submarine cable, as per Schedule 6655, Fort Lafayette, New York Harbor; 5,000 feet soft-steel leaded and armored single-conductor wire, 9,000 centimeters, as per Schedule 6657, Brooklyn, N. Y.; telephone switchboard, front-connection type for ship's service, and telephones and spare parts, as per Schedule 6658, Philadelphia, Pa.; until May 12 for furnishing 58,300 pounds seamless-drawn condenser tubes, Composition "A," five-eighth inch O. D., 13 feet 2.25 inches long, as per Schedule 6674, Norfolk, Va.; 100 wavemeters, as per schedule 6675, Brooklyn, N. Y.; until June 2 for furnishing 5,000 electric primers, three-foot wires, as per Schedule 6660, Pearl Harbor, Hawaii.

NEW INCORPORATIONS.

MARION, ILL.—Ohio Valley Electric Company has been incorporated with a capital stock of $2,500 by F. H. Wykes, E. Lewis and E. T. Gallagher.

MEXICO, IND.—Mexico Electric Company has been incorporated with a capital stock of $2,500 by Melvin E. Smith, George B. Wilson and Mabel Smith.

INDEPENDENCE, MO.—Independence Electric Supply Company has been incorporated with a capital stock of $20,000 by Henry S. Esler, Lloyd E. Allen and Virginia Esler.

DOVER, DEL.—The Maryland Electric Vehicle & Manufacturing Company has been incorporated with a capital of $100,000. The incorporators are residents of Dover, Delaware.

SHEPHERDSVILLE, KY.—The Shepherdsville Electric Light, Water & Cold Storage Company is being organized here, with a capital stock of $10,000. S. W. Bates is president.

SAN LUIS OBISPO, CAL.—The Santa Maria Gas & Power Company has been incorporated with a capital stock of $1,000,000 by T. B. Adam, P. O. Tietzen, J. F. Goodwin, J. E. Walker et al.

INLAND, N. Y.—Inland Telephone Company, Incorporated, has been granted articles of incorporation, capitalized at $5,000, the incorporators being Adam Kaiser, John Kaiser and H. W. Long, all of Grand Island, N. Y.

NIAGARA FALLS, N. Y.—Niagara Searchlight Company, Incorporated, has been granted articles of incorporation, with a capital stock of $100,000. The incorporators are James F. Murphy, John Tugby and Firnum G. Anderson, all of this place.

NEW YORK, N. Y.—Alpha Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $25,000, to deal in electrical apparatus, etc. The incorporators are George H Makepeace, J. Milton Ferry and P. Joseph Carbone, all of this city.

LOS ANGELES, CAL.—Articles of incorporation have been filed for the Midland Counties Public Service Corporation, with a capital stock of $2,000,000, by William Kerckhoff, A. C. Balch, Kasper Cohn, A. Haas, A. G. Wishon and A. E. Wishon.

CHARLOTTE, N. C.—The Piedmont Electro-Chemical Company has been incorporated with a capitalization of $100,000 by I. Hechenbleikner, D. C. Carmichael and E. R. Bucher. The company proposes to manufacture, deal in, buy and sell alkalis and chemicals.

MANHATTAN, N. Y.—South Electric Manufacturing Company has been incorporated with a capital stock of $25,000 to manufacture and deal in machinery, devices, general contracting, electrical and mechanical engineering. The incorporators are William S. Lison, Charles R. Pedle and Lewis C. Randolph, all of New York City.

CLEVELAND, O.—F. M. Grant Electric Company has been incorporated with a capital stock of $10,000 to deal in all kinds of electrical supplies, and engage in wiring and construction work. The incorporators are F. M. Grant, M. L. Thomson, H. B. McGraw, Frederick A. Henry and Vernon E. Davis.

FINANCIAL NOTES.

The issue of $3,000,000 first-mortgage 5s of the Chicago Railways Company offered by local bankers have all been sold.

El Paso Gas & Electric Company has called for redemption at 105 and interest on or before December 15, 1914, at the Central Trust Company, of Illinois, all its $500,000 general-mortgage six-per-cent bonds.

The sale of $1,100,000 first-mortgage five-per-cent bonds of the Mesaba Railway Company by a syndicate headed by Tucker, Anthony & Company, New York City, to bankers, marks the first anniversary of the completion of construction of the road, which is now in full operation.

Authority has been granted the West End Street Railway Company by the Massachusetts Public Service Commission to issue $600,000 30-year bonds and 5,600 additional shares of common stock. The proceeds of this issue will be used to reimburse the Boston Elevated Railway Company for improvements made in accordance with terms of lease.

Harris, Forbes & Company and N. W. Halsey & Company, New York City, have jointly purchased $2,000,000 additional Pacific Gas & Electric Company five-per-cent notes, being the remainder of an authorized issue of $7,000,000. Notes are dated March 25, 1914, and due March 25, 1915, callable at any time at 100½ and interest. The $7,000,000 five-per-cent notes, in addition to being a general obligation of the company, are secured by deposit of $5,000,000 general and refunding-mortgage five-per-cent bonds and $5,000,000 general-lien six-per-cent bonds.

The sale of a $5,000,000 issue of one-year five-per-cent gold notes of the Portland Railway, Light & Power Company has been announced by E. W. Clark & Company of Philadelphia. The notes are dated May 1, 1914, and are due May 1, 1915. They were sold at 99.5 and interest to yield about 5.5 per cent and are secured by deposit of the entire issue of $5,000,000 of the first-mortgage sinking-fund thirty-year gold bonds of the Mount Hood Railway & Power Company, due in 1937; also of the entire capital stock (excepting only director's shares) of the Mount Hood Company.

Six subsidiary organizations of the American Telephone & Telegraph Company have arranged to sell to New York bankers $30,000,000 two-year five-per-cent notes, all having the indorsement of the parent concern. The notes were apportioned in this way: The Iowa Telephone Company, $2,500,000; the Cumberland Telephone & Telegraph Company, $6,000,000; the Nebraska Telephone Company, $4,000,000; the Missouri & Kansas Telephone Company, $7,500,000; the Northwestern Telephone Exchange Company, $7,500,000, and the Cleveland Telephone Company, $2,500,000. The sale of these securities is in line with the policy announced by President Vail at the annual meeting of the American Telephone & Telegraph Company of raising funds this year and next on direct borrowing by the constitutent concerns. A part of the proceeds, it is understood, will go into the American Company's treasury to liquidate loans previously made to the minor organizations.

Dividends.

	Term.	Rate.	Payable.
Bangor Ry. & Elec. com.	Q	0.5	May 1
Cape Breton Elec. com.	S-A	$3.	May 1
Cape Breton Elec. pf.	S-A	$3.	May 1
Common'th Pr. & St. com.	Q	1.	May 1
Common'th Pr. & St. pf.	Q	1.5	May 1
Conn. Ry. & Ltg. com..	Q	1.	May 15
Conn. Ry. & Ltg. pf....	Q	1.	May 15
Edison, Boston	Q	3.	May 1
Keystone Tel. pf.....	S-A	3.	May 1
Lewiston, Augusta & Waterville pf.........	Q	1.5	May 1
Mexican Tel. pf......	S-A	2.5	May 1
Pub. Service Invest. pf..	Q	$1.50	May 1
Rys. Co. Gen...........	Q	1.	May 1
West Penn Rys. pf.....	Q	1.25	May 1
Western Union	Q	1.	Apr. 15
J. G. White pf.........	Q	1.5	May 1
Am. Gas & Elec. pf..	Q	1.5	May 1

Reports of Earnings.

SOUTHWESTERN POWER & LIGHT.

Combined earnings of subsidiaries of Southwestern Power & Light Company for February, 1914, and the 12 months ended February 28 are:

	1914.	1913.
February gross	$ 216,317	$ 175,680
Net after taxes........	98,949	76,628
Twelve months' gross..	2,344,500	1,994,139
Net after taxes........	1,068,654	873,717

INTERSTATE ELECTRIC CORPORATION.

	1914	1913.
January gross	$ 20,650	$ 16,335
Net	8,524	7,591
Twelve months' gross..	216,702	194,797
Net	102,436	93,729

PHILADELPHIA ELECTRIC.

The annual report of the Philadelphia Electric Company for the year ended December 31, 1913, compares as follows:

	1913.	1912.
Gross	$7,815,615	$7,051,497
Surplus after charges..	1,928,243	1,666,189
Dividends	1,180,815	974,668
Surplus	747,427	691,520
Previous surplus	1,818,913	1,127,393
Stock dividends	1,499,265	....
Total surplus	1,067,076	1,818,913

CHICAGO RAILWAYS COMPANY.

The Chicago Railways Company has issued its annual report for the year ended January 31, 1914. The income statement (joint account with the city of Chicago) compares as follows:

	1914.	1913.
Total earnings	$19,674,715	$18,076,777
Expenses and taxes..	12,371,804	11,728,502
Balance	7,302,912	6,348,275
Five per cent on valuation	3,928,580	3,778,449
Net income	3,374,332	2,569,826
City proportion, 55%..	1,855,882	1,413,404
Co.'s proportion, 45%.	1,518,449	1,156,422

The non-partnership account compares as follows:

	1914.	1913.
*Gross income	$5,877,241	$5,149,139
Interest	4,472,437	4,140,569
Miscellaneous	1,121	....
Sinking fund	250,000	250,000
Corporation expenses and adjustment	157,297	120,574
Total debentures	4,880,854	4,674,063
Net income	996,387	475,076

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*Consists of 5% interest allowed on investment, Chicago Railway's share of net income (45%), and miscellaneous interest.

TEXAS POWER & LIGHT.

	1914.	1913.
February gross	$ 122,620	$ 92,038
Net after taxes........	43,562	37,437
Surplus after charges..	18,358	25,335
Twelve months' gross..	1,246,332	1,034,492
Net after taxes........	445,886	421,842
Surplus after charges..	207,232	302,350
Balance after preferred dividends	96,982	230,425

FORT WORTH POWER & LIGHT.

	1914.	1913.
February gross	$ 64,605	$ 48,099
Net after taxes........	36,430	27,941
Surplus after charges..	26,223	23,466
Twelve months' gross..	708,009	534,560
Net after taxes........	420,171	267,803
Surplus after charges..	332,794	204,373
Balance after preferred dividends	275,053	160,973

AUGUSTA RAILWAY & ELECTRIC CORPORATION.

Augusta Railway & Electric Corporation reports for year ended December 31, 1913, as follows:

	1913	1912
Gross earnings	$725,073	$662,591
Net after taxes	321,988	293,152
Surplus after charges......	116,818	99,942
Balance after preferred dividends	26,818	9,942

DAYTON POWER & LIGHT COMPANY.

	1914	1913
March gross	$ 77,677	$ 37,523
Net earnings	16,725	*6,477
Surplus after preferred dividends	7,616	*14,914
Three months' gross......	246,242	181,730
Net earnings	104,103	88,120
Surplus	29,021	13,932

*Deficit. Small earnings for March, 1913, were due to flood.

VIRGINIA RAILWAY & POWER.

	1914	1913
March gross	$ 415,399	$ 396,443
Net....................	210,278	197,019
Surplus................	81,332	78,002
Nine months' gross....	3,863,509	3,629,161
Net	1,932,532	1,815,241
Surplus	788,061	762,507

AMERICAN RAILWAYS COMPANY.

	1914	1913
March gross	$ 415,279	$ 399,796
Seven months' gross....	4,136,488	3,854,742

AMERICAN POWER & LIGHT.

Combined gross and net earnings of operating subsidiaries of the American Power & Light Companw for February 1914 and the 12 months ended February 28 show as follows:

	1914	1913
February gross	$ 546,745	$ 486,308
Net after taxes........	251,172	214,882
12 months' gross........	5,992,965	5,404,321
Net after taxes.........	2,756,597	2,404,482

KENTUCKY SECURITIES CORPORATION.

Combined earnings of the Kentucky Traction & Terminal Company and the Lexington Utilities Company, operating subsidiaries of the Kentucky Securities Corporation for the eight months ended February 28, 1914, compare as follows:

	1914	1913
Gross earnings	$518,104	$495,698
Net earnings	266,851	237,904
Surplus after charges ...	103,439	89,566

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

The gross earnings and income of the properties of the Public Service Corporation of New Jersey and subsidiary companies, for the past ten years, follow:

	Electric Properties.	Gas Properties.	Railway Properties.
1913.......	$8,545,845	$10,222,668	$16,201,932
1912.......	7,582,374	9,809,670	15,262,426
1911.......	6,689,731	8,985,688	14,450,088
1910.......	5,872,237	8,491,882	13,290,431
1909.......	5,117,728	7,870,878	12,114,412
1908.......	4,584,682	7,349,930	11,086,253
1907.......	4,647,219	7,251,480	10,705,392
1906.......	4,161,917	6,526,316	10,086,933
1905.......	3,721,631	6,059,442	9,488,358
1904.......	3,502,811	5,378,442	8,415,278

DETROIT EDISON COMPANY.

	1914	1913
March gross	$ 546,741	$ 468,137
Net	231,733	202,598
Surplus after depreciation and reserve.....	121,794	102,974
Three months' gross...	1,703,402	1,431,128
Net	758,922	658,263
Surplus after depreciation and reserve......	429,804	346,997

PORTLAND RAILWAY, LIGHT & POWER.

	1914	1913
February gross	$ 538,236	$ 530,071
Net after taxes........	278,247	282,714
Surplus after charges..	103,367	130,205
12 months' gross.......	6,760,919	6,675,837
Net after taxes.........	3,442,900	3,371,359
Surplus after charges..	*1,391,666	1,580,321

*Equivalent to 5.9 per cent on capital stock.

CUMBERLAND COUNTY POWER & LIGHT.

	1914	1913
February gross	$ 168,062	$ 157,324
Net after taxes........	53,606	62,925
Surplus after charges..	*9,859	6,211
12 months' gross.......	2,377,457	2,161,772
Net after taxes	1,026,401	947,479
Surplus after charges..	298,534	290,103

*Deficit.

GRAND RAPIDS RAILWAY.

	1914	1913
February gross	$ 96,747	$ 93,550
Net after taxes........	34,109	37,002
Surplus after charges..	20,447	22,181
12 months' gross.......	1,302,624	1,247,860
Net after taxes........	487,713	534,576
Surplus after charges..	323,361	359,311
Balance after preferred dividends	248,361	284,311

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sub-licensee companies, report for the two months ended February 28, 1914, all duplications, including interest, dividends and other payments to American Telephone & Telegraph Company by associated holding and operating companies, are excluded), compared as follows:

	1914	1913
Gross earnings	$36,476,473	$34,425,557
Operating expenses, tax mt. and depreciation	26,669,337	24,623,295
Net earnings	9,807,133	9,802,062
Interest	2,984,156	2,749,241
Balance	6,822,977	7,052,821
Divident est. for two months	5,065,988	5,035,527
Surplus	1,756,989	2,017,294

The American Telephone & Telegraph Company reports or the three months ended March 31, 1913, compared as follows:

	1914	1913
Dividends	$6,295,408	$6,425,254
Interest and other revenue	3,634,392	3,031,635
Tel. tr. net...........	1,496,654	1,564,183
Other sources	137,547	195,170
Total	11,564,004	11,216,242
Expenses	1,330,572	1,218,503
Net earnings	10,233,431	9,997,739
Interest	2,048,669	1,811,630
Balance	8,184,761	8,186,109
Dividends	6,892,549	6,781,606
Balance	1,292,212	1,404,503

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 20	April 13
American Tel. & Tel. (New York)........................	120½	120
Commonwealth Edison (Chicago)	135	137
Edison Electric Illuminating (Boston)........................	250	255
Electric Storage Battery common (Philadelphia)........................	50¼	52
Electric Storage Battery preferred (Philadelphia)........................	50¼	52
General Electric (New York)........................	144	145
Kings County Electric (New York)........................	119	120
Manhattan Transit (New York)........................	1	1
Massachusetts Electric common (Boston)........................	10	11
Massachusetts Electric preferred (Boston)........................	59½	61
National Carbon common (Chicago)........................	108½	109½
National Carbon preferred (Chicago)........................	118½	119
New England Telephone (Boston)........................	135	135
Philadelphia Electric (Philadelphia)........................	25½	27
Postal Telegraph and Cables common (New York)........................	81	82
Postal Telegraph and Cables preferred (New York)........................	69	69
Western Union (New York)........................	61¼	62¼
Westinghouse common (New York)........................	72¼	73¼
Westinghouse preferred (New York)........................	117½	117

PERSONAL MENTION.

MR. S. B. WAY, vice-president of the Milwaukee Electric Railway & Light Company, has been elected vice-president and general manager of this company and also of the Milwaukee Traction, Light & Heating Company.

MR. THOMAS A. EDISON, together with his family, all of whom have been spending the past six weeks at their winter home in Fort Myers, Fla., have returned to Glenmont, Llewellyn Park, West Orange, N. J. Mr. Edison expressed himself to a friend that "a vacation is such a lazy thing a fellow has to put on weight whether he wants to or not."

MR. W. R. HURROW, of the Kansas Gas & Electric Company, of Independence, Kans., is a member of the Booster Clubs of Southeastern Kansas, which are on a 6,000-mile trip to New York and other Eastern cities. Nine counties of Kansas were represented on the special train of eleven cars, which left Independence on April 15 for the East, carrying Kansas products of all descriptions.

MR. A. H. R. JACKSON, manager of the Jefferson City (Mo.) Light, Heat & Power Company, has been made general manager of the Oskaloosa (Iowa) Traction & Light Company, which is controlled by the McKinley interests. The appointment is effective May 1. The change is in the nature of a promotion for Mr. Jackson, who has been at Jefferson City for several years. His successor has not been selected.

MR. J. W. RICHARDSON, superintendent of the Kansas City & Western Electric Railway, has recovered sufficiently from a recent operation to allow his removal from St. Margaret's hospital in Kansas City, Kans. Mr. Richardson, who is 45 years old, has been prominent in electric railway circles for the past quarter of a century, being a superintendent of the Metropolitan Street Railway Company, of Kansas City, before joining the interurban 12 years ago.

GEN. GEORGE H. HARRIES has been re-elected to the presidency of the Louisville (Ky.) Gas & Electric Company at the annual stockholders' meeting; MR. H. M. BYLLESBY has been chosen chairman of the Board, and MR. DONALD McDONALD, vice-president and general manager. MESSRS. JAMES B. BROWN, M. A. MORRISON, and F. C. GORDON have been appointed vice-presidents, and MR. T. B. WILSON, secretary-treasurer of the company.

MR. THOMAS SIDLO has been appointed by Mayor Newton D. Baker, of Cleveland, O., as head of the Public Service Department. The construction of a new $2,000,000 lighting plant will be one of the many problems which Mr. Sidlo will have to handle. Although but 26 years of age, Mr. Sidlo has been assistant street railway commissioner of his city since 1912. Shortly after this appointment he was made commissioner of franchises and then commissioner of information.

MR. CHARLES F. BROOKER, president of American Brass Company, was the guest of honor at a dinner at Sherry's, New York City, on April 15, on the occasion of the fiftieth anniversary of his entrance into the brass and copper business. The dinner was given by about 150 men prominent in finance and industry, with the copper trade particularly well represented. Mr. John D. Ryan, of the Amalgamated Copper Company, was toastmaster, and among the speakers were Col. T. L. Livermore, vice-president of Calumet & Hecla; Mr. C. A. Coffin, of the General Electric Company; Dr. William H. Nichols, of the Nichols Copper Company; ex-Senator William A. Clark; Mr. Howard Elliott; Mr. Charles M. MacNeil, president of the Utah Copper Company; Col. R. M. Thompson, of the International Nickel Company; Mr. Melville E. Stone, of the Associated Press, and Mr. B. Hochschild, of the American Metal Company.

DR. LEO. H. BAEKELAND, the inventor of Velox paper and of Bakelite, who made the Townsend cell an effective piece of apparatus in the manufacture of bleaching liquor, will be the first lecturer in the Chandler Foundation, on the afternoon of May 29, at Columbia University, during the celebration of the fiftieth anniversary of the founding of the School of Mines. Dr. Baekeland has an extraordinarily wide knowledge of the relation of chemistry to the industries, and is peculiarly fitted to introduce this series of lectures.

MR. W. A. BLONCK, of the Chicago engineering company of that name, spoke on "Boiler-Room Economy" before the Kansas City (Mo.) Electric Club, at the Coates House, on April 14. About 70 members of the club, which is winding up the season's work, attended. A dinner preceded the address. Among other things, Mr. Blonck asserted that there is no excuse for smoke of any great proportions emanating from boiler rooms. Most of the smoke which does issue from chimneys of such plants is caused by improper arrangement of the combustion chambers, or boilers he asserted. Mr. Blonck, prior to forming the company which bears his name, was chief master mechanic of the Chicago, Milwaukee & St. Paul Railway. The Kansas City Electric Club, comprised of all who are interested in electricity in any form, will conclude its season's work in May. Meetings will not be resumed until next fall because of hot weather. The club has been meeting semi-monthly.

OBITUARY.

MR. ORLANDO B. ROBBINS, a well known electrical contractor of Pittsburgh, Pa., died recently at his home in that city. He was employed at the city filtration plant. He is survived by his wife, one brother, and four sisters.

MR. DAVID ROBISON, JR., builder of the first electric railroad in Toledo, O., died in that city on April 15, at the age of 85. Mr. Robison was also chiefly responsible for the building of the Terminal Belt, a steam railroad encircling the city for a distance of 30 miles.

MR. CHARLES D. HEWITT, a Philadelphia electrical contractor, died suddenly on April 13, at his home in Burlington, N. J., at the age of 74 years, following an attack of apoplexy. He was famous as a big game hunter and widely known among sportsmen of the Eastern States.

MR. D. H. LOUDERBACK, a pioneer investor in and developer of telephone and telegraph and other public utilities, died at his home in Chicago, suddenly, on April 9. Mr. Louderback was a leading figure in Chicago traction affairs some time ago, but more recently was heavily interested in local real estate.

MR. ALFRED NOBLE, chief engineer of the Pennsylvania Tunnel and Terminal Railway Company and a former president of the American Society of Civil Engineers, died on April 19 at the age of 70 years. Mr. Noble was born in Michigan in 1844, and served for three years in the Army of the Potomac. He receive the degree of civil engineer in 1870, and for the next 12 years was in charge of improvements in the St. Mary's Falls Canal and St. Mary's River. From 1883 to 1886 he was general assistant engineer of the Northern Pacific Railroad, and for some years after that was in charge of the construction of railroad bridges in various parts of the country. He was a member of the Nicaragua Canal Board in 1895, of the United States Board of Engineers on Deep Waterways in 1899 and 1900, of the Isthmian Canal Commission from 1899 to 1903, and of the Board of Consulting Engineers of the Panama Canal in 1905. In May, 1912, Mr. Noble received the Elliott Cresson medal from Franklin Institute at Philadelphia in recognition of his work.

NEW PUBLICATION.

TERRESTRIAL MAGNETISM.—The United States Coast and Geodetic Survey has published the results of magnetic observations made at Sitka, Alaska, in 1911 and 1912 by Daniel L. Hazard. A separate bulletin contains a discussion of all the magnetic work of the department from July, 1911, to December, 1912, by R. L. Faris.

DATES AHEAD.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Electrical Supply Jobbers' Association. May meeting, Chalfonte Hotel, Atlantic City, N. J., May 12-14. General secretary, Franklyn Overbagh, 411 South Clinton Street, Chicago, Ill.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit, June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Ward Motor Vehicle Company, New York City, has issued a circular describing Ward electric vehicles.

Transportation Utilities Company, 30 Church street, New York City, announces that it has acquired the entire business of the General Railway Supply Company.

Wightman & Richards, New York, City, counsellors and consulting engineers in technical advertising, announce the removal of their offices from 29 Broadway to 50 Union Square, New York City.

C. & C. Electric & Manufacturing Company, Garwood, N. J., announces that its Cleveland agent, Charles S. Powell, has removed his office to more commodious quarters in the Illuminating Building, Cleveland, O.

The Strong-Smith Manufacturing Company, 24-26 First Street, South, Minneapolis, announces that it has purchased the factory and business of the Zimmer Vacuum Renovator Company and will continue the business.

Peerless Insulated Wire & Cable Co., 18 Broadway, New York City, has issued a booklet on Peerless weatherproof insulation. The first few pages of this booklet are devoted to a description of the manufacturing process, while the last few pages give the results of tests performed by the Electrical Testing Laboratories, of New York City.

Allen-Bradley Company, Milwaukee, Wis., has issued bulletin B-53 which deals with type G inclosed switches for small alternating-current motors that require no starting resistance. These are made in three forms varying in their equipment of protective devices. They are of simple and rugged construction and made for motors ranging from one-fourth to ten horsepower.

Line Material Company, South Milwaukee, Wis., announces that L. E. Hendee, vice-president of the company, has taken active charge of the sales department. W. D. Kyle, general manager of the company and formerly in charge of the sales department, will devote more of his time to investigating and developing the company's line of street-lighting fixtures and line-construction material.

The Richmond Electric Works, Richmond, Va., manufacturer of alternating-current motors, which for a number of years has been represented in the Philadelphia territory by E. B. Day, announces that it has discontinued the agency with Mr. Day and has opened its own office at 1418 Walnut Street, Philadelphia, Pa. The already large stock of Richmond motors carried in that city, will be materially increased to take care of the growing demand.

Standard Underground Cable Company, Pittsburgh, Pa., has issued bulletins Nos. 200-1 and 400-1. The former is devoted to the specifications for standard Colonial-Copper-Clad wire. These specifications conform with those recommended by the American Society for Testing Materials for hard-drawn copper wire. Bulletin No. 400-1 describes weatherproof insulated wires and cables, solid and stranded, double and triple braid. Numerous tables giving size of conductors, prices, weights and shipping data are given.

The Brown Instrument Company, Philadelphia, Pa., has issued catalog No. 9 describing in detail pyrometers for various purposes. This 60-page catalog first considers the various applications for pyrometers, then their construction and finally the different types. A number of illustrations show the various methods of installing thermo-electric couples. For high temperatures, the radiation pyrometer is recommended. Notes are given on wiring and adjustments. An appendix giving 100 letters from satisfied users accompanies the bulletin.

The L. K. Deal Lumber Company, Des Moines, Iowa, was incorporated January 1, 1914, with a capital stock of $25,000 to engage in the cedar-pole business. L. K. Deal is the president and W. C. Sharp is vice-president and secretary. The company occupies large offices on the fifth floor of the Clapp building, and is well prepared to fill the needs of cedar-pole users. The company has cut a normal stock of northern poles from its own lands in northern Minnesota. This stock is now being shipped to the yards. The company also has a western connection in Spokane to look after its western (red-cedar) stock. The Deal Company is prepared to make quick shipments, in fact, it claims to be able to ship on 48 hours' notice. Mr. Deal has been in the cedar business a number of years. Mr. Sharp, who joined the company the first of the year, was formerly manager of the Helena Light & Railway Company, Helena, Mont. His long experience in railway and lighting construction will undoubtedly enable him to be of material assistance to users of poles.

Fairbanks, Morse & Company, Chicago, has recently issued bulletin No. 27 on direct-current type-CP motors and generators. This eight-page illustrated bulletin describes these commutating-pole motors in detail. Bulletin No. 29 is devoted to a description of direct-current type-TRC motors and generators. These motors are of the commutating-pole type and are suitable for driving machine tools and for installing on floor, wall or ceiling. The company has also issued bulletin No. 210 describing internal-starter motors, types KBV and KBH for two and three-phase circuits. Type-KBV motors are adapted to operate on electric-light circuits where the starting of squirrel-cage motors would impair the lighting service. The other type is designed for intermittent service. Torque-time and current-time curves for these motors are given as well as illustrations of the various parts of the motors A reprint of the bulletin on alternating-current type-B constant-speed induction motors has also been issued. This bulletin, No. 202B, is well illustrated by views of installations, the motors and their parts, and several types of motor starters.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports a number of important orders recently received from the metal-mining industry, among which were the following: United Verde Copper Company, Jerome, Ariz., one 24-panel switchboard for the new smelter at Clarkdale. El Paso (Tex.) Smelting Company, two 55-horsepower direct-current back-geared motors for operating converters. Magma Copper Company, Superior, Ariz., nine squirrel-cage induction motors totaling 267 horsepower and transformers aggregating 90 kilovolt-amperes for operating copper concentrating mill. Anaconda (Mont.) Copper Mining Company, six 150-kilovolt-ampere transformers for the Washoe smelter; also 14 motors totaling 290 horsepower for driving mine ventilating fans. National Copper Mining Company, Wallace, Idaho, one four-ton barsteel locomotive. Utah Copper Company, Magna, Utah, four 15-horsepower slow-speed vertical motors for direct connection to agitators used in oil flotation process; also two 50-kilowatt motor-generator sets with switchboards and three 100-kilowatt transformers. Kennecott (Alaska) Mines Company, one 50-horsepower back-geared alterating-current motor and three 25-kilowatt transformers. Alaska Gastineau Mining Company, Juneau, Alaska, two 18-ton barsteel locomotives for underground and surface work. Alaska Juneau Mining Company, Juneau, Alaska, one 5.5-ton storage-battery locomotive. Mason Valley Mines Company, Thompson, Nevada, two 15-horsepower motors with brakes, controllers and resistors, for use in ladle tilting in copper smelter. Tonopah Belmont Company, Tonopah, Nevada, one 75-horsepower motor used for driving an Aldrich pump. Brunswick Consolidated Gold Mining Company, Grass Valley, Cal., three 100-kilowatt transformers.

General Electric Company, Schenectady, N. Y., announces that among its recent orders for electrical machinery were the following: Sierras Construction Company, Imperial Valley, Cal., a 2,000-kilowatt synchronous condenser, three 1,250 and nine 300-kilowatt transformers, switchboard and accessories. Montana Power Company, Butte, Mont., a 3,750-kilowatt alternating-current generator. Pittsford Power Company, Rutland, Vt., a 1,250-kilowatt alternating-current generator, three 400-kilowatt water-cooled transformers and a switchboard. Towaliga Falls Power Company, Griffin, Ga., a 1,600-kilowatt alternating-current generator and switchboard. Pennsylvania

Steel Company, Steelton, Pa., a 450-kilowatt regulating set, a 600-horsepower induction motor and switchboard. Detroit Seamless Steel Tube Company, Detroit, Mich., two 300-horsepower induction motors with control equipments and switchboard. Indiana Steel Company, Gary, Ind., 27 15-horsepower induction motors. Worcester Pressed Steel Company, Worcester, Mass., three 300-kilowatt transformers, a 500-horsepower induction motor with control equipment and switchboard. American Iron & Steel Manufacturing Company, Lebanon, Pa., a 4,000-kilowatt two-unit motor-generator with combined exciter and blower set. John Wood Manufacturing Company, Conshohocken, Pa., two 200-kilowatt rotary converters, four 110-kilowatt transformers and a switchboard. Jeanesville Iron Works Company, Hazelton, Pa., three 200-horsepower induction motors with compensators. American Cement Plaster Company, Fort Dodge, Iowa, 34 motors ranging from 7.5 to 75 horsepower, switches and accessories. American Bottle Company, Streator, Ill., 40 motors ranging from very small sizes up to 125 horsepower, switchboard and accessories. California Portland Cement Company, Colton, Cal., 35 motors ranging from 10 to 50 horsepower, relay panels, switches, etc., and a 25-kilowatt motor-generator set. St. Lawrence River Power Company, Massens, N. Y., three 1,250, two 1,000, one 300, one 100 and two 50-horsepower induction motors, together with transformers, switchboards and other accessories. Riverside Portland Cement Company, Crestmore, Cal., nine motors ranging from 10 to 200-horsepower, transformers, switches, etc. Ottawa Silica Company, Ottawa, Ill., six motors ranging from 35 to 100 horsepower, a 50-kilowatt motor-generator set, switchboard, etc. Iowa Portland Cement Company, Des Moines, Iowa, a 160-kilowatt motor-generator set, a 165-horsepower induction motor, switchboard and accessories. State Phosphate Company, Alafia, Fla., a 400-horsepower induction motor. Western Rug Company, Duluth, Minn., 30 motors ranging from 1 to 35 horsepower, switches, etc. Power & Mining Machinery Company, Cudahy, Wis., 33 motors ranging up to 150 horsepower. Indiana Quarries Company, Bedford, Ind., 38 30-horsepower induction motors. Hanover Brick Company, Whipanny, N. J., 14 motors ranging from 3 to 75 horsepower, with compensators and accessories.

Record of Electrical Patents.

Issued by the United States Patent Office, April 14, 1914.

1,092,849. Rotor Construction for Indication Motors. J. D. Nies, assignor to Kimble Electric Co., Chicago, Ill. Has separate high and low-resistance windings, the latter being thrown in by centrifugal force.

1,092,878. Therapeutic Electric Apparatus. R. H. Wappler, assignor to D. T. Garrie, New York, N. Y. Strength of current varied by sliding motor-operated core.

1,092,880. Rheostat. H. J. Wiegand, assignor to The Cutler-Hammer Mfg. Co. Resistance elements staggered on opposite sides of contacts.

1,092,886. Rock-Drill. C. E. Youmans, Yonkers, N. Y. Includes electric ignition of driving engine.

1,092,891. Trolley Switch. A. Bevan, Providence, R. I. A trolley switch for electric signal system operated by trolley wheel.

1,092,918. Signal Device. David G. Knittel, assignor to American Fire Alarm Co., Pittsburgh, Pa. A multiple signal transmitter.

1,092,919. Signal Transmitter. D. G. Knittel and W. J. Davis, assignors to American Fire Alarm Co. A modification of 1,092,918.

1,092,952. Compression-Rheostat. P. J. Ray, Lakewood, O. A cam and spring-plunger arrangement.

1,092,957. Means for Reducing Reflection Losses in Phantom Circuits. T. Shaw, assignor to American Telephone & Telegraph Co. Includes use of transformers at junction of phantom and physical circuits.

1,092,966. Recording Flow-Meter. J. Wilkinson, assignor to General Electric Co. Has magnetic float and magnetic transmission of motion.

1,092,969. Automatic Electromagnetic Switch. Curtis Benton, San Francisco, Cal. A flasher having magnetically controlled contacts.

1,092,977. Printing-Controlled Electric Sign. M. Compos, Mobile, Ala. Operated by means of perforations on strip of insulating material.

1,092,982. Pneumatic Transmission System. E. D'Humy, assignor to The Western Union Telegraph Co. Pressure-controlled incandescent lamp denotes arrival of carrier.

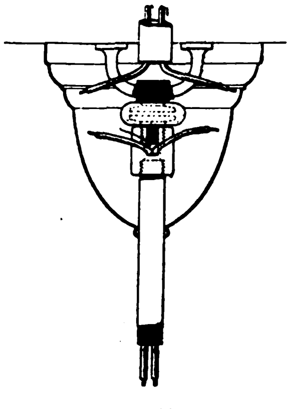
1,092,985. Appliance for Cleaning Tarnished Metals. H. M. Fetters, Laporte, Ind. Utilizes electrolytic action.

1,093,001. Telegraphy. I. Kitsee, assignor to American Telephone and Telegraph Co. Transmission system for telegraphic cables utilizing two transformers.

1,093,007. Hickey. C. D. Platt, Bridgeport, Conn. For an electric fixture. (See cut.)

1,093,009. Lamp Support. J. C. Ramsey, Jr., assignor to Herrick Aiken Co., Inc., Lawrence, Mass. A rotable electric-lamp fixture.

1,093,010. Method of and Means for Manufacturing Metal Pipe and Tubing. E. E. Ries, New York, N. Y. Seams electrically welded.



1,093,007.—Hickey.

1,093,025. Trolley-Wheel Construction. W. H. Arnold, Stockton, Cal. Bearing pin has two spaced conical bearing shoulders.

1,093,034. Party-Line Telephone System. A. G. Cerda, assignor to Walter Mooers, Arlington, Mass. Has electrically actuated cut-out for severing connection with all branches except the one in use.

1,093,041. Party-Line Telephone System. C. J. Erickson, Chicago, Ill., assignor to First Trust and Savings Bank, Chicago, Ill. An automatic system.

1,093,045. Dynamo-Electric Machine. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Magnetism of auxiliary poles is dependent on difference of voltage between main and auxiliary brushes.

1,093,051. Oil Switch. E. M. Hewlett and C. E. Eveleth, assignors to General Electric Co. Arc extinguished by displaced oil.

1,093,056. Rotary Explosive Engine or Motor. A. K. Landsmann and F. Dippon, St. Louis, Mo. Has electric ignition.

1,093,072. High-Frequency Discharge Apparatus. H. W. Perkin, assignor to High Frequency Ignition Coil Co., Los Angeles, Cal. Has coil of high inductance and condensers to prevent flow of high-tension current to discharge coil.

1,093,074. Electric Motor. E. S. Pillsbury, assignor to Century Electric Co. Centrifugal force changes rotor connections at predetermined speed.

1,093,083. Distribution System for Vapor Electric Devices. R. G. Standerwick, assignor to General Electric Co. Current-regulating device for mercury-arc lamp.

1,093,100. Multiple Key. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Has a number of current-supply contacts and circuit contacts.

1,093,113. Spark Plug. C. M. Conklin, Cincinnati, O. Has bifurcated electrode.

1,093,122. Lamp. C. E. Godley, assignor to Edmunds and Jones Mfg. Co., Detroit, Mich. A circumferential spring supports reflector.

1,093,126. Temperature Regulator. W. S. Hadaway, Jr., New York, N. Y. Heater is electrically controlled by pressure-operated contacts.

1,093,132. Call System. J. Hergesheimer, Glenside, Pa. An electromagnetic annunciator system.

1,093,137. Electromagnetic Controlling Device. H. J. Keating, Chicago, Ill. A solenoid-operated device having pneumatic damping means.

1,093,144. Portable Electric Lamp. W. J. Monaghan, assignor to Waterbury Mfg. Co., Waterbury, Conn. Spring makes contact with zinc casing of battery.

1,093,147. Electrical Controlling Mechanism. F. N. Reeves, assignor to Western Electric Co. An electromagnetically controlled system.

1,093,149. Driving Mechanism for Electrically-Propelled Vehicles. E. W. Schneider, New York, N. Y. Motors mounted in hubs of wheels.

1,093,164. Refillable Fuse-Cartridge. G. W. Appler, Lyons, N. Y. Has opening in tube for operating fuse-clamping means.

1,093,182. Arc-Electrode and Process for Making It. J. L. R. Hayden, assignor to General Electric Co. Consists of iron tube packed with solidified fusion of magnetite, rutile, chromite, and fluoride of potassium.

1,093,195. Electrical Water Heater. R. R. Lockhart, Winnipeg, Manitoba, Canada, assignor to himself, G. A. Glines, W. E. Wright, V. Williams, D. B. Sprague, and J. D. Sinclair. Heating element inside of heater. (See cut.)

1,093,197. Method of Welding Lamp-Filaments. G. F. Morrison, assignor to General Electric Co. Electromagnet deflects arc during welding process.

1,093,221. Case for Incandescent-Electric-Lamp Sockets. A. Weber, Sr., and J. Weber, assignors to Weber Electric Co., Schenectady, N. Y. Includes a sleeve and cap.

1,093,235. Trolley-Wire Feed-Tap Insulator. E. L. Alvord, assignor to The Johns-Pratt Co., Hartford, Conn. Has insulating bushing with flanges to prevent longitudinal movement.

1,093,236. Electrolytic-Cleaning Electrode. T. Appleby, Philadelphia, Pa. Zinc electrode separated from metallic tank by insulator supporting article to be cleaned.

1,093,237. Electric Heater. G. A. Arnold, assignor to Arnold Electric Co. Spiral heating element can be inserted in pipe through terminal openings.

1,093,240. Wireless-Telegraph Receiver. J. G. Balsillie, Melbourne, Victoria, Australia. Covers arrangement of circuits.

1,093,271. Electromagnetic Tachometer. N. M. Hopkins, assignor to The Electric Tachometer Co., Philadelphia, Pa. Has thermostatic temperature-compensating device.

1,093,281. Electric Welding Machine. N. Macneale, assignor to The Toledo Electric Welder Co., Cincinnati, O. Includes a horn having a laterally offset portion.

1,093,287. Electric Cap-Light. A. R. Neff, Los Angeles, Cal. Fits ordinary dry cell.

1,093,292. Apparatus for Producing Electric Signals. F. Rieber, Berkeley, Cal. A pneumatic telegraph key with pneumatic arc extinguishers.

1,093,318. Electrical Sparking Device. W. J. Cunningham, assignor of one half to F. G. Meyer, Toledo, O. A spark plug for an engine cylinder in which magnet assists in controlling contact points.

1,093,332. Securing Device for Electroliers and the Like. G. W. Jockers, assignor to E. H. Hopkins, Cleveland, O. Clamping device for fixture pipe. (See cut.)

1,093,367. Terminal for Electric-Light Fixtures. F. W. Wakefield, assignor to The F. W. Wakefield Brass Co., Vermilion, O. A combination of a plate and terminal member.

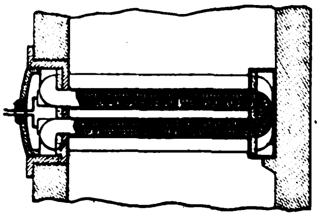
1,093,368. Vapor Electric Device. E. Weintraub and A. E. Hibschman, assignors to General Electric Co. Has outside conducting surfaces on tube near anodes.

1,093,378. Motor-Control System. L. E. Bogen, assignor to Allis-Chalmers Mfg. Co. Starting rheostat and load-balancing means for direct-connected motor of wound-rotor type.

1,093,382. Electric Furnace. J. W. Brown, assignor to National Carbon Co. Has channels and means for causing charge to move through these channels.

1,093,384. Rotary Electroplating Apparatus. C. J. Charlton, South Benfleet, England. Has revolving electrodes.

1,093,395. Automatic Fire-Alarm. E. A. Gehrke, Lincoln, Nebr. Has thermostat.

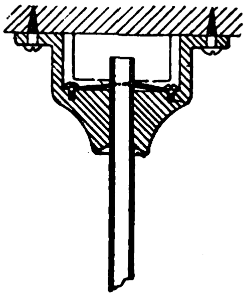

1,093,195.—Water Heater.

1,093,423. Spark-Plug. E. Holzworth, Alliance, O. Two electrodes pass through plug.

1,093,468. Separable Attachment-Plug. J. G. Peterson, assignor to Manhattan Electrical Supply Co., Jersey City, N. J. Has laterally disposed plugs.

1,093,477. Means for Protecting Electric Circuits from Excessively High Differences of Potential and Similar Disturbances. R. Rüdenberg, assignor to Siemens-Schuckert Werke, G. M. B. H., Berlin, Germany. Inductances are inserted in lines, and condensers and resistances between lines.

1,093,479. Insulator. J. A. Sandford, assignor to The R. Thomas and Sons Co., East Liverpool, O. A built-up petticoat insulator.


1,093,332.—Securing Device for Electroliers.

1,093,480. Insulator. J. A. Sandford, assignor to R. Thomas and Sons Co., East Liverpool, O. A modification of 1,093,479.

1,093,491. Static Electric Eradicator. A. Smith, assignor to Static Electro Eradicator, Inc., Syracuse, N. Y. Includes a series of projecting wires connected to ground.

1,093,494. Electric Furnace for Medium Temperatures Particularly for Melting Copper and its Alloys. E. Stassano, Turin, Italy, and N. Petinot, Niagara Falls, N. Y. Has cylindrical melting chamber and two electrodes.

1,093,507. Trolley-Wheel Guard. E. W. Warnick, Cuyahoga Falls, O. Plates serve to prevent displacement of trolley.

1,093,510. Electric Stove or Iron. G. Wenzelmann, Galesburg, Ill. Contains electric heating coil.

1,093,511. Coin or Check Controlled Apparatus. W. B. Wheeler, Washington, D. C. Has electric timing mechanism.

1,093,539. Machine for Covering Electric Conductors. E. H. Cook, assignor to International Wire Co. Includes means for covering and impregnating wires.

1,093,544. Internal-Combustion Engine. C. de Lukacsevics, assignor to G. W. Morgan, Jr., New York, N. Y. Includes electric ignition.

1,093,545. Starting Means for Vapor Electric Apparatus. J. T. H. Dempster, assignor to General Electric Co. A conducting filament formed of carbon having one end tipped with titanium carbide.

Patents Expired.

The following United States electrical patents expired April 20, 1914:

580,851. Magneto Telephone. L. E. Dye, Morris, Minn.

580,853. Telephone Switchboard. C. E. Egan, Chicago, Ill.

580,889. Armature for Dynamo-Electric Machines. A. L. Parcelle, Boston, Mass.

580,893. Elevator. C. R. Pratt, New York, N. Y.

580,894. Elevator Safety Device. C. R. Pratt.

580,927. Fire-Alarm System. C. E. Buell, North Plainfield, N. J.

580,929. Interlocking Switch for Theater Dimmers. G. L. Colgate, Westfield, N. J.

580,931. Electric Selling Device. A. Davidson, New York, N. Y.

580,957. Automatic Cutout. C. A. Rolfe, Chicago, Ill.

580,973. Switch and Signal Apparatus. C. A. Geissenhainer, Pittsburgh, Pa.

580,977. Sectional Armature for Dynamos and Electric Motors. G. L. Jeck, Nashville, Tenn.

580,987. Oscillating Interrupter. D. M. Moore, Newark, N. J.

580,988. Interrupter. D. M. Moore.

581,023. Section Insulator for Electric Railways. S. L. Foster, San Francisco, Cal.

581,044. Annunciator-Signal for Telephone Systems. W. F. Smith, San Francisco, Cal.

581,064. Junction-Box Coupling for Electric Wire Conduits. J. P. Coughlin, Worcester, Mass.

581,088. Electric-Wire Insulator. J. E. Sharpe, Oneida, N. Y.

581,089. Dynamo-Electric Machine. M. O. Southworth, Indianapolis, Ind.

581,091. Electromedical Apparatus. R. H. Wappler, New York, N. Y.

581,101. Magnet. G. G. Brown, Brooklyn, N. Y.

581,104. Construction of Batteries. E. N. Dickerson, New York, N. Y.

581,115. Elevator. C. A. Harkness, Providence, R. I.

581,129. Electric Light and Headgear for Surgical Use. L. W. Nevins, Chicago, Ill.

581,135. Telegraph Key. M. M. Porter, Malone, N. Y.

581,136. Electric Arc Lamp. W. L. Preece, Derby, England.

581,170. Electrical Resistance-Coil. J. Nebel, London, England.

581,204. Electric Pump. B. Heftye, Tuxpan, Mexico.

581,242. Erecting Aerial Electric Cables. F. S. Viele, Pittsburgh, Pa.

581,246. Combined Telephone and Electric-Lighting System. C. E. Buell, North Plainfield, N. J.

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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LIGHTNING PROTECTION.

Of the electrical papers presented at the joint meeting of the American Institute of Electrical Engineers and the American Physical Society in Washington last week, the one dealing with the lightning protection of buildings created the greatest interest. It dealt with a subject which is of importance both to engineers and laymen and one whose mysteries have not yet been entirely unraveled.

The discussion of this paper resolved itself into an experience meeting and brought out evidence that a great many lightning discharges are probably non-oscillatory in character, although the existence of oscillatory discharges in certain instances is not denied. The requirements for a high degree of protection seem to be a number of rods extending considerably above the highest point of the building to be protected, and running as directly as possible to good grounds. The material of the rod is not very important, but a rod with a poor ground—that is to say one of high resistance—may be worse than no rod at all.

Various speculations have been made as to the sequence of events immediately prior to and during a lightning discharge, but as yet little definite information exists upon this point, even though some records have been obtained which indicate such steps as a preliminary brush discharge, the production of an ionized conducting path, and the supply of electricity for a series of discharges by the clouds adjacent to the point where breakdown occurs. The existence of a steep wave front in a discharge of this character might account for some of the observed effects which have led to the belief in an oscillatory discharge, while at the same time providing an explanation for the direct-current effects which have been observed. While the use of rotating mirrors or rotating cameras provides a means for obtaining intelligible records of lightning performances, the difficulty of foretelling the time of a discharge interposes great difficulties in the way of securing desired data. This element of chance in securing reliable records of the happenings involved in a discharge of lightning has greatly interfered with the study of this subject and the accumulation of information which would lead to a thorough knowledge of the facts and the formulation of a theory which would indicate how complete protection from harmful results could be secured.

The protection of transmission and distributing lines from lightning is a different problem. Unless provided with an elaborate system of ground wires, such a line is pretty certain to be subject to induced currents from lightning discharges. Lightning arresters offer protection from such induction which is usually adequate, but when they protect from direct strokes of lightning it is usually at the cost of their own destruction. The choice of types of arrester for different services was fully discussed by Prof. A. H. Ford at the annual convention of the Iowa State Section of the National Electric Light Association. A report of this convention is given elsewhere in this issue and the rather full abstract of Professor Ford's address contains much information of value.

CONCENTRATION IN POWER SALES.

One of the essentials in extending central-station power service is the ability to concentrate upon particular features of the local power situation, spotting the weak points of the existing service and emphasizing the fitness of the electric drive as a means of bettering the conditions. The experienced power solicitor scents these weak points almost by instinct, and by constant practice even the man fairly new to the game can acquire much skill in their location. The winning proposition to install service is often built around one or two features of an established mechanical drive which the factory or store owner has never realized are grossly inefficient.

The investigation of steam leaks in old engines and of excessive condensation in cylinders and piping is a fertile field for study, as is the determination of power losses in belts, shafting and quarter-turn pulley combinations. Few factory owners realize the amount of coal required to transmit their mechanical power from a basement engine to the line shaft of a distant department compared with the additional demands of the productive load at the machines. A hasty survey of a plant should suffice to "tip off" the power engineer as to the existence of a relatively large friction load, and by the simple expedient of taking indicator cards during the noon hour and in the full working periods the basis for many a clinching power proposition is at hand. It is well for the central-station man to realize that it is not always necessary to present the prospective customer with the ultimate figures of estimated electric-service economy in order to win the business. That is, he may carry a power survey far enough to demonstrate a highly favorable showing by the adoption of electricity; but he need not show the desired customer the full saving to be expected in every case if the business seems to be coming along on the strength of more modest benefits to the consumer. It is better, in other words, to capture a power installation upon an underestimate of the profits of electric service than to promise the prospect very large immediate savings which may be realized if the equipment is given a fair show but which may not be realized if it is subjected to abuse or improper service demands.

It is in working along such lines that concentration of effort pays. The handling of the fuel may be extremely inefficient; untoward prices may be paid for water or the disposal of ashes; inadequate maintenance may be causing frequent costly breakdowns of pumps and engines; or the intermittent service may be a factor in the high cost of operating the mechanical plant. Some of these features often can be improved without the substitution of electric motors, but the wise central-station man will content himself with comparing conditions as they are under mechanical drive with conditions as they may be if electricity is substituted, and will confine his efforts to giving the customer the best and most economical service possible rather than to pointing out desirable betterment work in the mechanical rearrangement of old plants run by competitive motive powers.

No one can study electric power applications long without being convinced that even a rehabilitated mechanical plant can scarcely hope in the long run to make as good a showing on total yearly cost as the same plant equipped with a properly designed motor drive. Let the central-station man seek to benefit his customer as much as possible by studying his service after the motor installation is made as well as before, but let the power solicitor new to the business keep a close control of his promises as to sweeping and extreme economies to immediately result from the adoption of electricity. Far better is it to let the consumer find out some of these economies in his own bills, so long as a sufficient margin demonstrated by the electric-service estimate leads him to decide in favor of the electrical installation.

WEATHER CONDITIONS AND LINE DESIGN.

The importance of a thorough study of weather conditions in connection with the design of transmission lines led to an extended investigation of the subject last year by Mr. Ira W. Knight at the Massachusetts Institute of Technology in connection with postgraduate thesis work in the Department of Electrical Engineering. The results of the author's work, which includes a graphic analysis of weather conditions at 105 stations of the United States Weather Bureau for the years 1901 to 1911, and a résumé of the most extreme conditions that have been recorded since the foundation of the various stations, cannot be reprinted here, but the data obtained emphasize the desirability of more thorough reports by operating companies upon sleet formation and wind velocities, and the need of delving with great care into local temperature, thunderstorm, and wind-direction records in determining the factor of safety desirable for transmission lines in various parts of the country.

In a report on "Transmission Line Crossings" presented at the National Electric Light Association's 1910 convention, the committee approved an allowance of not over 0.5 inch of clear ice on lines, and stated that indicated wind velocities of from 65 to 75 miles per hour may be expected several times each year, though much less frequently in conjunction with sleet. The question that naturally arises is how nearly these assumptions represent actual conditions, both with respect to the extremes chosen and in regard to the liability of their simultaneous occurrence. A new company building a new line in an unestablished field can ill afford to spend the capital necessary to so construct the line that it will withstand a 60-mile gale with 0.5 inch of ice on a day when the temperature is —20 degrees, if such an extreme condition has never occurred in that locality. In fact, if it were known that the general high wind velocity in the region is only 40 miles per hour and that velocities of 60 miles and over have occurred only once or twice in 30 years, a new company with little capital but good earning prospects perhaps could well afford to design its line for the lower velocity. There would be some little risk of failure, but this would be balanced against the saving in initial investment. The judgment of the designer here comes into play, reinforced, however, by available statistics. From such data as Mr. Knight has compiled or from similar tabulations which can be collated from Weather Bureau records and plotted in various ways on maps and cross-section paper, the transmission engineer can tell at a glance just what are the severest conditions that have ever occurred in any section of the United States; how often they are liable to re-occur; and to what extent the various worst conditions occur simultaneously.

An interesting feature of the investigation was a study of the experience of about a score of transmission systems with ice and sleet formations on wires. Trouble seems to be concentrated in three regions: the Atlantic seaboard from Georgia to Massachusetts; the vicinity of the Great Lakes, particularly northwestern New York; and the north Pacific Coast. The thickness of the ice formed is independent of the material of the wire and is also independent of the voltage on the line at the time, at least up to the corona point. Observations up to 22,000 volts uphold this view. It is not known whether the formation of corona tends to ward off the collection of sleet, but it has been noticed that for a considerable formation of sleet the charging current on the line is doubled. The cross-section of ice varies from round to unsymmetrical oval shapes and ice tends to form thicker at the bottom of long spans. The ice may be melted from the wires in cases where enough current can be transmitted to raise the wire temperature above the freezing point and it is desirable to consider the strains resulting from uneven melting in the design of line structures. With a considerable wind velocity the ice forms thicker on the windward side of the wire. It is noteworthy that ice one or two inches thick, sometimes rising to several inches, is not uncommon in the experience of the companies in the Rocky Mountain states.

THE DECREASING COST OF POWER.

Attention has frequently been called to the fact that the cost of generating power from fuel shows a continual decrease. Two principal reasons given for this are the increasing efficiency of prime movers as designs are improved, and the increasing size of prime-mover units, which not only aids the attainment of higher efficiencies but makes the initial cost of the machine less per kilowatt, and consequently decreases the item of fixed charges, which must be considered in the estimation of the total cost of generating power.

The increased efficiency of prime movers acts in an indirect way to still further decrease certain items of cost. During the last ten years the steam consumption per kilowatt-hour generated under the most economical conditions by steam turbines has been reduced by about one-third of its former value. This means much more than a saving in coal. It means that the boilers and other steam-generating equipment need have a capacity only two-thirds as great as formerly for a station of the same output. Similarly the condensing facilities are required to care for only two-thirds as great a quantity of steam and the expense for this part of the installation is correspondingly reduced. The fixed charges against these portions of a steam station are reduced in direct ratio to the cost of equipment.

Contemporaneous with the improvement in steam consumption of steam turbines, there has been an improvement in the methods of firing steam boilers, so that boilers may fairly be given a higher rating today than was suitable ten years ago. This again means less investment in boilers for the same output.

These decreases in capacity of steam-generating and condensing equipment carry with them a lessened requirement in capacity of buildings and in amount of land needed for a given power output. This means another saving in fixed charges. Putting it in another way, it has been possible to largely increase station capacity without enlarging buildings or adding to the installation of boilers. In addition to all this, the cost of water for condensing purposes, where such water must be purchased, is correspondingly decreased.

The above goes to show that the increase in efficiency of steam turbines has acted to decrease the cost of power not only in the lesser requirements for coal and coal-storing and coal-handling facilities, but also indirectly from its effect upon the fixed charges for buildings and steam equipment.

All of this applies, of course, only to the cost of power at the point of generation and it has made the hydroelectric plant a much less formidable competitor to the steam plant than was formerly the case. It must be remembered, however, that the cost of power where utilized involves a considerable outlay for distribution expense, which sometimes involves a transmission line.

Many Contracts Closed for Chicago Electrical Show.

Notwithstanding the fact that Chicago's seventh annual electrical show is still about six months in the future, there is a gratifying preliminary demand for space. The directors decided to make an early campaign owing to the intervening summer months, with the idea of getting contracts rounded up before the outing season begins. The show is set for October 31 to November 14.

Among the contracts already secured by Manager Homer E. Niesz are those signed by the General Electric Company, Westinghouse Electric & Manufacturing Company, Simplex Electric Heating Company, National Electric Lamp Association, Pelouze Manufacturing Company, Federal Sign System (Electric), Electric Storage Battery Company, Commonwealth Edison Company, Electrical Testing Laboratories, Hughes Electric Heating Company, American Telephone & Telegraph Company, Chicago Telephone Company, Fort Wayne Electric Works, Birtman Electrical Company, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN *Electrical World*, *Popular Electricity*, and others. Many of these concerns have taken more space than they used in the last Chicago show. The offices of the Electric Show are in the new Edison Building 72 West Adams Street, Chicago, where diagrams of the floor space and other information may be secured.

Utah Society of Engineers.

The annual banquet and meeting of the Utah Society of Engineers was held at the Hotel Utah, Salt Lake City, on April 17. Ledyard M. Bailey was toastmaster and addresses were made by A. S. Peters, chief engineer of the Mountain States Telephone & Telegraph Company, retiring president; W. W. Armstrong, president of the National Copper Bank; W. J. Barrette, president of the School Board; John C. Howard, president of the Utah Oil Refining Company.

Following the banquet, the annual election of officers were held. Sylvester Q. Cannon, city engineer of Salt Lake City, was elected president. The other officers chosen were: Samuel S. Arentz, chief engineer of the Interurban Construction Company, vice-president; Frank W. Moore, architect, secretary; L. H. Jones, of the city engineer's staff, treasurer.

Kentucky Workmen's Compensation Act.

Every manufacturer of electricity or electrical appliances in Kentucky who has more than six people on his payroll constantly will be subject to the provisions of the new Workmen's Compensation Act which was passed by the last State Legislature. It becomes a law on June 16, but does not become effective between the employers and their employees until the first of next January.

Electrical Day at Portland Ad Club

Electrical Day at the Portland, Ore., Ad Club's luncheon at the Portland Hotel on April 8, brought out an attendance that crowded the large main dining room of the hotel to its capacity.

The combined electrical interests of Portland were in charge of the arrangements for this day, with C. C. Craig, sales manager of the Northwestern Electric Company, as chairman of the day. Many amusing features were developed during the luncheon, among them the mock contest for the chairmanship between A. C. McMicken, sales manager of the Portland Railway Light & Power Company and C. C. Craig. Mr. Craig, after winning out, indulged in a touching tribute to his rival.

Another feature was the electrical contractors' efforts as producers of harmony—in the form of a band concert—but it was soon discovered that the melody proceeded from a band stationed behind a screen and the contractors succeeded in having themselves ejected.

The dining room was attractively festooned with varicolored incandescent lamps and other lighting effects. A number of interesting high-frequency experiments were performed in the center of the room under the direction of a red-garbed devil, with effects startlingly realistic.

The French inventor, Prof. Henri Jacques Boissant, demonstrated and explained his new talking arc lamp. Thomas Drier, editor of *Associated Advertising*, then gave a very interesting talk. It was a much enjoyed occasion throughout and the electrical people earned the appreciation of all present for the elaborate arrangements made.

Summer School at Wisconsin.

The fourteenth annual summer session of the College of Engineering of the University of Wisconsin will open on June 22 and continue for six weeks. Special courses of instruction and laboratory practice are offered in electrical, hydraulic, steam and gas engineering, mechanical drawing, applied mechanics, testing of materials, machine design, shopwork and surveying.

Students interested in this work may secure detailed information regarding the proposed classes by addressing F. E. Turneaure, University of Wisconsin, Madison, Wis.

Chicago Jovian Meeting.

At the meeting of the Jovian League of Chicago on April 27, R. J. Sewart, of the H. W. Johns-Manville Company presented a paper on the Audiffren refrigerating machine, in which he described in detail the construction and operation of the machines and their wide application.

Preceding the paper, Joseph Fowler, Jovian statesman from Memphis outlined the activities of the local Jovian league. This League is taking a part in the civic affairs of the city and is accomplishing much good. An electrical show will be held in Memphis in June under the auspices of the League.

John G. Learned, of the Public Service Company of Northern Illinois presided at the meeting.

Jovian Electrical League of Southern California.

At the weekly luncheon held on April 22 at Los Angeles, Cal., by the Jovian Electrical League of Southern California, District Attorney Joseph W. Ford delivered an address on the "Duties and Responsibilities of a District Attorney." Mr. Ford related some of his experiences, both tragic and humorous. The chairman of the day, Harry W. Harrison, also furnished some high-class cabaret entertainment.

A rejuvenation will be held at the Clark Hotel, Los Angeles, Friday evening, May 15. It is expected that at least 40 new members will be initiated at that time.

Utah and Idaho Jovians Celebrate.

On April 18 a fine rejuvenation of the Jovian Order was held at Pocatello, Idaho. James B. Brockaw, statesman for Idaho, was in charge and was assisted by A. E. Smith, A. L. Faber and H. F. Holland, of Salt Lake City, Utah, and E. A. Wilcox, of Twin Falls, Idaho.

On the evening of April 21, following the conference of Utah Power & Light Company representatives at Salt Lake City, Utah, a very successful Jovian rejuvenation was held. Statesman John C. Jones, of Utah, was in charge. He was assisted by several very active committees.

Handbook of Jovian Procedure.

The Jovian Order has published a handbook of Jovian Procedure, covering in minute detail all the duties of a Jovian Order and Jovian rules and procedure covering every contingency which may arise in the prosecution of Jovian work. There is also a considerable portion of the book devoted to suggestions for increasing local membership and information with respect to building up attendance and creating practical development work.

Godfrey H. Atkin.

The electric storage battery is one of the earliest practical devices related to the commercial development of the electrical industry. In fact, there was a time, as we all well know, when this source of electrical energy was considered to be the first and last word in this development. However, with the invention and design of other forms of apparatus for the generation of electrical energy there has been a corresponding development of the electric storage battery and today we find it occupying a most important and necessary place in the field of power production, and while from the technical standpoint the storage battery has been greatly improved since the earlier types, the commercial feature of the storage battery has experienced just as great and significant a development. New uses for the equipment and enlarged ideas with respect to ultimate service have been due in a great measure to the men who have had the responsibility of making the electric storage battery a commercial success. Conspicuous among those who have contributed to the position the electric storage battery now holds in the electric field is the subject of this sketch, Godfrey H. Atkin.

Mt. Atkin was born in England in 1866, and his British parents christened him Godfrey Harold. He is better known, however, among a host of friends in the electrical fraternity as "Tommy." "Tommy" began his career with the Thomson-Houston Electric Company in the little old Michigan Avenue shop in Chicago in 1890, and he has been identified with the electrical industry ever since. For the past 12 years he has been manager of the Chicago office of the Electric Storage Battery Company, of Philadelphia. This office controls the sub-offices at St. Louis and Denver. In 1902 Mr. Atkin's office had four employees. There are now 21. At that time the only Exide depot was in a part of an automobile-equipment store back of Michigan Avenue, and the force consisted of one man. The Exide Depot in Chicago has been increased until it now takes 60 employees to keep things going.

Mr. Atkin is broad shouldered and energetic. His enterprise is well known and his genial good nature is a happy feature of the gatherings of electrical men at state and national conventions. Always popular, he has taken an active part in electrical affairs and in connection with Chicago conventions of electrical men he has always carried a large part of the responsibility for the comfort and edification of the visitor to the city. He has been vice-president of the Chicago section of the Electric Vehicle Association; president of the Railway Electrical Supply Association; one of the promoters and at present a director of the Electrical Trades Exposition Company, under the auspices of which the six big electrical shows have been held in Chicago.

Godfrey H. Atkin,
Manager of the Chicago Office of The Electric Storage Battery Company.

He is a member of the Chicago Athletic Association, the Midday, Evanston Country, Evanston Golf, Evanston Yacht, Chicago Yacht and Royal Canadian Yacht Clubs. He is an ardent sailor and is owner and skipper of the schooner *Nomad* and Fleet Captain of the Chicago Yacht Club.

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Empire State Meeting.

The spring meeting of the Empire State Gas and Electric Association was held at the Alerts Club, Medina, N. Y., on April 22, there being about 100 people, representing 50 or 60 companies present. J. T. Hutchings, president of the association, occupied the chair at both sessions of the meeting.

At the morning session the speakers were: Assemblyman Cyrus W. Philips, of Rochester; Edgerton Parsons and Mr. Belden, of Buffalo, all of whom spoke on the subject of the new workmen's compensation law, which is going into effect in New York State on July 1, 1914. Mr. Philips explained many of the important features of the law and answered numerous questions in regard to them. Mr. Belden discussed the subject from the standpoint of the liability insurance company and Mr. Parsons explained a plan for mutual insurance for the gas and electric companies of the state

At the close of the morning session luncheon was served to the delegates at the Alerts Club, following which they were taken to the power house of the local company and to other points of interest in the town.

Upon reconvening for the afternoon session some time was devoted to discussion of the water power situation, both as regards proposed legislation in this state and pending legislation at Washington. The association's Safety Committee submitted a brief report indicating the work which the committee had undertaken.

The delegates extended a hearty vote of thanks to A. B. Swett, president of the Swett Electric Light & Power Company, of Medina, and to his associates, as well as to the speakers of the day.

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Los Angeles Jovians Discuss City Planning.

John E. Lathrop, of New York City, director of exhibits for the American City Bureau, gave a very interesting and forceful lecture at the regular weekly luncheon of the Jovian Electrical League of Southern California, held at Los Angeles on April 15. The subject of "City Planning" was covered very thoroughly and the need of Los Angeles for a definite scheme of segregation for factories, homes, schools, etc., was discussed. Mr. Lathrop predicted that a city plan commission would soon be appointed in Los Angeles. This will be a valuable addition to the city government in view of the great problem which the city will face upon the opening of the Panama Canal. Miss Stafford, whistling virtuoso, entertained.

Gas Engines versus Steam Turbines for Steel-Mill Plants.

A joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, was held on the evening of April 27 in the rooms of the latter society, Monadnock Block, Chicago. D. W. Roper presided.

The paper of the evening was entitled "Power Problems in Steel Mills," and was presented by F. G. Gasche, of the Illinois Steel Company. This paper dealt almost exclusively with the question of prime movers for steel-mill plants and discussed the relative advantages of the gas engine and steam turbine for this purpose. Mr. Gasche pointed out the descrepancy between the expected and the actual performance of gas engines supplied with blast-furnace gas. He discussed the thermodynamic efficiency of the two types of units and stated that in a run of about three months of a plant operating with gas engines under the best conditions, the efficiency of these units was 19.2 per cent, compared with something over 50 per cent theoretical. He called attention to the high temperature of the exhaust gases from the gas engine.

The efficiency of steam turbines is steadily being increased and he looked forward to a still further increase by making use of higher temperatures of superheat, so that the efficiency of the turbine unit will gradually be brought up to that of the gas engine.

Turning to installation costs, Mr. Gasche pointed out that a gas-engine equipment cost about $100 per kilowatt; whereas, a steam-turbine installation for identically the same plant would cost but $55 per kilowatt. In a typical plant operating gas engines about 6,000 hours per year, the operating cost per kilowatt per year would be $8 and in a corresponding turbine plant, $13.10. On adding to these operating costs 15 per cent fixed charges there would still be left a balance of $1.65 per kilowatt per year in favor of the steam turbine.

The operating characteristics of gas engines are far from ideal, considering the widely variable and quickly fluctuating character of the load of a steel mill. The time lag of a four-cycle gas engine is so great that anything like regularity of speed is impossible, which is still more objectionable in an alternating-current plant. Gas engines, moreover, have low efficiency at low loads. The total efficiency of a gas-engine unit at 70 per cent load-factor is only about 16 per cent, compared with 19.2 per cent when operating under ideal conditions of constant full load. Therefore it is the best practice to use steam turbines to carry the peak loads and to make up the deficiency in generating capacity that has been noticed in practically every gas-engine installation for steel-mill service.

The discussion was opened by W. B. Jackson, who stated that he had not felt it wise to advise any of his clients to use gas engines on a large scale. However, he pointed out that the gas engine by achieving a higher efficiency of conversion of the potential energy of the fuel to the electrical energy at the switchboard is an important step in the right direction. It may be possible in the future to secure an energy conversion direct from the fuel to electricity of higher efficiency than is now attained from the mechanical energy in the shaft of the generator to the electrical energy at the switchboard.

Taliaferro Milton called attention to the value of a storage battery as an auxiliary to a gas-engine installation in keeping the load very nearly constant on the engines. Referring to the installation at Gary, Ind., he pointed out that the battery there serves admirably in reducing the sudden peak loads and in equalizing the service.

E. W. Allen said it must be admitted that there has been an advance in gas-engine practice. However, very sudden fluctuations of 30 per cent on either side of the average load are very common in steel-mill practice. It is possible to use a storage battery connected through rotary converters to the alternating-current buses but the additional equipment added to an installation already representing very high initial cost would make the total cost practically prohibitive. Therefore, a steam-turbine reserve is almost always essential to take care of the violent fluctuations of load and permit the gas engines to operate more nearly under their best conditions. He looked forward to considerable advance in steam-turbine efficiencies, particularly from the suggested combination mercury and steam turbine unit that is being developed by Mr. Emmett.

O. H. West said he felt called upon to say a few good words on behalf of the gas engines. The engines at the Gary plant can be started from standstill and synchronized in something like 30 seconds. The objection that Mr. Gasche had raised to the high temperature of gas-engine exhaust can be done away with by utilizing the latter for developing steam for turbine auxiliaries. In recent years the governors of gas engines have been very decidedly improved, so that their regulation is much better than was the case formerly.

Mr. Gasche replied to some of the points raised by stating that he thought it feasible to utilize an initial temperature of 1,000 degrees Fahrenheit, or even higher, by means of superheating the steam for turbine use. This, together with other refinements in turbine practice, will not only increase the thermodynamic temperature range of these units but also improve their operating performance in other ways. Relying to questions raised by Messrs. Wait and Roper, he stated that in a plant where gas engines were to be used it would be desirable to have at least 30 per cent of the generating capacity driven by steam turbines. Replying to some remarks on the use of flywheels that had been made by Mr. Sykes, he said that great inertia is necessary in all steel-mill motors, particularly those used for operating rolling mills. If massive rotors or separate flywheels were not provided for these machines the stress fluctuations would be so violent as to tear the machine to pieces. He stated further that it is true that much advance has taken place in gas-engine practice, particularly in the operation of these machines under severe conditions. While it is possible to use the engine exhaust for developing steam in low-pressure boilers, the cost of the additional equipment would be greater than the benefit derived.

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Utah Electric Club Discusses Panama Tolls.

At the regular weekly luncheon of the Utah Electric Club, held at Salt Lake City, April 16, Judge C. S. Varian read an able paper prepared by him especially for the club on the Panama Canal tolls question. Judge Varian traced the history of negotiations from the time that an isthmian canal was first considered down to the present day. He quoted copiously from presidential messages, state department papers and treaties, which indicated clearly that it had been the intention of the United States Government long before it had itself considered the proposition of building a canal to so arrange matters that, by whomsoever the canal was built, it should be maintained and operated entirely neutral. He maintained very strongly that both by treaty and by moral obligations, the United States should not exempt coastwise vessels from tolls.

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Oklahoma Gas, Electric and Street Railway Convention.

The Gas, Electric and Street Railway Association of Oklahoma, will hold its third annual convention in Oklahoma City, Okla., on May 13, 14 and 15, with headquarters at the Lee-Huckins Hotel. An interesting series of papers has been prepared for the convention, among them being one by Corporation Commissioner G. A. Henshaw, and another by W. J. Norton, editor of *Rate Research*.

Iowa State Section, National Electric Light Association.

Fourteenth Annual Convention, Cedar Rapids, Iowa, April 22, 23 and 24.

The fourteenth annual convention of the Iowa State Section of the National Electric Light Association was held in Cedar Rapids, Iowa, April 22, 23 and 24, headquarters being established at the Montrose Hotel. During the week also the tenth annual meeting of the Iowa Street and Interurban Railway Association was held, and also the second semi-annual convention of the Iowa Electrical Contractors' Association, the latter holding two parallel sessions with the central station. The opening session was called to order by A. L. Dodd, of Charles City, president of the Association, who presented the annual presidential address. In his introductory remarks, Mr. Dodd paid a tribute to the late George Westinghouse, and briefly reviewed some of the events of his career.

The nitrogen-filled incandescent lamp was referred to by Mr. Dodd as one of the greatest developments of the year in the electrical industry. He stated that there are many in use in Charles City which are operating satisfactorily in both indoor and outdoor service. He held that these lamps were the greatest weapons so far developed with which to successfully combat the so-called gas arcs.

Speaking of conditions in the state, Mr. Dodd said that the increase in the number of municipally owned plants in some localities was significant and should be seriously considered by all companies in the state. He urged that utilities take an active part in civic affairs and extend the lowest consistent rates for city pumping and street lighting service. This, coupled with good service and equitable rates to all customers, will have a strong influence in discouraging municipal ownership. Mention was made of the Society for Electrical Development as an influence for good in the electrical industry and all companies were urged to take an active part in the affairs of this organization.

It was pointed out that the tendency of the times is toward consolidation of the smaller companies, and mention was made of the economies that can be effected by such mergers. Mr. Dodd ventured the opinion that the entire state could be profitably supplied from two or three large generating stations.

In conclusion, he referred briefly to the regulation of utilities by state commissions and urged the companies represented in the Iowa Association to co-operate in having a good utilities' bill presented to the Legislature.

The Nominating Committee, composed of Austin Burt, M. A. Harrison, H. C. Blackwell and H. O. Brownell, was then appointed.

Secretary H. B. Maynard, of Waterloo, then presented the report of the secretary-treasurer, which indicated a substantial growth of membership and a flourishing financial condition.

At this point Fred Benson, of the General Electric Company, was called upon for a few remarks relative to the new high-efficiency incandescent lamps. Mr. Benson urged particularly that the new lamps should not be referred to as nitrogen-filled or nitrogen-gas lamps. These lamps are now made in sizes from 750 to 1,000 watts for multiple service, and 5.5, 6.6, 7.5 and 20 amperes for series street-lighting circuits. 400 and 500 multiple lamps will soon be available. Mr. Benson referred briefly to some of the uses for the new lamps and pointed out that they were particularly desirable for use in street lighting when such service is furnished on a candlepower basis.

E. O. Switzer, of the Westinghouse Electric & Manufacturing Company, discussed Mr. Benson's remarks, calling attention to the fact that the efficiency of the metallic-flame lamp compares favorably with that of the new high-efficiency incandescent lamp. He also stated that the cost of cleaning and renewing the incandescent lamp could be compared with the cost of trimming the arc lamps, and he strongly urged that the four-ampere luminous arc should be given consideration for street lighting purposes. He thought that the incandescent lamp would eventually find a greater field for indoor illumination.

The paper entitled: "The Society for Electrical Development," by J. M. Wakeman, was then read by Secretary Maynard. This paper outlines the plans of the Society and asks for the co-operation of all companies and individuals allied with electrical work.

At the afternoon session a paper entitled "Co-operation Between Contractors and Central Stations" was presented by J. T. Marron, of Rock Island, Ill. This paper comments at some length on the relationship which should exist between the central-station company and the local electrical contractors, and the good that can come from close co-operation. The utility company should cultivate the friendship and co-operation of the contractors by refraining from doing any interior wiring and by maintaining standard prices on devices that are sold.

On the other hand the contractor should see that all wiring is done in the best manner and that all specifications are complied with. Sufficient outlets should be provided so that the service will be as convenient as possible to the user and this also makes for a greater use of electricity.

It is essential that central stations and the contractors meet at least once each week and discuss plans for securing new business and other mutual subjects. Mr. Marron thought that the contractors were considerably to blame for the lack of harmony which has previously existed and that due to the efforts of the various organizations both national and local, this condition is fast disappearing. Co-operative advertising by central stations and contractors was advocated as an economical and satisfactory plan.

Mr. Marron thought that jobbers of electrical material should curtail credit extended to the so-called curbstone contractors and in this way encourage the legitimate firm which is endeavoring to do its work in the best possible manner. In conclusion he thought that the central-station companies should encourage the establishment of electrical stores and through these bring to the attention of the public the great number of electrical devices suitable for domestic and commercial use.

In commenting on Mr. Marron's paper, A. L. Dodd, of Charles City, explained that the local central station turns all wiring over to the local contractors and in addition, pays 10 cents for each outlet wired. In addition to stimulating the wiring of a greater number of outlets, this plan creates good feeling between company and contractors.

George A. Wrightman, of Des Moines, then presented a paper entitled "The Compensation Law and Its Application." This paper was divided under two general headings, (1) fundamental principles of the Iowa law which is to go into effect on July 1, 1914; and (2) liability insurance as affected by this law. Mr. Wrightman stated that the law about to be enforced is extremely simple, and there are only a few fundamental clauses that need be remembered by employers of the state. In the first place, every employer is assumed to have elected to come under this law unless notice to the contrary is given.

The next general feature is that the

law provides a specific schedule of payments to be made which vary according to the injury sustained by the workman. Under the old liability law there was practically no limit set for the payments that could be ordered by juries, and this feature of the new law makes it possible for an employer immediately after an accident to know exactly what his liability will be. Also, under the new law, litigation is practically eliminated and no extensive law suits will be necessary.

The third general feature is that employers may insure under the law and thus provide against unexpected expenditures that may be caused by a serious accident.

Mr. Wrightman stated that there are approximately 25,000 employers in Iowa and so far no instances of anyone refusing to come under this law has come to his notice. He explained that if an employer should elect not to come under the new law he would be prohibited from using the three old common-law defences. He stated further that such an employer would moreover go into court with prejudice against him. This also applies to the employee who should elect not to come under the law, the advantage being in either case with the party coming under its provisions. However, if both employee and employer reject the law it automatically places both parties under it.

Speaking of the insurance feature, Mr. Wrightman stated that all of the existing insurance companies must necessarily raise their rates for insurance under the new compensation law. The rates of New Jersey are taken as a standard and as these are at present three times higher than the rates existing in Iowa, it is safe to assume that the rates which will be made for insurance in Iowa after July 1 will be from 5 to 10 per cent higher than the present New Jersey rates. Mr. Wrightman said that anticipating this situation, the Manufacturers' Association of Iowa has formed an insurance company to handle the liability insurance of its members and the electrical associations of the state were invited to participate. He said that the Association by the elimination of the overhead charges of the reserve companies can make rates at least 50 per cent lower than those which will be given by these companies. All money left over at the end of the year will either be returned pro rata or applied on the premiums for the following year. The fund, however, will be reinsured in an established company so that there will be no possible chance of an assessment in case the fund created by the policies is exhausted by reason of unusual accidents.

At the session on Thursday morning, the first business taken up was a paper by W. A. Ross entitled "A Few Features of the Operations of the New Development at Keokuk." In the absence of the author, this paper was read by A. D. Ayers. This paper comments on the features of the noteworthy Keokuk development and enumerates some of the difficulties that were encountered in construction. The most important of the latter was the variation in flow of the river at the point selected for the development, this variation being from 20,000 to 300,000 second-feet. The electrical equipment of the generating station was described, and important features of the transmission lines and substations commented on. It was pointed out that the load-factor of the station at the present time is 63 per cent. The kilowatt-hour output in December last year was 923,000. It was also pointed out that the loss in voltage between the generating station at Keokuk and the substation at St. Louis amounted to 12 per cent.

Following this, a paper entitled "Conduct of Public Utilities under Commission Supervision" was presented by F. W. Stearns, of Chicago. Mr. Stearns reviewed briefly the history of commission regulation, commenting on the policies of the utility companies which in a measure were responsible for the growing demand for supervision of some kind. Massachusetts, New York and Wisconsin were the first states to provide for state regulation of public utilities, and since the establishment of these commissions, 26 states have follower their example.

Mr. Stearns strongly advocated the central control of utilities by state commissions rather than home rule which is so uniformly advocated by many of the large cities. He stated that while some public service companies were at first doubtful as to the results of regulation, at present there is hardly a company in any of the states having commissions that would favor the return to municipal regulation. Mr. Stearns stated that while the commissions at present are not entirely free from politics, as the commissioners are in every case appointed, still the commissioners by devoting their entire time to the study of utility problems become much better qualified to handle the work than city councils who are, of course, unfamiliar with the problems which they are trying to solve. It is also true that the state commissions usually surround themselves with competent engineers who are in a position to handle their work on a scientific basis.

One of the good features of utility regulation in most states is that electrical securities now have to be approved by the public service commission, and this puts the securities on an investing rather than a speculative basis.

Mr. Stearns referred to several of the decisions made by public service commissions in rate and franchise cases and stated that where the utility meets the commission in a spirit of fairness, fair treatment is usually given. However, many of the state public service laws are lacking and unnecessarily curtail the powers of the commissions to protect the utility companies. A case in Stockton, Cal., and in Oregon, Wash., were cited in this connection, in both instances franchises being issued to municipal plants although no complaint could be found with the service and rates of the existing privately owned companies. In both of these states the commissioners criticized the law which prevented them from withholding franchises from these municipalities.

Prof. A. H. Ford opened the discussion inquiring of Mr. Stearns whether a company could earn an amount greater than the rate specified by the commission if such excess was due to economies in management. Mr. Stearns replied that in most states the commissions make reasonable provision for economies in management. Prof. Ford added that it would seem advisable to introduce into the law a section making reduction of rates impossible until a certain specified rate of return is exceeded. This would allow a company to effect economies by efficient management and profit thereby, whereas under existing laws the savings effected by good management are penalized.

William D. McJunkin, Chicago, then delivered an address on "Co-operative Advertising." Mr. McJunkin first called attention to the value of advertising by public utility companies and to the economies that could be effected by co-operative advertising. He outlined in some detail the plans of the McJunkin Agency for furnishing advertising copy, news items, hand bills, bill stuffers, etc., on a co-operative basis.

He also referred to a scheme adopted by the Commonwealth Edison Company for illuminating local billboards on a co-operative basis. The annual revenues of the company from this business have now reached the figure of $60,000. Samples of advertising of various kinds furnished under the co-operative plan mentioned were exhibited.

The report of the Committee on Facts and Factors of which Austin Burt, of Waterloo, is chairman, was then presented. This report, as has

Facts and Factors of Iowa Central Stations.

STATION NUMBER	Population of District	No. Consumers per 100 Population	Station Rating, Kw	Sation Rating per Capita, Watts	Station Rating per Employee, Kw	Ratio Station Rating to Con'cted Load, per Cent	Average Load During Operation, Kw	Ratio o Av. Load to Station Rating, per Cent	Annual Load Factor, per Cent	Operating Load Factor, per Cent	Investment per Kilowatt of Rating	Investment per Capita	Gross Income per Kilowatt of Rating	Gross Income per Consumer	Gross Income per Capita	Gross Income per $100 Invested	Gross Income per Kw-hr. Made, Cents	Ratio Expense to Gross Income, per Cent	Net Earnings, per $100 Invested, Interest and Depreciation not Deducted	Total Hours of Operation per Year
Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1............	700	12.8	75	107	37	93	10.0	13.3	34.2	50.0	$200	$21.43	$58.70	$48.90	$ 6.29	$29.30	7.3	127.1	$ 8.00	6,000
2............	750	16.0	75	100	25	250	4.4	5.9	10.5	26.0	173	17.33	38.54	24.08	3.35	22.22	18.5	68.5	7.00	3,540
3............	1,050	7.9	17	16	17	62	......	....	....	....	400	6.67	167.30	34.30	2.71	40.65	....	77.4	9.15	2,500
4............	1,100	19.4	75	68	25	...	......	....	....	....	160	10.90	80.00	28.00	5.46	50.00	....	66.7	16.67	8,760
5............	1,200	14.6	50	42	25	91	10.0	20.0	16.5	22.2	240	10.00	112.20	32.05	4.67	46.75	8.6	85.5	6.75	6,500
6............	1,200	16.6	75	62	25	37	13.8	18.4	17.3	27.6	224	14.00	100.00	37.50	6.25	44.65	9.9	70.0	13.40	5,500
7............	1,200	14.2	90	75	90	...	3.5	3.9	....	....	164	12.30	35.70	18.88	2.67	21.75	10.5	69.8	6.57	8,760
8............	1,200	14.6	50	43	25	28	13.0	26.0	15.0	30.0	400	16.67	154.00	44.00	6.42	38.50	13.9	89.6	4.05	4,380
9............	1,400	21.4	125	89	42	48	15.0	12.0	23.9	25.0	120	10.72	......	......	......	......	....	.....	....	8,360
10............	1,400	7.0	40	29	40	100	11.0	27.5	8.7	30.0	262	7.50	67.60	27.57	1.93	25.75	9.6	55.5	11.50	2,550
11............	1,500	13.3	60	40	20	48	25.0	41.7	15.7	50.0	167	6.80	124.20	37.25	4.97	73.05	10.8	84.0	11.66	2,750
12............	1,500	25.0	125	83	25	...	......	....	....	....	200	16.67	104.60	34.90	8.72	52.30	....	84.5	8.08	8,760
13............	1,600	20.3	110	69	29	21	72.9	66.0	66.0	75.0	243	16.25	149.10	49.10	9.97	61.40	2.8	46.6	32.75	7,710
14............	1,600	16.6	200	125	50	67	14.8	7.1	14.4	17.7	125	15.62	53.70	40.70	6.71	42.95	10.5	74.5	10.92	7,120
15............	1,600	20.0	100	62	33	42	10.3	10.3	12.1	12.1	370	23.10	80.00	25.00	5.00	21.62	8.9	.....	....	8,760
16............	1,700	12.2	175	103	58	70	22.6	12.9	16.9	39.3	131	13.51	47.50	39.95	4.89	36.10	9.8	76.5	8.48	3,760
17............	2,000	10.3	90	45	30	60	25.8	28.7	12.2	36.8	178	8.00	99.40	43.40	4.47	55.90	11.9	64.0	20.10	2,900
Average 1914.	1,337	15.4	90	68	35	73	18.0	21.0	20.2	34.0	221	13.40	92.00	35.35	5.31	41.40	10.2	76.0	10.61	5,800
Average 1913.	1,416	14.2	88	61	28	56	20.2	26.6	....	30.2	216	10.93	93.28	31.96	5.43	51.51	11.6	66.6	20.51	4,871
Average 1911.	1,415	11.9	82	62	36	94	19.4	26.3	....	33.8	205	11.03	84.30	48.20	4.33	43.50	10.9	73.4	8.23	4,840
Average 1909.	1,600	10.0	67	42	27	94	......	....	....	36.0	236	10.00	94.00	37.00	4.06	38.00	....	70.0	....	.....
18............	2,200	15.9	140	64	47	42	16.9	12.0	21.9	23.2	171	10.85	92.50	37.00	5.89	54.20	9.2	55.4	24.15	8,260
19............	2,400	12.1	130	54	26	26	20.0	15.4	20.9	22.2	215	11.66	76.90	34.50	4.17	35.70	6.1	80.0	7.14	8,260
20.	2,500	22.9	160	64	26	23	56.6	35.3	37.7	37.7	237	15.20	127.90	35.75	8.20	53.90	4.1	72.2	15.00	8,760
21.	2,900	15.7	190	65	38	26	14.9	7.8	15.0	15.0	225	14.74	62.40	26.00	4.09	27.70	9.1	63.7	10.05	8,760
22............	3,000	20.0	100	33	25	33	37.0	37.0	34.9	35.0	250	8.33	166.67	27.80	5.55	66.67	5.2	72.0	18.65	8,740
23............	3,000	16.6	210	70	35	47	26.3	12.5	27.6	27.7	166	11.63	66.40	27.90	4.65	40.00	6.1	89.2	4.30	8,740
Average 1914.	2,667	17.2	155	58	33	33	28.6	20.0	26.4	26.8	211	12.07	98.80	31.50	5.42	46.40	6.6	72.1	13.21	8,600
Average 1913.	2.437	16.6	163	67	36	43	27.1	16.7	....	27.4	201	12.88	105.40	41.53	6.76	58.10	8.0	75.6	18.46	8,573
Average 1911.	2,650	12.7	157	60	29	55	28.4	25.1	....	33.0	190	10.61	83.20	37.40	4.52	41.90	5.7	76.1	10.39	7,620
Average 1909.	2,470	10.0	122	44	38	48	......	....	....	....	221	9.40	95.00	43.00	4.04	41.00	....	63.0	....	.....
24............	3,500	12.8	300	86	60	50	53.7	17.9	27.1	29.0	150	12.85	68.60	45.70	5.88	45.70	4.7	67.8	14.71	8,200
25............	3,850	13.1	400	104	44	...	......	....	....	....	237	24.60	47.90	38.00	4.98	20.20	....	88.8	3.73	8,760
26............	4,200	17.3	285	68	28	35	......	....	....	....	141	9.60	82.30	32.30	5.58	58.20	....	58.9	23.88	8,200
27............	5,000	10.8	270	54	30	30	57.0	21.1	19.0	19.0	333	18.00	119.00	59.60	6.43	35.73	6.4	58.9	14.70	8,760
28............	5,000	13.2	190	38	31	40	28.6	15.0	25.9	25.9	263	10.00	113.40	32.70	4.31	43.10	8.6	74.2	11.10	8,760
29............	5,200	19.0	1040	200	62	50	152.0	14.6	38.0	38.0	120	24.00	52.40	55.00	10.47	43.60	4.1	68.7	13.60	8,760
30............	6,000	10.1	380	63	47	50	22.2	5.8	14.8	14.8	158	10.00	50.40	31.50	3.19	31.90	9.9	79.2	6.62	8,760
31............	7,000	18.9	300	43	33	43	78.0	26.0	20.8	20.8	300	12.85	136.30	31.00	5.84	45.45	6.0	50.9	22.32	8,760
32............	7,000	14.7	875	125	125	62	30.8	3.5	13.7	13.7	343	42.85	27.45	23.43	3.43	8.00	8.9	41.1	4.71	8,760
33............	8,000	12.0	590	74	37	39	68.5	11.6	24.8	24.8	495	36.60	112.00	68.80	8.28	22.60	11.0	68.0	7.24	8,760
Average 1914.	5,475	14.2	463	86	50	44	61.4	14.4	23.0	23.3	254	20.14	80.97	41.80	5.84	35.45	7.5	65.7	12.12	8,648
Average 1913.	4,550	12.9	277	61	33	66	36.7	21.4	....	33.0	222	12.67	116.16	52.78	7.06	61.76	7.7	63.4	27.81	7,379
Average 1911.	4,580	11.5	239	53	33	74	42.1	18.0	....	26.7	248	12.30	88.50	38.75	4.46	38.25	6.8	67.1	13.95	7,720
Average 1909.	5,670	10.0	285	51	37	50	......	....	....	....	202	10.00	85.00	42.00	4.40	49.00	....	56.0	....	.....
34............	10,000	13.4	725	72	20	51	117.0	16.1	25.0	25.0	388	28.10	75.70	40.85	5.49	19.53	5.4	65.5	6.73	8,760
35............	10,750	14.3	1100	103	27	77	143.2	13.0	29.0	29.0	454	46.52	55.45	39.60	5.67	12.20	4.9	62.0	4.63	8,760
36.	11,000	13.6	2000	182	74	133	228.0	11.4	45.6	45.6	342	62.20	35.67	47.50	6.48	10.42	3.6	52.8	4.91	8,760
37..	12,000	10.4	950	79	47	95	113.0	11.9	26.9	26.9	....	......	......	.....	.....	......	....	.....	....	8,760
38............	17,000	11.8	850	50	61	40	202.3	23.8	30.0	30.0	470	23.40	113.70	48.35	5.70	24.30	5.4	49.0	12.40	8,760
Average 1914.	12,150	12.7	1125	97	46	79	160.7	15.2	31.3	31.3	414	40.10	70.10	44.10	5.84	16.60	4.8	57.3	7.17	8,760
Average 1913.	17,060	7.2	1080	63	119	56	215.0	20.0	....	29.7	579	27.47	82.55	64.07	4.27	60.55	4.9	50.3	18.13	8,760
Average 1911.	14,500	8.4	1206	92	128	70	141.0	14.1	....	22.6	277	18.70	65.70	52.95	4.27	24.10	5.5	54.7	12.71	8,760
Average 1909.	15,500	5.0	775	50	71	67	......	....	....	22.0	139	8.00	60.00	60.00	3.20	54.00	....	71.0	....	.....
39....	25,000	9.7	1000	40	33	23	323.8	32.4	32.4	32.4	310	12.40	128.60	53.20	5.15	41.50	4.5	44.1	23.20	8,760
40	26,000	7.7	3000	115	176	27	582.0	19.4	35.9	35.9	177	20.38	67.95	102.40	7.84	38.45	4.0	55.0	17.30	8,760
41. .. .	30,000	13.3	2700	90	77	44	380.0	14.1	31.6	31.6	....	......	......	.....	.....	......	....	.....	... ..	8,760
42..... ...	38,000	12.2	4225	112	78	47	667.0	15.8	29.0	29.0	286	31.80	56.60	51.50	6.29	19.70	4.1	51.4	9.60	8,760
43..	45,000	6.6	5000	111	111	90	862.0	17.2	30.0	30.0	195	21.70	42.65	72.30	4.74	21.80	2.8	41.2	12.84	8,760
44............	117,000	7.6	8850	76	49	51	1675.0	18.9	35.0	35.0	339	25.60	66.55	66.70	5.03	19.62	4.0	.....	. ..	8,760
Average 1914.	46,830	9.5	4130	91	87	47	748.3	19.6	32.3	32.3	261	22.40	72.50	69.20	5.80	28.20	3.9	47.9	15.73	8,760
Average 1913.	44,500	7.5	3120	64	209	56	593.0	24.4	....	24.3	326	19.91	81.35	71.10	4.52	28.22	4.1	50.6	15.03	8,760
Average 1911.	55,600	6.2	2890	51	81	43	653.0	22.7	....	31.5	541	27.20	80.50	68.90	4.17	15.27	4.1	48.9	10.26	8,750
Average 1909	53,000	5.0	2110	46	262	42	......	....	....	24.0	195	9.00	88.00	79.00	3.50	42.00	....	51.0	....	.....
Grand Av.1914	9,890	14.3	852	77	46	57	159.2	18.5	25.2	30.0	251	18.40	85.80	41.35	5.57	36.70	7.6	67.9	11.57	7,565
Grand Av.1913	11,400	12.5	778	61	71	35	155.0	23.2	....	29.3	255	14.23	93.50	49.90	5.74	50.60	8.2	63.6	21.00	6,950
Grand Av.1911	14,920	10.6	576	64	51	72	117.0	22.0	....	30.1	252	13.85	82.10	47.60	4.36	36.80	7.8	67.5	11.82	6,710
Grand Av.1909	9,411	9.0	401	44	63	56	......	....	....	32.0	220	9.60	89.50	46.00	3.93	41.60	....	64.0	....	.....

been the custom for several years, gives detailed statistics on a large number of Iowa central stations, the material this year being compiled by the engineering experiment station of the University of Iowa, under the direction of F. A. Fish. The report is presented herewith.

At the session on Friday morning, E. W. Lloyd, contract agent of the Commonwealth Edison Company, Chicago, delivered an address entitled "The Object and Results of Affiliation." As vice-president of the National Electric Light Association, Mr. Lloyd called attention to the vast amount of data that the Association is collecting for the use of its members, particularly the Commercial Section, which is completing a revision of the Commercial Section Digest. Mr. Lloyd called particular attention to the educational work which the Association is carrying on and to the activities of the various committees. Reference was also made to the street-lighting statistics which are being compiled and to the preparation of a schedule of the principles of rate making. Mr. Lloyd stated that uniform rates were just as vital as uniform accounting to the central-station industry.

Following this address, J. E. Latta, of the Underwriters' Laboratories, Chicago, presented a paper entitled "Rubber-Covered Wire." Mr. Latta stated that up to 1911 a weakness of the National Electrical Code rules was the lack of requirements for sufficiently exacting factory and laboratory tests for a reliable determination of the real properties of the rubber compounds employed in rubber-covered wires. No chemical test at all was called for and the way was left open for the use of compounds which might be woefully lacking in the permanent properties of high-grade rubber, although such compounds might show up splendidly when the code tests were run on the new wire. But two tests were called for, namely, tests for insulation resistance expressed in megohms per mile and the test for dielectric strength. Since 1911 the rules have called for careful electrical tests on rubber-covered wire and for thorough physical and chemical tests of the rubber covering. The new-code wire is inspected at the factories by representatives of the Underwriters' Laboratories, and found to conform with the requirements of the latest edition of the National Electrical Code.

Mr. Latta strongly urged the use of new-code wire by central stations and contractors of the state and asked for their co-operation in discouraging the use of old-code wire. He said that it was significant that in no case would an engineer, architect or contractor permit the use of old-code wire in an expensive building where the cost of wire is a large item, but in residences and small installations where the additional cost of new-code wire over old-wire is negligible, numerous instances of the use of the poorer material are found. Mr. Latta predicted that unless the use of old-code wire could be stopped by mild means very soon, drastic treatment on the part of inspection bureaus would become necessary.

Following Mr. Latta's paper, W. H. Thomson, of Des Moines, made a motion to the effect that the Association encourage the use of new-code wire and in every case discourage the installation of old-code wire.

A. L. Fowler, a contractor of Cedar Rapids, stated that the Iowa Contractors' Association had passed a resolution to discourage the use of old-code wire and this Association would be more than willing to co-operate with the central-station organizations in this matter.

A paper entitled "Is There a Saturation Point in the Sale of Electricity?" was then presented by J. S. Forbes, of Cedar Rapids. This paper, which is presented in full in another part of this issue, urges central-station companies to maintain a new-business department even if this department must necessarily be limited to one man. Details of a house-wiring campaign carried on at Marshalltown, Iowa, are presented and some of the various schemes adopted by the Cedar Rapids Company for securing different classes of business, are described.

Rufus E. Lee,
President-elect, Iowa State Section, National Electric Light Association.

Following this paper, the convention went into executive session, at which the report of the Nominating Committee was presented. The following were elected to office for the ensuing year:

President, Rufus E. Lee, Clarinda.

Vice-president, A. D. Ayers, Keokuk.

Secretary, W. H. Thomson, Jr., Des Moines.

Treasurer, W. A. Mall, Belle Plaine.

The new Executive Committee is composed of A. L. Dodd, H. B. Maynard, H. C. Blackwell and M. A. Harrison. Keokuk was decided upon for the place of the next annual meeting.

The entertainment features of the convention included the annual banquet on Wednesday night at which the manufacturers and supply men were the hosts, and a theater party on Thursday night given by the Cedar Rapids and Marion Street Railway Company, and the Iowa Railway & Light Company. Following this, a rejuvenation of the Jovian Order was held at which 27 candidates were initiated. Charles Young, of the Iowa Railway & Light Company, statesman for Iowa, conducted the rejuvenation, and J. B. Terry was in charge of the degree team. On Thursday afternoon a special car carried the delegates to Iowa City, where an inspection trip of the laboratories and buildings of the state university was made. Prof. Ford presented a paper on "High Tension Lightning Protection," demonstrating the various types of lightning arresters at present on the market. He conducted numerous demonstrations showing the principle involved in arcing rings for insulators, and pointed out that insulators should be purchased which would flash over at 50 per cent below puncture voltage.

Lightning Protection.

Lightning troubles on high-tension lines have their origin in differences in potential that exists between charged rain-clouds and the earth. The danger to lines is in the sudden collapsing of the charges. The clouds held a large charge on the transmission lines due to induction. When the flash takes place this large charge travels along the transmission line seeking a path to earth, and usually manages to "spill over" through a weak insulator on a pole, or through a poorly insulated spot in a transformer. The only means for securing perfect protection for a transmission line is to completely surround it with a tube of such low resistance and carrying capacity that no inductive effects or direct stroke can reach the conductor itself. This is, of course, impracticable, but an approximation to this condition can be had by stringing several conductors above and at the sides of the line and grounding them at frequent intervals. Such protection has been found to be commercially practicable only to the extent of stringing one or two wires above the transmission line itself. Such overhead ground wires should have ample carrying capacity, and should be grounded at intervals not greater than 1,000 feet. Commercial types of lightning arresters are now on the market which will protect the apparatus connected to them from the inductive effects of lightning, but so far no device has been put forth which will protect from a direct stroke without itself being destroyed. Trouble is experienced in operating a simple spark gap on a transmission line as a lightning arrester, due to the normal tension on the line maintaining an arc after it is once started by the lightning stroke. Some form of current interrupter is therefore necessary. Magnetic blow-outs or self-restoring circuit-breakers are sometimes used in the case of direct currents. Simpler methods will break up an alternating-current arc. The most common one is to make the arrester of metal the vapor of which is a non-conductor, as zinc or brass, and make it of sufficient size to cool the vapor path quickly. Another common form is the horn gap, which is so made that the heat of the arc starts an upward current of air which breaks up the discharge. Both the horn-gap and the magnetic blowout have objections. The simple gap of non-arcing metal is admirably adapted for the protection of secondary circuits of distribution transformers, where the potential is not over 300 volts. When arresters are operating on voltages of over 1,100 volts it is necessary that considerable resistance be put in series with the spark gap so as to limit the current to such value that the cooling effect of the arrester will put the arc. When the voltage is increased it is necessary to put more gaps in series to still keep the current within a reasonable value. Such an arrangement has been used up to 66,000 volts. Series resistance selection for this type of arrester is very important. If the resistance chosen is too low the power current which follows the discharge is so great as to trip the circuit-breakers in the powerhouse, while if too high the effectiveness of the arrester is hindered. Increasing the number of gaps in series so as to increase the ability to suppress the power arc has the effect of making the arrester discharge less freely, so that arresters of this type are not very satisfactory for use above 5,500 volts. The compression gap arrester was next discussed and mention made of the peculiar effectiveness of this type when operating several in series. The shunted-gap arrester next was taken, and its approximation to the ideal pointed out. The desirable arrester was said to consist of an arrangement which will allow a spark to pass when the voltage is slightly above the line voltage, but which will allow only enough current to flow to discharge the line. This the shunted-gap arrester accomplishes by bridging a high resistance around part of the gap. The aluminum-cell arrester consists of a number of electrolytic cells made of aluminum treated with sodium hydroxide and placed in an electrolyte of permanganate of potash, connected in series between the line and ground. This cell allows only a very small current to flow until the voltage exceeds a certain predetermined value. Arresters of this kind are connected to the line through a horn spark-gap which is set to discharge at a pressure just above the working voltage. The hydroxide film is dissolved in time, even at oridnary room temperatures, so that it is necessary to connect the arrester directly to the line at frequent intervals—preferably daily—in order to charge it. The first rush of current during charging is very large unless it is reduced by means of a series resistance; so it is customary to have the charging contacts connected to the line through resistances.

The speaker advocated the following plan. Use insulators so proportioned that the puncture voltage is much greater than the arc-over voltage when the insulator is dry, so that an insulator will always fail by arcing over. Install an arcing ring or its equivalent at each insulator. If a guard ring were not provided the discharge takes place as a puncture. When a line is equipped in this way the lightning arresters will relieve the ordinary discharge without interruption to the service and the arcing rings will prevent damage to the insulators when the discharge approximates that of a direct stroke.

In conclusion the following points were made. Low-voltage circuits (not over 300 volts) from a distributing transformer should be protected by placing a single spark-gap arrester every 500 feet. Primary distribution circuits, up to 4,000 volts, should have an arrester of the series gap or compression type at each transformer for its protection—unless the transformers are less than 1,000 feet apart. An arrester of the shunted-gap type with choke coils should be installed at the entrance to the power station. Transmission lines operating between 4,400 and 33,000 volts should have either aluminum-cell or shunted-gap arresters with choke coils at the generating station and at the important substations. In the substations of secondary importance horn-gap of compression-type arresters with choke coils should be used. A similar arrangement, without the choke coils, should be installed every five miles along the line. The arresters at other points than where transformers are connected are for the purpose of protecting the insulators. Lines operating higher than 33,000 volts should have aluminum-cell arresters with choke coils installed at the generating station and at each substation and horn-gap arresters each five miles along the line. The common practice of using the same pipe which serves as a ground for the low-valtage windings of a transformer for the grounding of the high-tension side was not recommended, because of the liability of the small leakage current drying out the earth in the neighborhood of the pipe.

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Iowa Street and Interurban Railway Association.

The eleventh annual convention of the Iowa Street and Interurban Railway Association was held at the Montrose Hotel, Cedar Rapids, Iowa, April 23 and 24, one session, that on Thursday afternoon, being held jointly with the Iowa Section N. E. L. A. which met at Cedar Rapids on the same days. The morning session was opened by President C. D. Cass, of Waterloo, and the reports of the various committees presented. Papers were presented by M. A. Welsh, Jr., of Waterloo, entitled "Some Results Obtained from the Safety First Campaign" and T. A. Wood, of Council Bluffs, entitled, "Shop Practice."

On Thursday afternoon the railway delegates joined with those of the Iowa Section N. E. L. A. in the inspection trip to the University of Iowa.

On Friday morning a paper was presented by M. M. Lloyd, of Des Moines, entitled "Car Cleaning and Sanitation," and P. T. Crafts, entitled "Modern Public Policies of Public Service Corporations."

At the executive session, which was also held on Friday morning, the following officers were elected:

C. A. Sluessler, Council Bluffs, president.

J. D. Porter, Davenport, vice-president.

H. E. Weeks, Davenport, secretary-treasurer.

This association also agreed to meet iu Keokuk next year.

Semi-Annual Convention of Iowa Electrical Contractors' Association.

The second semi-annual convention of the Iowa Electrical Contractors' Association was held at Cedar Rapids, Iowa, April 22 and 23, two of the sessions being parallel sessions with the State Section of the National Electric Light Association convention, which was held at the same time.

The first session was called to order by M. A. McCarten, Marshalltown, president, who welcomed the delegates to the meeting and spoke of the value of the organization to the contractors of the state. Although the association has been in existence only since February of this year, the growth has been exceedingly satisfactory.

A paper entitled "Modern Business Methods in Reference to Electrical Contracting," was then presented by Ed Kunkel, of Davenport. This paper is published in full elesewhere in this issue.

Charles Brown, of Chicago, presented a motion that the paper be printed by the association, which motion was unanimously carried.

J. W. Perry, of Ames, called attention of the delegates to the engineering and extension work recently undertaken by the Iowa State College of Agriculture and Mechanical Arts. He assured the contractors that it was the aim of the college to be of the greatest possible usefulness to the men engaged in practical electrical work, and to this end the college has recently inaugurated practical courses and also correspondence courses for those not able to attend personally.

George O. May, of Sioux City, called attention to the need of closer co-operation of electrical contractors in Iowa. He spoke of the possibilities if such co-operation were made feasible through the work of the Iowa Association.

J. E. Latta, of Chicago, spoke briefly of rubber-covered wire, pointing out that until 1911 the test required in the National Electrical Code on wire was not sufficiently comprehensive to ascertain whether the insulating compounds were of a proper kind. It happened frequently that the rubber used, which showed up favorably under these tests when wire was new, soon became worthless when the conductors were put in service. The present Code rules, he said, call for much more exacting tests, which insures the wire having the necessary insulating properties which will be retained in service. The additional cost of the new code wire is negligible when compared with its advantages. Mr. Latta appealed to the contractors to take measures to discourage the use of all old-code wire in Iowa.

Messrs. Kunkel and May both made brief talks in which they endorsed the request of Mr. Latta that the use of old-code wire be discontinued in the state.

The afternoon session was held jointly with the Iowa State Section of the National Electric Light Association, and the report of this meeting will be found elsewhere in this issue.

Thursday morning was taken up largely with a further discussion of liability insurance, George A. Wrightman, of Des Moines, adding to his remarks made at the morning session. A paper by Floyd A. Wallace, of Des Moines, entitled "Uniform Plans and Specifications" was then presented by the author. This paper is printed in full in another section of this issue.

W. J. Ball, of Moline, then presented a paper entitled "System of Bookkeeping for Electrical Contractors." This system was fully described and illustrated in our issue of July 12, 1913.

An afternoon session was held at which E. J. Burns, of the Illinois Contractors' Association, described in detail the plan of the Illinois Association for obtaining liability insurance from one of the Eastern reserve companies through co-operative measures. He cordially invited the Iowa Association to take advantage of the rates obtained by the Illinois Association, which invitation was unamiously accepted. The remainder of the afternoon was devoted to an executive session.

Standards Committee Expediting Work.

The Standards Committee of the American Institute of Electrical Engineers, which is revising the Standardization Rules of that organization, expects to so far complete its work as to present a draft of the new rules to the Board of Directors before the annual convention to be held in Detroit in the latter part of June. The committee held a two-day session in New York City, on April 21 and 22, at which the reports of the subcommittees were revised and approved. It was decided to print a few hundred copies of this draft, which will be available to any member of the Institute who desires to secure a copy in order to offer constructive criticism to the committee before the rules are finally adopted.

After final revision and adoption a copy of the Standardization Rules in their final form will be available to the entire membership of the Institute and may be secured by others upon payment of a stipulated sum. The new rules will differ greatly from the old ones.

JOINT MEETING OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS AND AMERICAN PHYSICAL SOCIETY.

Meeting and Exhibit of Physical Apparatus at Bureau of Standards, Washington.

A joint meeting of the American Physical Society and the American Institute of Electrical Engineers was held on April 24 and 25 at the Bureau of Standards, Washington, D. C. The new electrical building of the Bureau of Standards was opened for inspection and the sessions were held in the lecture room on the top floor of this building. A description of this laboratory will be found in our last issue. In connection with the meeting there was an exhibit of physical apparatus by various laboratories, manufacturers, dealers and others.

Sessions were held on Friday morning, Saturday morning and Saturday afternoon by the American Physical Society, with President Ernest Merritt in the chair. On Friday afternoon there was an address by Sir Ernest Rutherford on "X-Ray and Gamma-Ray Spectra." On Friday evening the session was conducted under the auspices of the Electrophysics Committee of the American Institute of Electrical Engineers, with Chairman J. B. Whitehead in the chair. Following this session there was a luncheon and smoker, arranged by the Washington and Baltimore Sections of the Institute. On both days of the meeting the members and visitors were the guests of the technical staff of the Bureau of Standards at luncheon. The attendance of members of the Physical Society was greater than at any previous meeting of that Society.

There were in all about 40 papers presented by members of the American Physical Society in the form of abstracts. A number of these were upon electrical subjects, of which the following may be mentioned: "New Methods for Measuring Time-Constants of Low Resistances," by F. Wenner, E. Weibel and F. B. Silsbee; "A Sensitive Moving-Coil Galvanometer," by F. Wenner, E. Weibel and F. C. Weaver; "Surface Leakage Over Insulators," by H. L. Curtis; "Corona Produced by Continuous Potentials," by S. P. Farwell; "An Electromagnetic Puzzle," by F. J. Rogers; "The Testing of Potentiometers," by Frank Wenner and E. Weibel; "Some Records of Wireless Time Signals Made with a Physiological Recorder," by C. W. Waggoner; "Electric Conduction and Thermoelectric Action in Metals," by E. H. Hall; "Electrochemical Indicators and Recorders. Instruments for Showing Continuously the Chemical Content of Solution," by F. A. Harvey; "Characteristic Curves of Tungsten-Filament Incandescent Lamps and Their Application in Heterochromatic Precision Photometry," by G. W. Middlekauff and J. F. Skogland; "The Thomson Effect and the Thermal Conductivity of Tungsten at Incandescent Temperatures," by A. G. Worthing.

At the Friday evening session there were three papers presented under the auspices of the American Institute of Electrical Engineers, preceded by an address by President C. O. Mailloux. The first paper was by C. R. Underhill and was entitled "Solenoids."

Solenoids.

Maxwell's law for the attraction between the halves of a bar electromagnet is not correct for electromagnets of the plunger type with air gaps between the cores because the flux in the cores is, to a large extent, independent of the reluctance in the air gap on account of the magnetic leakage from the inner end of either core back to the other end of the same core. In this paper, only the characteristics of direct-current electromagnets are discussed. An attempt is made to show the correct law of attraction for tractive electromagnets and to calculate the value of the magnetizing force at any point along the axis of any solenoid. Test characteristics are given to support the theories. The work done by an electromagnet of the plunger type in closing its air gap is largely proportional to the length of the air gap, although, when the reluctance of the air gap and the total magnetomotive force are of low value, the law of Carichoff is approximately correct for the total attraction.

This paper was discussed by C. W. Burrows and E. R. Carichoff. Dr. Burrows took exception to the numerical values given in Mr. Underhill's tables, many of which he claimed contained large errors. Mr. Carichoff presented in writing a demonstration that the maximum work may be obtained from a plunger electromagnet when the reluctance of the air gap is equal to that of the ferromagnetic material.

The next paper was entitled "Some Investigations of Lightning Protection for Buildings," by L. A. DeBlois.

Lightning Protection for Buildings.

A description was given of investigations conducted for a large manufacturer of explosives to determine upon a suitable system of lightning protection for buildings containing explosives. The work was divided into the following sections: (1) An analysis by oscillograph of the secondary currents induced by actual lightning discharges in vertical earthed conductors, the results seeming to indicate that such currents are non-oscillatory though occuring in either a negative or positive direction. An attempt is made to explain the phenomena generally attributed to high-frequency oscillations by the existance of undirectional waves of almost vertical front. (2) An investigation of the primary effects of a 20-inch spark in air having the same essential characteristics as those attributed to lightning when applied to a model protective system consisting of isolated vertical conductors surrounding a small building. (3) An investigation of the secondary effects produced under the above conditions, which are considered to be static inductive rather than dynamic inductive. A brief description was given of a general protective system recommended for explosives

The discussion of this paper was opened by E. E. F. Creighton, who emphasized the value of the paper and suggested that the subject of protection from lightning would be a good one for the Bureau of Standards to take up. Regarding the frequency of lightning discharges, no evidence can be obtained from the oscillograph, since the latter does not respond to a high frequency, but can only show a summation of the collective discharges in an oscillation. Lightning arresters which are sensitive to high frequency and not to impulses often respond, showing that a high frequency must be present in many discharges.

G. R. Olshausen referred to the work of Walter, showing a number of separate parts of lightning stroke—predischarge, a complete flash, a rest period during which leakage takes place, and then a series of discharges, with a final discharge after an interval. He stated that there was experimental evidence of both oscillatory and unidirectional discharges. He showed some lantern slides which indicated a predischarge, a single discharge and an oscillatory discharge.

A. G. Webster stated that the evidence regarding the oscillatory nature of the discharge was rather uncertain. Hot upward currents of air appear to attract a discharge. An initial discharge ionizes the air and provides an easy path for successive discharges.

Elihu Thomson stated that there may sometimes be oscillatory discharges, but they are more often unidirectional. This is indicated by the clicking produced in a telegraph relay, which would not be affected by a high-frequency discharge. Studies of the lightning problem often result in incorrect conclusions on account of considering a cloud as a charged conductor. This is not correct, since the cloud has the same consistency as a fog and there is no continuous conducting path through it. After a discharge has begun, the differences in potential are sufficient to cause charges to pass from point to point in the cloud, and these breakdowns serve to feed the main discharge with electricity. There is a flow of energy toward the point of discharge from all clouds in that neighborhood, and this flow is not compatible with an oscillatory discharge. The reason barns are so frequently struck by lightning is because they are well grounded, due to the moisture and ammonia salts which are usually present. Even where lightning rods are provided for barns, the ground may be better inside the building than for the rod outside, and hence they may still be struck. He considered Oliver Lodge wrong in deciding that an iron rod is better than a copper one.

W. J. Humphreys pointed out that the branching frequently observed in lightning discharges is always downwards and never upwards, indicating a unidirectional discharge.

L. T Robinson stated that the oscillograph could be arranged for frequencies as high as 50,000 cycles per second, but that the photographic films were not sensitive enough to obtain the records with the short exposure which would be necessary

Burton McCollum told of an instance where the series field of a generator had been reversed by a lightning discharge, which was good evidence that it was not oscillatory in character.

The last paper to be presented at this session was one by W. S. Franklin, entitled "Some Simple Examples of Transmission-Line Surges." In the absence of the author this was presented in abstract by Burton McCollum.

Transmission-Line Surges.

This paper treated the wave phenomena which take place on a transmission line when switches are opened and closed. These phenomena are practically the same in alternating and direct-current systems for transmission lines up to 150 or 200 miles in length, and therefore the surges which are described in the paper are the surges which take place when a steady voltage is connected to the line or when the line is disconnected with a steady current flowing in it. Line resistance and leakage are assumed to be zero. The details of line surging which takes place under such conditions are most easily described in terms of what may be called the "ribbon wave." A number of practical examples are described.

In discussing this paper, J. M. Weed pointed out that the conditions assumed did not correspond to actual transmission lines where there is distributing capacity, inductance and leakage. The method of study was, however, a valuable one and could be modified so as to include considerations. In practice, wave fronts are sometimes found to be so steep as to cause damage, even where apparatus has been designed to provide for this condition.

A. G. Webster told of some experiments along this line which he had made.

Trygve D. Yensen presented written discussion describing some work done in association with Professor Berg, at the University of Illinois. Laboratory experiments which were there carried out indicated a undirectional discharge. Experiments had also been conducted showing that protection could be secured by the proper grouping of a number of lightning rods.

At the session on Saturday the American Physical Society voted to create a class of membership for nonresidents of North America, for which the annual dues are to be $4.00.

The Council of the Society was given power to undertake the arrangements for an International Congress on Physics to be held in Washington in 1915, providing such a congress is found to be feasible and can be properly financed. More than 80 members signified their willingness to subscribe for membership in such a congress.

Exhibits.

The laboratory apparatus and general equipment of the electrical and photometric section of the Bureau of Standards were open for inspection.

The Electrical Testing Laboratories, New York City, exhibited an electrodynamometer galvanometer, a phase-shifting set of transformers, a Sharp-Millar photometer, an integrating-sphere photometer, diagram and working drawings of a new photometer, a shock-testing apparatus for incandescent lamps, and other apparatus.

James G. Biddle, Philadelphia, exhibited a large number of instruments of foreign manufacture.

General Electric Company, Schenectady, N. Y., exhibited a series of 100-watt lamps, including a nitrogen-filled lamp with a consumption of one-half watt per candle, X-ray tubes, resistor material, insulating material, brushes, and various instruments.

Leeds & Northrup Company, Philadelphia, exhibited galvanometers, bridges, photometric equipment, an 8,000-ampere recording ammeter, etc.

Taylor Instrument Companies, Rochester, N. Y., exhibited electrical measuring instruments, pyrometers, thermocouples, etc.

Western Electric Company, New York City, exhibited a sine-wave oscillator and capacity-testing apparatus.

Among others exhibiting were the Navy Department, War Department, Case School of Applied Science, Carnegie Institution of Washington, Columbia University, Harvard University, University of Illinois, Lehigh University, Princeton University, University of Virginia, the Dubilier Electric Company, Emerson Apparatus Company, Esterline Company, William Gaertner & Company, Radio Telephone & Telegraph Company, the Scientific Instrument & Electrical Machine Company, Arthur H. Thomas Company, Thwing Instrument Company, Ultraviolet Ray Sterilization Company, United Gas Improvement Company, Wireless Specialty Apparatus Company, Wesleyan University, Radium Research Laboratory of the Standard Chemical Company.

Commercial Practice
Management, Rates, New Business

IS THERE A SATURATION POINT IN THE SALE OF ELECTRICITY?[1]

By J. S. Forbes.

Our Committee in getting up the subjects for the papers at this Convention, have asked us a question. In answer to this question, I would say, "Yes, there is a point that might be called the saturation point, but how are we to get to it?"

If we could get every house, every store and factory in our city, have each one equipped with every kind of current consuming device, then we would have reached the saturation point in the sale of electricity.

The Iowa State Electric Association's membership consists of managers of companies operating in comparatively small towns. These companies are unable to spend the money necessary for a separate department for securing new business. That part of the work must be taken care of by a man who has duties in other departments, but this in no way should interfere with each and every company operating in the State of Iowa, from having a first-class, up-to-date new-business department.

In traveling over the country investigating business possibilities in the smaller towns, the writer has invariably met this idea among the managers of the smaller towns. Upon request for possibilities of new business, it has been almost invariably stated by the manager, that the saturation point in his town had been reached. There were no more residences to get; there was no possibility of increasing the connected load in the stores; there was no possibility of increasing the connected load and increasing the length of burning hours on window lighting. "My town is too small for electric sign business."

The above answers have been received, and seem to indicate a lack of initiative on the part of the small central-station manager. They do not seem to realize that almost for the asking, they can increase the number of consumers; increase the number of current-consuming devices by a little concentrated thought and action on their part, devoting each day a certain fixed proportion of the time to that phase of the question. They do not seem to realize that any additional business that they can secure, even assuming that it is an expense of $2 or $3 per consumer to secure it, will give them an increased revenue, all of which is clear profit, excepting the amount of coal consumed to furnish the energy required.

To the managers of the small cities I certainly advise you to organize a new-business department, having it consist of the following main departments.

Illuminating engineer, who shall take charge of window and street illumination.

Power engineer, who will keep in touch with all the power possibilities in town.

Residence solicitor, who will not only secure all the house wiring, both new and old houses, but have in mind the current-consuming devices of convenience for the home.

Electric sign department, who will give ideas and secure figures on electric signs.

Of course, you as manager of the plant will necessarily have to be all of these departments and then some. Advertise these various departments on your monthly bills; make a window display by indicating that the various departments have been organized; talk it yourself and have all your men employed by you, talk about it, and in a small town it will soon be noised around that the electric light company is getting busy and going out after all the business.

Next, secure an accurate list of the possible consumers in each department, keep this list in a place where you will find it kicking around every morning to remind you that you might, on this day, increase your revenue by putting on additional customers, or by increasing the connected load of some of the other customers.

What are a few things your manager has to think of every day in conducting your business? For instance, is my coal supply far enough ahead? Is my pay roll ready? Are all my connect-ups arranged for today? Are all my bills collected? Is all the material needed ordered? And why not add to this list, How many kilowatt-hours can I arrange to sell today?

Do you realize that one kilowatt-hour per day for a year means, at a 15-cent rate, an increase in revenue of $54.75 a year? Do you realize that that revenue capitalized on a 20 per cent basis means increased value of your property of $270? Can you not then well afford to arrange your time so that 2 or 3 hours per day can be spent exclusively to increase your business?

You know more about the electric business than anyone else in your town. If you do not believe this statement, I am sorry for you. If you do not believe it, make yourself believe it, or at least run the bluff that you do. Your office should be the source of all information that is needed by your consumers, regarding electric matters, and if you let the fact be known that you are the best posted man in town, electrically, they will all come to you for advice. Give it to them. Make it your honest advice. Get them to use service that fully serves the purpose for the least possible expense to them per month. If you see people who are using electricity uneconomically, or wasting it, force your advice on them, and insist that they reduce their monthly bills. After you have advised, by changing their installation, or changing their method of operation, that which will save money on their monthly bills, you will be the best advertised man in your town, with lots of friends to boost your game. Then see your revenues increase. The customer who feels that he is getting the most that the company can give for a dollar, generally arranges to spend cheerfully, more dollars than ever before, and you are making more money out of him. He seldom is the man to kick for lower rates. He does not care how much per kilowatt-hour he pays, he has the service and he is satisfied with it, and is satisfied to pay his monthly bills.

The first question has now made room for another. How are we to reach the point in question? What are the cheapest, best and most effective methods to use in increasing our revenues?

The second question can be answered chiefly in one word, that is "Service." Service that serves, and service to customers will not only hold the customer already secured, but will bring in more new business than all the advertising or soliciting that you can do. It has been only within the last few years the central stations have maintained a department to go out, consult and advise with customers as to the best forms of using electric light, for both commercial and residential purposes, and also to advise them in regard to proper motor installations. In all cases where this plan has been adopted, material increases in business have been secured, but what is more important, material increased satisfaction to the consumer, has been the result with its increased advertising benefits.

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[1] A paper presented before the recent convention of the Iowa State Section, National Electric Light Association.

Generally speaking, I believe the largest increase in consumers has been made in the residential sections. Partly on account of the many good current-consuming devices that have been brought out for use in the homes, and partly because central-station managers have realized the value of residential business.

One of our best methods in Cedar Rapids for securing old house wiring has been to advertise a complete installation of fixtures, lamps and wiring for 4 rooms for $21. The advertising for these campaigns has been done in a variety of ways, and in several cases we have analyzed the effect of the different classes of advertising, and we give herewith a statement of a campaign in Marshalltown, Iowa, showing in detail the results of this campaign.

REPORT OF HOUSE-WIRING CAMPAIGN.

November 21 to December 24.

Total residence wattage since November 21	34,285
Total contracts given to contractors	91
Total amount of contracts	$2,431.40

Division of contracts according to different means used in getting prospects:

	Per Cent	Watts	Cash
Contracts secured through window display	30	8,829	$729.30
Contracts secured through hand bills	10	2,943	243.10
Contracts secured through newspaper	10	2,943	243.10
Contracts secured through office employees	10	2,943	243.10
Contracts secured through outside employees	10	2,943	243.10
Contracts secured through personal canvas	15	4,420	364.65
Contracts secured through neighborhood canvas	10	2,943	243.10
Contracts secured through street-car advertising	5	1,471	121.55

Total cards received in office	65
Number of prospects from cards closed	35
Number of residences outside of limits of lines now erected or residences where new extensions would have to be built	13
Number of cards with wrong addresses or where parties were wanting information out of curiosity and not ready prospects	10
Number of houses estimated and parties yet undecided	1
Number of prospects estimated and could not be closed	6
Number of residences connected up during campaign that gave their contracts to non-operating companies	21
Number of new services connected up since November 21	101
Number of contracts yet to be completed	25

We find that this advertising of a fixed sum for a complete installation is the best bait to secure an interested possibility. After they have expressed a desire to have the service, and by their inquiry have intimated that they are willing to invest that amount of money to secure the service, it is very easy for a good salesman to induce them to make a complete equipment of their home.

As a general thing residential wiring should be taken up actively with the consumer when other work in the nature of repairs are being made to his home, or at house-cleaning time, and we are very active during those periods of the spring and fall in our residential-campaign work.

Our increase in commercial business has been brought about by a persistent campaign of education along the lines of scientific, efficient and up-to-date illumination.

The business men of today are becoming educated to the fact that the general public are attracted to their stores by attractive fixtures and appliances, including electric light fixtures and it is generally conceded by the average purchaser that the well illuminated store is the first-class store, and one in which they wish to trade.

The electric sign business is a very material factor in our revenues, and we call it a very good business, although with the 5-watt and 2.5-watt lamps in use, the connected load is not very great, but running them on a flat rate, as we do, until 11 o'clock every night, the number of hours burning makes the revenue quite satisfactory. It will take persistent work on the part of the manager of the smaller towns to sell the first one, unless the first one is the one over your own office, and it is pretty hard to sell to another man what you do not purchase yourself. But taking it from the standpoint of good advertising, I feel that eventually the merchants in the smaller towns will spend the money for the electric sign in preference to the painted sign.

Flat-rate window lighting is very profitable. Five years ago there were only 2 or 3 stores in Cedar Rapids that had any light in their windows after 6:30 P. M. At the present time every store of any importance has its windows well lighted, so that displays can be seen by the public until 11 o'clock each and every night.

But it was difficult at first to convince these business men of the importance of store front advertising. It was the hardest proposition I have ever tackled, when I tried to tell them that four-fifths of their rent was spent for location and window space, and that their cheapest and most effective advertising medium, their best salesman was being kept in absolute darkness, on an average of five hours each and every day of the year when the public were where they could see their displays. We adopted the scheme of counting the number of passers by at fixed points in the city between the hours of 6:00 p. m. and 11:00 p. m., and most of the merchants were surprised. They did not realize that as many people passed their store at that time of the night. We told them that the people passing at night were in more of a mood to look at their windows than in the rush of the business day, that the people were in more receptive mood as they sauntered up and down the streets at night to see what the merchants had for sale. The results of this campaign has been a well illuminated Cedar Rapids. Our revenues have increased even though the stores are closed now at 5:30 and 6:00, and in one instance I recall 65 per cent of the connected load of the store is used for street front advertising purposes.

The power business is being successfully handled by our new-business department through its engineering department. We have found it the cheapest and the best in the long run to spend the money in securing an accurate test of the amount of power consumed, also giving with this report, an outlay of motors and the cost of installation in each and every power job of any size. We will spend from a week to ten days, thoroughly investigating conditions, and make a written report to the manager of the company with whom we are endeavoring to do business. These reports are left with the manager. They convey to him the idea that we have given the matter very careful consideration, and from time to time we call on him and our conversation with him at that time indicates that, as a rule, our reports have been given very careful study.

Our small power solicitation is done in the ordinary way, giving advice in regard to size of motors, and the proper transmission from them to the machinery, and in all cases we have found that our readiness and ability to advise, and standing back of these recommendations, has given us a general hold on the power business in Cedar Rapids. The condition is such that with one exception no new steam or gasoline plants have been installed in Cedar Rapids in the last five years, and a great many of the old plants have discarded their steam outfits for electric power during that period. We operate, today, in Cedar Rapids, 90 per cent of the factories in the City, and have not in any sense given up the idea of securing the rest of them.

At this time I want to suggest to all of the companies represented the possibilities of the farmer business. This is a class of business that is almost entirely new, and up to a year ago considered by all of us, rather impractical and impossible for us to handle. It seems to the writer that the possibilities of increasing our sale of current by this method are very great, provided certain conditions can be secured, covering investment for this service.

From the figures collected from other companies and from our own meagre experience, I have placed the average monthly consumer at $1.25, if using light only, and an additional $2.50 if power is being used. Six consumers per mile is what we consider the average for these farmer lines, and this mile of line, at 2,200 volts, including transformers and secondary leads, will hardly be built under $600.

Upon the above basis it can be readily seen that this business is not a paying business if the company invests this $600. My suggestion at this time to all companies is that we adopt a uniform plan of taking on this business, which plan provides that the farmers along each road, organize a company, preferably an incorporated one, build their own line, furnish their own transformers and meters and purchase current of the lighting company from the primary at a point where their line taps the compay's line. This has been tried out in several places and the rates vary from 7.5 to 9 cents per kilowatt-hour on the primary, the farmers charging themselves regular city rates, the difference between the two rates being sufficient to pay for transmission losses and provide funds for maintenance and insurance. The important feature of this suggestion is that we all adopt a uniform contract and stick to it all over the State and I would suggest a committee be appointed by this Association to draft a form of contract and present it to the member companies for their consideration.

Card Index of Prospects at Louisville.

Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, is installing in his department a card index system which will cover the whole of the territory served by his company. The system will show at a glance who of the residents on any street are not subscribers of either the gas or the electric services of the company. This system is designed to aid in the prosecution of the company's house-wiring campaign which is holding up to its average of about 70 contracts a week and which, the officers of the company have decided, will be made a permanent affair. Every mail brings numerous inquiries to the offices of the company as to the plan of the campaign.

New-Business Conference at Utah.

The first "Get Together" conference of the new business department of the Utah Power & Light Company was held in Salt Lake City, April 20 and 21.

This company during the past eighteen months has taken over the electric lighting and power systems of a majority of the towns in southern Idaho and in northern and central Utah.

This conference was called for the purpose of bringing the various representatives of the company, particularly the new-business department, in closer relationship with the general office and with each other.

About 30 representatives from towns outside of Salt Lake City attended the meetings, in addition to all employees in the head office interested in the matters under discussion.

At the dinner given by the company to its representatives at the Hotel Utah on Monday evening, the principal officers of all of the central-station companies in this district, and representatives of the manufacturers, jobbers and electrical contractors doing business in territories served by the Utah Power & Light Company were present as guests.

New York Companies Section Entertainment.

An entertainment meeting of the New York Companies Section, National Electric Light Association, was held in the Edison Auditorium, New York City, on April 20. F. C. Henderschott presided and introduced the lecturer of the evening, Harry C. Ostrander, who told of his recent trip through China and Japan. The talk was largely a description of personal adventures and was profusely illustrated with moving pictures. About 400 were present and at the conclusion of the lecture, the members were treated to a Broadway cabaret show, arranged for by E. A. Norman. Dancing concluded the evening's pleasures.

The Searchlight Salesman.

What has proven to be one of the greatest ideas for selling real estate in Southern California during the past few years is the "searchlight salesman" recently employed by the Harry H. Culver Company, of Los Angeles. This salesman is simply a powerful electric searchlight which has been placed on the company's land, Culver City, lying eight miles southwest of Los Angeles, the purpose of which is to attract the attention of the people of that section to that city. It is also used in the selling of real estate at night. From its location upon the top of a three-story building, its rays may be turned on any lot or series of lots in the entire tract, making the portion upon which it is turned as light as day. It is run from seven until nine o'clock every evening, except on special occasions, when it is kept burning later. The selling of lots in the city by this aid has proven so unique and satisfactory that night selling has been made a permanent feature of the company.

The light is a powerful affair of 8,500,000 candlepower and throwing its beam a distance of 32 miles. It is 30 inches in diameter and has a depth of 30 inches. It is 5.5 feet tall and may be turned in any direction.

The switch room is located beneath and is complete with switches, starting boxes, meters, etc., and also has a 60-cycle, 15-horsepower electric motor and a 56-ampere direct-current generator, having a speed of 1,800 revolutions per minute.

Louisville Central Station Co-Operates with Contractors.

Contracts for the wiring of Louisville, Ky., homes are being written at the rate of seventy a week by representatives of the Louisville Gas & Electric Company, which is pushing the campaign. The contractors themselves are securing about an equal number of contracts due very largely to the extensive advertising carried on by the company. These advertisements bring before the housekeeper the desirability of having her house wired for electricity so that she can then be able to use any of the electrically operated labor-saving devices for household use. Just now the vacuum cleaner is being featured. As the weather grows warm the electric fan will be featured.

Kansas Municipal Plants to Manufacture Ice.

A bill providing that all municipal light plants in Kansas may manufacture ice in connection with their regular business will be presented to the State Legislature at its next meeting. Attorney General Dawson has ruled that under the present laws no municipal plant has authority to engage in the manufacture of ice, unless a special act is passed by the Legislature. An effort to attain this end will be extended.

South Hadley, Mass., to Purchase and Distribute Electricity.

The town of South Hadley, Mass., formally took over the local lighting plant from the Amherst Power Company on April 10, and will operate the system as a municipal installation. Energy will be purchased from out-of-town central stations and distributed by the lighting department.

Electric Sign Data

Spectacular Electric Signs.

Spectacular electric advertising is the strongest feature of modern methods of publicity.

In considering the erection of an electric sign on a roof, for instance, where it will command crowded streets, it is well to remember that:

(a) The minimum cost of the framework, letters and wiring for a simple sign would be the largest part of the cost of a sign having more spectacular effects.

(b) The cost of operation after the sign is built will not be much more or less, perhaps, for spectacular effects than for a plain sign.

(c) The spectacular effect should not be overdone, long drawn out in duration of its cycle, nor foreign to the keynote of the advertisement.

(d) The sign should be of ample size, but quality is more important.

Evidently, a good sign is not easy to produce, but as everyone knows it is a very valuable advertisement if well done. And evidently it is worth doing as well as is possible.

If general publicity is of value to you do not overlook the electric sign method of securing it.

The city council of Burlington, Ia., has approved a number of agreements for the erection of electric signs in front of business houses.

There were nine applications for permission to erect electric signs in front of the respective business houses and the requests were granted. At the last meeting the marshal was instructed to investigate the erection of signs without the consent of the council and without the agreement that the city was to be held blameless in case of accidents or any other kinds of damages, and the large number of applications received came as a result of the investigation.

A start has been made in an electric sign campaign at Rome, N. Y. Current was recently turned on for the big sign which the Chamber of Commerce has placed over the south portals of the barge canal bridges at Mill Street, so that all who pass over the New York Central tracks at night may know that it is Rome, N. Y.

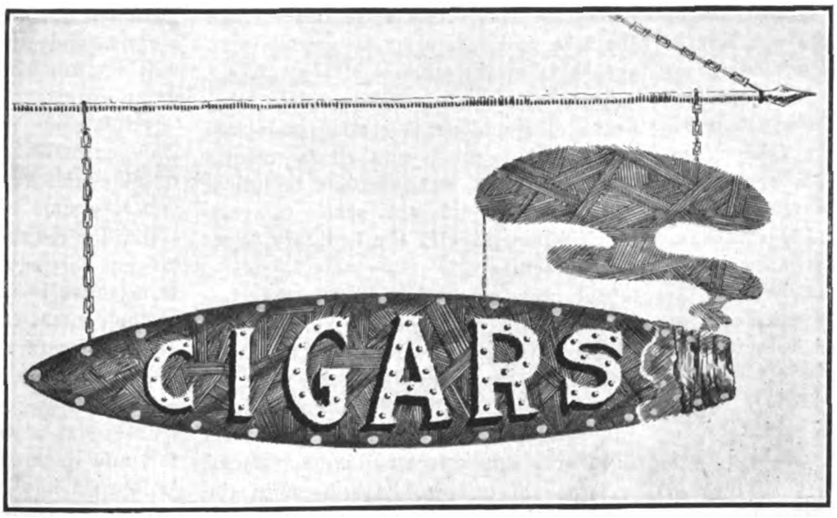
Permission for the erection of this sign was secured from the state authorities and the New York State Railways some time ago. The contract for the installation was let by the Chamber of Commerce to the Rome Gas, Electric Light & Power Company.

The Rockford Electric Company has introduced a movement among the merchants of East State Street, Rockford, Ill., for the installation of electric signs, in order that the street will become one of the best lighted thoroughfares in the city.

Through the instigation of A. C. Martin, of the Rockford Electric Company, letters have been sent out to twenty-five merchants of the street stating that the signs will be placed and installed free of charge in the event that the merchant orders them. Twelve favorable replies have already been received by the company from merchants who are in favor of the plan.

As East State Street now is lighted, many of the shoppers of the city who are only allowed evenings for their trading pass up the many stores in this thoroughfare on account of the attraction of the electric signs on the west side of the river. It is true that Seventh Street is better lighted than is East State Street and for some time there has been some agitation among the trade to improve the lighting system.

The Columbus Conventions & Publicity Association has asked for bids on a 65-foot electric sign, which is to be placed in the form of a modified arc on top of the Pennsylvania railway building facing the exit from the Union Station. The wording, "Columbus Welcomes You," is to appear in letters four feet high, except the initials, which are to be five feet. The letters are to be in white enamel with red edges, so as to make the sign attractive in daylight when not illuminated. The municipal electric light plant will supply the current.



Sketch for cigar-store sign contributed by the Greenwood Advertising Company, Knoxville, Tenn.

Dimensions of sign are 11 feet by 4.5 feet. The sign is double faced and is provided with 236 receptacles.

The letters are 14-inch raised spur block and the colors are natural cigar likeness.

Flasher gives effect of smoke rising from end of the cigar.

Elyria, O., witnessed a stirring ceremony carried on by an enthusiastic outpouring of the population of the city, upon the occasion of the dedication, on April 24, of the city's new slogan sign and the outline lighting on the Henry L. Doherty property. The sign and outline lighting were officially turned over to the city, 8,000 persons participating in the ceremony.

Electrical Construction

MODERN BUSINESS METHODS IN ELECTRICAL CONTRACTING.[1]

By Edward Kunkel.

There is no essential difference between modern business methods in electrical contracting and modern business methods in other lines of business. The underlying principles are the same. Methods and activities that will produce certain results in one line of business will produce similar effects in others.

We all have a pretty fair idea of what we consider the right things in a business way, and if each could set down his ideas in definite form, I believe they would all look very much alike, but probably differ widely in ideas as to best methods to achieve these results.

Of course, the primary idea of business is necessarily a selfish one. Away back in the savage or animal period the all-important thing, in the eyes of each individual, was to secure enough to feed and protect those dependent on him. The natural instinct when the supply of these things was limited was to prevent other individuals from taking more than their share of these things, by killing or driving them off.

This condition may be fairly compared to what we now term cut-throat competition, a state of affairs when each tries to get his share (or more) of the available business, by injuring or destroying the business of his competitor, by fair means or foul. This is an unpleasant and wasteful plan at best.

After a certain period of time, the savage man conceived the idea of co-operation, and found he could do better in the struggle for existence, by acting together with certain other individuals and banding together into tribes and communities, whereby their circumstances were very much bettered. They could then devote part of their time at least to creating new supplies, instead of fighting over those already in existence.

History shows us that every important step forward was accomplished by the combined effort of many rather than by individual effort. We have heard a great deal recently about co-operation and may be inclined to think that it is of recent origin, but this is not the case. It has been the keynote of progress through the history of man.

It is true there have been certain individuals of exceptional ability and energy who seemed to have achieved remarkable results and to stand out prominent and apart from the rest, but their careers have been more or less meteoric, and their influence largely of an educational value. The real progress of society, has been due mostly to the steady continued effort of many, working jointly to the common end.

The development of the electrical industry has gone through about the same course that society in general did. In its early days, there was the same story of individual effort; each pioneer working along in his own groove without the help or encouragement of the others.

We find Thomson, Brush, Bell, Edison, Westinghouse, and all the others, each following the course of his own thought, indifferent or antagonistic to the ideas of the others.

True, these men, having great natural ability and perseverance, produced wonderful results, but these results were largely of scientific and technical interest, and did not seem to very much affect directly the ordinary average citizen.

But now, since the industry has become highly developed and organized, largely through co-operative effort, we find that the ordinary daily life of every person is directly affected, in a thousand different ways, by electrical influences, appliances and conveniences.

Those of us who have been in the business for some years can remember when each separate manufacturing concern, basing its developments on the inventions and work of one man or set of men, would build up in a certain narrow way, and try to advance its own business and growth by antagonizing and belittling the work and products of its rival.

The same destructive competition prevailed to a large extent in the other classes: the lighting companies, the jobbers and the contractors, the individual in each class seeming to feel that his salvation lay in pulling down his competitor and climbing up over him.

In addition to this strife in the several divisions of the industry, there was general distrust and often open antagonism between the classes. The jobber claimed the business that the manufacturer was trying to get; and there was also friction between these and the central-station interests, making a fine three-cornered wrangle.

The contractor, being the "goat", and also generally the smallest, was the prey of all three of them. Each class felt it perfectly legitimate, besides being safe, to take a whack at him any time. Naturally enough, under these conditions, neither class nor individual could advance as his natural ability and effort justified.

Happily under the co-operative system, this state of anarchy is being greatly changed. The manufacturer has found that through the interchange of ideas and inventions, the comparison of production and factory methods, of accounting and cost systems, of business getting and advertising campaigns, and numerous other ways of working together, that both he and his competitor are better off at the end of the year financially; each has a warmer feeling for the other, and best of all, each has a greater measure of self-respect.

Similar results of co-operative effort, largely through the means of associations, have been obtained in the hands of the central stations, the jobbers, and, as all of you realize, among the contractors.

The feeling between the different classes has also become infinitely better, and in most localities a cordial relationship has been established.

Perhaps I have devoted too much attention to this subject of co-operation, but I cannot help feeling that this is one of the most important elements of modern business methods; not only for the electrical contractor, but for every other line of business.

It broadens a man's outlook in all directions and makes a more efficient business man out of him. Co-operation is also an important factor in the introduction of the various changes in business methods that differentiates the intelligent, up-to-date contractor from the hap-hazard guess-work type that was prevalent a number of years ago.

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[1] Paper presented at convention of Iowa Electrical Contractors' Association.

Another important element of modern business methods, I consider to be the substitution of the slogan "service" instead of price, relegating to the rear the old idea that cheapness was the necessary and all-important feature in business getting, and making prominent the various elements that make for good service.

Don't let it be said, any more, that the John Jones Electric Company gets a lot of business because its price is always low. Rather let your patrons get the habit of saying to their friends: "Get Jones to do your electrical work; he knows how; he keeps posted on everything and is up-to-date; he will take the time and trouble to tell you about something he knows of, that you need or ought to have; and will explain it to you so that you will understand it and thank him for the suggestion; he will get his men on your job when he says he will; and when he is through, it will be the job that is done, not you. He will go to considerable trouble to re-arrange his workmen, so as to get one of them to you in case of an emergency. He is always accommodating and obliging."

In many ways you can show that getting business and customers is no more important to you than taking care of them after you have them.

An especially important feature of an up-to-date business is a good accounting system, and the intelligent and accurate handling of such a system. I maintain that this is a vital matter; in fact, it ranks second only to a real practical and technical knowledge of the business itself.

If a business is not worth the application of a well designed, complete and accurate bookkeeping system, and the necessary intelligent, clerical help to keep it up, the business is not worth having. A man cannot afford to spend his time running a business unless he knows what it is doing; he had better get a kit of tools and go to work for someone else.

I once heard a contractor say that he did not need to keep a set of books; that he had a little memorandum book in which he kept a list of the people who owed him money and the amounts; he didn't try to keep track of those whom he owed: "Let them bother about that." A very simple system and easily kept! I don't know where that man is; I don't even remember his name, but I am certain he didn't get far in the world of business.

I don't mean to say, for a minute, that the smaller contractor should maintain an expensive and complicated bookkeeping system, such as would be suitable and necessary for some of the larger concerns; but I do say that every contractor absolutely needs a clear and well designed system, adapted to the size and character of his business with some provision for its future growth.

Other points of great importance in a modern electrical contracting establishment are:

(1) An intelligent and consistent advertising scheme.

(2) Prompt and accurate estimating methods.

(3) Concise and definite way of closing up contracts and other business.

(4) Careful and systematic handling of work after it is secured.

(5) A well arranged stock room and a systematic checking system for it.

(6) A tastefully arranged salesroom for retail supplies, appliances and fixtures.

(7) Prompt and insistent collection of accounts.

Each of these points is worthy of separate treatment, but this would manifestly extend my talk far beyond a reasonable length; and most of them are to be handled in detail by other speakers coming later. Therefore, I just mention them in this connection.

In closing, I wish to reiterate and emphasize these ideas: friendly co-operation in place of vindictive enmity and distrust; good service and high quality in place of low prices and inferior work; accurate records and a well planned organization in place of hap-hazard and wasteful methods; thoughtful planning and honest business ethics instead of cunning and sharp practices; kindly and considerate, but firm handling of your employees; honest effort and a legitimate profit.

Oregon Electrical Contractors' Association Shows Enterprise and Activity.

One of the most enterprising and active electrical associations is the Oregon Electrical Contractors' Association, which is affiliated with the National Electrical Contractors' Association. The local association has compiled and issued a valuable book for its members giving certain information with respect to prices of electrical supplies, and addenda showing simple means for figuring net profits and giving other necessary information for facilitating the work of the electrical contractor both in estimating and in billing out his work. The officers of the Oregon Electrical Contractors' Association are: president, R. G. Littler, secretary, F. C. Green, treasurer, J. R. Tomlinson.

UNIFORM PLANS AND SPECIFICATIONS.[1]

By Floyd A. Wallace.

Uniform specifications for electric work is one of those things to which this association and many others have given much time and thought and must continue to give much time and thought before any considerable results are accomplished.

The average specification is in a great part misleading and contains much useless matter, while the essential things are often left out and in many instances the specifications are little more than nothing.

When you consider that nearly every contract which an electrical contractor enters into states that work is to be done in accordance with the plans and specifications, you can easily see that the specification itself is of vital importance to the electrical contractor, as it really forms a part of the contract, and if parts of the specification are vague or misleading or not easily understood, then the contract entered into is vague and misleading, and unsatisfactory conditions are bound to be the result.

A set of specifications should state in the plainest English just what is expected of the electrical contractor in detail and should not have any useless matter; such as, repeating portions of the National Electrical Code in various sections of the specifications, when the rules have already been specified.

Any special conditions or rules to be observed should be distinctly and clearly stated and also any special apparatus to be installed should be fully described. Bear in mind that the specifications are a part of the contract entered into and therefore should be complete, distinct, and easily understood. In the matter of material to be used, the specifications should give complete details of types and styles, finish, and, when material ordinarily used is not desired, the specifications should enter into the description in detail. How many dollars have been lost by electrical contractors by entering into a contract to do work according to plans and specifications, when the specifications were so written that they could be construed to require apparatus much more expensive than that on which the contractor figured!

Uniform, definite, and complete specifications would mean that all contractors who figure on a job would know just what to figure on—and therefore, they would all base their estimates on the same class of work and the same class of material and the large differences in bids now prevailing in the letting of a contract would be reduced, and better conditions prevail in this respect.

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[1] Paper presented at convention of Iowa Electrical Contractors' Association.

The ideal of uniform specification cannot be attained by individual effort, neither by the efforts of a group of individuals, but only by the concerted effort of all of the interests affected thereby, and I believe that contractors' associations are the most interested of all, and should give this matter close attention; not let the thing die between meetings, but keep hammering until results shall begin and show for our efforts. I believe that this body should take decisive action in this matter at this meeting and get to work for the attainment of the desired end at once. For just as soon as a standard specification is adopted generally by the architects, just so soon will the leak be stopped from the pocket of the electrical contractor.

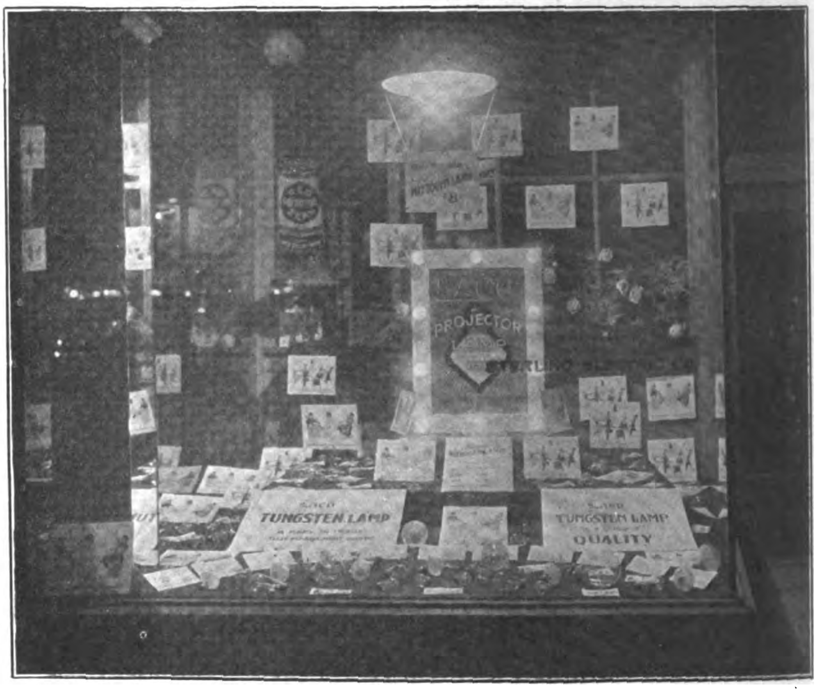
We must expect opposition in the adoption of standard specifications from many of the architects because they, in a large part, copy specifications from textbooks on architecture, and it, at times, seems as though the architect deliberately garbles a specification to confuse electrical contractors and thus get a cheaper job. Furthermore, a standard specification would eventually mean the doing away with much of the cheaper class of work and materials; such as, the use of cutouts in a cabinet when a panelboard would be a great deal better, and this would be opposed by certain persons who believe that anything that will "get by" is good enough.

Certain of the less desirable class of property owners would oppose these measures on the same grounds, but on the whole, the better class of architects and owners will favor anything that will tend to bring out a clear statement of contract between the electrical contractor and the owner.

A standard form of specification covering all electrical work in detail would have a further tendency to do away with the present custom of letting the contract for the electric motors required in a ventilating system to the ventilation contractor or for electric generators to the persons installing steam plants and engines.

I have prepared a list of items that should be included in a specification for electric wiring for your consideration and discussion. Please do not understand that I give you this as an ideal or even as being complete, but rather consider it as a basis for discussion to the end that a complete and perfect thing may be brought out of the present mixed-up conditions of affairs.

(1) Bids; (2) Drawings; (3) General systems; (4) Quality of work and rules to be followed; (5) Entrance and service connection, location, etc.; (6) Meter setting, location, etc.; (7) Mains and feeders; (8) Special material and class of work; (9) Wire shafts; (10) Center of distribution; (11) Cutout, cabinet and panelboards; (12) Branch circuits; (13) Class of work; (14) Specification of material; (15) Details of installation; (16) Switches and control of lights; (17) Outlets—floor, wall, and ceiling; (18) Fixtures and cords; (19) Lamps; (20) Window Lighting; (21) Decorative or special lighting; (22) Signs; (23) Motors and motor circuits; (24) Location of rheostats and controllers; (25) Fans; (26) Telephone and bell systems; (27) Ordinances and inspection fees; (28) Manner of changing locations and pay for same; (29) Schedule giving summary and total of all outlets, etc.; (30) Guarantee and bond; (31) Retaining and final payments.



Window Display of Sterling Electric Company.

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An Electric Illusion in Window Display.

The illustration herewith is from a picture of a window display installed by the Sterling Electric Company, contractors and supply dealers, Minneapolis, Minn., and is somewhat of an illusion. The very brightest spot in the display appears to be absolutely black. This particular spot is the coiled filament of a 2,000-candlepower Laco nitrogen-filled tungsten lamp, which is seen hanging above the center of the display. The general illumination of the window was so intense that it caused the photograph to have a foggy appearance.

Another peculiar thing is the reflection on the window pane of the Corinthian five-light standard at the curb, some 10 feet from the window. This is caused by the volume of illumination giving the window the effect of a mirror. An illusion can also be noticed at the extreme left side of the picture. By looking at this part of the picture there appears to be another complete and separate display. The most peculiar thing of all is that none of the illusions shown in the picture can be seen with the naked eye when viewing the display.

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Universal and Selective Motors.

The increasing use of small motor-driven portable tools and numerous motor-driven household devices such as vacuum cleaners, sewing machines, etc., has created a demand for motors that can be satisfactorily operated in all sections of a city regardless of whether alternating or direct current is available. Two types of motors that meet these requirements are on the market, being known as universal and selective motors.

The universal motor, as its name implies, is a motor which will operate on both alternating and direct current without any change being made in the windings. Such motors are always of the series type, both the field and armature structures being laminated to insure low power-factor and satisfactory operation on alternating current. However, there is always one difficulty that has to be overcome in the design of a series alternating-current motor which is the tendency for such motors to spark, due to transformer action between the field and the armature while an armature coil is being short-circuited by a brush. This trouble can be minimized by the use of a small number of armature turns, which, however, means a high speed of rotation. Most portable devices, however, operate at a high speed so that universal motors having speeds in the neighborhood of 8,000 revolutions per minute have a large field of usefulness. When low speeds are required special design is necessary. A low-speed universal motor was described on page 687, Electrical Review and Western Electrician, for April 4, 1914. In this motor a resistance is inserted in series with the field, the armature being shunted across part of this resistance. In this way a comparatively uniform field is obtained, and owing to the reduced voltage across the armature, only a small number of armature turns is required for low speed. The power-factor of the field and armature will be nearly the same with this arrangement, and due to the uniform field, a nearly constant speed is maintained at all loads.

However, no strictly universal motor has as yet been designed, the motors all being universal at only one load, as the characteristic curves on alternating and direct current vary widely. In selecting a universal motor it is therefore necessary to accurately calculate the load at which the motor will operate, if the best results are desired. Under these conditions the universal motor will be found to be satisfactory for many small-motor applications. Their efficiency, however, due to their small size and the compromise in their design, is not very high, often being about 35 per cent. Such efficiencies, however, are not of great importance compared with the other advantages.

The field of the universal motor can be extended by employing resistances in series with the motor when operating on direct current or low-frequency alternating current. Under these conditions the characteristics of the motor on alternating and direct current can be made to be somewhat similar. Such motors have been built in comparatively large sizes and are giving satisfactory service. One example is that of the motors of the New York, New Haven and Hartford Railroad's electric locomotives which are supplied with alternating current on the main line and with direct current at the Grand Central Terminal, New York City.

The selective motor is also a series motor, but it employs separate windings for alternating and direct current. In this way the windings may be selected to suit the current available. These motors are also of the high-speed type and are generally made in only the smaller sizes.

M. Edwin Arnold.

Intelligent, energetic and enterprising effort seldom fails to win appropriate appreciation and reward. A company which is characterized by enterprising and progressive policies, supplemented by an energetic head who keeps closely in touch with business conditions and the proper conserving of its resources is pretty sure to meet with success.

These statements are well exemplified in the career of M. Edwin Arnold, head of the firm of M. E. Arnold & Company, electrical contractors in Philadelphia, Pa. Mr. Arnold is a man intimately conversant with the various phases of his business, which include the supply and installation of everything electrical.

Mr. Arnold was graduated from Girard College, Philadelphia, in 1894. He secured a position in the Philadelphia office of the General Electric Company at once, where his work was of a very practical nature. Later he was employed by the Bell Telephone Company and several large wiring contractors of the same city. In 1897 he organized the firm of M. Edwin Arnold, which was later changed to M. E. Arnold & Company, although the business is still conducted by Mr. Arnold individually. The business grew steadily from year to year, necessitating several removals to larger quarters. In 1904 the premises at 114 North Eleventh Street were secured, and in 1912 an additional floor was added at the same address, where the firm has continued uninterruptedly its business.

M. Edwin Arnold.

Mr. Arnold has always taken a wide interest in the larger activities connected with his line of business. He was one of the original members of the National Electrical Contractors' Association, and was the delegate from Philadelphia to the Denver convention of the Association. He is president of the Electrical Contractors' Association of the State of Pennsylvania and is also president of a local association known as the Philadelphia Electrical Contractors' Association. He is a Jovian and is treasurer of the local Jovian Electrical League. The firm is a member of the Society for Electrical Development.

Mr. Arnold's residence is in the beautiful suburb known as Germantown, and he makes his way to and from his office by automobile, as motoring is his principal recreation.

Electrical Work on an Enormous Coal Dock.

The Erner-Hopkins Company, of Columbus, O., is the successful bidder for the electrical work on the new $2,000,000 coal docks of the Hocking Valley Railroad Company at Toledo, O. This is the most important operation of its kind on the Great Lakes and has been over a year in building. Two 75-kilowatt engines and generators, together with housing and connections, are the principal electrical features. They will furnish power to a pair of giant Brown hoists, built at Cleveland, O., and said to be the largest ever turned out of the shops. Each has a capacity of lifting direct from the switchback tracks a coal car of 100-ton load and dumping into the hold of a vessel at the rate of about one car per minute. The concrete slips into which the vessels tie up for loading will accommodate at one time five of the largest coal carriers on the lakes. Added to the electrical apparatus to be grouped about the two slips, the contract includes the wiring and lamps for the entire docks, which extend a long distance along the water front, and which will accommodate thousands of coal cars awaiting transshipment by boat. The lighting requirements will be met by 100 lamps, each of 500 watts. The contract amounts to about $15,000. It must be completed in readiness for the navigation season. Toledo is now said to be the greatest soft-coal loading port in the world, being the gateway for the Northwest for mines throughout Ohio, West Virginia and Kentucky. A large force of men has been engaged.

Municipal Electrical Inspection Begun in Jacksonville, Fla.

The City Council of Jacksonville, Fla., has recently passed an ordinance creating the position of city electrical inspector, requiring all electrical work to be inspected by him or his assistants, and specifying the fees for the inspections. The ordinance also establishes the National Electrical Code as the basis of installation rules, but contains some additional requirements necessitated by local conditions in the city. I. L. Barnes is city electrical inspector; L. F. Beerbower and F. B. Miller are his assistants.

Steel Towers for Panama Wireless to be Erected by Columbus Contractors.

The Childers Construction Company, of Columbus, O., has been awarded the United States Government contract for the erection of three steel towers in the Panama Canal Zone that will be used for the wireless station. Each of the towers will be 600 feet high, with a 150-foot triangular base, tapering to 10 feet at the top. The three towers will require 1,000 tons of steel. The towers will be about 90 feet apart and located near Gatun. J. L. Childers sailed for Panama on April 2, to begin the preliminary work of construction. It is expected that the towers will be completed in about five months. The steel is being fabricated at Toledo, O., and part of it is ready for shipment. Mr. Childers had a prominent part in the steel work already done at the locks, under the McClintic-Marshall Company, of Pittsburgh. His brother, W. B. Childers, who remains in charge of the Columbus headquarters, was general superintendent of the Gatun gates contract, and this time a year ago was working a force of 2,500 men. The Childers Construction Company contract, which is confined simply to setting the towers in place after the material has been delivered, involves about $50,000.

Oil Thrown From Bearings.

Sometimes the "trouble shooter" or wireman from a contractor's shop will be sent out on a complaint of a motor throwing oil from its bearings. This is generally caused by the rings picking up so much oil from the well and carrying it onto the shaft that it is impossible for it to leave the shaft by means of the lubricating oil grooves fast enough. The oil will then creep along the shaft until outside the bearing housing, where the centrifugal force will throw it off in small drops or as spray.

The manufacturers use various means to eliminate this, one of the most common being to cut a groove about one-eighth to one-quarter inch wide, and correspondingly deep, in the bearing near the ends. A hole is drilled through this groove in the bottom of the bearing to allow the oil to escape as it is collected on the shaft. Very often this groove is not cut deep enough, or the hole in bottom groove may be plugged up with dirt, waste, etc., and cause oil throwing. The groove should be cut deeper and hole cleaned out or drilled out a little larger in this case. It may sometimes be necessary to drill an additional hole in the bottom and cut the groove as deep as the metal will allow before the oil throwing is stopped.

H. W. Parsons.

Among the Contractors.

A new electrical contracting establishment, which commenced business on March 1, is the City Electric Company, at 200 California Building, Tacoma, Wash. M. R. O'Keefe and J. J. O'Keefe, who comprise the organization, are both men with a number of years practical experience in the electrical contracting line and they enjoy a large acquaintance in Tacoma.

The Shiery Electrical Company, Urbana, O., has been handling a large volume of wiring and other house work under a special offer to wire and install fixtures for $55. The company guarantees its work to pass state, insurance and other inspection, giving certificates to that effect. The campaign is incidental to one on behalf of the company's line of electric appliances.

J. Don Alexander has recently purchased the stock and business of the Goeller Electric Company, at 613 Sprague Avenue, Spokane, Wash., and will conduct a general electrical and contracting business under the name of Alexander Electric Company. Mr. Alexander has had over eight years' experience with the Washington Water Power Company in their motor and meter departments and has a broad knowledge of electrical conditions in Spokane. He has had 12 years' experience in the electrical business, having taken the apprenticeship courses at the Westinghouse Company and the Allis-Chalmers Company.

J. J. Agutler & Company, of 73 Madison Street, Seattle, Wash., is installing the electrical equipment of the Liberty Theater, the Ames Building and the Peterson Building, all of which are situated in Seattle. The company is also installing the electrical equipment in the five new buildings for the state insane, at Sedro Valley, Wash., and also the electrical work on the Cheney Normal School, at Cheney, Wash. A recent installation completed by this company is that of the new Elks' Club Building in Seattle.

Buxbaum and Cooley, of 68 Columbia Street, Seattle, Wash., is building some interesting apparatus for the Sessnon Lighterage Company, of Nome Alaska. This consists of a 10,000-candlepower searchlight and a five-kilowatt motor-generator set to deliver 55 volts to the searchlight. The motor had to be constructed specially for the purpose, the speed required being 900 revolutions per minute. The searchlight will be used for lighting up boats and lighters at a distance as great as two miles from the beach.

The Gem City Electric Company, Quincy, Ill., has recently installed 25 motors at the factory of the J. R. Little Metal Company, and 11 motors and three 10-kilowatt transformers at the new Morris Brothers' shoe factory. Both of these installations are located in Quincy and are furnished with 25-cycle, 440-volt alternating current from the distribution circuit of the Mississippi Valley Power Company. The Gem City Power Company recently changed the plant of the Ruff Brewing Company, of Quincy, from steam to electric power, and is doing the same at the plant of the Menke Stone & Lime Company. The firm is also installing motors totalling 130 horsepower in capacity, together with a lighting system at the filtering plant of the Citizens' Water Works. Many smaller contracts were obtained, due to the lighting company changing its power from 550 volts direct current to 440 volts alternating current.

The Sterling Electric Company, of Minneapolis, Minn., has secured the contract to furnish material and install an electric light plant for the Browerville Electric Light & Power Company, of Browerville, Minn., consisting of a 25-kilowatt generator and a 220-volt 120-ampere storage battery. The contract price was $5,000.

The Avery-Loeb Electric Company, Columbus, O., has received through the Wayne Oil Tank & Pump Company, of Ft. Wayne, Ind., the contract for installing 28 motors in the new factory of the Hanna Paint Company, Columbus, as a part of the system for distributing oils and other liquid paint materials through the factory. The contract amounts to $1,500. Another contract received by the same company is the underground wiring for elevators and lighting in the new Pennsylvania railway station at Piqua, O. This concern will also have the wiring and lighting work for the Made-in-Columbus Exposition to be held in booths encircling the State House Square, in June.

The United Electrical Company, of Marion, O., has secured the contract for the new Elks' hall at Marion. The improvement includes a fully equipped theater. Wiring and lighting will amount to about $2,000.

A contract has been let by Ohio State University to the McKeever Electric Company, of Columbus, O., for lighting and power in connection with the new physics building now in course of construction on the University campus. The contract will amount to approximately $800.

National Association of Electrical Inspectors.

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11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison
Frank R. Daniel
James H. Fenton
F. G. Hartwell
J. E. Latta
James B. McCarthy
Thomas D. McColl
C. W. Mitchell
A. A. Moffitt
R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary's annual report is in preparation and will shortly be sent to each member. He desires to state here that since the biennial meeting in March, 1913, the membership of the Association has doubled. It is also a satisfaction to be able to state that out of the twenty odd members who were at that time liable to be struck from the rolls on account of arrearage in dues, all but one (who has been dropped) are on the list in good standing today.

E. M. Addis, of Brattleboro, Vt., has become a member of the Association, having joined the Western New England Section at its last meeting.

Thomas P. Hussey, municipal inspector of Marblehead, Mass., has also become a member, having joined the Eastern Massachusetts Section recently.

One of the most important questions now coming to the front to disturb whatever equanimity the harrassed inspector may still possess is that of the use and installation of the nitrogen-filled high-power tungsten lamp.

This question has been referred by the Electrical Committee, National Fire Protection Association, to a special sub-committee of which our representative, Commissioner Cole, is chairman. Such matters as type of socket to be used, suitable wire for use in fixtures, etc., allowable closeness to surrounding combustible material, and many others which will doubtless occur to all, are to be considered.

The Secretary earnestly hopes that any of our members having any experience whatever with these lamps will make it a point to communicate his data with full detail to him. This is one way in which each member can, without serious exertion, do a little to assist the officers in their work; such information would not be published, if the writer so desired, but would be transmitted to Mr. Cole as field information to assist his committee.

The Secretary particularly recommends this question as especially interesting for consideration by the various sections and would suggest that it form a subject for a section meeting, the discussion thereon to be sent in to this office by the section secretaries.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

The following important communication has been received from President Day.

The President is in receipt of the following letter of inquiry. Other than expressed in his answer, he is without any experience. The letter comes from an active and enterprising city in the Middle West. The President would appreciate any word, from our membership, which might be of assistance to the gentleman making the following inquiry:

About two years ago the city commissioners of the city of ———— adopted an electrical ordinance. This ordinance was a part of that submitted by the writer. About a year ago the ordinance was partly amended to require conduit wiring in fire limits and conduit service for all light and power service wiring. We made an effort the first time, as well as last year, to have the commissioners adopt the National Electrical Code as part of the electrical ordinances. The city commissioners felt that the city could not afford to reprint the Code as part of the ordinances and refused to insert the words "The rules and requirements of the National Board of Fire Underwriters are hereby adopted as the rules and requirements for electric wiring in the city of ————." This year the electrical contractors of the city made an effort to have the commissioners insert this phrase as part of the ordinances. The request was refused for the reason that the commissioners stated that the Supreme Court ruled against the City of Springfield, Ill., which had a similar requirement in its electrical ordinances.

There are several electrical contractors in the city of ————, many of whom follow the Code for their standard of wiring irrespective of the fact that the city ordinances do not call for all wiring to be done in accordance with the Code. There are, however, several other contractors who insist on using single-braid wires in conduit, refuse to put boxes on the end of conduit, armored cables, etc. We are wondering whether you have had any experience with cities where the courts ruled against the insertion of the Code as part of the ordinances, and what is the best method of getting around this ruling of the courts. You understand, of course, that the city commissioners refuse to go to the expense of printing the entire Code. For your information we are enclosing a copy of the city electrical ordinances.

We should very much like to hear from you as to suggestions, and can assure you that we will appreciate anything that you can do towards clearing up the situation for us here.

Very truly yours,
ENGINEER.

To this the President has replied as follows:

Dear Sir:

In answer to your inquiry of the 13th, I beg to state that I have never heard prior to your inquiry of any objection to a city ordinance giving recognition to the National Electrical Code, the recognized and accepted standard for the installation and application of electrical wiring and apparatus.

I know of a number of cities with ordinances having the words, "and the National Electrical Code shall be the standard of electrical installations." I have known of others that had a slight change in the above language, to wit, "and the National Electrical Code, as it shall appear from time to time, etc.," this latter language binding by local legislation several interests and the citizens to a condition which only the future can determine. This is not thought to be legal. The first form indicated is that most generally used.

Giving recognition, in the above manner, incurs no obligation on the part of a municipality to have the National Electrical Code printed.

A supply adequate to the needs of a municipality can be procured free of expense from the proper place. It is a well known fact and indeed it is a practice in many places for the electrical contractors and the supply companies to procure a sufficient number of copies for their employees with no expense to the municipality.

Some of the larger cities, like New York and Boston, where, because of conditions peculiar to these places, the National Electrical Code does not completely fill the needs, have printed their own edition of the Rules, such editions containing the special local rules for the treatment of the existing conditions.

I have been retained in law suits where some of the questions involved have been adjudicated by the requirements of the Code and that part of the Code that pertained to the questions in dispute has been accepted by the Court and admitted in evidence. Beyond the few facts I have mentioned, I am without any experience. However, I will present your letter to our Association in the usual manner and, should I receive further advice, will be pleased to communicate such to you.

Very truly yours,
Thomas H. Day,
President.

The Secretary particularly requests our members who act under municipal and statutory authority to inform him regarding the matter of the above letters, particularly as to how the question is handled in their several jurisdictions. He would be especially grateful for either the quotation of the decision of the Supreme Court of Illinois, above referred to, or a reference to the case in the Illinois reports (if indeed there be one and the above not referred to merely *obiter dicta*).

He may be permitted to suggest that a very simple way out would be the adoption of a by-law authorizing the proper official to establish suitable "rules and regulations for the installation of electrical wiring for light, heat and power distribution purposes within the city of ——————," which is perfectly proper, and then under that by-law let the official promulgate the National Electrical Code and his set of supplementary rules.

Thus in Massachusetts we are governed by two provisions, in part as follows (Revised Laws, 1902, Chap. 104, Sect. 1): "Every city and every town which accepts the provisions of this section may for the prevention of fire and the protection of life by ordinance or by law . . . . regulate the inspection, materials, construction, alteration and use of buildings, etc. . . ."

Also (Chap. 122, Sect. 18): "Every city shall, and a town may at an annual meeting instruct its selectmen to appoint an inspector of wires who shall . . . . supervise every wire within a building designed to carry a light, heat or power current . . . . and shall see that all laws and regulations relative to wires are strictly enforced."

The first of these gives power to promulgate by-laws or ordinances with penalties for disobedience, and the second authorizes the appointment of the inspector.

Under these two, my own town adopted a by-law simply saying that no person should use any electrical wire, fitting or appliance within a building until the same should have been approved by the inspector of wires, under such and such a penalty, and that said inspector should have power to make and promulgate rules and regulations governing the use and installation of such wires, fittings and appliances, not contrary to law, as he should from time to time consider necessary.

The statue further provides that the rights of the several parties in case of controversy are protected by invoking the Superior Court in equity, so that in a way after appointment the inspector of wires is a public officer and his decision not subject to review by the local town officials, thus protecting him from possible petty political interference.

Section Meetings.—The Secretary of the Western New England Section, R. G. Forsyth, of the Greenfield Electric Light & Power Company, reports as follows:

The regular bimonthly meeting of the Section was held on Monday, April 13, in the Y. M. C. A. Building, Hartford, Conn., President George W. Perry, of Hartford, presiding. After the reading of the minutes of the last meeting, the Secretary presented to the Section a communication from the National Secretary containing four questions which had been sent in to his office and by him communicated to the several Sections for consideration. Upon motion it was voted that the consideration of these questions be deferred until the regular June meeting, that each question be referred to a committee of two, said committees to work in conjunction with the Chairman of the Executive Committee, City Inspector M. S. Nettleton of New Haven, in preparing papers for presentation and discussion.

President Perry then presented the speaker of the day, David E. Bartlett, engineer of the Underwriters' Laboratories, who presented an address upon the work of the Laboratories. In beginning he paid a tribute in well chosen language to William H. Merrill, the founder and present manager of the Laboratories, and later illustrated the breadth and scope of the work being accomplished by a large number of lantern slides, which showed in a clear manner the method of making some of the many tests referred to. An abstract of the address follows[1].

Address by D. E. Bartlett.

General Remarks.—It gives me much pleasure to have this opportunity to speak to you this morning, not only personally, but in my capacity as one of the engineers in charge of the work at Hartford and vicinity for the Underwriters' Laboratories, which organization as you are doubtless aware, is the most important of its kind in the world, and is probably well known to you by reputation and also by experience in your inspection work in the different municipalities.

Origin and Development of the Laboratories.—I will first outline to you briefly, the history and development of the Laboratories, which I have been so fortunate as to obtain through the courtesy of William H. Merrill, the present manager of the Laboratories and also its founder. (This information you will find given more fully, accompanied by illustrations, in the quinquennial issue of the *Spectator,* published in May, 1913.)

The Underwriters' Laboratories first started from a bench, table, some electrical measuring instruments, and a few chairs, located on the third floor of the Fire Insurance Patrol Station, Monroe Street, Chicago, Ill., the staff consisting of Mr. Merrill, one helper, and one clerk.

This work, however, was extended to embrace the territory of the Western Union as well as the Chicago Board, the organization then being called the Underwriters' Electrical Bureau, and operated as a joint effort of the two organizations.

The electrical testing work which the office began to turn out attracted the attention of territory outside the Western Central District, and together with reports on electrical fires and model blank reports, gained a small allowance from the National Board of Fire Underwriters, the name being then changed to the Electrical Bureau of the National Board.

The invention of the acetylene gas generator increased the extent and scope of the work, necessitating larger quarters. After leasing various premises to supplement those at the patrol house, the organization was finally moved to a two-story brick building with adjoining lot, on East Twenty-first Street, Chicago. The next step was to incorporate under the laws of the State of Illinois, a charter being granted to "establish and maintain laboratories for the examination and testing of appliances, and to enter into contracts with the owners and manufacturers of such appliances and devices respecting the recommendations thereof to insurance organizations."

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[1] According to the provisions of the Association's Constitution, the Association assumes no responsibility for statements or opinions expressed in any papers, articles or discussions, unless such paper, article or discussion has been submitted to the Executive Committee, has been approved by said Committee and carries at its head a statement to that effect attested by the Secretary. In any other case the responsibility lies with the author alone, and his name shall be attached thereto.

In 1904 the quarters which the Laboratories then occupied on East Twenty-first Street proving inadequate for their needs, they determined to erect a building of their own, and after securing land on East Ohio Street, they erected their present structure, consisting of a model fireproof building, three stories and basement in front, and one story in the rear. In 1908, the plant was extended 66 feet to the east, and in 1911-12 a steel and concrete structure with ground area 66 by 70 feet in the rear of Building No. 2, was designed especially for test work in structural methods and materials. In 1913 additional land was obtained, thus allowing plans to be started for the extension of the plant to cover an entire frontage of 266 feet, holding in reserve a portion of the land in the rear for yard purposes.

In 1906 after originating the service of labeling and inspections at factories, it became necessary to establish offices outside of Chicago, the first field office being at Boston, in charge of Franklin H. Wentworth. The great favor with which this service was received resulted in agencies for the Laboratories and inspection offices covering the work being established in 67 cities of the United States and Canada. In 1911 the volume of electrical business made it advisable to establish an electrical testing office outside of that at Chicago, which was accordingly done in New York City.

The Underwriters' Laboratories are engaged exclusively in experimental work along the lines of fire-protection engineering and testing devices and materials having a bearing on fire hazards, being the only plant of the kind in existence for such purposes.

Each and every device which has been tested or examined by the Laboratories is recorded on cards, approximating 5,000 in number, and arranged alphabetically in files by the kind of hazard and device, such as:

Acetylene-gas generators, gasoline engines, electrical devices, fire retardants, i. e., extinguishers, fire doors, shutters, etc.

The cards bearing approved and non-approved articles are so marked, and where not approved the reason is given on the card.

If the manufacturer of a fire-protection device wishes the stamp of approval of the Laboratories, he must first submit it for a rigid test as to advantages claimed for it. Any defects discovered are brought to his attention, and where they can be remedied he is so informed; until all such defects or dangerous features are eliminated, the device is not approved.

Label Service.—I will make a few remarks as to the relationship of the label service of the Underwriters' Laboratories to the safeguarding of public welfare as regards fire protection and loss.

The inspection work is based on standards issued by the Laboratories, containing accurate descriptions of the device to be labeled and giving with it a report requiring the careful inspection and examination of the product which is offered for label service. On examination, if such article conforms to these standards, labels are permitted to be used on the device described.

Rubber-Covered Wire.—You will also probably be interested in knowing the method of testing the rubber-covered wire with which you doubtless come in contact in your regular routine.

On visiting the wire plant, the inspector first goes to the stock room, there selecting stock coils of various sizes of wire giving a fair representation of the wire output from time to time. These coils selected are then taken to the testing department where the man in charge unwraps the coils, putting them into their regular testing tank for tests to be made on the following day, at the same time samples being taken from some of the coils for physical tests on the rubber compound and for wrapping tests, a sample being selected from one of the coils to be sent to Chicago for the check tests and chemical test of compound. The following morning, the coils previously put into the tanks are subjected to voltage test according to the several sizes of wire as given in the National Electrical Code, also to megohm test to see if the insulation resistance is up to that required in the Code for the different sizes.

The National Board has now given an appropriation enabling more buildings to be used for the testing of this wire, and when these are finished, the chemical laboratory facilities will be second to none in the country. German and Italian inquiries have been received which may possibly result in business abroad. A London, Eng., office has been established, and the factories served have increased very greatly. Branch offices also have been increased for this class of work.

Snap Switches.—You probably run across the testing of switches in your work, so a word regarding them will not come amiss.

The inspector on going to the factory proceeds, as before mentioned, to the stock room or assembly room and selects at random such switches as are ready for labels, then taking them to the testing room of the plant and subjecting them to an overload test of 50 per cent of their rating and operating with this load for 50 complete consecutive cycles. A portion are then left with the test man for an endurance run of 6,000 cycles and also a heating run at the maximum rated load of the switch; that is, on a switch rated 5 amperes, 250 volts and 10 amperes, 125 volts, the heating test would be on a current of 10 amperes.

Insulating Joints.—The testing of insulating joints is done in a similar manner, they being tested for one minute at 4,000 volts, some of them for five minutes at 4,000 volts. Joints which are made for combination gas and electric fixtures, are tested also for leakage, being submerged in water and a pressure of 25 pounds per square inch applied to them one minute.

On July 1 a new set of specifications will go into effect requiring additional electrical tests of these joints; also mechanical tests as to their tensile, bending and tortional strength.

The above described duties are, of course, only a small portion of the work which the inspector has to deal with in the course of his inspections, but are the ones I thought most interesting to those present.

In Conclusion.—I would like to say a word regarding the great service which these Laboratories are rendering and have rendered to the public at large in the matter of cutting down the appalling loss by fire in this country, also in Canada, as there are neither state laws nor state officials whose duty it is to regulate or prohibit the installation or use of dangerous devices. Were it not for the rigid tests and investigations of these Laboratories, the loss of life and property from fires would be much greater than at present.

This work is not only one of great benefit to manufacturer, buyer, user, and property owner everywhere, but is also a work of humanity as represented in the saving of loss of human life alone.

During his address, Mr. Bartlett explained in great detail the methods of making the several tests of rubber-covered wire, covering both factory and field experience. He gave many valuable and helpful suggestions to assist the electrical inspectors in making tests in the field without instruments which would indicate whether or not the sample of wire under consideration was in accordance with the specifications of the Code, and what the Laboratory and manufacturers' labels indicated it to be.

His talk elicited many questions from the members, which were indicative of the attention with which his remarks were received, and the resulting discussion brought out many interesting points. The great value of the paper was in bringing home to the members present the intimate relationship between the Underwriters' Laboratories and the electrical inspectors in the field, and how the work of each was helpful and necessary to the other. Mr. Bartlett was tendered a vote of thanks.

After this an animated discussion concerning the best method of grounding wireless-telegraph apparatus was engaged in at the request of the President.

The President then called the attention of the members to the fact that at times answers to the questions in the Association's columns in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN appeared without any explanation or reason for the answer. He deplored the use of the words "yes" or "no" as an answer and thought that some explanation would help the person who had asked the question as to why the member of the Executive Committee gave such an answer. In view of this the following resolution was unanimously passed:

"*Resolved:* That the Secretary be and hereby is directed to request the National Secretary to direct his best efforts toward securing explanatory answers which are to appear in the Question Box of the National Association, these answeres to have more than the words 'yes' or 'no.'"

After lunch at the City Club the members proceeded to the Dutch Point Station of the Hartford Electric Light Company, where as the guests of Fred C. Wilbraham they spent the afternoon and adjourned, all feeling that they had spent a most profitable day.

[Attest] R. G. Forsyth,
Secretary.

The Secretary earnestly hopes that the other sections are holding as interesting and profitable meetings as the Western New England, and again desires to call the section secretaries to the provision in the National Constitution referring to the forwarding of reports of meetings. He also *recommends particularly* to the members of the Executive Committee consideration of the resolution of the section noted above, it being exactly in line with his own desires.

The regular meeting of the Eastern Massachusetts Section was held on April 16 at the office of Commissioner Cole in Boston. Considerable business dealing particularly with the nitrogen lamp was discussed, but the meeting was held too late for the report to be gotten ready for this issue, and it must lie over until later.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Pacific Telephone & Telegraph Company. The Commission has issued an order authorizing a compromise between the Pacific Company and the city of Oakland which grants the company the right to operate under a franchise it purchased in 1912 from the Bay Cities Home Telephone Company. The city dismissed its suit against the Bay Cities Company's bondsmen and is to receive 2 per cent of the gross annual receipts of the Pacific Company. In its suit the city of Oakland sought $500,000 damages on the ground that the transference of the franchise was in violation of the agreement by which it was originally issued. The Pacific Company will add fourteen years to its franchise term by operating under the franchise authorized by the compromise and it is estimated that the city will receive approximately $1,500,000 a year of the company's revenue.

The Pacific Gas & Electric Company is authorized to sell $2,000,000 of its collateral trust notes at a price not less than $975 and accrued interest for each $1,000 note.

Certificate of Public Convenience and Necessity. The Commission rendered a decision denying the application of the Calistoga Electric Company for a rehearing in the matter of the extension of the Napa Valley Electric Company. The Napa Valley Company had been authorized to extend its electric distribution system in territory adjacent to the town of Calistoga and such extension was opposed by the Calistoga Company.

ILLINOIS.

Jurisdiction of Commission Over Contracts. In the case, Frank Porter vs. Louisville & Nashville Railroad Company, the Commission held that a contract between the parties is not a bar to the action of the Commission in the regulation of rates under the Public Utilities Law. According to agreement between the petitioner and the respondent railroad, the petitioner was to receive an annual pass or free transportation over all lines within the state of Illinois, covering a period from February 22, 1913, to December 31, 1916. The respondent notified him that although it is willing to do so it cannot issue free transportation to him for the reason that it is prohibited from so doing by the Public Utilities Law. The petitioner asked the Commission to order the railroad company to comply with its agreement and the petition was denied. The Commission says: "The intent of the Legislature in passage of this section of said Act (Section 37) evidently sought to prevent a public utility from receiving either greater or less or different compensation from any corporation or person, than that offered by its schedule to any other corporation or person.

"If petitioner could lawfully claim that he is entitled to transportation by reason of his contract with the railroad company then this Commission would be compelled to recognize the contractual relations of parties, made with public utilities with reference to service. Such a view of the law would defeat one of the purposes for which the Act was passed.

"It is urged in support of the petition that a refusal by this Commission to recognize the validity of, and to be governed by the terms of the contract entered into by the petitioner and the railroad company would be violative of the provisions of both the Federal and State Constitutions relating to existing contracts. This Commission does not agree with such contentions.

"We hold that the said contract so entered into by the petitioner and the railway company cannot prevail over the inherent power of the state to exercise its authority through a public utility commission to fix and determine reasonable and just rates for such service. To hold otherwise would allow a public utility to contract with third parties for service or commodities in such a manner as to defeat the purpose of the law and nullify the power of the state to regulate its public utilities.

"Contracts such as the one under consideration here, are presumed to have been made in view of the possible exercise by the state of its higher power through legislative enactment for the regulation and control of public utilities."

Grafton Telephone Company. The Commission authorized the sale of the property of the telephone company at Grafton for $6,000, the price agreed upon by the parties to the sale.

The Western Union Gas & Electric Company, furnishing gas and electric service in a number of municipalities in Illinois, asked for authority to extend the discount period for the payment of gas and electric bills by municipalities and the United States Government. The Commission granted the application. Because of the systems of accounting and the various dates upon which they are enabled to pay bills, municipalities and the United States Government were unable to pay the bills for gas and electricity within the discount period fixed in the company's schedules.

Financial Statement. According to a recent statement the revenues of the new state utilities commission from its organization on the first of the year to April 25, total $71,418.66. The total expenses of the Commission to May 1, are about $4,800. Deducting all expenses the net receipts up to the first of the month are $23,722.93 which amount may be turned into the state treasury over and above what the Commission has cost the state.

INDIANA.

Indianapolis Street Lighting Rates. The Merchants Heat & Light Company and the Indianapolis Light & Heat

Company have submitted propositions to the city in an attempt to secure the proposed ten-year contract, beginning April 1, 1915, for electric street lighting. The Merchants Company has offered rates considerably lower than the present rates of the Indianapolis Company and the Commission may be asked to determine the reasonableness of the rates to prevent discrimination in favor of the city as against the domestic consumers.

NEW YORK.

Commissioner John E. Eustis has resumed his work as member of the Public Service Commission, First District. Upon the expiration of his term as commissioner, Mr. Eustis went on a vacation trip from which he has just returned. It was understood when he left that another appointment would be made to fill his place on the Commission. George M. S. Shulz, appointed by the Governor and confirmed by the Senate, has not qualified. It has been held by the counsel of the Commission that the Public Service Commission law is so framed that there is no vacancy on the board through the expiration of the term for which one of its members is appointed, as he holds over until he is displaced by the qualification of his successor. It is expected now that, when the special session of the Legislature convenes on May 4, the Governor will send in a new nomination to the Senate. The return of Commissioner Eustis is likely to break a deadlock which has existed in the Commission since March 3.

VERMONT.

The Reduced Rate Toll Charge, when a party is called, but not secured, is to be abolished in Vermont May 1. The announcement was made by the New England Telephone & Telegraph Company after consulation with the Vermont Commission. This charge had been discontinued in Maine, New Hampshire and Massachusetts. It was conceded by both the Massachusetts Public Service Commission and the Vermont Commission that such a charge was a reasonable one for the service rendered. They nevertheless urged its discontinuance on the ground that it was certain to be a continual source of misunderstanding on the part of the public, partly because the reason for it was not appreciated, and partly because no other company operating in this territory or in adjoining territory made such a charge.

WISCONSIN.

Certificate of Convenience and Necessity. The Commission denied the application of the Wisconsin Telephone Company for a certificate of convenience and necessity to build an extension of its lines into the town of Rock, Rock County, on the ground that the subscriber to be served could receive adequate service, except for long-distance service, from the Rock County Telephone Company. The Commission states that it will take up the matter of a physical connection between the Wisconsin Telephone Company and the Rock County Telephone Company at a later date.

Equitable Electric Light Company. A supplementary order has been issued modifying the Commission's original order in the case of H. G. Douglas et al. vs. Equitable Electric Light Company, of Lake Geneva. Objections were made as to the primary rate for lighting service, the character of the schedule for power and the high rate for street lighting. The supplementary order defines the active load for lighting consumers more specifically and also reduces the charge for excess current for this class of users. The power schedule is changed from a service and energy rate to a schedule similar to the Commission's customary lighting schedule. The street-lighting rates were reduced by contract between the parties and were not considered in the decision. The order also provides for an electric heating rate designed to encourage the sale of current for this purpose.

Stock and Bond Issues. The Commission authorized the Rock County Telephone Company to issue 250 shares of stock of par value $100, the proceeds to be used for the completion of the company's aerial cable system and a portion of its central-office equipment. The Commission also authorized the Caledonia Farmers Telephone Company to issue one share of stock of par value $30, the proceeds to be used for extensions and additions to the plant. The application of the Belmont Pleasant View Telephone Company for authority to issue $400 of capital stock was granted. The Pilsen Telephone Company was authorized to issue $175 of stock.

The Wild Rose Telephone Company secured permission to issue stock to the extent of $850 and $3,150. Both issues were authorized for the purpose of making extensions to the company's plants.

Utility Work of Bureau of Standards.

The Bureau of Standards has asked Congress for an appropriation of $100,000 to be used in the investigation of problems in connection with public utilities. The Bureau desires this appropriation to enable it to conduct the necessary investigations to determine proper standards of service for public utilities, to be used as a basis of regulation by states and municipalities. The House Committee on Appropriations has allowed the Bureau $25,000 for this purpose.

Austin Dam and Power Plant Soon to be Placed in Operation.

The big dam which is being built across the Colorado River just above Austin, Tex., was expected to be completed about May 1. The City Water Power Company, of Hartford, Conn., was given the contract for constructing the dam and power plant according to the plans of Lamar Lyndon, the eminent engineer of New York City. By the terms of the city's contract, the dam builder is obligated to install electrical equipment capable of generating 6,000 horsepower of electrical energy; and guarantees that with the water of the lake standing 18 feet lower than the crest of the dam, two of the three generating units installed can be operated with an output of 3,300 horsepower continuously. The contractor agrees to operate the plant for 25 years, during which time he guarantees to deliver to the city 600,000 horsepower-hours of energy in every thirty-day period regardless of river conditions.

The power plant is built on the site of the one destroyed several years ago and makes use of the remaining portion of the old building. Three vertical turbines of 2,400-horsepower capacity each when operating under a head of sixty feet are connected to three 6,600-volt, three-phase, sixty-cycle alternators capable of delivering a total of 6,000 horsepower under these conditions. Two small direct-current generators supply the necessary exciting current. Five large penstocks of steel incased in concrete supply the water to the turbines.

The dam is of hollow reinforced-concrete construction between 1,100 and 1,200 feet long, having a base nearly 100 feet thick and standing 65 feet above low-water level. When water begins to flow over the crest of the dam, the floodgates automatically open. These gates are 14 feet high on the part of the old dam utilized and five feet high on the new structure, thus throwing the maximum strain against the stronger part of the dam. Owing to the hollow construction of the dam, an interior passage is provided more than half way across the river. By means of this passage and the footpath on top of the structure, the keeper of the works will have the entire dam under his observation.

The rapidity with which Jerusalem is growing owing to the return of the Jews in great number to the home of their ancestors, has necessitated the introduction of modern electrical improvements. Four separate tramway routes are to be built, all starting from the Jaffa gate.

Flame Carbon Arc Lamps.

At the meeting of the Pittsburgh Section of the Illuminating Engineering Society on April 17, C. E. Stephens presented a paper on "The Development of Flame Carbon Arc Lamps," and F. Alex. McDermott on "The Firefly and Other Luminous Organisms." The main papers were preceded by a discussion of the history and theory of arc lamps by R. B. Chillas.

Mr. Stephens introduced his subject by calling attention to the improvements that have been made in recent years in the appearance of lamp units, the increased use of ornamental poles, and the efforts to reduce the number of poles on the streets by using combination poles for lamp, trolley and auxiliary apparatus.

Flame arc lamps may be classified as open-flame carbon arcs and inclosed-flame carbon arcs. In the former the arc is maintained between mineralized carbons, inclined together at an angle of approximately 25 degrees, with the arc chamber thoroughly ventilated. Because of the free oxidation the carbons are consumed quite rapidly, the life being 16 to 20 hours, depending on their length. The method of forming the arc between inclined carbons necessitates the use of carbons of small diameter to insure that the ends will burn evenly; hence to secure a reasonable life, carbons of comparatively great length are required. The long, small-diameter carbon is necessarily expensive.

The open-flame carbon arc lamp is useful only where large quantities of light are required, outdoors, and in some industrial establishments where the areas to be lighted are great and mounting heights high. The light efficiency is high, but the distribution is such that the maximum intensity is directly under the lamp, and this makes the lamp unsuitable for producing a uniform illumination over large areas. The mechanism is complicated and the lamp requires frequent attention.

In order to secure a long-burning open-flame carbon arc lamp, various magazine types have been devised. In general, these lamps have been commercially unsuccessful because the quantity of carbon consumed was approximately the same, the only saving being in the labor of trimming. Also the magazine added to the complexity of the mechanism.

Early attempts to lengthen the carbon life by restricting the air supply resulted in a heavy deposit of white powder over the glassware, which in a short time became so thick as to absorb practically all the light. The problem was so to dispose of the metallic fumes that the glassware would remain comparatively clean throughout an entire trim of carbons, which should be 100 to 125 hours. This is achieved in the modern lamps.

The inclosed-flame arc is maintained between mineralized carbons in an inclosure where the air supply is restricted. The carbon forms the conducting vapors, and the illuminosity of the arc depends on the quantity of the mineral salts vaporized. This vaporization must be uniform to produce a steady light. Practically all of the light emitted comes from the arc flame, and only a very small portion from the incandescent craters on the carbon ends. The carbons are vertical and superimposed, so that the arc flame is also vertical.

The diameter of the carbons is approximately seven-eighths inch and their length 14 inches. The rate of consumption is comparatively small, allowing a simple and rugged mechanism, which is a modification of the ordinary inclosed carbon arc mechanism, the difference being in the sneak feed and the focusing arc principle. In other words the carbons are fed into the arc simultaneously, at rates depending upon their relative consumptions, maintaining the arc in a fixed position, and they are fed gradually, instead of by steps. The fumes from the arc are deposited in a relatively cool condensing chamber above the globe.

The successful operation of the lamp is entirely dependent on the character of the carbons. The cored type have not proven successful and modern carbons are homogeneous, show an efficiency of 0.2 to 0.3 watt per mean lower hemispherical candlepower and a life of 100 to 125 hours. The maximum candlepower is from 10 to 30 degrees below the horizontal, making the lamp particularly adapted to the illumination of large areas. A particular advantage of the flame carbon lamp is that it is suitable for either direct or alternating-current circuits and for frequencies as low as 25 cycles.

The efficiency of the inclosed-flame carbon arc lamp is much better than that of the new nitrogen-filled tungsten lamps; moreover, it is susceptible of improvement, while the latter is near the theoretical limit of its efficiency. The efficiencies of the new tungsten lamps are given for clear glass globes, and when they are inclosed in suitable diffusing glassware the efficiency will be still lower. The tungsten lamp is undoubtedly desirable for series circuits in residential sections, and the gas-filled lamp will probably enlarge this field somewhat; but, in the opinion of Mr. Stephens, it will never compare favorably with the flame arc lamp for business streets, boulevards, parks, driveways, city squares, and other areas where there is any great amount of traffic and which require a high illumination intensity.

The new high-efficiency Mazda lamp is too new to predict its limiting field with any degree of accuracy. Its immediate effect will probably be to entirely wipe out all of the old inclosed carbon arcs; to extend the present field of the tungsten lamp; and to accelerate improvements in flame arc lamps of both the flame carbon and metallic flame types.

In his paper on the "Firefly," Professor McDermott reviewed the present state of knowledge of the production of light by living organisms, with special emphasis on the physical properties of the emitted light, and the chemical processes involved in its production. Although there still remain many points for future workers to clear up, it has been shown that the firefly expends all of the energy used in light production within the range of the visible spectrum, the maximum of the energy distribution curve falling near those wave-lengths having the greatest illuminating power. Infra-red, ultraviolet, and penetrating radiations are absent. The chemical processes involved are probably those of the oxidation of some physiologic substance; there is some evidence that this substance may be a nucleo-albumin. The watts-per-candle efficiency is in the neighborhood of 0.054. The illuminating efficiency is estimated at 90 to 96.5 per cent. The material may be dried out of contact with the air, without losing its power to produce light when moistened. The power to produce light is quite widely distributed among animal forms, and much less widely among plant forms. The fireflies do not appear to produce the substance as needed, but start life with a limited amount. The organs for the production of light vary greatly in structure in different groups of animals, and in some cases show very intricate structures. In the fireflies, the light is of a secondary sexual character; in other forms the usefulness varies.

G. M. Little, S. G. Hibben, G. W. Roosa, Alan Bright, M. C. Turpin, H. H. Magdsick, R. B. Chillas, C. E. Stephens and F. A. McDermott participated in the discussion of the two papers. The following points were brought out.

In addition to being rated with clear glass globes, the ratings of the gas-filled tungsten lamps are given in horizontal (in other words, maximum) candlepower values, while arc lamps are rated in mean spherical or mean hemispherical candlepower values. Failure to note this distinction will cause confusion in comparing values.

One of the improvements in flame arc carbons is the reduction of the etching of the inner globe by the fumes. Most of the impregnating salts are fluorides, which will attack glass. Most substances which will prevent this action, reduce the efficiency of light production, but recently carbons have been produced in which the etching is eliminated without an objectionable reduction in efficiency.

A number of 25-cycle flame arc lamps are being used successfully, but their application must be carefully guarded. They are not satisfactory around rapidly moving objects such as flywheels, pulleys, etc., as they produce a flicker which, in addition to being objectionable, produces a false sense of position. They are being successfully used for general illumination of large areas which do not include rapidly moving machinery.

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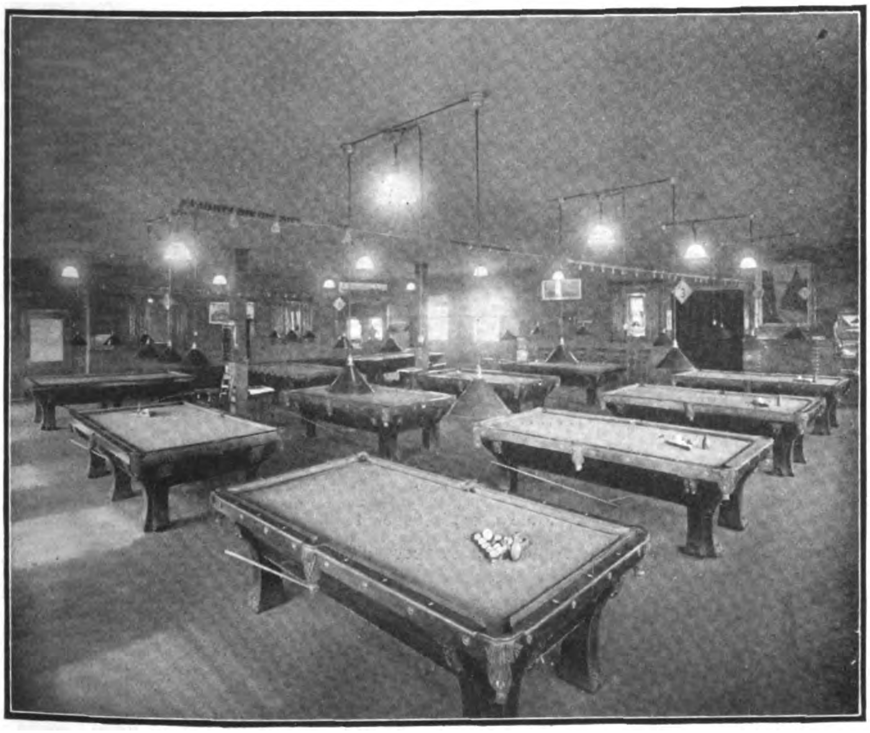
The extension of the electrification of the New York, New Haven & Hartford Railroad to New Haven, Conn., is expected to be completed in June.

Colorado Electric Club in Permanent Quarters.

Lounging Room of Colorado Electric Club.



Pool and Billiard Room of Colorado Club.

The Colorado Electric Club, of Denver, is now one of the leading commercial organizations of that city and is undoubtedly one of the strongest electrical clubs in the country. It recently consolidated with the Colorado Traffic Club and took over the quarters of the latter organization in the Chamber of Commerce Building. The combined membership numbers 1,510 and an aggressive campaign is being made to reach a membership of 2,000. It is thought that the Club will be successful in doing this in the course of a month or so.

The Colorado Electric Club has had remarkable success since its organization five years ago. During the first year of its life, it held an electric show which returned a dividend of 100 per cent on the stock of the company formed to hold the show. The following year another show was held, which was also a pronounced success. The Club is active in every movement that makes for the building of the city and state and will undoubtedly be a powerful factor in the development of the electrical industry in the Rocky Mountain states. Just now, plans are being made to create a large advertising fund which will be used to advertise the advantages of Colorado and a special effort will be made to assist in the colonization of the farm lands. The directors of the Club believe that the settlement of Colorado's lands should receive the concentrated attention of all the commercial organizations in the state and they hope to crystallize a sentiment which will do much towards active colonization of Colorado's large expanses.

The Club's new quarters are spacious and comfortable and afford all the advantages of the modern club. There is a splendid restaurant and the members are able to meet every day in the year. Certainly nothing has been done to knit more closely the electrical interests of the mountain states than the permanent establishment of headquarters for the Colorado Electric Club.

The following are the officers and directors: W. F. Cozad, president; L. M. Cargo, first vice-president; W. H. McAloney, second vice-president; C. F. Oehlmann, secretary and treasurer; W. J. Barker, Irving Hale, Benedict Shubart, Joseph F. Reardon, Harry C. Biglin, John J. Cooper and Herman A. Giese, directors.

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The International Electrotechnical Commission will recommend to the International Electrical Congress, which is to convene at San Francisco in 1915, the adoption of the name "siemens" for the unit of conductance.

Allis-Chalmers Fiscal Report.

The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued its first annual report covering the period from April 16 to December 31, 1913. For this period of eight and one-half months the net profits were $755,124. The income account follows:

Sales billed	$11,127,621
Cost, including depreciation and development expenditures	9,503,473
Factory profit	$1,624,148
Deduct—Selling, publicity, administration and general expenses.	1,017,552
Net manufacturing profit	$606,596
Other income—	
Interest on investments, bank balances, discounts, etc.	148,528
Net profit	$755,124

President Otto H. Falk, in his remarks to stockholders, says:

"The plants engaged in manufacturing operations are in good condition at present and of ample capacity to handle a much larger volume of business, and with the changes and economies that have been effected in the various departments throughout the organization there is every prospect, with the revival of business, that the Allis-Chalmers Manufacturing Company will earn substantial profits.

"An agreement has been consummated whereby the preferred stock of the Bullock Electric Manufacturing Company is to be exchanged for first-mortgage six-per-cent bonds of that company at the rate of $80 in bonds for $100 of preferred stock and the payment of the accrued and past due dividends on preferred stock of the Bullock Electric Manufacturing Company to January 1, 1914, amounting to seven and one-half per cent. After this exchange is completed the Allis-Chalmers Manufacturing Company, which now owns all the common stock, except directors' qualifying shares, will be the sole stockholder of the Bullock Electric Manufacturing Company. The Allis-Chalmers Manufacturing Company has agreed with the holders of the preferred stock to purchase at any time on or before February 1, 1915, all or any part of such bonds as may be tendered at 95 per cent and accrued interest.

"The board of directors carefully considered the question of the declaration of a dividend on the preferred stock out of the surplus profits of $755,124, but in view of the present depressed conditions concluded to adopt the conservative policy and defer taking action thereon until such time as current profits and future prospects would justify a reasonable assurance of the continuance of dividend payments."

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Engineer Utilizes Abandoned Telegraph Wire for Wireless Antenna.

One of the engineers of the J. G. White Engineering Corporation, a part of whose work is the erection of the great transoceanic stations for the Marconi Company, recently made an interesting experiment in his apartment in New York. Finding an abandoned telegraph wire fastened outside his window, he connected a tuning coil, a crystal detector, and an ordinary telephone receiver to the wire. He was surprised to hear such stations as Washington, Wellflect, Cape Cod, etc.

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Annual Report of the General Electric Company.

The twenty-second annual report of the General Electric Company for the year ending December 31, 1913, has been published as of date April 20 by order of the board of directors and under the hand of C. A. Coffin, chairman of the board.

In 1913 the business of the company exceeded in volume the record of any previous year.

The value of orders received was $111,819,142.00; the amount of sales billed was $106,477,438.76; the net results were: Profits from sales, $10,269,605.45; income from other sources, $3,796,184.43, a total of $14,065,789.88; less interest and discount on debentures and notes payable, $1,007,910.69; dividends paid, $8,149,204.55; carried to surplus account, $4,908,674.64.

More than 600,000 orders were received, and the tendency toward an increase in the number of orders and a reduction of their average value continued during the past year. The number of employees engaged in factories, offices and subsidiary companies on December 31 exceeding 65,000. During the year additional manufacturing floor space to the amount of 1,740,000 square feet was provided, making a total manufacturing floor space available at the end of 1913 of over 13,900,000 square feet. Quarterly dividends at the rate of eight per cent per annum were paid during the year. The condensed balance sheet is as follows:

Condensed Balance Sheet.

ASSETS.

Patents, franchises and good-will			$ 1.00
Cash			14,844,210.14
Stocks and bonds		$25,964,316.94	
Notes and accounts receivable		26,210,458.94	
Due from subsidiary companies		6,817,563.44	
Installation work in progress		2.012,514.35	
		$61,004,853.67	
Merchandise inventories:			
At factories	$31,697.055.53		
At district offices, in transit, etc.	4,010,538.45		
Consignments	2,083,144.79		
		37,790,738.77	
			98,795,592.44
Manufacturing plants (including all lands, buildings and machinery)		$29,427,168.29	
Real estate, buildings, warehouses, etc. (other than manufacturing plants)		1,058,386.49	
Furniture and appliances (other than in factories)		2.00	
			30,485,556.78
			$144,125,360.36

LIABILITIES.

Debenture bonds:		
5% series of 1892	$ 16,000.00	
3½% series of 1902	2,047.000.00	
5% series of 1907	88.500.00	
5% series of 1912	10,000,000.00	
		$12,151,500.00
Notes payable, due April 16, 1914	$ 8,000,000.00	
Accounts payable	2,846,656.88	
Accrued taxes	302,133.88	
Advance payments on contracts	279,561.47	
Accrued interest on debentures	197,016.63	
Dividend payable January 15, 1914	2,027,472.00	
		13,652,840.86
Capital stock issued		101,381,200.00
Surplus:		
At January 1, 1913	$12,031,144.86	
Added during year	4,908,674.64	
		16,939,819.50
		$144,125,360.36

Electrical Opportunities in Central America.

The Central American republics are undoubtedly about to begin a period of great economic development in consequence of the opening of the Panama Canal. Commercial interests in Europe are already making preparations to make the most of the business opportunities about to be offered, and for this reason the British government has recently issued a Blue Book on the subject which contains much information which will be of value to American technical men, and of which the following is a condensation in so far as the electrical industries are concerned.

San Salvador, with a population of 60,000, the capital of the republic of the same name, does not yet possess any electric street railway, but there is now under consideration a proposition to electrify the existing lines, on which the cars are now being drawn by mules. The energy must be furnished by batteries. Within a short distance of the town are to be found water falls which would be sufficient to provide power for a generating station. There is in existence at the present moment a hydroelectric plant which sells current for public and private lighting; this company is doing well financially.

Tegucigalpa, the capital of Honduras, with a population of 35,000, and the neighboring town of Comayagua (12,000) are both electrically lighted. The current, which is also sold for domestic lighting, is produced by a plant owned by the government.

Managua (35,000), the capital of

Nicaragua, has an electric lighting system for public and private service. The current is supplied by a power station in which steam engines are used; the boilers of the installation are heated by wood.

The electric plant at San Jose (40,000), Costa Rica, has been built by English capitalists. The company sells current for lighting and power; it also operates a street railway. Public lighting is furnished by a native company; in both cases the plants are run by water power.

Bogota (130,000), capital of Colombia, has a street railway system which is partly electrified. The power plant was until recently in the hands of Americans; it has now been taken over by the municipality. Current for lighting is furnished by a private native company. San Jose de Cucuta (10,000) and Medellin (60,000) are electrically lighted.

At Caracas (73,000), Venezuela, current for private and public lighting is supplied by an English company which has quite recently acquired the concession from a native concern. Current for street railways is produced by a hydroelectric generating plant owned by a local company. The street railway has also a reserve plant in which the power is produced by a Diesel engine. There is now being built in the neighborhood of the town another hydroelectric plant owned by an English company.

The republic of Guatemala, with a population of two millions, imports from Germany the largest part of the electrical material used; the value of this is about $50,000 a year. This is accounted for by the fact that the power and lighting companies are controlled by German capitalists. One of the conditions imposed upon consumers of light and power is that they must buy their material at the power plant. It is proposed to electrify the street railway system in the capital, which belongs to an American company. The prospects for electrical industries are favorable, as the country possesses abundant water power. But there is considerable difficulty in complying with the customs regulations, and quarrels between importers and the customs officials are of frequent occurrence.

Electrical importations into San Salvador are divided between Germany and the United States. The government buys its telegraphic material, however, from commercial houses in the United States.

In Honduras the influence of the United States predominates. Electrical imports amount to about $25,000 a year. Germany gets but a small part of this. The mining industry, which is rapidly developing, promises an important market for electrical material. In Nicaragua also electrical importations are mostly from the United States.

In Costa Rica the importations of electrotechnical materials have rapidly increased in the last few years; the annual value now exceeds $100,000. Three-quarters of this comes from the United States, the other quarter principally from Germany.

Importations into Panama are divided between England and the United States, the latter getting 54 per cent of the total, which amounts to $75,000 a year. During the last few years, however, English influence has increased. It is said that some of the goods sold as of English make are in reality German.

The importations of Colombia are divided between the United States and Germany. Business in electrical lines is small, amounting to only $50,000 a year. But the prospects are good, and the Colombian market is worthy of attention from American electrical manufacturers.

In Venezuela the electrical industries have recently experienced a boom, imports suddenly rising from $25,000 to $75,000 a year. Four-fifths of this comes from the United States, Germany and Italy dividing the remainder. Canada has recently entered the market, which is due to the fact that some of the mines have lately gone into the hands of Canadian capitalists.

Besides the English company above mentioned in Caracas, there has recently been started by French capitalists a local enterprise which furnishes energy to the town and suburbs. This company now has three hydroelectric stations running on the Guaira River, and generating about 25,000 horsepower. These plants furnish current for street railway and industrial purposes, for which there is an increasing demand, as a number of manufacturing concerns are beginning to make use of electric power.

The commercial houses of Europe are thoroughly alive to coming opportunities in this region, and there seems no reason why a considerable amount of the business which will shortly be developed should not come to the United States.

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Week-End Cablegrams to Germany for $2.00.

The Commercial Cable Company announces that week-end cablegrams for delivery on Mondays may now be sent by the German Atlantic cables to Germany at reduced rates. The charges from New York City will be $2.00 for 25 words or less and 8 cents a word for words in excess of 25.

DECORATIVE LIGHTING OF THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.[1]

By J. W. Gosling.[2]

The searchlight has been used at most expositions to some degree, but as it was somewhat of a novelty at Chicago, its use was naturally crude. At that time there had not been developed the methods of today in spreading light over large surfaces, nor had they at that time perfected the use of color screens in connection with the searchlights.

By the double use of the searchlight, decidedly pleasing effect is obtained. Using two rays of unequal power from different angles, it is possible to give a definite idea of the depths of an object and bring out clearly any decoration or modelling it may have. What we do is really to illuminate the shadows. By the introduction of color into either the weaker ray, which is of course the shadow, or both, some weirdly beautiful results are obtained.

In the earlier expositions the lighting of streets, roads and open spaces has generally been treated much as we would light an ordinary thoroughfare. The illumination of the roadway was cared for mainly by that light which flooded out from the lighted buildings, thus bringing all sources of light within the range of vision of the observer. Where maximum illumination is required, it is necessary to have the source either wholly or partly exposed and in consequence there has been developed much efficient glassware which will subdue the very brilliant spot at the source and diffuse the light through a globe where the same quantity of light covers such a large area that it is not objectionable to the eye.

The development of lighting apparatus of all kinds has been so great that we will be able to obtain effects which have never before been seen, at least on such a grand and interesting scale as we will be enabled to use them.

Searchlights or projectors with wide-angle doors have a value in the lighting of large areas which has not heretofore been applied. There will be 375 arc projectors in use in the exposition, varying in size from 13 to 30 inches, for general illumination, for the illumination of sculpture, towers, streamers, panels and flags, while in the great battery composing the scintillator there will be 48 36-inch projectors.

The lighting of the exposition is divided into various types or classes, viz: interior lighting, court lighting, lighting of the setting of the Fine Arts Building, South Gardens, boulevards and roads, lighting of sculpture, festive lighting, lighting of jewels and spectacular lighting.

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[1] Portion of an address delivered before the San Francisco Architectural Club, March 24.

[2] Designer for the Illuminating Engineering Department of the Exposition.

All windows in the exposition will be equipped with lamps which are intended to cast an even, bright, warm illumination through them, so that when the exposition is seen from the hills it will have a generally gay, pleasing and hospitable aspect, much resembling a great building during a gala occasion. In many cases the lamps will be colored.

Festival Hall, besides its great auditorium, contains a number of small conference rooms, halls and passages of odd form. Most of these conference rooms and halls have low ceilings and are lighted by semidirect lighting units, which are made of plaster and have a glass bowl set in them for direct diffusion of the light. The entrance halls and foyer will be lighted by large suspended fixtures composed of a dish of leaded glass, something in the form of the Greek amphora. It is intended that these fixtures will give warm, even illumination throughout the entrances. The vestibules will be equipped with a rather ornate lantern similar to that which will light the colonnades of the Court of Flowers. The auditorium is lighted by both indirect and direct light. Indirect illumination is obtained by the use of searchlights which are set in a well under the center of the room, the light being sent upwards through a diffusing plate on the well head. This well head is about four feet in diameter, and on a level with the backs of the seats. It is estimated that the twelve 18-inch projectors used for this work will give a general even illumination upon the interior of the dome, and reflecting the light downward will give an illumination of about 1.5 foot-candles at the floor.

In order to offset any effect of the flatness or coldness generally derived from indirect light, there will be suspended six large ornamental-ball-type fixtures in the arches over the balcony as well as 12 well fixtures placed around the corridors at the rear of the balcony. These fixtures will be composed of glass work which will give off a warm, soft, mellow light and will be kept out of the direct range of vision of anyone watching the stage, although none of them is so intense or brilliant as to tire the eyes.

The style of architecture of the California Building has been the means of developing a number of lighting devices which will be somewhat out of the ordinary, the principal ones of these being the great ring of candles in the foyer, the spheres of light which will illuminate the body of the ball room, the method of lighting the dining room of the president of the exposition and the lanterns which will glow at all the principal entrances. The arcades are lighted by small lanterns and the forecourt by many tiny lanterns strung through and about the trees and hedges. The oval entrance stairway will have newels composed of three figures, each bearing luminous glass balls. In the president's dining room there is a ceiling panel about 12 feet square, above which there is a skylight; suspended beneath this skylight will be a silk shawl or curtain through which will pass the light for illuminating the room.

The Court of the Universe, being the most important of the courts and one of odd form and dimensions, presents some very unique problems in illumination. The main source of light will be placed in the two large fountains at either end of the sunken garden. The part giving the light is in the form of a column in the center of each fountain. The columns are of heavy diffusing glass, about 38 feet high and 5 feet in diameter, each containing ninety-six 2,500-candlepower nitrogen lamps. It is calculated that there will be a generally even light on the face of the peristyle of about 3 foot-candles.

In this court there are also a number of small sources of light, none of them intense, but being placed to accentuate the elliptical form of the sunken garden and act as a means of adding an appearance of festivity and brilliance to the court, to draw the eye from the brighter fountain light, and relieve the space between the fountain and the columns from any effect of monotony. On the back of each column set in the fluting will be three glass bowls, each containing a lamp, which will shed a warm light over the arcade and tend to wipe out any objectionable shadows which might be cast by the main lighting source.

It is in this court that we have the great ring of figures bearing stars of jewels. In the base of each figure is placed a projector, not visible from below, but casting a beam of light across the court and shining on the star of a figure on the opposite side. The north approach to this court will have a row on either side of the pool of single-unit standards of the new style of lamp, giving the colonnades the same color tone as the great court within.

The Court of the Four Seasons will have a light of a different color. By this is not meant that the color will be different in the sense that yellow is different from red, but in the sense that the light of the arc is quite different from that of the incandescent lamp. About the fountain in the center of the court, midway between it and the colonnade, will be ranged eight standards, each having two ornamental luminous arcs and the approach will also be equipped with this same standard. These standards will be so placed that the light of the arcs will fall full upon the building and be shielded on the side away from the building. The shields on these standards are in the form of decorative figures bearing garlands of flowers.

The Court of Abundance, with its unique architectural treatment, has suggested many lighting effects which will strike the visitor with surprise as he enters the court. The basin in the center has at one end of it a fountain which is in the form of a globe surrounded by figures, and so arranged that the upper half of the globe will remain exposed. The globe, though 18 feet in diameter, will be built of glass and contain a mechanical arrangement of light which will give the globe the effect of turning as the earth does upon its axis. Streams of water will pour upon and over it, while about the sides will issue steam in slowly rising whirls, giving the whole the effect of the earth turning in space. At the opposite end of the pool and a part of the sculptural composition will be the sun, setting at the water's edge. The sun will be formed of a disk of plate glass about six feet in diameter, and have arranged behind it a mass of small incandescent projectors driving a powerful light upon the earth at the further end of the pool. By the use of colored shutters the sun will be given that effect of tremulous movement it sometimes has as it sinks through the denser atmosphere close to the horizon.

At the end of the pool and flanking the fountain of the earth, will be two great sunbursts of incandescent lamps. These are, in form, very much like a snow crystal and will face south, sending a warm light through the court, as the lamps, of which there are 435 in each burst, will be colored in all tints of yellow and orange.

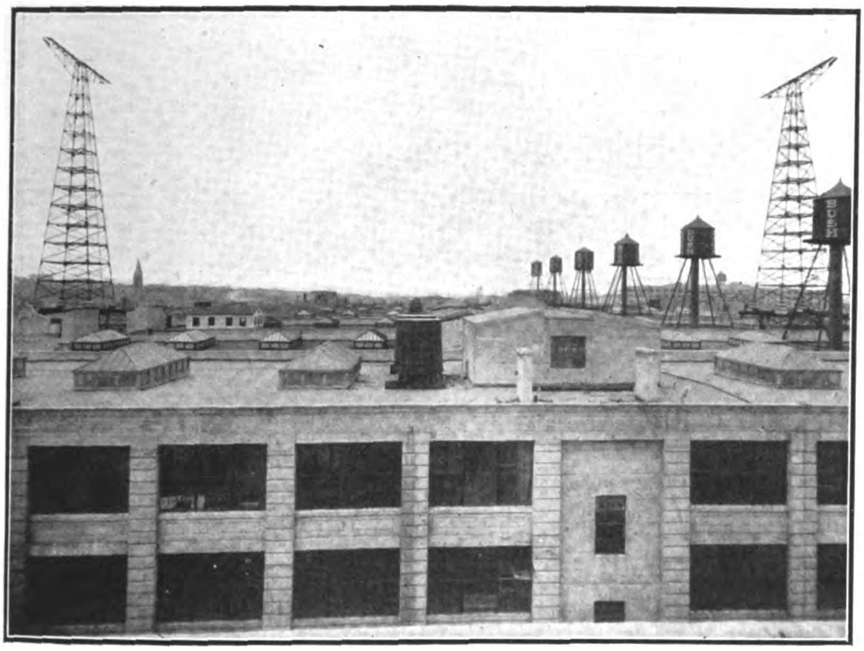
Gas flambeaux are to be placed at intervals about the pool and will tend to break up that steady evenness of the electric light, as the flames will wave in the breeze. To further give interest to the illumination by gas, into the gas flames will be occasionally introduced barium, sodium, strontium, and other salts which will cause the gas to flare up in variegated colors.

Steam is employed in connection with the lighting of this court, for there will be a number of caldrons which will boil and give forth a wavering mist of color.

The cloisters surrounding the court are lighted by small lanterns, as well as the rays of searchlights placed above the cornice lines. These searchlights will be fitted with wide-angle doors, flooding the cascades with radiance.

The north approach to the Court of Abundance will be lighted by four of the same sunbursts as used in the inner court and also have many gas flambeaux, cloister lanterns and steam caldrons.

Quiet, mysterious and peaceful will be the lighting effects of the Palace of Fine Arts and its setting. An effect of moonlight will be striven for to cover the lake, shrubbery and trees. Enough light will be centered upon the rotunda so that it may be seen in soft reflection in the water surrounding it. No light will be visible here except an occasional firefly in the trees. This will be the spot to rest the eyes after viewing the brilliance of the scintillator display.



Wireless Towers on Bush Terminal Buildings.

The South Gardens will be illuminated in general by luminous arc standards. Two rows of these, 55 feet high and bearing nine lights each will flank the central fountain, all facing the tower. The reverse side of the lamps will be shielded so that an observer entering the grounds through the main entrance will not be compelled to look at a single powerful light source.

It is in the gardens where we will be able to show to the best effect all the efforts at festive lighting. Down the long avenues of palms strung from tree to tree will be the Mission bells, small globes containing low-candlepower lamps and made in the form of little bells and in an endless variety of colors. In the trees will be placed oranges and the ever useful fireflies. Swaying in the breeze, as the trees will do, the chain of lights, all soft and harmonious in color, will move gently and quietly.

The Foreign Concessions streets will be lighted mainly by high-pressure gas, the design of the standards being similar to that in use in the North Garden.

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Visit of the New York Electrical Society to the Bush Terminal at Brooklyn.

More than 100 members of the New York Electrical Society visited the Bush Terminal in Brooklyn, N. Y., on April 22. They were received by a committee consisting of T. I. Jones, of the Brooklyn Edison Company, chairman; F. C. Farnsworth, A. LeBlanc, W. L. Sturges, superintendent, and R. E. Ireton, educational director of the Bush Terminal Company. The delegation was taken to the Aid Society's rooms, where the meeting was called to order by President H. H. Barnes, Jr., who outlined briefly what the delegation was going to see and introduced Mr. Ireton.

Mr. Ireton reviewed succinctly the operations and facilities of the terminal, preparing the visitors, in a measure, for the many interesting things which later were shown them, and dwelling particularly upon the plant's electrical equipment. Mr. Ireton described briefly, among other things, the equipment for handling freight shipments; the wireless on the roof of one of the factory buildings; the automatic sprinkler system installed in each of the terminal's ten factory buildings, 130 warehouses and 7 piers; the electric battery crane trucks, which serve both for lifting and hauling; the 114 electric elevators throughout the entire plant, and the numerous electric cranes and other hoisting apparatus. He also called attention to the ability of the plant to supply its tenants with live steam, gas, water and electric current for use in their operations, stating, in this connection, that 16,000 horsepower was supplied by the plant. He further emphasized the fireproof character of the buildings at the terminal and the additional protection afforded by the automatic sprinkler system, which cost $1,000,000 to install and comprises 150 miles of fire-alarm wiring, 126,000 sprinkler heads and 220 miles of piping throughout the factory buildings, warehouses and piers. He also pointed out the economy enjoyed by Bush tenants through the terminal's methods of handling all rail shipments, incoming or outgoing. These are floated between the terminal's docks and the several trunk-line railroad terminals, in standard railroad freight cars, which are hauled to or from a tenant's building at the terminal by electric locomotives.

T. I. Jones also addressed the meeting and gave some very interesting data of the service supplied by the Brooklyn Edison Company to the terminal.

An object of particular interest to the delegation in its tour of inspection was the new two-story pier, recently constructed to prepare for the increase in trade expected to follow the Panama Canal's operation. This huge dock is 1,450 feet in length, 270 feet in width and over 50 feet in height. Its two floors comprise an area of 15 acres—greater than any pier existing elsewhere. Six large ocean-going vessels may be accommodated at this pier and they may load and unload simultaneously. The American-Hawaiian Line which has leased this pier, expects to handle 1,500,000 tons of freight annually at the pier. The enormous range of giant warehouses along the bulkhead and the completely equipped railroad yard of the plant were other features inspected by the visitors.

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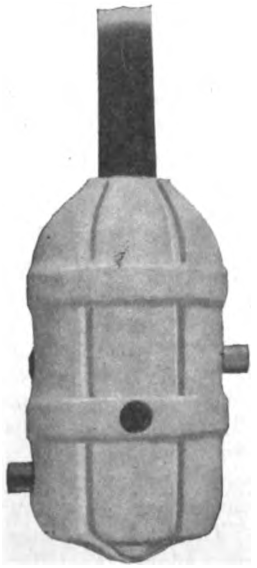
Electric Club of Chicago.

At the Electric Club luncheon and meeting held at the Hotel Sherman, Chicago, on April 23, over 400 members and guests were present to listen to an illustrated address by Maj. M. C. L. Funkhouser, second deputy superintendent of police of the city of Chicago. This address dealt with observations that have been made by the speaker in connection with vice conditions in the second largest American city, particularly on the regulation that had become necessary of dance halls and of motion-picture shows.

New Electrical and Mechanical Appliances

New Two-Circuit Porcelain Pendent Switch.

A new all-porcelain two-circuit pendent switch has been added to the specialty line of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This switch, which is really two switches in one, permits the control of two circuits, two groups of lamps, lamps and a fan, or other combinations from one point. The lamps of a large cluster or chandelier can be divided into two groups, each operated independently and controlled by this two-circuit switch. The two operating mechanisms used are of the same type as employed in the brass-shell two-circuit pendent and other C-H switches. The action is positive and snappy, and the switch is easy to install. The removal of one screw separates the casing halves and exposes the three terminal screws at the top to which the ends of the three-conductor cord are secured. This switch has been approved by the Underwriters' Laboratories and has the following rating: 6 amperes, 125 volts; 3 amperes, 250 volts.



Two-Circuit Switch.

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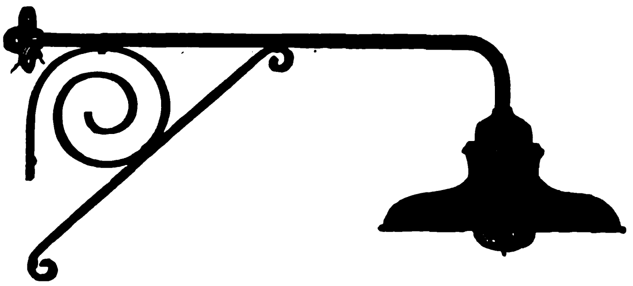
New Outdoor Fixtures for Nitrogen-Filled Lamps.

Anticipating the still greater use of incandescent lamps for street illumination due to the new high-efficiency nitrogen-filled lamps, the Line Material Company, South Milwaukee, Wis., has completed a new line of fixtures for use especially with these new units. These fixtures are made in a number of styles, for bracket support either plain and ornamental, for rope or span suspension, besides a simple street post type.

The bracket and suspension types have a large porcelain casing which makes unnecessary an extra insulator whether used on multiple or series circuits. The most practical feature is probably the new universal series socket which is made in one piece. It can be readily adjusted up or down so that the same fixture and reflector can be used with lamps of different size and thus provide for practically any installation.

The provision for moving the socket up and down makes it possible to place the lamp in the proper position in relation to the reflector and allow the use of a one-piece reflector, which is rigidly attached to the casing so that it cannot fall off under any condition. One fixture therefore can be used with lamps of various sizes and this decreases the amount of stock necessary to carry. The bowl-shaped reflector used with the fixture is made either with porcelain enamel reflecting surface or with Ky-ce-lain, a surface recently developed by the Line Material Company. The span type of reflector has a self-locking cable grip to prevent the fixture from sliding along the rope. The new street post is designed to take up small sidewalk space and the price is low enough to make street post lighting not prohibitive in cost.



Bracket Fixture for Nitrogen Street Lamp.

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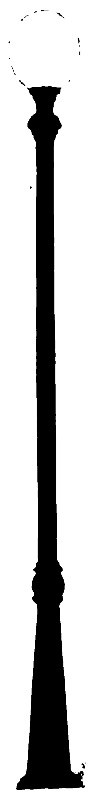
Largest Hydraulic Valves in the World to be Motor Driven.

The electrically driven gate valves which have been constructed for the Niagara Falls hydroelectric plant of the Ontario Power Company are said to be the largest in the world. Each of these valves was designed to control the water supply to a hydraulic turbine developing 12,000 horsepower, coupled to a three-phase alternating-current generator. They are of the Chapman type. The width of the valve opening is nine feet and the weight of each valve 130,000 pounds. The overall width and height of these valves are 11 and 30 feet, respectively, the thickness over the flanges being 6 feet 8 inches.



Post for Nitrogen Lamp.

Each gate weighs more than 275 tons and is under a pressure of 60 pounds per square inch. A 14-inch bypass is utilized to relieve the pressure on operating the valve.

One 15-horsepower alternating-current motor is used to operate each valve, it taking about three minutes to completely shut or open the same. It is stated that the motor cannot restart in the wrong direction on account of the use of automatic switches at the end of the gate travel. An electromagnetic brake and means for reversing the motor when the valve is partly open are also provided.

Benjamin Fixtures for Nitrogen-Filled Tungsten Lamps.

The development of the nitrogen-filled tungsten lamp has created a demand for special fixtures designed particularly to suit the requirements of this highly efficient lamp. Of these requirements the principal ones call for ventilation of the globe, reflector or hood of the fixture and a design that will provide effective screening of the bare lamp or diffusion of its rays to prevent annoying glare due to the very high intrinsic brilliancy of the concentrated filament; reflection of the light into useful directions, while not imperative, is usually also provided in fixtures for these lamps.

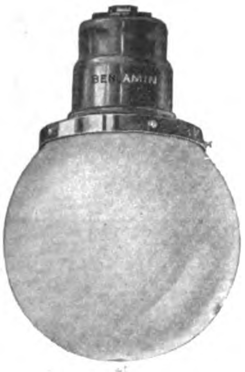


Fig. 1.

A study of these requirements by the engineers and designers of the Benjamin Electric Manufacturing Company, Chicago, Ill., has brought about the development of a special line of fixtures suitable particularly for the high-power multiple nitrogen lamps. A few of these fixtures are illustrated herewith. Fig. 1 is a simple fixture made for either indoor or outdoor use. It includes a 12 by 18-inch alabaster diffusing globe with a ventilating opening at the bottom. A mogul base socket with lamp grip is provided. The hood and globe holder are arranged to protect the lamp from rain or snow, if used outdoors. In this case the hood and holder are furnished in copper with oxidized copper finish. For indoor use the holder and hood are of brass with brushed brass finish.

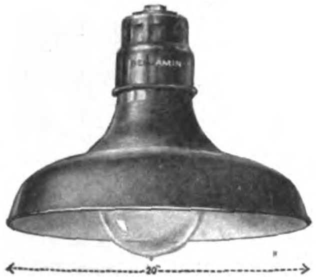


Fig. 2.

For industrial establishments and similar installations, fixtures of the types shown in Figs. 2 and 3 are made. The former has an enameled-steel reflector of the broad and relatively shallow type and finished outside in blue-black. The reflector gives a good light distribution and is deep enough to hide the filament from horizontal lines of vision, if the fixtures are hung low. Reflectors are made 18 and 20 inches in diameter. Fig. 3 shows a fixture with deeper bowl reflector. This is usually white enameled inside and outside with a blue bead. The hood is well ventilated. Reflector diameters are 13 and 15 inches.

For stores, corridors, etc., a neat fixture is that shown in Fig. 4. The body of this fixture is practically the same as the fixture shown in Fig. 1, but is arranged for chain suspension, the distance between the top of the hood and ceiling being 13 inches. The standard finished is brushed brass.

A new type of indirect fixture is shown in Fig. 5. The reflector is 20 inches in diameter and has a fluted surface which eliminates showing on the ceiling shadows of the suspension chains. The reflector shape and lamp suspension are such as to give a minimum of bulb absorption. If 400 or 500-watt lamps are to be used, the reflector can be raised a little over two inches. This makes a very efficient indirect unit.

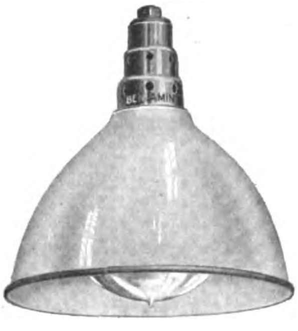


Fig. 3.

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New Type Railway Motors for Pittsburgh Traction System.

In connection with its new equipment of low-floor cars, the Pittsburgh Railways Company will install 100 motor equipments, consisting of four motors each, the design of which embodies some novel and interesting features. The motors will be known as GE-247; they are of the box-frame, commutating-pole type, and have a nominal rating of 30 horsepower at 500 volts. The motor equipments are being designed and built by the General Electric Company, Schenectady, N. Y.

The new cars will possess a number of unusual features, although they follow the principles developed in the original low-floor cars. They will be so constructed that a marked reduction in weight will be obtained. Complete with double-end control and couplers at each end, they weigh but 36,000 pounds. The most important innovations are the relatively small motors and wheels. The motors are, however, ample for the service on account of the light weight of the cars. The wheels are only 24 inches in diameter and permit the car floor to be kept down to a point which, in the center of the car, is but approximately two feet above the rail.

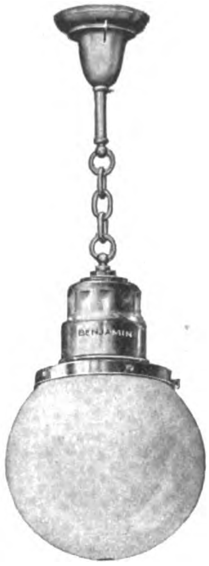

Fig. 4.

Payment is collected on entering as usual. A distinctive point of the design is the provision of a front auxiliary exit door in addition to the center doors. Either or both of the center doors may be used for entrance or exit, the file of passengers being guided in each instance by the conductor. A ramp in the floor gives a slight rise between the trucks and the center of the car.

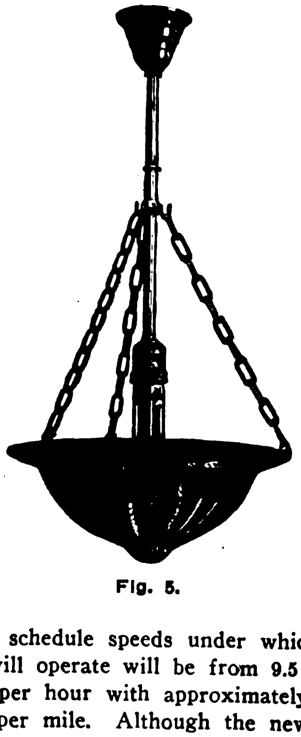
Fig. 5.

The schedule speeds under which the cars will operate will be from 9.5 to 10 miles per hour with approximately nine stops per mile. Although the new motors will operate on cars having small wheels, the design of the motors is in no way radical. They followed well tested and recognized standards in both mechanical and electrical design. In addition to the modifications in mechanical design necessary for adaptation to 24-inch wheels, there has been incorporated a more efficient scheme of ventilation than the method now used in the well known types of ventilated motors made by the General Electric Company. This improvement has resulted in a further reduction in weight without sacrificing the capacity of the motor for the work it is designed to perform.

With the combination of weight reduction, the larger portion of which has been effected in the motors and trucks, and the high continuous capacity of the motors, it is possible to carry the same number of passengers with these motors, having the nominal 30-horsepower rating, in the same service that cars with 30-inch wheels were formerly employed, equipped with 40-horsepower motors and weighing from 2.5 to 4.5 tons more. Thus another very important advance has been attained in electric railway engineering.

The field coils of the new motors are asbestos-insulated and impregnated, which results in a solid structure, practically indestructible and moistureproof. They are supported on spring metal seats and are securely held from movement in any direction by spring flanges, resulting in evenly distributed pressure and preventing abrasion of the insulation. The armature shaft is removable without disturbing the commutator connections or windings. The shaft bearing surfaces are ground and rolled. The armature is banded while hot, which insures permanently fixed and tight coils. The armature bearing linings are bronze with a thin layer of babbitt. The oil-well covers have deep lips and fit on machined seats, so that water is prevented from entering and flooding the wells.

The brush-holders are adjustable and are supported by mica-insulated studs. The car axles between the motor-axle bearings are entirely inclosed with sheet-steel dust guards. The motors have a gear ratio of 58 to 15. Both the gears and pinions are solid and are made from heat-treated rolled steel having an elastic limit of 140,000 to 150,000 pounds per square inch. The gear cases are steel, each upper and lower half being pressed out in a single integral piece. The steel supports for the top and bottom halves of the cases are fastened by means of welding.

The control system used is the Sprague-General Electric type M, which will be arranged to operate, however, on what is known as the Jones system of control. In this system of control, the sequence of connections is so arranged that during the entire period of acceleration practically all resistance is cut out. It is designed by P. N. Jones, general manager of the Pittsburgh Railways Company, and is described by him as operating through using a permanent series connection between all of the motors in a four-motor equipment without the use of resistance. Rheostat losses are thus virtually eliminated.

There are seven notches on the controller, of which three are running positions. On the first notch the four motors are connected in series through a small resistance, which is used only to avoid the jar of starting when the gears and pinions become worn so that back lash exists between the teeth. The second notch leaves all motors in series, but cuts out the resistance, and this is a running position. The resistance remains cut out on all subsequent notches. The third controller notch connects two motors in series, leaving the other two to run idle, thus giving an easy transition to the fourth notch in which the motors are connected in series-parallel. This is a running notch. In the fifth position of the controller handle two of the motors are left in series, and one of the other two motors takes full voltage, the third motor running idle. In the sixth position one of the two motors in series is cut out, the car being propelled during this period by two motors, each of which takes full voltage. The seventh position, which is the notch for full-speed running, all motors are in parallel and take full voltage.

CONTINUOUS SHOW 10
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Lighting by Nitrogen Lamps in Front of Miles Theater, Minneapolis.

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Nitrogen-Filled Lamps for Theater Facade Illumination.

In the accompanying illustration is shown the exterior of the Miles Theater, Minneapolis, Minn. The illustration was made from an untouched photograph taken by artificial light entirely. The brilliant illumination in front of this theater is obtained by means of five 1,000-watt nitrogen-filled Mazda tungsten lamps. These lamps are mounted in enameled steel reflectors, so as to throw their illumination entirely downward. The brilliance of the illumination effect is very well shown by the illustration. The entire width of the street is exceptionally well lighted, with practically every paving block clearly discernable. The lamps are mounted a few feet above the edges of the marquee. The illumination they produce is so intense upon the sidewalk that a shadow is noticeable underneath the marquee.

This installation has caused much comment and has been instrumental in producing similar installations before other theaters in the city. The lamps were supplied by the Bryan Marsh Works of General Electric Company. The installation was made by the Sterling Electric Company, of Minneapolis. This company had one of the nitrogen lamps conspicuously displayed in its store when the manager of the Miles Theater observed it one day, and becoming enthusiastic about its utility forthwith ordered the installation to be made in front of his theater.

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New Golden Glow Headlights.

The Esterline Company, Indianapolis, Ind., has added two new Golden Glow headlights to its line. While these two new headlights embody the use of the Golden Glow glass reflectors which characterize the Esterline Company's lighting products, they possess several new and important features. The lamp bodies and fronts are made entirely of pressed steel, which materially reduces the weight and improves the appearance of the headlights. In the design of these lamps the makers have taken advantage of the accuracy with which steel stampings can be made, thus producing a headlight which is waterproof and dustproof. A metal ring, which holds the reflector in place, also clamps a heavy gasket over which the front or door presses, making a very tight joint.

Golden Glow Headlight Recessed in Dash.

The hinges and latches are designed so as to have no projecting portions likely to catch wires or ropes. Another innovation is the use of electrically welded joints and fastenings instead of screws or rivets. The headlights are properly ventilated in such a manner as not to admit dust or water, which prevents sweating and clouding of the reflector and front glass.

After assembling, the lamp bodies are given several coats of baked enamel, inside and out to render them proof against rust. The front glass, which is made extra heavy, is held in place by spring clips which permit of expansion and contraction without cracking the glass.

Golden Glow Headlight Mounted on Front of Dash.

In the construction of the new headlights nine-inch Golden Glow reflectors are used. These give a headlight larger in diameter and deeper, allowing for sufficient space for lamps up to 60 watts. One type of these headlights is made to recess into the dash of the car, while the other is designed for mounting on the front of the dash.

The Golden Glow headlights, the makers state, meet the demands of railway men for a headlight which projects a non-blinding light of sufficient intensity to serve as a warning to other kinds of street traffic under all weather conditions. They also enable motormen to see a car ahead a sufficient distance to prevent collisions, and to see which way track switches are thrown as they approach the switch.

Recent tests of these new headlights fitted with a 36-watt lamp, on a city street and dark night, showed that the second hand of a watch can be read at a distance of 600 feet, and that, from the car, a man lying on the track can be seen further than is possible with an arc lamp.

The Esterline Company states that 60 railways and steamship lines are now using Golden Glow headlights, and many of them complete equipments. While thousands of these headlights are in use, not a single accident to persons or equipment has been reported, due to lack of light on the right of way or failure to see the approaching car.

Front View of Headlight.

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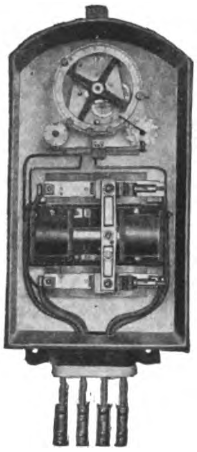
Aristo Time Switch.

A new type of electric time switch has been placed on the market by the Chicago Electric Time Switch Company, 2213 Michigan Boulevard, Chicago. This switch has a number of distinctive features, one of which is that it is operated entirely by electrical means and is substantially free from such mechanical contrivances as springs, gears, trips, cams, dogs, etc. This simplifies the arrangement of the control gear and reduces the possibility for trouble. The control is by means of solenoids which provide a very quick action for the switch. Thus this switch is given a very quick break which of course is desirable when opening circuits carrying heavy currents. To further reduce the tendency to arc on opening the circuit, carbon break contacts are provided.

The switch is mounted in a cast-iron waterproof and dustproof case, so that it can be mounted outdoors or indoors as desired. The clock for controlling the switch is of the eight-day type and is especially designed for this purpose. The clock is used merely for controlling the solenoids and is not called upon to provide the power for operating the switch. The solenoids are energized only at the moment of switch action; thus the arrangement of the switch is a very economical one.

The standard Aristo switch is arranged so that the circuit can be closed or opened as frequently as each hour throughout the day, which is a feature seldom incorporated in automatic time switches. The company is also manufacturing special time switches that can operate to close and open the circuit at still shorter intervals if desired. The intervals do not have to be identically the same; they may be made irregular, if desired.

A special form of this switch is also manufactured for remote control. In this switch the clock mechanism is mounted at any desired place so as to be readily accessible for weekly winding and adjustment of the operating periods. The switch itself is installed at any convenient point in the circuit, so as to minimize the amount of wire needed, which is an important consideration when heavy circuits are to be controlled.



Aristo Automatic Time Switch.

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Central Electric Publishes Big Automobile Supply Catalog.

An innovation in catalogs has just been produced by the Central Electric Company, 320 South Fifth Avenue, Chicago. This relates to the 160-page book on automobile supplies. Four pages of indexes and cross indexes render finding very simple, and the arrangement of descriptive matter and illustrations facilitate ready reference. The book is bound attractively in a gray cover, printed in colors, and is mailed in a special sealed envelope, assuring the protecting of the contents.

Packard Bell-Ringing Transformer.

The illustration herewith shows a new bell-ringing transformer which has just been placed on the market. A very special feature of merit about this transformer is the fact that the case is made entirely of porcelain. There is thus no iron case to rust out and ground the windings. Moreover, the porcelain case is of pleasing appearance, making a nice window display. It is furnished in three colors, white, brown and gray. The core is made of silicon steel and the coils are form-wound and vacuum-treated. The entire case is filled with insulating compound.

This transformer stands a complete short-circuit continuously without damage either to itself or connections. The primary is wound for connection to alternating-current circuits ranging from 100 to 130 volts and 60 to 133 cycles.

Porcelain-Incased Bell-Ringing Transformer.

Large facilities for manufacturing make it possible to place it on the market at a price not exceeding that of the ordinary type and a liberal proposition is made to contractors and jobbers. This transformer is manufactured by the Packard Electric Company, Warren, O.

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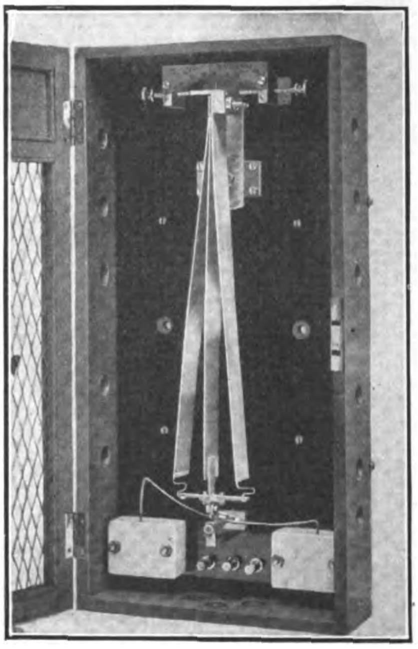
Automatic Temperature Regulator for Electric Radiators.

It is a great advantage to be able to keep a room heated to just the same degree in order to secure a uniform temperature, for this means much more comfort and avoids the drawback of overheating the room and the need for opening of windows to expel the surplus heat, with its attendant liability of exposure to cold drafts. A considerable reduction in the current bill is another advantage achieved by a thermostatic regulator if electric heating is employed. All this is done by the new Grundy electric regulator, which keeps the temperature uniform to one degree and even less. It operates in connection with an electric air heater or radiator of the customary kind, preferably in round stove form.

The long blades of the regulator are of different metals so that by their contracting or expanding at different rates under heat, the three-bar piece travels back and forth as a whole, and its lower end bears upon a curved piece or lever so as to tilt it. The ends of this latter piece work in mercury cups so as to make and break the circuit. When the heat becomes too great, the three-bar piece moves and trips the lever so as to break the circuit, cutting off current from the electric stove until the heat falls again to the standard, when the motion of the bar again throws on the current. A screw adjustment at the top permits setting to any desired degree at which the room is to be kept. Current for the heater is not controlled direct, but by means of a solenoid switch placed in the circuit.



Temperature Regulator for Electric Radiators.

This thermostatic regulator is manufactured by A. Schonfield & Company, Glasgow, Scotland.

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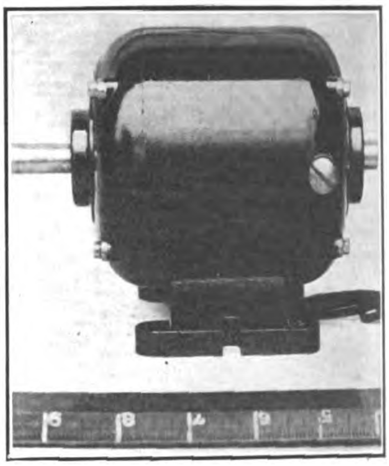
Ward Leonard Electric Lighting Equipment for Cyclecars.

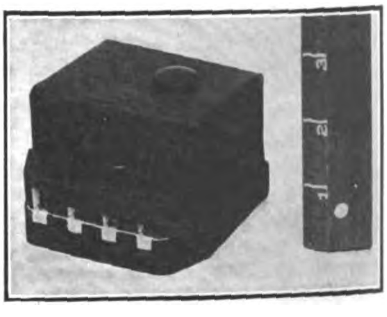
The Ward Leonard Electric Company, Bronxville, N. Y., appreciating that small automobiles such as cyclecars, etc., will have an electric lamp load of not more than five amperes, has developed for this trade a special electric lighting system. It is identical in its construction and method of operation with the larger outfits used on big cars, which demand a lamp load of approximately 9.5 amperes.

The dynamo delivers six amperes at 1,800 revolutions per minute, weighs less than nine pounds, and is very compact, as shown in the comparison of the dynamo with the scale which is photographed with it. The controller for the dynamo is of the separate constant-current control type, which has become well known on the larger generator outfits of the Ward Leonard Company; it is light in weight and its compact size can be gauged by comparison with the scale photographed with it. This controller also embodies the automatic battery switch.



Dynamo for Cyclecar Lighting.

Use of a constant-current control system is claimed to have many advantages, one of which is appreciated by cyclecar manufacturers, for with a constant-current charging system a smaller charging battery can be used than with any other type of charging system. This Ward Leonard cyclecar equipment is claimed to be the smallest, lightest and most inexpensive properly operated lighting system on the market.



Controller for Lighting Outfit.

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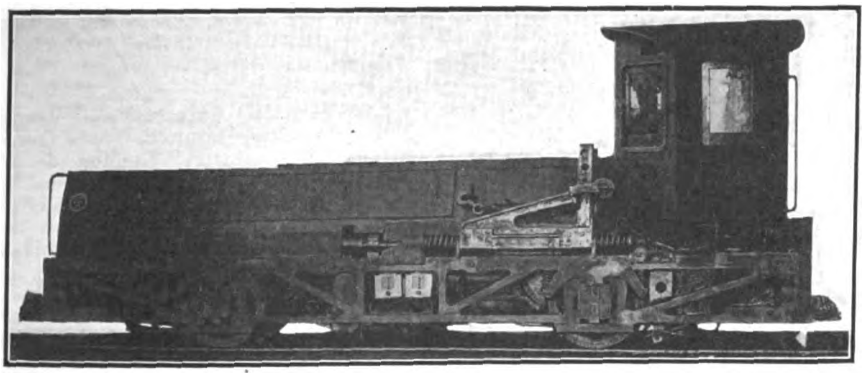
Electric Fog Horns for Warning.

The city of Bayonne, N. J., through the enterprise of the Electrical Committee of the City Council, will install electric fog horns at important street intersections to protect the public from danger, and at the same time give warning to the police, trolley cars, etc., of the approach of fire apparatus when called out for service. The signs will carry the word "Danger" and will be illuminated day and night.

◆

An Interesting Electric Locomotive.

For handling cars at the Cleveland ore docks, the Pennsylvania Lines West have recently had built three locomotives of unusual design. The most novel feature in these locomotives is that they do not run on the same tracks as the cars they move, but on narrow-gauge (42-inch) parallel tracks. They are not attached to the cars by couplings, but each locomotive is equipped with an arm on each side which can be lowered by means of compressed air controlled from the cab and acts as a pusher. Single cars or trains can be easily handled and cars can be shifted and cut out from trains with the least time and trouble.



Electric Switching Locomotive.

The locomotives are of Baldwin-Westinghouse make and are 25 tons in weight. They have bar-steel frames, which give great strength but permit ready access to the interior. The motors are of the Westinghouse commutating-pole type. Power is obtained from two rails lying inside the rails on which the locomotives operate; these rails are protected by a wood covering.

◆

A Handbook for the Man on the Job.

The National Metal Molding Company, Fulton Building, Pittsburgh, Pa., has published a handbook on National metal molding and fittings. This illustrates and describes each fitting with its assembly and installation. It is essentially a handbook for the man on the job, and is full of useful information relating to the installation of electrical conductors with National metal molding. In addition to the matter dealing specifically with the National metal molding and fittings there is a chapter which illustrates in detail methods of utilizing this material to the best advantage in installations of practically every description. This is one of the most useful and practical handbooks that has been available for a long time, and will be found of considerable value to the electrical contractor and particularly the man actually at work in wiring practice.

◆

British Westinghouse Profits.

More business and better prices during 1913 enabled the British Westinghouse Electric & Manufacturing Company to show a greatly improved result, and as a result of its friendly relations with Continental Westinghouse companies still better profits are anticipated. The profits for the last six years are given below:

1913—Net profit	$532,470
1912—Net profit	205,370
1911—Net profit	103,540
1910—Net profit	62,183
1909—Loss	8,998
1908—Loss	37,228

Orders for apparatus of Westinghouse manufacture were 40 per cent better in 1913 than in 1912.

◆

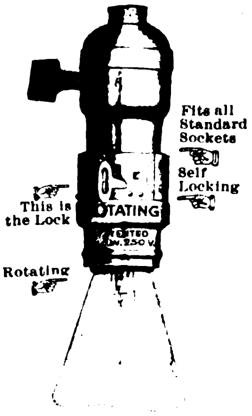
Rotating Electric Lamp Lock.

Much study has been given in recent years to means for adequately protecting high-priced electric lamps, reflectors and shades from unauthorized removal or theft. Of the various lamp-locking devices now on the market, the one illustrated herewith has several unique features. One of these is that it can be fitted to any standard socket in a moment. After insertion, the lamp can be rotated in either direction without removal. A key of special construction must be inserted in the lock before the lamp or the entire locking device with the lamp can be removed.

The device itself may be described as a plug socket, the plug of which fits all standard sockets; the socket of the device, which receives the lamp, has a rotating screw shell that can be held stationary for inserting or removing the lamp only by using the key to force a spring into an opening in the screw shell.

Surround the upper or plug end of the device is a sleeve, one half of which is hinged to form a door. This fits over the bead of the socket to which the device is attached and is self-locking by merely snapping the door in place. The key must be used to open this door and remove the device from the socket. The key is turned in the other direction to permit release of the lamp. Thus lamps can be renewed or removed for cleaning without taking the entire locking device from the socket, or the device can be removed with lamp and attached to another socket.

All parts of the device are well made and carefully insulated with fiber. The key is also partly made of insulating material; it is made in peculiar shapes that cannot be readily copied. Electrical connections are so perfect that the lamp can be rotated while lighted without flickering. The rating of the device is 660 watts, 250 volts. The device has been approved by Underwriters' Laboratories. It is patented and manufactured by the Rotating Electric Lamp Lock Company, 4433 North Crawford Avenue, Chicago, Illinois.



Rotating Lamp Lock.

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More Telephone Train Dispatching in South.

Vice-president T. C. Powell of the Alabama Great Southern Railroad, Queen and Crescent system, announces that the telephone will be substituted for the telegraph in dispatching trains and handling messages on the entire line of 296 miles between Chattanooga, Tenn., and Meridian, Miss. For this purpose two copper circuits will be constructed and instruments installed at every station and block office. The telephone has been used with success on the main Queen and Crescent line, so that soon trains will be handled by telephone for the entire distance of 630 miles between Cincinnati and Meridian.

Latest Approved Fittings

CABINETS.—Standard Electric Fittings Company, Stamford, Conn.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved March 25, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—The Adapti Manufacturing Company, Winter and Leonard Streets, Cleveland, O.

"Adaptiboxes."

Outlet boxes for use with rigid conduit for sizes one-half to four inches inclusive. Type 2,700. Pole cap; catalog No. 4,500.

Approved March 13, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—F. E. Baldwin, 115 S. Sherman Street, Wilkes-Barre, Pa., submitter; manufactured by Wilkes-Barre Indicator Company, 115 South Sherman Street, Wilkes-Barre, Pa.

"Jiffy Bushing." A sheet-metal conduit-box connector for armored cable, with eccentric holes for connecting to the flexible armor and bent prongs for engaging with the opening in the box.

Approved March 19, 1914.

CUTOUT BASES, Cartridge Fuse.—The Johns-Pratt Company, Hartford, Conn., manufacturer; E. H. Johns-Manville Company, New York, N. Y., sole agents.

These devices consist of special cutouts bases inclosed in cabinets and arranged to facilitate the testing of meters on the customers' premises without interrupting the service.

The cases of No. 16 U. S. gage metal are sealable as a protection against tampering with the circuit.

Class B meter-testing blocks; catalog No. 9,101, 0-30 amperes, 250 volts, four-pole; catalog No. 9,129, 0-30 amperes, 250 volts, five-pole; catalog No. 9,130, 31-60 amperes, 250 volts, five-pole.

Approved March 19, 1914.

GROUND CLAMPS. — National Metal Stamping Company, Mulberry and Murray Streets, Newark, N. J.

National ground clamp. A two-piece clamp of copper having the ends secured by a single bolt and provided with a lug for soldered connection to the ground wire, adjustable for use with armored cable, metal moulding and pipe, or conduit up to one inch in diameter.

Approved March 26, 1914.

GROUND CLAMPS.—H. & H. Manufacturing Company, 1009 North Marshall Street, Philadelphia, Pa.

"H. & H." ground clamp.

A single-piece clamp of tinned copper, provided with suitably spaced holes and with bolt, nut and washer, for clamping to rigid conduit. Adjustable for use with conduits up to one inch in size. One end of clamp is channeled to form the equivalent of a lug, for soldering to the ground wire.

Approved March 14, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

MOLDING FITTING. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Fittings for use with "National" metal molding.

Crosses, tees and elbows; catalog No. 437.

Straps; catalog No. 428.

Flush switch adapters; catalog No. 384 and 441.

PANELBOARDS.—Starrett Electric Company, 215 South Superior Street, Chicago, Ill.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each panelboard.

Approved March 11, 1914.

PICTURE MACHINES AND APPLIANCES. — Cameron Picture Machine Company, 61 Poplar Street, Brooklyn, N. Y.

"Cameron Motion Picture Projector." Two types; one for hand operation, the other driven by one of the special motors mentioned below supplied by the Cameron Picture Machine Company, and expressly approved for this purpose.

Direct-current motor: Colonial Fan & Motor Company, one-eighth horsepower, 110 volts.

Alternating-current motor: Colonial Fan & Motor Company, one-eighth horsepower, 110 volts.

Approved March 24, 1914.

RECEPTACLES, Standard. — The Tregoning Electric Manufacturing Company, 418 Prospect Street, Northwest, Cleveland, O.

"Tregoning" receptacles, 660 watts, 250 volts.

Cleat type; catalog No. 303.

Sign; catalog Nos. 300, 301, 302, 310.

Approved March 10, 1914.

RHEOSTATS.—Jewel Electric Company, 115 Hollingsworth Street, Baltimore, Md.

Type LN reversing controllers for direct-current electric elevators, five to 20 horsepower, 110 to 500 volts.

Each controller consists of main-line and reversing switches mounted on a slate panel and operated from the shipper shaft of the elevator, and a series of contractors which short-circuit a wire-wound resistance inclosed in a cast-iron case.

Approved March 24, 1914.

SOCKETS, Standard.—The Arrow Electric Company, Hartford, Conn.

"Arrow E" porcelain shell.

Key, 250 watts, 250 volts; catalog Nos. 4,058, 4,065.

Keyless, 660 watts, 250 volts; catalog Nos. 4,059, 4,066.

Pull, 250 watts, 250 volts; catalog Nos. 4,015-4,017, inclusive, 4,060, 4,067.

Approved March 20, 1914.

SWITCHES, Automatic. — Venner Time-Switches, Limited, 6 Old Queen Street, Westminster, London, S. W. England.

"Type C 4" 25 amperes, 250 volts; 12 amperes, 500 volts.

Double - pole, mercury - contact switches for the control of lighting circuits. Clock mechanism and special switch gear inclosed in cast-iron case. Provided with flexible leads extending through bushings for connection to supply and lead wires.

Approved March 20, 1914.

SWITCHES, Automatic. — Chicago Electric Time Switch Company, submitted, 5128 Prairie Avenue, Chicago, Ill. Manufactured for the above by Atlas Model Works, 125 South Fifth Avenue, Chicago, Ill.

"Aristo" electric time switch, 25 amperes, 250 volts, alternating current and direct current. This device consists of an eight-day, 24-hour clock, arranged to open and close a circuit by solenoid-operated contacts.

Approved March 25, 1914.

SWITCHES, Knife.—Trumbull-Vanderpoel Electric Manufacturing Company, Bantam, Conn.

125, 250 and 600 volts; all capacities.

Approved March 10, 1914.

WIRES, Rubber-Covered.—Canadian General Electric Company, Limited, 14-16 King Street, Toronto, Canada.

Marking: One red and one black thread crossing in the braid.

Rubber-covered wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 18, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

BRATTLEBORO, VT.—The Crowton Development Company has been organized for the purpose of constructing and owning real estate, storage reservoirs, water power, hydroelectric and steam plants. The capital stock is $200,000 and the incorporators are F. L. Houghton, Fred W. Putman and J. B. Manley, all of Brattleboro.

CHICOPEE, MASS.—Electric power will replace the present steam method at the Cooley Brook pumping station in the near future, according to Charles A. Bogardus of the Water Department. Requests for bids have been sent to a number of electrical contractors and as soon as their estimates have been furnished to the department, work on the installation of electric motors and equipment will begin. Motive power will be obtained from the municipal electric lighting plant.

NEW HAVEN, CONN.—The Southern New England Power Company has been granted articles of incorporation; capitalized at $100,000.

CATSKILL, N. Y.—The Kingston Ellenville Trackless Trolley Company has been incorporated with a capital of $5,000. The directors are John Purce, George J. Giger and Frank Leonard, all of Paterson. According to its certificate, the company has permission to run its cars from Kingston to Ellenville through Hurley, Marbletown, Stone Ridge, Accord, Kerhonkson and Warwasing.

NEW YORK, N. Y.—Columbia Mills Power Company, Incorporated, has been granted articles of incorporation, capitalized at $500,000, to manufacture electricity. The incorporators are T. D. McChesney and William R. Hees, of New York City, and George H. Hees, of Toronto, Canada.

ROCHESTER, N. Y.—The Rochester Telephone Company is planning extensive improvements to its local equipment, including a new switchboard.

SENECA FALLS, N. Y.—The Municipal Board is making plans for the extension of the lighting system on various streets of this village. The lamps will be of the same style as those used at present in this village, the large pedestals being of concrete and one lamp used. Address the village clerk for desired particulars.

BAYONNE, N. J.—The City Council is arranging to pass an ordinance requiring the installation of underground conduits throughout the city. The Public Service Company will be affected by the law. A.

NEWTON, N. J.—The Board of Public Utility Commissioners has ordered William L. Keplinger receiver of the Newton Gas & Electric Company to make improvements and additions in the company's electric light and power, and gas plants and system to render adequate local service. A.

SAYREVILLE, N. J.—The Township Committee will install an electric lighting system in the Morgan Heights district, and on the highway to Morgan. The Sayreville Electric Light & Power Company and the New Jersey Central Traction Company will supply the electric energy. A.

TRENTON, N. J.—H. M. Voorhees & Brother will install an electric light and power plant in their new department store on East State Street. A.

SOUTH ATLANTIC STATES.

WILMINGTON, DEL.—The South Kentucky Power Company has been incorporated with a capital stock of $100,000, to acquire power and water rights of all kinds. The incorporators are F. D. Buck, George W. Dillman, M. L. Horty, all of Wilmington, Del.

CHESTERFIELD, VA.—The City Council has granted a franchise to the South Richmond & Chesterfield Railway Company, to construct an electric railway in Chesterfield. F. R. Armstrong, of Rochester, Minn., is president.

NORWOOD, VA.—The Nelson County Telephone Company has been incorporated with a capital stock of $3,000. S. M. Golloday, Buffalo Station, Va., is president.

WHEELING, W. VA.—Plans and specifications for new power houses to be constructed at dams Nos. 15 and 20 on the Ohio River have been prepared by the local United States engineers, and bids on the contract will be asked in the very near future. Dam No. 15 is located at New Martinsville and No. 20 at Belleville, O. The houses will be of brick, and the contracts will also include clauses referring to the installation of equipment.

ELKIN, N. C.—The Center Falls Power Company, Elkin, has been incorporated with a capital of $25,000, subscribed by A. M. Smith, R. H. Chatham and others, for development of water power for long-distance electric transmission and for providing light and power for public service and general purposes.

CANTON, GA.—An election will be held on May 23 to decide the question of issuing $5,000 in bonds for enlarging the electric light plant. Address Howell Brooke, mayor, for further particulars.

TALBOTTOM, GA.—The city is planning to obtain current from city of Manchester, Ga., for an electric lighting system. Address John A. Smith, mayor, for desired information.

NORTH CENTRAL STATES.

CINCINNATI, O.—The City Council of Cincinnati will appropriate $50,000 for a new police station in Walnut Hills. Various electric equipment will be required, including wiring.

CINCINNATI, O.—The Union Gas & Electric Company has announced that it will extend its lines to Sayler Park, Fernbank and Delhi, suburban villages, as soon as arrangements can be made to do so.

CLEVELAND, O.—The city of Cleveland will spend $100,000 for a distribution system for its East Fifty-third Street municipal electric light plant. The money has been appropriated, and contracts will shortly be let for the work.

MASSILLON, O.—The plant of the Massillon Electric & Gas Company is to be enlarged immediately to three times its present size, at an estimated cost of $125,000, to supply current for new industries. R. A. Brooks is manager.

SANDUSKY, O.—The Sandusky Gas & Electric Company has installed two ornamental electric light standards in front of the postoffice in that city, each carrying two 145-candlepower tungsten lights inclosed in ball globes, and another in the residential district of the city, for the purpose of demonstrating the efficiency and beauty of this means of public lighting. They have given such satisfaction that plans are under way for lighting a number of the streets in this manner.

SEBRING, O.—Cluster lights are to be placed on 15 streets. Address the city clerk.

SYCAMORE, O.—The village of Sycamore, which has a population of about 1,000, has closed its electric light plant and an election will be called to decide upon the proposition of issuing bonds to make the necessary improvements for reopening.

EVANSVILLE, IND.—The Evansville & New Harmony Traction Company has been incorporated with a capital stock of $15,000 to build a traction line from here to New Harmony, Ind., a distance of 30 miles. A campaign to sell bonds for the purpose of financing the road will be started here soon. Address the secretary of the company for information.

SHELDON, ILL.—A municipal lighting system will be established here. Address the village clerk for general information.

MARQUETTE, MICH.—At a recent meeting of the officials of the Marquette County Gas & Electric Company, of which A. C. Harrington is the manager, it was decided to run wires to Palmer, five miles to the south of Negaunee, in order to supply current to the residents of that place.

NORTH BRANCH, MICH.—The Council plans to expend $7,000 improving the electric light plant. Address the village clerk for particulars.

OMER, MICH.—A new telephone company was organized by J. K. Mead, manager of the Omer Telephone Exchange. Frank Nowak is president. This line will connect with the Omer Exchange and starts with 16 subscribers.

JANESVILLE, WIS.—To enlarge and reinforce telephone facilities serving practically every part of the city, the Wisconsin Telephone Company will spend $25,000 in improvements in Janesville this spring. With the proposed addition of 1,600 miles of telephone wire, as provided in the present plans, telephone facilities will be adequate to care for growth in all parts of the city. Address the local manager.

MAYVILLE, WIS.—Central Mayville Mutual Telephone Company has been incorporated with a capital of $600 by Gust Laach, G. F. Schmidt, N. H. Laveen, Herman Krase and George Koehn.

LITTLE FALLS, MINN.—The Little Falls Water Power Company has just commenced the erection of a modern, concrete, reinforced dam to take the place of the old timber structure erected in 1887. Provision will be made for a large extension to the present generating plant to care for further business. Mr. Ralph D. Thomas, of Minneapolis, prepared the plans and specifications, and is overseeing all of the work.

EAGLE GROVE, IOWA.—The Evergreen Mutual Light & Power Company has been incorporated with a capital stock of $10,000. The nature of business to be transacted is the construction and maintainance of an electric light and power line in Wright and adjoining counties, Iowa.

NEVADA, IOWA.—The Franklin Township Lighting Company has been formed here for the purpose of furnishing light for the members of the company. Samuel Kooser is president and E. C. Wonderlich, secretary.

SIBLEY, IOWA.—May 5 bids will be received for the proposed electric light plant and distributing system to be constructed here. Address George F. Dietrich, mayor.

SULLIVAN, MO.—Electric Light & Power Company has been incorporated with a capital of $25,000 by Richard Zinkman, E. W. Illien and W. E. Anderson.

GRANVILLE, N. D.—Andrew Thrane and John Kvame, of this place, and John H. Muus, of Vleva, have incorporated the Farmers Telephone Company, with a capital stock of $15,000.

PINGREE, N. D.—The James River Valley Telephone Company has been granted a franchise for extension of its lines.

PORTAL, N. D.—Plans for the establishment of an electric power plant that will supply Portal, Bowbells and Flaxton, and possibly one or two other cities, are under way here. The estimated cost of the plant is $35,000. Portal already has a plant sufficient for local needs, and the plans to supply the other towns contemplate the increasing of its capacity. The nearness of lignite coal mining properties to this place makes the proposition feasible.

LETCHER, S. D.—Bentley Township Telephone Company has been incorporated with a capital of $25,000 by N. M. Steinpler, George I. Green and Henry Larimer.

WESSINGTON, S. D.—A. H. Savage, of Minneapolis, holds a 30-day option for the purchase of the local electric light system. If he purchases the system, he will make many improvements and increase its capacity.

YANKTON, S. D.—The South Dakota Telephone Company has been incorporated with a capital stock of $1,500,000 by E. A. Bruce, W. L. Bruce and others.

DODGE CITY, KANS.—A transmission line from Dodge City to St. Marys of the Plains Academy, near that city, has been asked by Bishop Hennessey. M.

PITTSBURG, KANS.—The "White Way" contract was awarded to the United Iron Works of this city at a price of $12,383. The city will erect the poles, of which there will be 173, each one bearing a cluster of four lamps. The outside wiring will be done by the Home Light, Heat & Power Company.

WELLSVILLE, KANS.—The City Council has passed an ordinance providing for the use of 60 lamps in street lighting, many of which will be 200 candlepower, and the remainder half that power. C. A. Smith will install a lighting plant at a cost of $25,000. M.

SOUTH CENTRAL STATES.

BUFFALO, KY.—C. L. Herron, head of the Hodgenville Lighting Company, is contemplating extending the company's service to Buffalo, Ky., a neighboring town. G.

FULTON, KY.—Engineer R. C. Houston, of Memphis, is preparing specifications to extend the light and water service to South Fulton. Address J. H. Swann, mayor, for information.

JACKSON, KY.—The Wolf Valley Coal Company, which is building a town for its employees in Eastern Kentucky, near Jackson, will construct an electric plant there for lighting and power purposes. It is understood that the same plant will supply the lights for the mine itself. G.

McBRAYER, KY.—Davis Brown, of the distillery firm of J. T. S. Brown & Sons, will install an electric-lighting plant for the distillery and a new summer home he will build near the distillery here. G.

WEST COVINGTON, KY.—The Union Light, Heat & Power Company has been granted a franchise to operate a street car line through the city for 20 years. Engineer W. L. Glazier, of Newport, is employed by the city to draw up the plans.

CHATTANOOGA, TENN. — Merchants of Seventh Street in this city are organizing a movement for installing a "White Way" in front of their places of business. The "White Way" installation along Market Street has spurred them to emulation. G.

HARTSELLE, ALA.—J. R. White has received a franchise to establish an electric lighting plant here.

OZARK, ALA.—$25,000 will be expended enlarging the municipal electric light plant. Address the mayor in regard thereto.

CUSHING, OKLA.—An election will be held May 15 to vote on a franchise to the Cushing Traction Co., which proposes to build an electric freight and passenger line from this city to the oil field at a cost of $250,000. Frank Brown, of Indepence, Kans., is president of the company.

GLEN POOL, OKLA.—The Glen Pool Mutual Telephone Company has been incorporated with a capital stock of $3,000 by Fred Markle, John Shaffer and others.

JET, OKLA.—A special election will be held May 5 to vote on issuance of bonds for the installation of an electric lighting plant to cost about $3,000.

MEHAN, OKLA.—The Stillwater Valley Telephone Company has been incorporated with a capital stock of $2,000 by C. M. McKenzie, William Varley, of Mehan, and others.

TULSA, OKLA.—Bids are being received for the furnishing of labor and materials, and installation of electrical wiring and fixtures in the new convention hall now being completed at a cost of $100,000. The city auditor, E. B. Cline, is custodian of plans and specifications.

CUERO, TEX.—The Cuero Light & Power Company has leased the Guadalupe River bed and will construct two dams for water power developing.

HANDLEY, TEX.—The Northern Texas Traction Company has been granted a franchise to construct, maintain and operate an electric power system at Handley.

PITTSBURG, TEX.—The Home Light & Ice Company will remodel and improve the light plant and $6,000 worth of new machinery will be purchased. Separate dynamos and engines will be used. The main lines will also be extended. H. E. Poynter is manager.

LUBBOCK, TEX.—A rural telephone company has been organized here and a number of trunk lines will be run 15 miles in the country. Address the county judge for information.

WESTERN STATES.

HARDIN, MONT.—The Big Horn Canyon Irrigation & Power Company has completed surveys for an electric railway 68 miles long, and is now surveying for the dam site and reservoir. The project includes the construction of a hydroelectric plant on the Big Horn River to develop 25,000 horsepower. Ed. Lawlor is secretary.

ISMAY, MONT.—The Ismay, Ekalaka & Southern Railroad Company has been organized here, with a capital stock of $500,000, and will construct an electric line from Ismay on the Chicago, Milwaukee & St. Paul Railway to Ekalaka, about 44 miles from Ismay. A. J. Halsey is general manager.

LAUREL, MONT.—The City Council is considering the installation of a new street lighting system to cover the business section of the city, and a large part of the residence section. Address the city engineer. O.

LEWISTON, IDAHO.—Commissioner Emery, A. M. Roberts, W. A. Morey and others, have been appointed by the City Council to investigate the proposition of constructing a dam in the Clearwater River, for the purpose of installing a municipally owned power plant. From estimates provided by an engineer, the plant will cost complete about $500,000. The Committee has been asked to report back to the Council as soon as possible. O.

POCATELLO, IDAHO.—The Idaho Pacific Railway Company has been organized to construct and operate an electric railway to connect Twin Falls County with the Hagerman Valley. M. J. Sweeley is president.

RUPERT, IDAHO.—Farmers in this vicinity recently organized and incorporated the Farmers Electric Company, of which M. T. McDermott is president; J. A. Plowman, vice-president; J. M. Butler, secretary and treasurer. The company is capitalized at $3,000, and purposes the erection of a power plant and extension of transmission power and light lines into the nearby territory. O.

JEROME, ARIZ.—Voters of this city will be given an opportunity on May 25 to vote on the proposition of granting the Upper Verde Public Utilities Company a franchise for an electric light and power system, telephone and telegraph, gas and water systems here.

PORT ANGELES, WASH.—The City Council recently granted the Olympic Power Company permission to extend, erect, operate and maintain a transmission line for the transmission of electric current of a voltage of 60,000 volts, from its main transmission line at a point on the Boulevard to its intersection with Third Street, and to its substation to be erected at or near this point. O.

SEATTLE, WASH.—The building of a substation of the city lighting plant at Ninth Avenue, S. W., and Henderson Street, is contemplated in an emergency ordinance now before the Council. It is estimated that about $10,000 worth of machinery will be necessary to successfully operate the additional plant. O.

WALLA WALLA, WASH. — Promoters of the newly incorporated Walla Walla River Power Company are engaged in securing rights of way on the Walla Walla River, preparatory to starting construction on an electric power plant. The company is capitalized at $120,000.

ANDREWS, ORE.—The Wild Horse Power & Milling Company will soon begin the construction of a small hydroelectric plant. Plans have been completed. Address Jean Bart Balcomb, engineer.

FOSSIL, ORE.—The Fossil Electric Light Company, formerly owned by August Ilse, has been transferred to M. Dittmer, of Spokane. The plant is valued at $40,000, and it is understood the new owner plans to make extensive improvements. O.

SACRAMENTO, CAL.—Resolutions were passed by the City Commissioners authorizing City Electrician Pearce to draw plans and specifications, with estimates of probable cost, for the construction of the municipal electric light plant.

SAN JOSE, CAL.—The new owners of the San Jose Terminal Railway, who state that they propose to run an electric line from Almaden, through this city, on to Alviso, and from that town to Port San Jose and out to deep water, there to connect with a line of steamers to San Francisco, have been granted the franchises they desired for constructing and operating their proposed line within the municipal limits. The road has the backing, it is said, of a syndicate composed of Lee H. Landis, president of the Tidewater & Southern Railroad; Eric Lindbloom, W. W. Jones, Charles A. Warren and John J. Mahoney, all of San Francisco, and others. The road must be completed within the city by January 1, next.

SANTA BARBARA, CAL.—The Santa Barbara & Suburban Railway Company is considering the construction of an electric railway from Santa Barbara to Carpinteria. W. A. Brackenridge is manager.

FAIRBANKS, ALASKA.—Local agents, representing John L. Timmins, have filed a claim to the waters of the Nenana River, where it is proposed to build a power plant capable of generating sufficient electricity to supply the entire district. Mr. Timmins recently informed his agents that he has been successful in his efforts to interest capital in the enterprise, and that preliminary work will be started soon.

PROPOSALS.

ELECTRIC LIGHT FIXTURES.—Bids will be received on May 7 for furnishing and putting in place the electric-light fixtures for the new Grand Forks County courthouse, Grand Forks, N. D., according to plans and specifications on file in the auditor's office, prepared by Buechner & Orth, architects, St. Paul, Minn. Address Hans Anderson, county auditor.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 19 for furnishing 5,400 feet of submarine steel-armored telephone cable (twisted pair) five-pair, as per Schedule 6712, for delivery at the Navy Yard, Brooklyn, N. Y.; until May 26 for furnishing one electric freight elevator, as per Schedule 6704, for delivery at the Navy Yard, Charleston, S. C.; one electric furnace for shrinking pit for five-inch 50-caliber gun, as per Schedule 6703, for delivery at the Navy Yard, Washington, D. C.; 100 telephone head sets, as per Schedule 6709, for delivery at Navy Yard, Washington, D. C.

FOREIGN TRADE OPPORTUNITY.

[*Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Customhouse, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.*]

NO. 12,996. ENGINES, MOTORS, SEWING MACHINES, AND MUSICAL INSTRUMENTS.—A business firm in the Far East informs an American consulate that it desires to receive quotations and catalogs of motors, from such American manufacturers as might be willing to deal direct with the market in question. Correspondence may be in English.

NEW PUBLICATIONS.

WISCONSIN WATER POWERS.—A paper read before the Engineering Society of Milwaukee in January by Daniel W. Mead, entitled "The Present Status of the Water Powers of Wisconsin," has been separately published.

MUNICIPAL ELECTRICIANS.—The eighteenth annual report of the International Association of Municipal Electricians covering the proceedings of the convention held at Watertown, N. Y., in 1913, has been published.

REGULATION IN GREAT BRITAIN.—Appendix G of the annual report of the Public Service Commission for the First District of New York for the year 1913 has been separately published. It is entitled "Regulation of Public Service Companies in Great Britain," by Robert H. Whitten.

WATT-HOUR METERS.—Technical Paper No. 207 of the Bureau of Standards, Washington, D. C., is entitled "A Comparative Study of American Direct-Current Watt-hour Meters," by T. T. Fitch and C. J. Hunter. Six types of meter have been studied and performance data are given.

NEW INCORPORATIONS.

TULSA, OKLA.—The Drumright Ice & Light Company has been incorporated with a capital stock of $30,000 by Charles W. Shobe, Charles F. Petty and others.

BASIC CITY, VA.—The Price Electric & Manufacturing Company has been incorporated with a capital stock of $500,000. Paul Steinman is president, and T. A. Sammis, of this city, secretary.

NEW YORK, N. Y.—Berk Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $2,500. The incorporators are Maxwell B. Berk, Lionel P. Bristweller and James E. Beggs, of this city.

NEW YORK, N. Y.—Kelvin Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $25,000. The incorporators are Clarence McMillan, Solomon Popper and Katherine Tikios, all of New York City.

NEW YORK, N. Y.—Nathan Klein & Company, Incorporated, has been granted articles of incorporation, with a capital stock of $20,000, to deal in electric motors, etc. The incorporators are Nathan Klein, David Price and Isadore Jacoby, of New York City.

CLEVELAND, O.—Gould Storage Battery Company has been incorporated with a capital stock of $10,000 to deal in storage batteries. The incorporators are R. P. Anthony, C. Koenig, John A. Nieding, L. A. M. Pejein and Quay H. Findley.

BURRAGE, MASS.—Sun Electrical Manufacturing Company has been incorporated to deal in supplies; capitalized for $25,000. Gabriel B. Levy, Brookline; Julius Nelson, Boston; Samuel O. Reinstein, Brookline; Frank Sanford, Bryantville, are the incorporators.

KANSAS CITY, MO.—The Stephens Gas-Electric Chandelier Company has been incorporated with a capitalization of $20,000. The company will continue the business of the Stephens Gas-Electric Appliance Company. D. S. Stephens will continue as president. Others interested in the company are E. G., S. B., and M. L. Stephens, W. C. Chapman, A. E. Briggs and P. C. Chapman. M.

RICHMOND, VA.—A charter has been issued to the National Securities Corporation, a holding company capitalized at $25,000,000, which will have headquarters in this city. Murray M. McGuire is president, Thomas P. Bryan, vice-president, and John S. Eggleston, secretary-treasurer, all of Richmond. The corporation is incorporated to construct, equip, improve or work upon any and all kinds of plants for the manufacture, storage, utilization, supply or disposition of electricity, gas, water or steam, or of power produced thereby, and to do a general contracting business.

FINANCIAL NOTES.

The reorganization committee of the American Water Works & Guarantee Company has appointed E. C. Converse, former president of the Bankers Trust Company, New York City; William Nelson Cromwell, of Sullivan & Cromwell, New York City; Howland Davis, of Blake Bros. & Company, New York City; Andrew Squire, of Squire, Sanders & Dempsey, of Cleveland, and Albert H. Wiggin, president of the Chase National Bank, New York City, to act as voting trustees of the new American Water Works & Electric Company stock, covering a period of five years. Robert Wetherill, of R. Wetherill & Company, of Chester, Penn., it was announced by the committee, will serve on the board of directors of the new company.

Dividends.

	Term.	Rate	Payable
American Rys. pr.......	Q	1.75%	May 15
Automatic Elec.	Q	1 %	May 1
Bellows F. Pow. pf....	S-A	2.5 %	May 1
Cent. St. Elec. Corp....	Q	1 %	May 19
Col. Ry. Pow. & Lt. pf.	..	1 25%	May 1
Conn. Ry. & Lt. pf.....	Q	1 %	May 15
Kaministiquia Pow. ...	Q	1.5 %	May 15
Kellogg Sw. & Sup.....	Q	3 %	May 2
Lehigh Val. Tr. pf.....	S-A	1 %	May 11
Mont. Lt., Ht & Pwr...	Q	2.5 %	May 15
Ohio Trac. Co...........	Q	1.25%	May 1
So. Cal. Edison com....	Q	$1.50	May 15

Reports of Earnings.

CONSUMERS POWER OF MICHIGAN.

Consumers Power of Michigan reports earnings for the three months ended March 31, 1914, and for the 12 months ended March 31, 1914, as follows:

	3 Months	12 Months
Gross earnings	$885,710	$3,216,089
Net after taxes..........	582,347	1,812,100
Surplus after charges....	302,321	759,444
Balance after preferred dividends	219,821	429,444

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1914	1913
March gross	$242,732	$ 121,121
Net income	171,232	108,283
Balance after preferred dividends	91,232	78,283
12 months gross.......	2,360,428	1,267,660
Net income	2,122,560	1,228,104
Balance after preferred dividends	1,212,560	868,104

SOUTHWESTERN POWER & LIGHT.

(Consolidated statement of subsidiaries.)

	1914	1913
March gross	$ 205,895	$ 167,433
Expenses and taxes...	119,933	97,376
Net earnings	85,962	70,057
12 months gross.......	2,382,962	2,015,019
Expenses and taxes...	1,298,403	1,135,434
Net earnings	1,084,559	879,585

MEXICAN TELEPHONE & TELEGRAPH.

The report of the Mexican Telephone & Telegraph Company for the twelve months ended February 28, 1914, compares as follows (Mexican currency):

	1914	1913
Gross	$749,290	$716,742
Expenses	376,241	332,132
Net	373,049	384,609

KINGS COUNTY ELECTRIC.

Kings County Electric Light & Power Company's consolidated income account for the quarter ended March 31, 1914, compares as follows:

	1914	1913
Gross operating revenue	$1,652,743	$1,461,413
Operating expenses, taxes and depreciation.	1,055,893	879,688
Net operating revenue	596,849	581,724
Other income	16,259	16,086
Total income	613,108	597,811
Surplus after charges.	395,542	353,427

The company discontinued issuing monthly statements last November. Quarterly statements are regarded as a fairer criterion of their business.

REPUBLIC RAILWAY & LIGHT.

	1914	1913
March gross	$ 250,182	$ 225,177
Net after taxes.........	102,650	82,087
Surplus after charges..	58,946	35,784
12 months gross.......	3,024,870	2,755,205
Net after taxes	1,189,593	1,092,875
Surplus after charges..	659,768	559,575

KANSAS GAS & ELECTRIC.

	1914	1913
March gross	$ 107,612	$ 95,663
Net after taxes........	34,295	31,781
Surplus after charges..	19,435	16,858
12 months gross.......	1,075,620	946,008
Net after taxes........	389,867	323,882
Surplus after charges.	213,177	161,367
Balance after preferred dividends	108,177	56,367

PACIFIC POWER & LIGHT.

	1914	1913
March gross	$ 99,939	$ 94,397
Net after taxes........	48,564	38,569
Surplus after charges..	17,585	11,834
12 months gross.......	1,307,305	1,259,462
Net after taxes........	652,292	611,034
Surplus after charges..	294,769	315,598
Balance after preferred dividends	49,769	76,848

HAVANA ELEC. RY., LIGHT & POWER,

(Railway Dept.)

	1914	1913
Week ending April 19..	$ 53,043	$ 52,451
Jan. 1-April 19........	853,118	841,593

EDISON ELECTRIC COMPANY OF BROOKLYN.

The Public Service Commission has issued a report covering the operations of the Edison Electric Illuminating Co. of Brooklyn for the year ended December 31, 1913, which compares as follows:

	1913	1912
Operating revenue	$5,655,200	$5,167,669
Expenses and taxes....	3,647,361	3,379,343
Operating income	2,007,839	1,788,326
Other income	25,385	15,767
Total income	2,033,224	1,804,094
Charges	1,961,527	1,757,901
Net corporation income	71,697	46,192
P. & L. adj...........	71,697	46,192

CENTRAL STATES ELECTRIC CORPORATION.

(Cleveland Electric Illuminating Co.)

	1914	1913
March gross	$ 384,984	$ 333,667
Net after taxes........	179,936	158,874
Surplus applied to common stock	104,153	83,820
12 months' gross......	4,165,652	3,396,379
Net after taxes........	2,013,842	1,608,060
Surplus applied to common stock	1,185,058	877,794

TEXAS POWER & LIGHT.

	1914	1913
March gross	$ 114,567	$ 83,902
Net after taxes........	33,622	25,015
Surplus after charges..	7,581	11,959
Twelve months' gross.	1,276,997	1,044,033
Net after taxes.........	454,493	417,053
Surplus after charges..	202,854	291,661
Balance after preferred dividends	92,604	219,736

FORT WORTH POWER & LIGHT.

	1914	1913
March gross	$ 68,165	$ 47,389
Net after taxes........	35,909	30,419
Surplus after charges..	26,114	23,400
12 months' gross......	728,785	541,230
Net after taxes........	425,661	277,981
Surplus after charges.	335,508	212,003
Balance after preferred dividends	278,467	168,603

MT. WHITNEY POWER & ELECTRIC.

	1914	1913
March gross	$ 47,605	$ 37,481
Net after taxes........	24,700	17,889
Surplus after charges..	13,300	8,764
12 months' gross......	591,440	457,615
Net after taxes........	319,940	248,425
Surplus after charges..	198,580	148,925

SAN JOAQUIN LIGHT COMPANY.

The San Joaquin Light & Power Corporation reports for the year ended December 31, 1913, as follows:

	1913	Increase
Gross operating revenue.	$1,741,301	$377,658
Expenses and taxes.....	840,930	*303,229
Net operating revenue..	$ 900,371	$74,429
Other income	21,019	4,750
Net income	$ 921,390	$79,179
Interest charges	431,288	57,637
Balance	$ 490,102	$21,542

*Decrease.

WESTERN UNION.

	1913	1914
Total operating revenues	$6,896,202	$6,754,712
Total operating expenses and taxes.....	5,654,316	5,507,376
Operating income	1,241,886	1,247,336

CITIES SERVICE COMPANY.

	1914	1913
March gross	$ 348,447	$ 136,523
Net after expenses	333,138	130,644
Balance after interest..	307,971	130,644
Balance after preferred dividends	171,138	677,178
Surplus after common dividends	92,662	33,649
12 months' gross.......	2,869,854	1,330,572
Net after expenses.....	2,777,733	1,263,563
Balance after interest..	2,567,171	1,263,563
Balance after preferred dividends	*1,438,296	614,492
Surplus after common dividends	836,939	349,104
Total accumulated surplus to March 31.....	2,543,109	....

*Equivalent to 11.22 per cent on $15,718,380 common stock.

KEYSTONE TELEPHONE.

	1914	1913
March gross	$108,386	$103,450
Net	53,975	49,885
Surplus after charges....	28,447	24,326
Three months' gross......	323,644	310,363
Net	163,112	152,011
Surplus after charges......	84,764	76,074

WASHINGTON, BALTIMORE & ANNAPOLIS ELECTRIC.

	1914	1913
March gross	$ 57,840	$ 90,360
Net after taxes............	22,633	55,171
Surplus after charges......	*2,019	30,194
Three months' gross......	168,607	190,926
Net after taxes............	66,315	91,197
Surplus after charges.....	*6,553	19,640

*Deficit.

Cause for large decrease in earnings is that March, 1913, was month of President Wilson's inauguration when traffic was very heavy.

NEW ORLEANS RAILWAY & LIGHT.

The New Orleans Railway & Light Company reports for the year ended December 31, 1913, compare as follows:

	1913	1912
Operating Revenues.		
Railroad department....	$4,401,152	$4,295,027
Electric department....	1,335,186	1,244,042
Gas department	1,158,095	1,089,078
Total operating revenue	6,894,432	6,628,147
Operating Expenses.		
Railroad department ...	$2,542,886	$2,450,917
Electric department ...	608,046	551,915
Gas department	449,449	417,524
Total operating expenses	3,500,382	3,420,356
Net operating revenue.	3,294,051	3,207,791
Taxes	731,196	565,991
Operating income	2,574,646	2,652,264
Other income	34,763	41,573
Total income	2,609,408	2,683,374
Interest, reserve, etc..	1,731,879	1,688,341
Surplus	*872,759	995,033
Dividends	799,600	799,690
Surplus	73,069	195,343

*Equal to five per cent on $10,000,000 preferred stock and an additional 1.86 per cent on $20,000,000 common stock. This compares with 5 per cent earned on preferred and 2.47 per cent on common previous year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 27	April 20
American Tel. & Tel. (New York)................	119	120½
Commonwealth Edison (Chicago)................	133½	135
Edison Electric Illuminating (Boston)............	245	250
Electric Storage Battery, common (Philadelphia)..........	49¾	50¼
Electric Storage Battery, preferred (Philadelphia)..........	49¾	50¼
General Electric (New York)................	140	144
Kings County Electric (New York)................	120	119
Manhattan Transit (New York)................	1	1
Massachusetts Electric, common (Boston)............	9¼	10
Massachusetts Electric, preferred stamped (Boston)..........	58	59½
National Carbon, common (Chicago)................	106	108½
National Carbon, preferred (Chicago)................	119	118⅛
New England Telephone (Boston)................	135	135
Philadelphia Electric (Philadelphia)................	25½	25½
Postal Telegraph and Cables, common (New York)..........	75	81
Postal Telegraph and Cables, preferred (New York)..........	67	69
Western Union (New York)................	60	61¼
Westinghouse, common (New York................	71	72¼
Westinghouse, preferred (New York)................	117	117½

PERSONAL MENTION.

MR. FELIX T. HUGHES, formerly of the Mississippi Valley Trust Company, has been elected a vice-president of the Engineering Securities Corporation.

MR. FREDERICK GREENSLADE, superintendent, the Jamesburg Electric Light & Water Company, Jamesburg, N. J., has tendered his resignation, effective May 15.

MR. RUSSELL G. SCHOEDINGER, for some time a representative with The F. Bissell Company, Toledo, O., is now connected with the National Carbon Company, of Cleveland, O.

MR. J. L. WHITE has been appointed local manager of the Oregon Power Company's office at Portland, Ore., having been transferred from Dallas, Ore., where he held a similar position.

MR. ROBERT MONTGOMERY, manager of the commercial department, Louisville Gas & Electric Company, has recently been elected a member of the local Rotary Club.

SIR WILLIAM MARCONI has reached the age of 40 years, which makes him eligible as an Italian Senator, and it is reported that King Victor Emmanuel intends to nominate him to this office at an early date.

MR. HENRY P. DUBOIS, formerly of J. G. White & Company, has been made a vice-president of the Engineering Securities Corporation. This company has opened new offices at 37 Wall Street, New York City.

MR. P. B. SAWYER, general manager of the Utah Power & Light Company, has been called to New York City in connection with the retirement of the short-time notes of his company which is now in progress.

MR. GEORGE HALE, a well known electrical engineer of Los Angeles, Cal., was married to Miss Grace Osborn, of Topeka, Kans., in the Kansas capital recently. The couple will make their home at Hollywood, a suburb of Los Angeles.

MR. P. D. TUCKETT, president of the Electric Light System, of London, England, is in Kansas City, Mo., for the purpose of aiding in the reorganization of the Kansas City, Mexico & Orient Railroad, a steam line now in the hands of receivers.

SURGEON-GENERAL WILLIAM C. GORGAS, U. S. A., was presented with the Louis Livingstone Seaman medal by the American Museum of Safety on Tuesday evening, April 28, in recognition of his work for health and sanitation in the Panama Canal Zone.

MR. H. C. KUNKEL, division plant superintendent of the Delaware & Atlantic Telephone & Telegraph Company, Trenton, N. J., tendered an address to the members of the Trenton Telephone Society on Thursday evening, April 23, on "Storm Trouble."

MR. HARRY ASKIN, general manager of the Cushing, Okla., Electric Light & Power Company, has been elected general manager of the Cushing Traction Company, just formed in that city. His new duties will not interfere with his position as head of the light and power company.

MR. F. H. HUGHES, selling representative of the Rauch & Lang Carriage Company, of Cleveland, O., is in Salt Lake City, Utah, and will spend the next three or four months there working in conjunction with the Spiker Electric Garage Company, the local Rauch & Lang representatives.

MR. DANA PIERCE, electrical engineer and agent at New York of the Underwriters' Laboratories, Inc., sailed on May 2 for England to visit the recently established London office of the Laboratories, which is engaged in the examination and test of electrical and other goods made in England.

MR. NEWTON W. BOLEN, general superintendent of the Public Service Railway Company, was given a dinner Monday evening, April 20, by the employees of the Montgomery and Bayonne Divisions, at the auditorium of the company, Jersey City, N. J.; 250 guests were present, including Mr. Richard E. Danforth, general manager.

MR. FRANK KOESTER, the well-known consulting engineer and counsel in efficiency movements, is the author of a splendid volume, just published by McBride, Nast & Company, New York, entitled "Model City Planning and Maintenance." The work is imposing in its physical appearance, and bears analysis well. Mr. Koester has brought to the study of this subject a ripe experience, both here and abroad, not only in connection with the engineering phases of the subject, but dealing also with the economic and sociologic aspects of the matter as well.

MR. C. E. VANDEL, assistant treasurer of the Western Electric Company, of Kansas City, Mo., will be a speaker at Merchants' Week to be held by the University of Kansas at Lawrence from May 5 to 7. Mr. Vandel will speak on "Credit." Several thousand retailers from all parts of Kansas are expected to attend the sessions, which will illustrate a modern tendency toward efficiency in storekeeping, as well as other lines of mercantile endeavor. Mr. Vandel, who has been president of the Kansas City Credit Men's Association, will resign at the annual meeting in May, but will give the organization the benefit of his wide experience by continuing as a director.

MR. W. R. GARTON announces the opening of offices at 299 Broadway, New York, where he will conduct a sales engineering business. Mr. Garton has taken the Eastern sales engineering agency for the Root Spring Scraper Company's products, the Nichols-Lintern Company's products, the J. F. Hodgkin Company's products and the W. J. Baker Company's lock washers; also the Monarch Refillable Fuse Company's products. Mr. Garton will continue to represent in an engineering and expert capacity some of the large interests with which he has been associated for some time. He will conduct both an engineering and sales engineering business under the latter general heading.

MR. W. C. COMER, who has been with the Metropolitan Street Railway Company, of Kansas City, Mo., for the past four years, has resigned and will enter the electrical contracting business in that city in the near future. Mr. Comer was assistant superintendent of the Forty-eighth and Harrison streets division at the time of his resignation, which was effective May 1. That division is the most important operated by the company. Mr. Comer has not yet definitely decided on the location of his establishment or the lines to be handled. He has been succeeded as assistant division superintendent by B. B. BOUCHER, who has held the same position at the Tenth and Minnesota division, in Kansas City, Kans. Mr. Boucher's place has been filled by the promotion of C. H. BALES, an inspector.

MR. THORNDYKE HARVEY, who for the past two years was commercial engineer of the Texas Power & Lighting Company, with headquarters at Dallas, Tex., has been appointed commercial agent in charge of all new business for the Kansas Gas & Electric Company, of Wichita, Kans. The Wichita Company has other properties at Independence and Pittsburgh, and smaller subsidiary plants are operated from these points. The company is in a growing territory and the prospects for a good power business are very bright. The industries include flouring mills, coal mines and railroad shops. Four flour mills have already been secured as customers at Wichita, and are now being connected up with a total of 1,200 horsepower. Mr. Harvey states that the organization is in fine shape and that the wheat crop prospect in Kansas was never better.

MR. C. C. CHAPPELLE, vice-president and general manager, Federal Light & Traction Company, New York, has tendered his resignation as executive officer of that holding company taking effect May 1, Mr. Chappelle will hereafter devote his entire attention to private business. Prior to coming with the Federal Company, he was for several years western sales manager of the Westinghouse Machine Company, with headquarters at Chicago. His earlier associations were with the engineering and sales organizations of the Westinghouse companies, subsequent to his graduation from Purdue University in 1895. Mr. Chappelle remains as one of the three members of the Executive Committee of the Kansas City, Clay County & St. Joseph Railway Company, which is not affiliated with the Federal interests.

OBITUARY.

MR. EDWARD R. HARRIS, assistant auditor of the Home Telephone Company, died in Kansas City, Mo., on April 19. Though a product of New Castle, Ind., Mr. Harris came to Kansas City 30 years ago. Most of his business career was spent with the Home Telephone Company.

MR. HENRY ATHERTON GUYON, manager of the Postal Telegraph office in Yonkers, N. Y., for the last three years, died there of pneumonia recently at the age of 55. He had been private secretary to the late Richard Mansfield, the actor, and the late Henry S. Ives. Mr. Guyon left a widow and three daughters.

MR. FREDERICK W. BURDICK, for the last ten years manager of the contracting department of the H. W. Johns-Manville Company, Forty-first Street and Madison Avenue, died April 27 at his home in New York City. He was a member of the Harlem Yacht Club and the Masonic order. Mr. Burdick was 49 years old and a bachelor.

MR. W. T. WESTBROOK, formerly head of the Delaware & Atlantic Telephone Company, died at his home at Philadelphia, on April 22. Mr. Westbrook was a pioneer telephone man, and before that a telegrapher, and member of the old military telegraph corps during the Civil War. He was a fine gentleman of the old school, who numbered among his host of friends and acquaintances who deplore his demise, many men prominent in the electrical industry.

DATES AHEAD.

Electrical Supply Jobbers' Association. May meeting, Chalfonte Hotel, Atlantic City, N. J., May 12-14. General secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Institute of Electrical Engineers. Annual meeting, New York, N. Y., May 19. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29.

American Institute of Electrical Engineers. 296th meeting, Pittsfield Mass., May 29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit, June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 22-26.

With the Electrical Manufacturers

The Koerting & Mathiesen Company, New York, N. Y., announces its removal to 49-53 East Twenty-first Street.

A. F. Daum & Company, Pittsburgh, Pa., has ready for distribution booklet No. 17, describing and illustrating the Daum refillable cartridge fuses for electric light and power circuits.

The Automobile Supply Manufacturing Company, Brooklyn and New York, has issued a circular describing "Apollo" electric horns. These horns are intended for use on automobiles and give a loud but agreeable sound.

Duncan Electric Manufacturing Company, Lafayette, Ind., has issued bulleetin 25 on induction-type watt-hour meters. This bulletin describes the entire construction of the meters. Numbers of illustrations are shown and a table of list prices is given.

The Packard Electric Company, Warren, O., has issued a flyer on porcelain-clad bell-ringing transformers. The transformer, which is entirely enclosed in a porcelain case, is suitable for residence door bells, buzzers and all classes of light signal work.

Norton & Bird, Chicago, Ill., announce that they have moved to permanent headquarters in the Harris Trust Building, 111 West Monroe Street, where they will continue their practice as consulting engineers, with special reference to public-service properties.

The Dubilier Electric Company, Incorporated, New York, N. Y., announces that it has moved to new quarters located at 80 Fifth Avenue. The company has largely increased its facilities and will be able to make very prompt shipments, as an enlarged stock of parts and material will be constantly available.

Hanovia Chemical & Manufacturing Company, Newark, N. J., announces that it is now manufacturing pure transparent quartz-glass apparatus of all descriptions for electrical and other devices. It is said that this is the first time that this material has been manufactured in this country. The company manufactures Heraens electric furnaces and quartz lamps.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has secured the contract for the equipment of the new hydroelectric plant which the Southern Power Company is building at Lookout Shoals on the Catawba River in North Carolina. This plant will develop about 26,000 horsepower. The equipment contract calls for an expenditure of about $225,000.

Eastern Electric Lamp Company, Hartford, Conn., has recently issued a catalog giving prices and details of those classes of incandescent lamps employed for ordinary illumination. The catalog covers Gem lamps, round, straight and tubular-bulb types of Mazda lamps for parallel operation, concentrated-filament Mazda automobile lamps, and Mazda series-street-lighting lamps.

Cooper Hewitt Electric Company, Hoboken, N. J., announces that the St. Louis, Mo., office has been removed from 1403 Central National Bank Building to suite 1201, the same building. This office and territory will be in charge of E. H. Waddington, the well known illuminating engineer, who was formerly connected with the General Electric Company and the Western Electric Company.

Metropolitan Engineering Company, New York, N. Y., has recently issued a number of loose leaves for its loose-leaf binder. These sheets cover meter-protective and testing devices, service cutouts, fuses, switches, charging plugs and receptacles, etc. Section No. 8 of the loose-leaf binder which is devoted to primary cutouts, fuses, transformer cutouts and high-tension series-arc-lamp cutouts, has been completely revised.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., recently issued a bulletin on push-button-operated controllers for printing machinery. This bulletin covers various types of speed regulators for printing presses, job presses and similar service. Dynamic-braking speed regulators are also described. By means of inching buttons the pressman can easily move the press a fraction of an inch when threading paper and preparing the press for a run. A number of installations are shown, and price lists, dimensions, etc., are included.

General Electric Company, Schenectady, N. Y., has recently issued a celluloid indicator, showing the effect of operating Mazda lamps above or below labeled voltages. This indicator gives the per cent of rated wattage, the per cent of rated candlepower and the per cent increase or decrease in the total cost of light for operating voltages of from 96 to 104 per cent of the rated lamp voltage. This indicator shows clearly that undervoltage operation of lamps results in an increased cost of light to the consumer and a loss of revenue to the central station.

James Clark, Jr., Electric Company, of Louisville, Ky., is filling its contract with the United States Government for a number of electrically driven tools to be installed on the new torpedo-boat tender No. 2, known as the Melville. The first shipment of these tools was recently made to Norfolk, Va., where the vessel is being put into commission. All these tools are driven by direct-connected motors and are similar to those which the company has sold for use in government shops. The shipment consisted of three 22.5-inch drills; two 16-inch sensitive drills; two floor grinders; one buffer; two shop saws; one small, portable radial drill and two center grinders.

National X-Ray Reflector Company, Chicago, Ill., has recently issued a portfolio of details and data on illumination from concealed sources. This portfolio is bound in a strong cover 12 by 5 inches and contains 52 pages, together with 24 loose detail plates. Many prominent installations of every conceivable kind and class are described with data. Methods of calculating installations of the indirect type, show-window type, and direct type are given. Tables, rules and charts are presented in a simple form, which ought to facilitate the laying out of an interior lighting installation. This portfolio is complete in all respects, covering installations for offices, hotels, banks, libraries, stores, schools, churches, hospitals, residences, etc. The portfolio retails at $5.00 per copy; a limited number of complimentary copies, however, will be mailed to responsible members of architectural firms requesting the same.

Sprague Electric Works of General Electric Company has recently issued bulletin No. 41010 devoted to a description of direct-current motors, types C and D. These motors are of the commutating-pole type and are adapted for floor, wall or ceiling mounting. A number of interesting installations are shown and tables of dimensions are given. Pamphlets Nos. 853 and 330 have also been issued. The former is devoted to a description of laboratory ozone apparatus. This pamphlet covers laboratory ozonators, motor-generator sets for supplying the necessary alternating current when not available, ozone mixers for subjecting oil to ozone treatment, air filters and industrial ozonators. Pamphlet No. 330 lists and describes direct-current and alternating-current General Electric and Sprague-Lundell fans of the non-oscillating, oscillating and telephone-booth types. Ceiling fans and ventilating fans are also included.

National Lamp Works of General Electric Company, Cleveland, O., has recently issued bulletins Nos. 11B and 13D, devoted to nitrogen-filled series street lamps and multiple lamps respectively. In bulletin No. 11B Mazda nitrogen-filled series street lamps are listed in sizes ranging from 80 to 1,000 candlepower, the efficiencies varying from 0.71 to 0.50 watt per mean horizontal candlepower. These lamps will operate satisfactorily on any series circuit where the current is kept reasonably constant at the value for which the lamps are rated. Owing to the high intrinsic brilliancy of these lamps and the high temperatures of the bulbs, reflectors and globes are recommended. A line of reflectors and globes suitable for these lamps is illustrated and described in the bulletin. Cuts of the new lamps, characteristic curves, distribution curves and operating data are also included. The last two pages of the bulletin are devoted to practical information designed to serve as a guide in selecting lamps. Bulletin No. 13D describes the 750 and 1,000-watt multiple lamps having efficiencies of 0.65 and 0.60 watt respectively and operating on 110 to 113 volts. These lamps are designed to operate satisfactorily on even poorly regulated circuits provided the voltage rating of the lamp corresponds to the average socket voltage used. It is recommended that inclosing globes or indirect fixtures be used owing to the high intrinsic brilliancy of the lamps. Suitable fixtures for these lamps are described in the bulletin, proper attention being paid to ventilation. Characteristic curves and numerous cuts add to the value of the bulletin. A table is given comparing the color composition of the new lamps with that of sunlight. Owing to the similarity of the light from these lamps to daylight, they are recommended for photographing purposes. They are also recommended for high-ceiling stores, auditoriums, armories, railway depots and outdoor illumination.

Record of Electrical Patents.

Issued by the United States Patent Office, April 21, 1914.

1,093,594. Phase Balancer. Ernst F. W. Alexanderson, assignor to General Electric Co. Comprises a synchronous dynamo connected to another dynamo, the phase rotation of the two being opposite.

1,093,596. Electric Block-Signal Apparatus. J. Beaumont and F. G. White, Chicago, Ill. An automatic signal for side tracks.

1,093,597. Electric Block-Signal Apparatus. J. Beaumont and F. G. White. A modification of 1,093,596.

1,093,598. Spark Plug. C. W. Beck, assignor to Michigan Motor Specialties Co., Detroit, Mich. For internal combustion engines.

1,093,607. Junction Box for Electrical Conductors. C. W. Davis, assignor to Standard Underground Cable Co. Has inclosed cartridge fuses. (See cut.)

1,093,614. Brush for Dynamo-Electric Machines. E. G. Gilson, assignor to General Electric Co. Graphite brush containing copper and iron.

1,093,615. Circuit for Electric Lighting or Power. M. H. Gray, Springfield, O. Means for controlling floating storage battery.

1,093,618. Automobile Lamp. W. S. Hamm, assignor to The Adams & Westlake Co. Contains incandescent lamp.

1,093,621. Indicator. A. B. Hazard, Chicago, Ill., assignor of one-half to R. E. Humpston. Has oscillating arm.

1,093,631. Automobile Drive. H. H. Kennedy, assignor to Waverley Co., Indianapolis, Ind. Electric motor geared to shaft.

1,093,634. Brush Holder. A. Krauss, assignor to The Firm of Robert Bosch, Stuttgart, Germany. Includes means for limiting brush movement.

1,093,650. Electric Generator or Motor. W. Rodgers, Hamilton, Ontario, Canada. A dynamo frame having dovetailed plates.

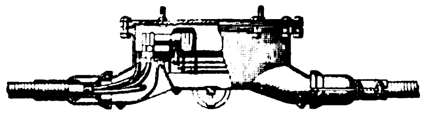
1,093,659. Internal-Combustion Engine. F. S. Thornley, Clarion, Iowa. Has electric ignition.

1,093,660. Pressure Governor for Pumps. W. V. Turner, assignor to The Westinghouse Air Brake Co. Has electromagnetically controlled valves.

1,093,670. Motor-Control System. M. A. Whiting, assignor to General Electric Co. Contactor arrangement having magnetically operated circuit-breaker.

1,093,679. Auxiliary Alarm System. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Has magnetically controlled signal train.

1,093,702. Relay. I. Kitsee, assignor to American Telephone and Telegraph Co. Closed magnetic yoke has a number of magnetic poles with fixed and movable coils.



1,093,607.—Junction Box.

1,093,717. Rectifier of Electric Currents. Thomas J. Murphy, Rochester, N. Y. Has automatically controlled resistance.

1,093,725. Attachment for Telegraph Apparatus. L. C. Page, Decoto, Cal. Has mechanical connection between relay and sounder.

1,093,744. Spark Plug. J. F. Tracy, Chicago, Ill. Has gap in center electrode.

1,093,745. Liquid-Level Indicator. J. A. Turner, Washington, D. C. Circuits to incandescent lamps completed through liquid in tube.

1,093,780. Relay Bond. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. For track signal system.

1,093,791. Electric Flat Iron. C. P. Madsen, assignor to The Michigan Stove Co. Switch comprises part of handle.

1,093,792. Armored Electric Heating-Unit. C. P. Madsen, assignor to The Michigan Stove Co. Has a fibrous fireproof insulating covering permeated with refactory insulating material.

1,093,793. Electric Switch. J. F. McElroy, assignor to Consolidated Car-Heating Co. Spring-operated switch.

1,093,794. Telephone Signal System. J. Meyerhoff, Chicago, Ill. Electric signal lamp for each station.

1,093,801. Signal System. G. W. Phelps, Chicago, Ill. A bell and lamp signalling circuit.

1,093,809. Lock Construction. H. G. Voight, New Britain, Conn. Hs electric indicating device.

1,093,857. Electric Igniting Device for Explosive-Engines. L. C. Jackson, Buffalo, N. Y. Mechanical device for operating ignition means.

1,093,875. Electromagnetic Separator. B. T. Mottinger, Youngstown, O. Field magnet has cored passageway for material to be separated.

1,093,888. Current-Amplifying Apparatus and Circuits. H. E. Shreeve, assignor to Western Electric Co. A microphonic repeater.

1,093,893. Mounting for Fuses. Clarence G. Stoll, Brooklyn, N. Y., assignor to Western Electric Co. Fuse held inside of porcelain cell.

1,093,912. Wheel Mount. F. E. V. Chapman, Asbury Park, N. J., assignor of one-fourth to Durand, Ivins & Carton, Asbury Park, N. J. For trolley wheel.

1,093,926. Signaling System. R. H. Gaylord, and G. B. Capps, assignors to Foulkes-Gaylord Company, Los Angeles, Cal. Lamp arrangement to show movement of cars.

1,093,947. Unit and Process of Mak-

ing The Same. M. H. Rice, New Rochelle, N. Y., assignor to National Electric Utilities Corporation, New York, N. Y. Has covering of cementitious material.

1,093,951. Case and Cap for Telephone Receivers. L. Steinberger, Brooklyn, N. Y. Special provision made for securing diaphragm.

1,093,955. Combination Sash - Lock and Alarm. J. Tregoning, New Haven, Conn. Has electric-bell alarm.

1,093,957. Electrode. E. Weintraub, assignor to General Electric Co. Contains calcium cyanamid, titanium oxide and carbon.

1,093,967. Insulating Compound. L. E. Barringer and F. C. Zapf, Schenectady, assignors to General Electric Co. China wool oil, pitch and asphalt.

1,093,968. Electric Furnace. R. S. Bicknell, New York, N. Y. Of resistance type, with resistors arranged so as to permit of several connection schemes.

1,093,972. Wire-Connector. W. G. Cady, Middletown, Conn. Has movable plates inside insulating case. (See cut.)

1,093,983. Repulsion-Motor Control. F. Eichberg, assignor to General Electric Co. Has inductance and resistance shunted around brushes.

1,094,000. Coin-Controlled Telephone Pay-Station. G. A. Long, assignor to The Gray Telephone Pay Station Co., Hartford, Conn. Includes means for indicating weight of coin used.

1,094,030. Electric Fuse. S. D. Sprong and W. E. McCoy, New York, N. Y., assignors of one-third to F. W. Smith. Has U-shaped fuse strip and three terminals.

1,094,036. Fuse Plug. S. Terada, Seattle, Wash. Tube of non-conducting material inserted in plug. (See cut.)

1,094,051. Ignition Device. J. Berg, assignor to Metal Specialties Manufacturing Co., Chicago, Ill. An ignition device having a cup shape.

1,094,077. Variable-Speed Dynamo. H. Leitner, London, England. A shunt dynamo having one separate field brush to add to strength of field at low speeds.

1,094,083. Electric Sign. A. C. Meyer, San Diego, Cal. A sign-changing device utilizing a movable stencil.

1,094,102. Repulsion-Motor. A. Simon, Milwaukee, Wis. Armature sectionalized to permit of varying speed.

1,094,103. Automatic Block-Signaling System for Electric Railways. O. E. Stevens, assignor to General Railway Signal Co. Inductive bonds sectionalize tracks.

1,094,104. Automatic Block-Signaling System for Electric Railways. O. E. Stevens, assignor to General Railway Signal Co. A modification of 1,094,103.

1,094,106. Electromagnetic Fishing Tool. C. N. White, Maricopa, Cal. Has a number of electromagnets.

1,094,109. Conduit. C. J. Alpaugh, assignor to The Trenton Electric and Conduit Co., Trenton, N. J. Metal molding with capping.

1,094,121. Resistance Unit for Controllers. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co. Has superimposed resistance units and staggered ventilating holes.

1,094,125. Magnetic Separator. R. W. Cousins, Chicago, Ill. Poles of rotating magnets pass near belt.

1,094,137. Contact Shoe Device for Third-Rail Systems. H. S. Farquhar, Bryn Mawr, Pa. Toggle arrangement for controlling shoe.

1,094,141. Process of Electric Welding. G. Gnüchtel, Lauter, Germany. Layer of high welding heat between electrodes and material to be melted.

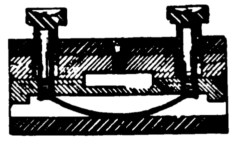
1,094,156. Battery Regulator. E. Lowe, assignor to General Acoustic Co., Jamaica, N. Y. Adjustable resistance fits over top of dry cell.

1,094,165. Apparatus for Reproducing Vibrations of Small Amplitude. A. Orling, Tooting, London, England. Fluid-operated relay.

1,094,170. Bell Ringer. J. E. Scovill, Chicago, Ill. Has electromagnet.

1,094,173. Battery Terminal. J. M. Skinner, Philadelphia, Pa. For storage battery.

1,094,206. Pull Socket. C. R. Hare, Hartford, Conn., assignor to The Arrow Electric Company, Hartford, Conn. Covers detail.



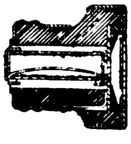
1,093,972.—Wire Connector.

1,094,224. Process for Producing 1.3 Diols. L. P. Kyriakides and R. B. Earle, assignors to Hood Rubber Co. Electrolytic reduction of ketone alcohols in dilute sulphuric-acid solution.

1,094,238. Electrically Driven Pendulum. G. Nobis, Davenport, Iowa. Movement of pendulum closes and opens circuit of operating magnet.

1,094,264. Heating Unit. C. S. Steward, Chattanooga, Tenn. Resistance wires in parallel slots provided with air passages.

1,094,292. System for Operating or Controlling Time-Indicating Devices. L. J. Aron, assignor to X. L. Electric Co., London, England. Includes means for giving magnetic impulses to clocks at predetermined intervals.



1,094,036.—Fuse Plug.

1,094,315. Process for Producing 1.3 Glycols, R. B. Earle and L. P. Kyriakides, assignors to Hood Rubber Co. Aldol reduced by electrolytic action in presence of sodium bicarbonate and mercury cathode.

1,094,316. Process for Producing 1.3 Glycols. R. B. Earle and L. P. Kyriakides, assignors to Hood Rubber Co. A modification of 1,094,315 employing 1.3 ketone alcohols.

1,094,354. Electric Furnace and Process of Heating Substances. E. F. von Wilmowsky, assignor to Mrs. O. Pieper, Potsdam, Germany. Has parallel electrodes one of which is surrounded by the other and solenoid turns surrounding the latter.

1,094,355. Electric Furnace and Process of Heating Substances Uniformly and at a Controllable Temperature. E. F. von Wilmowsky, assignor to Mrs. O. Pieper, Potsdam, Germany. Has electric arc and magnetic field through which gases pass.

1,094,356. System of Automatic Block-Signaling for Electric Railways. S. M. Young, New York, N. Y. Track-operated alternating-current signal with auxiliary magnetically controlled direct-current circuit.

1,094,371. Process for Extracting Metals from Ores. H. S. MacKay, Norwich, Conn., assignor to MacKay Process Co., Norwich, Conn. Electrolytic method embodying means for maintaining high efficiency of solvent and electrolyte.

1,094,381. Electric Furnace for and Process of Heating Substances Uniformly and at a Controllable Temperature in an Electric Arc. E. F. von Wilmowsky, assignor to Mrs. Olga Pieper, Potsdam, Germany. Has concentric electrodes with intermediate furnace chamber, the whole being surrounded by a solenoid.

1,904,389. Electric Motor. W. K. Howe, assignor to General Railway Signal Co. Has dustproof chamber for rotor.

1,094,407. Means for the Regulation or Control of Railway and Like Traffic. H. von Kramer, Edgbaston, Birmingham, England. Signal device on cars has inductive relation to track signaling circuit.

Patents Expired.

The following United States electrical patents expired April 27, 1914.

581,263. Electrical Connection. H. P. Brown, New York, N. Y.

581,281. Underground-Trolley Conduit. J. D. Griffen, New York, N. Y.

581,283. Secondary Battery. V. M. Harris, Chicago, Ill.

581,298. Registering Mechanism. W. H. McFall, Philadelphia, Pa.

581,327. Electric Gas-Lighter. L. L. Borradaile, Philadelphia, Pa.

581,340. Magneto-Electric Machine. E. B. Cutten, Atlantic Highlands, N. J.

581,350. Telephone Instrument. J. E. Keelyn, Chicago, Ill.

581,366. Electric Generator. C. C. Poole, Evanston, Ill.

581,368 Support for Electric Railway Conductors. E. D. Priest, Schenectady, N. Y.

581,406. Telephone Receiver. W. J. Morton, New York, N. Y.

581,411. Printing Telegraph. J. Burry, Long Island City, N. Y.

581,426. Primary Battery. R. R. Moffatt, Brooklyn, N. Y.

581,430. Semaphoric Electric Signal. R. S. Roberts, Philadelphia, Pa.

581,446. Electric Call. H. C. West, New York, N. Y.

581,455 and 581,456. Mounting for Fuses. W. W. Dean, St. Louis, Mo.

591,460. Electric Fuse. W. E. Harrington, Philadelphia, Pa.

581,465. Revolving Electric Headlight. J. Kirby, Jr., Dayton, O.

581,528. Electrical Alarm Device. J. J. Barton, Ypsilanti, Mich.

581,544. Thermostatic Fire-Alarm. O. A. Enholm, and Thomas H. Beck, New York, N. Y.

581,557. Controller for Electric Cars. S. W. Huff, Baltimore, Md.

581,561. Selective Signal for Telephone Circuits. H. W. Mason, New Bedford, Mass.

581,658. Electric Motor Controller. W. H. Chapman, Portland, Me.

581,684. Electrical Transmission of Power. R. M. Hunter, Philadelphia, Pa.

Electric Vehicle Section

Philadelphia Section, Electric Vehicle Association, Discusses Garaging.

The April meeting of the Philadelphia Section of the Electric Vehicle Association of America was held on April 8, at 226 South Eleventh Street, Philadelphia, Pa., Chairman R. L. Lloyd presiding; 52 members and guests were present.

The three main papers of the evening formed a symposium on the care of cars in electric garages. The subject was divided into three parts, J. C. Bartlett covering the subject of trucks as cared for in public garages; C. A. Haines speaking more particularly of passenger cars, and Wm. Elwell describing in detail the care of the Philadelphia Electric Company's cars in its own garage.

A resolution was adopted instructing the secretary to convey to the proper official of the state a communication stating that it was the sense of the Philadelphia Section of the Electric Vehicle Association of America that the record of automobile licenses should be so kept as to differentiate between electric cars and gasoline cars, and also if possible between passenger cars and commercial vehicles. It was explained that any additional labor in so keeping the records would be very light indeed, and the information thus secured would be very valuable for statistical reasons. The chairman read a clipping and made some statements in reference to the work of the committee appointed to promote the use of electric vehicles in the parcel-post service. Attention was also called to the formation of a Washington Section, a Cincinnati Section and the probable formation of a New Orleans Section. There were displayed for inspection two signs which have been adopted by the Association designated "Electric Garages" and "Electric Charging Stations"; also a sample was shown of the standard charging plug and its structure described.

The first paper of the evening was read by Mr. Bartlett, in opening which he explained the interrelations existing between the owner of the vehicle, the garage and the maker of the car. He explained that the maker exhausted every effort to produce a perfect car, and that it is sold under the statement of being "fully guaranteed for a year," or for life, and that it requires practically no attention, and that any one can get perfect results. He then went on to say substantially as follows:

We all speak English, of course, but every art, every branch of science or trade has its own language, and while the salesman has told the truth, he has told it in a language that the new owner does not comprehend. "Fully guaranteed" means simply that defective parts will be repaired. "Practically no attention" means just *that,* when compared to that eternal vigilance which is the price of service on a gasoline motor.

Even though very simple, the electric car is a piece of machinery, just the same, and even a wheel-barrow will squeak if it is not oiled. It must have some attention. The maker delivers the car to the owner, and it is consigned to the tender care of anyone who gets a rectifier and puts out the sign "Electric Cars Charged." Unless the electric garage receives a price commensurate with the service expected, it cannot render the service. Unlike the gasoline car, the electric car is not profitable to the garage; there are few of the supplies or repairs on which the average garage makes a big profit to offset the deficit of storage. It is a prime requisite in any electric garage that a competent night man be employed, and unless such a man is employed, it is a moral certainty that batteries will not receive the attention which they should.

Mr. Bartlett called attention to the fact that the owner or driver of the car knows exactly to what use the car has been put for the day, and has a general idea of what it will be expected to do tomorrow, so that if he would take the trouble to give some few directions or explanations to the garage man, better co-operation could be secured for economical results. Lacking such directions or explanations, the garage man has to use his best judgment, and make a very careful examination to see what is needed for the car and if not in the habit of always giving a full charge, make a guess as to what will be needed for the next day from past experience. Mr. Bartlett stated that the automobile agent is always glad to be able to say that the garage will charge a flat rate for the care of the car. It makes it much easier for him to make a sale when he can state that the cost for a car will be just so much per month. Have we heard of any one making such an arrangement for a gasoline car? And yet it would be just as reasonable to expect it. Some cars will use not over $4 worth of current in a month, while others will use as high as $65 worth in a month. Although it would be easy to make an average as to the charges for a car, it would be entirely unfair to make the one man pay so much more than he actually gets the use of, while the other man profits by the small user.

Mr. Bartlett said that "a truck is the most pleasant boarder that a garage can have; it is with you twelve months in the year, and while the profit made on this car is not large, yet it remains steady, and we believe that special inducements should be made by all garages to attract fleets of trucks. Not the least of these inducements is service. In order to charge batteries properly and be sure that the men pay strict and particular attention to this branch of the work, and at the same time procure a record from which the bookkeeping department can make up the bills, we have adopted a card record, one of which is filled out for every charge put in any battery. It is therefore possible for us to go back any reasonable length of time and recite to you the entire history of the battery day by day. This method insures careful charging, as well as accurate bills for the service rendered." Following his paper a number of slides illustrating various features of the electric garage were shown.

The next paper was read by Mr. Haines. He called attention to the fact that the garage owner must work for two masters, the owner of the car and the agent, and inasmuch as a man cannot serve two masters, there is trouble to be looked for at the outset. Like the other speaker he called attention to the glowing terms in which the vehicle agent speaks of the car, its simplicity and the freedom from trouble which one is liable to have. The owner, of course, gets the impression that nothing will ever happen to interfere with his operation, and on some occasion when he gets stuck after a run of a number of miles less than the guaranteed amount, he immediately calls on the agent to explain why. The agent naturally blames the garage man, without ever looking into the conditions, which are responsible on this particular occasion. He said it was very difficult to so charge the car so as to get the mileage to suit the agent, and yet keep the bill for current low to suit the owner. He also called attention to the necessity of a high-class man in charge of this branch of the garage work, and said it was difficult to find such men.

Mr. Haines then explained the operation of the inspection system which has been inaugurated by his firm whereby all of the Baker cars get free inspection once a month. By this method, they not only keep in touch with all of their own cars in the Philadelphia territory, but by preventing trouble and catching any minor troubles in time they avoid larger troubles and get better results. They have found this scheme very satisfactory, and recommend other agents to adopt a similar system.

Mr. Elwell then followed with his paper, which was a description of the equipment and care of the 44 electric vehicles owned by the Philadelphia Electric Company. Detailed explanation was given of the way the records are kept for each car and each battery, and a set of forms on which these records are kept was exhibited. It showed that by this method the highest efficiency was secured from each of the cars; they were kept on the street for a larger percentage of time and the up-keep cost was reduced to a minimum. All these records were compiled monthly, and a fixed charge per mile was made against each vehicle. Tires, batteries and general repairs were thus kept track of and a complete history of each car and each wheel was available at any time.

In the open discussion that followed the presentation of the three papers, F. E. Whitney gave a review of the work and recommendations of the Garage Committee in Chicago, wherein it suggested that the old method of a flat rate per month be done away with, and a method substituted by which charges are made for the various branches of the service rendered. Further discussion was entered into by Messrs. Kalas, Smith, Metcalf, Fredericks and others.

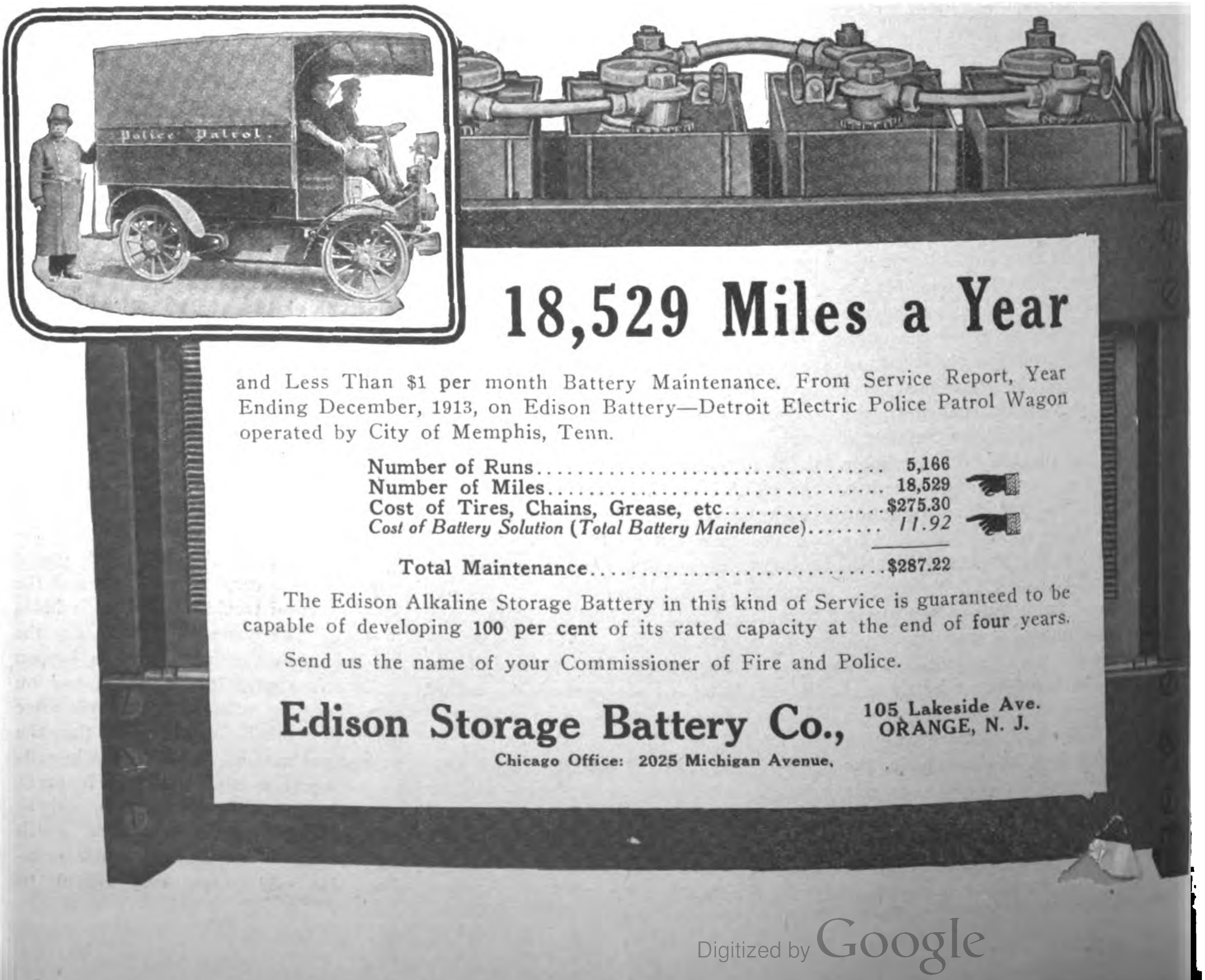
* * *

General Vehicle Wagons for Postal Transfer.

The Postal Transfer Service, Inc., a company that has contract for haulage of some of the mail on Manhattan Island, New York City, has purchased 20 two-ton General Vehicle wagons, which will be utilized in the general work of the concern. The contract has been made and the machines will be delivered as rapidly as they can be completed. This company succeeded to the business of the New York Mail Company, which had contract for the work for a considerable period, and the demands have been very much increased by the inauguration of the parcel post division of the postal service. The company was organized in the spring of last year and the bid made for what is officially known as route 407,012, was accepted in September.

The company has contract to haul all the mail between the general postoffice and the branches and the railroad terminals south of Forty-second Street, it being divided into three classifications. The "mail-messenger" class entails the haulage of the incoming European mail between the receiving pier and the general postoffice and the receiving pier and the outgoing railroad terminals, handling all of the mail brought into the city of this class; the "transfer" class is the haulage between the railroad terminals, this requiring trips to Jersey City, and the "station" class is the haulage between the general postoffice and the branch stations. This does not include the collection of mail at the substations or at the plants of individual concerns.

The firm began business with 80 two-ton and 20 one-ton gasoline machines, this including some of the equipment of the company that it succeeded, and the 20 wagons just bought will re-



18,529 Miles a Year

and Less Than $1 per month Battery Maintenance. From Service Report, Year Ending December, 1913, on Edison Battery—Detroit Electric Police Patrol Wagon operated by City of Memphis, Tenn.

Number of Runs	5,166
Number of Miles	18,529
Cost of Tires, Chains, Grease, etc	$275.30
Cost of Battery Solution (Total Battery Maintenance)	*11.92*
Total Maintenance	$287.22

The Edison Alkaline Storage Battery in this kind of Service is guaranteed to be capable of developing **100 per cent** of its rated capacity at the end of four years.

Send us the name of your Commissioner of Fire and Police.

Edison Storage Battery Co., 105 Lakeside Ave. ORANGE, N. J.

Chicago Office: 2025 Michigan Avenue.

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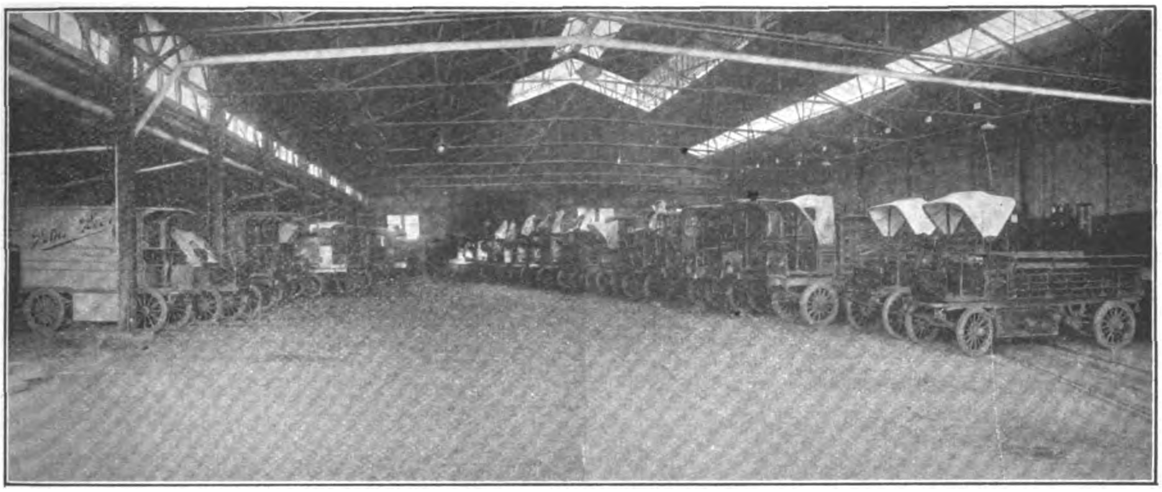

This photograph was taken in the Shipping Department of the brewery of F. A. Poth & Sons, Philadelphia. This company has 39 electric trucks, 21 of which are equipped with "Ironclad-Exide" Batteries and two with "Exide" Batteries.

The Philadelphia Electric Co. operates a fleet of 44 electric delivery wagons and trucks, 23 of which are equipped with "Ironclad-Exide" and 21 with "Exide" Batteries.

The Bergdoll Brewing Co. has 14 electric trucks, and C. Schmidt & Sons Brewing Co., of Philadelphia, 10 electric trucks; equipped with batteries of the "Exide" types.

John Wanamaker, Strawbridge & Clothier and Gimbel Bros., the three largest department stores in Philadelphia, have 12 electric vehicles, 11 of which are equipped with batteries of the "Exide" types.

The Curtis Publishing Co., publisher of the "Ladies' Home Journal" and the "Saturday Evening Post," uses "Ironclad-Exide" Batteries, having 12 electric trucks equipped with them.

The Union Transfer Co., The United Gas Improvement Co., and the Finkenauer Brewing Co., are other large users of "Electrics" in Philadelphia, using batteries of the "Exide" types.

Philadelphia has hundreds of other electric vehicle users—both commercial and pleasure—who have equipped their cars with either "Exide" "Hycap-Exide" "Thin-Exide" or "Ironclad-Exide" Batteries.

It will pay Central Stations to use and endorse the four "Exide" Batteries.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of The "Chloride Accumulator", The "Tudor Accumulator", The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago **PHILADELPHIA, PA.** Denver San Francisco Seattle
St. Louis Cleveland Atlanta Detroit **1888-1914** Rochester Los Angeles Portland, Ore. Toronto
886 "Exide" Distributors 9 "Exide" Depots "Exide" Inspection Corps

place a similar number that has been in service until no longer dependable. The company expects that it will be necessary to increase its equipment to 1,250 vehicles to take care of the business. The electric vehicles were purchased after inquiry into the service of the Motor Delivery Company, which has the contract for haulage of the mail north of Forty-second Street on Manhattan, to 180th Street on the west side and to Fordham on the east side of the city, and since 1909 has used from 22 to 28. In 1913 the company's machines were driven a total of 336,000 miles in 304 days. The haulage is to and from branch postoffices and the Forty-second Street terminal. The company originally took over a horse vehicle contract and utilized electric machines, and has continued its service with them, using no less than 14 of these for parcel post work.

The Postal Service Transfer has established a garage at First Avenue and Forty-second Street, where the electrics will be stored when not in use. The president of the company is H. Rowley and J. J. Cassidy is the vice-president and in charge of the operating.

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Few Auto Measures Enacted Into Law.

While there is always an apprehension regarding restrictive measures about to be enacted into law by the various state legislatures, affecting the free use of automobiles and the city and country streets and highways, the report recently issued by the American Automobile Association should afford some relief. This report shows the status of motor vehicle and highway legislation at approximately the present time.

Of ten legislatures convened, eight have adjourned. These are New York, New Jersey, Maryland, South Carolina, Virginia, Ohio, Kentucky and Mississippi. The Massachusetts session will continue another month or two, and Rhode Island one month more. The only other regular sessions will be in Georgia, to convene June 27, and in Louisiana, to convene May 11.

Record of bills up to the middle of April is as follows:

State	No. of bills Introduced Sen.	House	Bills Pas'd	Bills Sign'd	Bills Ret'd
Kentucky	5	9	1	1	..
Maryland ...	6	16	3	3	..
Massachusetts	6	42	4	4	..
Mississippi ..	3	4	2	2	..
New Jersey.	9	15	4	3	1
New York...	15	18	3	2	1
Ohio	..	..	1	1	..
Rhode Island	5	6	3	2	..
So. Carolina.	3	5	2	2	..
Virginia	8	8	4	3	1
	59	123	27	23	3

No drastic or very objectionable measure has been enacted in any state, but a number of bills approved by automobilists have become law. Massachusetts, New York and Rhode Island have adopted measures requiring lights on all vehicles at night.

Of fourteen bills in Kentucky, some very bad, only one got through. It is a general measure, which, as amended, fixes registration fees for motorcycles at $5, cars of 25 horsepower and less $6, of 25 to 50 horsepower $11, and of more than 50 horsepower $20.

In Maryland the only important new law regulates speed of motor vehicles, prohibiting speed exceeding thirty-five miles an hour, and limits trucks weighing four to eight tons, with load, to fifteen miles an hour, those weighing more than eight tons to twelve miles and traction engines to six miles. It limits width to 90 inches, gross weight to fourteen tons and weight per inch of tire to 800 pounds.

New laws in Massachusetts prohibit use of muffler cut-outs, relate to garages in Boston and grant privileges to non-resident motorists. Forty-eight bills were introduced.

New York passed a bill making it a misdemeanor to violate traffic rules in New York City, but a bill to include motorcycles in the motor vehicle law, which passed both houses, was vetoed April 13.

Only one bill of general importance got through in New Jersey. It authorizes park boards to limit the speed of motor vehicles and even to exclude them from park drives. The administration measures to exempt motor vehicles from personal property tax and increase registration fees was defeated. A bill authorizing the commissioner of motor vehicles to increase the number of special inspectors to thirty and to appoint men from other state departments upon request, passed both houses, but was not approved.

An extraordinary session of the Ohio Legislature passed a general license bill to take the place of the law of last year that was declared unconsitutional. It provides a fee of $2 for motorcycles, $3 for electric vehicles, $5 for all other motor vehicles, and $20 for dealer's license. Chauffeurs must be examined and pay $1 for registration.

Mississippi also enacted a new law for the one declared unconstitutional. It is called a "privilege tax" act and fixes the rates at which motor vehicles are permitted to use the roads as follows: Motorcycles, $2.40; electric vehicles, $4.80; commercial vehicles up to 4,400 pounds capacity, $8.40; and exceeding this capacity, $16.80; all other motor vehicles 36 cents per horespower. The funds go for road improvement and repair. A flat fee of $2 is required for registration and number tag.

Only one bill of more than local interest was enacted in Virginia. It prohibits driving a truck, tractor or traction engine fitted with cleats or lugs that will cause injury to the road over any turnpike that has been treated with bitumen or other binder.

Three other Virginia laws permit local authorities in Accomac, King William and Spottsylvania counties to levy special license taxes to provide funds for construction and maintenance of roads in these mountainous regions. Another prohibits speeding of motorcars between Big Stone Gap and Appalachia in Wise County.

The only bill enacted in South Carolina were local measures permitting special automobile licenses in Beaufort and Oconee counties to increase the road fund.

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Proper Method of Shipping Storage Batteries.

In a communication to *Motor Age*, W. H. Conant, of the Gould Storage Battery Company's Detroit office, gives some interesting information relating to the shipping of storage batteries, as follows:

"There is a general impression that storage batteries may be shipped wet or dry, as the occasion may seem to demand, and that the only difference between the two conditions is the presence or absence of sulphuric acid. As this impression may cause considerable damage to batteries and unsatisfactory operation of starting and lighting systems that might be charged to battery failure, it is important to state the true situation. It is not proper to pour the liquid from a storage battery and ship it, or even let it stand, in this so-called dry condition.

"If the negative plates of a battery be exposed to the air while in a charged condition, the lead sponge with which they are filled rapidly becomes oxidized. This oxidization is so rapid as to cause very marked heating of the plates. Undue heat in storage batteries is always harmful, but in this situation it is especially so. Here are three reasons:

"1. The oxidization of negative plates is in reality a discharge which results in a coating of lead sulphate over the active material. This coating, while similar in character to that of an ordinary discharge during regular operation, is much more severe and extensive. From long exposure to the air, it is carried much farther than usual and takes on a white appearance as compared with the normal yellow color. This white sulphate is very difficult, and sometimes impossible, to reduce so as to restore good capacity.

"2. The effect upon positive plates is in some respects similar, except that no heat is generated. The sulphate thus

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GENERAL VEHICLE COMPANY, INC.
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END DOOR
B723
BROWN-WALLS COMPANY
IRON STEEL & METALS
STRUCTURAL MATERIAL
GENERAL VEHICLE
GREATEST VALUE

formed sometimes responds to treatment when given very long, low charges with subsequent cycles of discharge and charge to restore capacity, but often is beyond repair in a commercial sense.

"3. Wood separators as used in most storage batteries are very thin, have been chemically treated so that the strength of their fiber is reduced, and are very porous. When cells are emptied of electrolyte, they retain some quantity of it in their pores. As this is dried out and broken up by the heat, the separators shrink and strain so as to open cracks that render them defective for further use.

"It is evident, therefore, that a dry battery as above cannot be brought back to a normal or healthy condition except by dint of great effort and then only in the minority of cases. Let us consider a battery shipped from the factory without electrolyte.

"If treated, wet, wood separators be used, a sulphating action is set up by means of this moisture which evaporates from the wood and the surrounding air. This produces a result somewhat similar to that from emptying a charged battery, though not as extreme. If, on the other hand, dry, untreated, separators be used, deleterious substances remain in the wood which will injure the plate when the electrolyte is ultimately added and charging begun.

"Whatever the condition of plates and separators after a period of standing without electrolyte, nothing beneficial happens from the mere addition of dilute sulphuric acid when it is desired to place the battery in service. Furthermore, an ordinary charge does not put the battery in normal condition.

"When storage batteries are assembled in the course of manufacture, they are put through a process called developing. This includes a long charge at a low rate until the plates' substances are in the proper state to perform the opposite electrolyte action known as discharging. The plates are further charged and discharged until capable of delivering the desired capacity in ampere-hours. This process is just as important in creating the storage feature of a battery cell as the material of which the parts are made. It thus should be clear that:

"1—Storage batteries should never be shipped dry except in a knocked-down condition.

"2—Batteries must not be emptied of their electrolyte except by one familiar with battery practice, and

"3—The putting in service of newly assembled or dry batteries must always be preceded by a proper developing process.

"The writer's paper last January before the Society of Automobile Engineers on storage batteries attempted to explain in a semi-technical manner the construction and principle of such batteries. The glossary of battery terms following this paper, and which may be found in the *S. A. E. Bulletin* for December, 1913, is intended to simplify the matters touched upon above."

New York City Has Fine New Garage.

A new Exide battery depot has been opened on Twenty-third Street near Tenth Avenue, New York City, by the Exide Battery Depots, Inc. The garage is equipped with every modern accessory for the handling and maintenance of electric vehicles and the charging of vehicle storage batteries. There is room for 100 commercial electric cars and with its equipment it is believed to be the largest public garage in the country. Electrical service is supplied by the United Electric Light & Power Company. This company, through its electric vehicle department, has been conducting a vigorous educational campaign.

Tariff for British Electric Vehicles.

The Electric Vehicle Committee has circularized all English electric supply authorities recommending tariffs to be introduced for encouraging vehicle-charging business. For charging during periods of off-peak load, a maximum charge of two cents per unit at the supply authority's declared system and pressure is suggested. Very little charging, it points out, should be necessary during hours of maximum load, especially for commercial vehicles. It is advised that as low a rate as 1.5 cents per unit should be offered to encourage charging between eleven p. m. and six a. m., with a special discount to large consumers, and a further 20-per-cent discount for energy purchased by consumers for resale. A minimum charge of 48 cents is recommended for any one charging operation including the housing of the car during charging.

Receiver Asked for Standard Electric.

The United States district court has been petitioned by stockholders of the Standard Electric Car Company, Jackson, Mich., to appoint an interlocutory receiver for the concern in order to safeguard the assets and property pending a final decree in the case, it is stated. The petition is filed in the name of E. C. Divine, Chicago, but represents a number of the holders of stock. Besides the above, the petition makes defendants of the officers and directors.

Motor-Trucks in Active Demand, and New Sales Policy Increasing the Business.

With each recurring season a substantial increase in the utilization of the motor-truck is being realized. This is true of both the electric and gasoline types. A more intelligent conception of service requirements, upon the part of manufacturers of motor-vehicle accessories, and a more reasonable understanding of the limitations of the equipment within its capacity, upon the part of users, have caused a remarkable advance in the sales of this modern medium of transportation.

"Two or three years ago," says a writer in the *Journal of Commerce*, New York, "long-headed men predicted that the 'mushrooms' of the business were bound to be thrown overboard and their sensational selling methods eliminated before the rest could expect to make much headway, and that ultimately there would remain a few substantial companies, making a dependable product, selling it on business principles and at a price which appealed to the hard-headed business man as worth while. When that time should arrive, they said, business men would buy trucks freely and readily at profit-bearing prices, and would learn to use them well enough to make unnecessary much of the absurd 'coddling' that the makers of that time claimed to be necessary.

"Recent conditions lead the conservative trade leader to believe that these predictions are coming true. A few of the large companies are making and selling motor-trucks on the same sharp economies and conservative claims as other machinery is sold; their trucks are making good their claims, they have brought maker and user into unity of purpose and responsibility, and the repeat orders—where the profit lies—are coming in with gratifying regularity. Yet, the sensationalism which prevailed a few years ago in selling and advertising methods is no longer in evidence.

"Several of the more conservative companies are doing excellent business at a good profit. Take, for instance, the Pierce-Arrow Company in the gasoline-truck field. It had had only one size truck until within a few months, and now has only two, and sells them at a high price, on stiff terms and only to discriminating customers. According to the claims of the former ideals of the former truck field operators, it should have been unable to make any progress because it would not 'meet the price.'

"The fact remains, however, that the Pierce company has perhaps as many five-ton trucks as any other company

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs., Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America.

President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

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CHAPTERS

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IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
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XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
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>
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>
> *"The attention you give patrons is especially valuable, inasmuch as the average electric vehicle owner knows little about care of batteries."*

Our unvarying instructions to representatives are to help all Gould Battery users with good attention, and good advice on how to keep their batteries free of faults. We wish to make strong satisfaction stronger—we stay close to customers so they will stay close to us.

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in successful and efficient operation and is booking repeat orders rapidly. In this city and immediate vicinity, for instance, according to a list issued not long ago, it has in operation almost 150 trucks in the hands of seventy-five owners. Of these, six owners operate forty in the aggregate, showing the operation of repeat orders.

"Then there is the General Vehicle Company, which has been conservatively managed for longer than any of the truck sales companies. It openly advertises that it has more than 4,000 trucks in operation with success and is selling them so fast that its factory is driven to the limit. Its recent development of industrial trucks has opened a new and immensely productive field.

"Then there is the General Motors Company, making both gasoline and electric trucks and recently in the limelight by its adoption of a sales policy which startled the trade and started business men to thinking of motor-trucks in a new way entirely, with the result that the company has had all it could attend to to fill orders. Its refinement of design, where the company has been able to standardize its trucks to something like 80 per cent, leaving only 20 per cent to be done in adapting the chassis either to gas or electric power, has been a step forward in meeting the business man's ideas of economy.

"'The unusual severity of the past winter has,' says W. K. Chilcott, 'in my opinion, been one of the largest factors in the big increase over any similar period in the number of motor-trucks that were brought and placed in operation in this country.'

"Business concerns in many instances simply had to buy motor-trucks in order to get their goods delivered on time, keep their customers satisfied, and meet competition of other concerns in the same line of business. The contrast between horse efficiency and motor-truck efficiency in transportation work was never before so clearly demonstrated as during the recent winter months. Concerns that used horses found their delivery department often crippled, while the users of motor-trucks kept their goods moving on schedule, practically the same as in other months of the year. The best evidence, of course, has been furnished by those concerns that employ both motor-trucks and horses.

"Then there is the Federal Company, which has been working along the lines of guaranteed service and harnessing up all its Eastern stations in a co-operative service chain. This has been a practical evolution which has proved popular with business men, and has given the company an unusually active demand for its product.

"The White Company is doing a rushing business, according to reports from Cleveland. Current sales of motor-trucks reported by the company include twenty-three trucks sold to department and dry-goods stores, giving the White Company a total of over 600 trucks in the service of 150 leading retail establishments.

"All of which would indicate that the companies which have adopted the conservative basis of the business man as their own and sought to meet him on his own ground are finding that the field for motortrucks is continuous and profitable."

Year's Gain by Public Service Corporations.

Based upon the annual reports of earnings furnished *The Financial World* for the fifth annual public service corporation review by 286 of the leading companies for the fiscal year 1913, and which appear in this number, the showing made must prove very gratifying to all interested in this particular field of enterprise.

The tabulated aggregated earnings reflect a healthful and normal increase in gross and net earnings, despite the fact that in other avenues of enterprise it has proven difficult to maintain earnings and profits up to a point where they would indicate no shrinkages as compared with the former year's business.

Gross earnings of these 286 companies for the year were $866,416,400, or $54,857,676 greater than a year ago. The percentage of increase was 6.76 per cent; net earnings were $370,801,186, a gain of $19,492,267, or 5.55 per cent, and surplus after all allowances for fixed charges and dividends, was $81,113,567, a gain of $2,655,893, or 3.54 per cent.

During the year these 286 companies disbursed to investors in interest on bonds, including all other charges, $150,223,407, which was $10,787,446, or 7.73 per cent more than a year ago, and in dividends there was paid $130,777,354, which amount was $5,881,041 greater than in 1912, or a gain of 4.72 per cent.

From the above tabulation it is apparent that the public service corporations in every respect have forged ahead both in gross and net revenues and in the profits and interest they have been able to divide with those whose capital has made their financing possible and successful. While the surplus over all charges and dividends shows a smaller ratio of increase, this is due to the fact that during the year the 286 companies increased their bonded debt by $87,820,793, the charges on which absorbed profits and cut into the surplus account.

This increased indebtedness was incurred principally for improvements and extensions which have not yet had much of an opportunity to develop additional traffic and revenues, but when they get fairly into play they are expected to add proportionately to the revenues of the companies.

What should attract the most marked attention is the vast amount of capital which has been invested in this class of enterprises and which can be taken as a reliable index of the prominent position these companies occupy in the development of our country.

Statistics indicate that the 286 companies have outstanding $2,151,842,261 in bonds. This is $87,820,793 more than in 1912; a total of preferred stock of $592,007,950, which is $18,821,721 greater, and common stock of $2,216,766,418, or an increase of $38,392,053. This is a total investment in public service corporation enterprises covering gas, electric light and power, telephone and telegraph, street railway and interurban transportation corporations of over 4,900,000,000.

No stronger proof could be asked for or furnished to support the argument that, next to the steam railroads, the greatest volume of capital has flowed into public service enterprises. The fact that the business has steadily developed into larger proportions with each year has shown the wisdom of this form of investment.

Of all industries none has evidenced a better ability to withstand adversity than public service enterprises.

Annual Meeting of Chicago Electric Vehicle Association.

The third annual meeting and election of officers of the Chicago Section Electric Vehicle Association of America, will be held on Tuesday, May 5, at 6:30 p. m., in the Louis XVI Room, Hotel Sherman, Chicago, Ill. President F. W. Smith, of New York City, will be present and speak on "The Past, Present and Future of the Association." Other men prominent in the trade will attend and speak on subjects of interest to all connected with the vehicle industry. Every body interested in electric vehicles is invited to attend—vehicle men, accessory men, garage men, users and prospective users. The meeting will be informal and tables will be arranged for groups of six each. Tickets may be obtained from the secretary, W. J. McDowell, General Motors Truck Company, the price being $2.00 per plate.

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The Union Pacific Railway will soon resume experiments on the wireless communication with moving trains. These tests will probably be begun at Omaha, Neb.

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CO-OPERATION IN SECURING NEW BUSINESS.

It is everywhere realized today that an active new-business department is one of the most important elements in the success of a central-station company. Large companies have found it worth while to devote considerable energy and money to the building up of a new-business department which shall be equipped to make active campaigns for adding load to its distributing lines. The company which waits for customers to come to it usually has a very slow development and one of the reasons for the rapid growth of the electrical business in recent years has been the general attitude of central-station companies in actively seeking new business.

In many small towns, however, there is not sufficient prospect of new customers to warrant the maintenance of a staff of solicitors, and such soliciting as is done must fall upon the manager of the plant or some subordinate who has other duties as well. The men who seek contracts under these conditions are usually those who have had no special training for the work and who cannot expect to be so successful as the specialist employed by the larger companies. The business, however, will not warrant the constant employment of a man who can furnish the highest talent along this line.

A solution of this problem for the small company is to secure through a co-operative arrangement with other companies the services of such a specialist for a limited time or for short periods of stated intervals. Thus, conditions might be such that four small companies could afford to employ a first-class man between them, and such a solicitor could devote one week in each month to each of the four companies.

Such a scheme as this was mentioned at a recent meeting of the Committee on New Business of the Ohio Electric Light Association, of which Thomas F. Kelly is chairman, and if there proves to be sufficient demand for services of this character it is probable that the Committee will undertake to secure a man and make arrangements so that the small companies in Ohio may have the use of his services for such periods as they consider desirable. This is an activity that other state associations might well take up, and where the result cannot be achieved through the state organization, local companies might easily through co-operation with each other achieve the same result. With recognition of the importance of this matter in developing the business of the small company there should be many opportunities for putting this idea into effect. Indeed it might well pay a private concern to supply solicitors from some central bureau for this purpose to any small towns where their services may be desired.

ELECTRIC HEATING AND COOKING.

The competition with gas on the basis of cost is frequently regarded as a most important question to be considered in relation to cooking by electricity and it is true that the greatest impetus to electric cooking and heating in this country has been felt in those sections where coal must be hauled long distances and consequently brings a high price. We should bear in mind in this connection, nevertheless, that in England, where gas is supplied at much lower prices than usually prevail in this country, as for example 60 cents per thousand cubic feet, electric cooking has made much greater progress than it has in this country. Of course this is partly due to the attractive prices at which electric current has been sold for this particular purpose, one cent per kilowatt-hour in addition to a demand charge being the price which is now available in no less than 17 cities. If we regard 90 cents per thousand cubic feet as an average price for gas in this country, we may regard 1.5 cents per kilowatt-hour as a rate for electricity which would put the two upon the same basis as in England. This is a price which American central stations do not seem to be in a position to offer, and a minimum for this class of service, even where special arrangements might be made to obtain such a load, would more likely be double this amount.

However, the question of price is not the only element to be considered with respect to electric cooking. Cooking at a lower temperature, which is the universal accompaniment of the electrical method, results in more savory and digestible dishes and in an appreciable saving in the weight of meats. This saving has been scoffed at in some quarters, it being represented that the loss consists of nothing more than water vapor. While this is not strictly true, its assumption does not weaken the electrical argument. A large part of all our food is made up of hydrogen and oxygen in the proportions which form water, and the loss of these elements is an actual loss of food. It must be remembered, moreover, that meat and other edibles are purchased at so much per pound, water vapor and wastes included. The question of the loss of weight and consequently of material available for food is, therefore, an important one, since the moisture present should be conserved to as great an extent as possible. There are moreover other compounds present in food which are volatilized at a high temperature, and still others which are chemically changed to a less digestible form by being raised to a high temperature.

Other well known advantages of electric cooking and heating, such as convenience, cleanliness, ease of control, safety, etc., need not be dwelt upon here.

It is only in some of our Western states that these applications of electric current have received the attention which they deserve. Two articles in this issue call detailed attention to these applications. There are a number of towns in Idaho where electric heating in buildings is being carried on upon a large scale. The high school at Rupert, for example, consumes 400 kilowatts when utilizing the maximum capacity of its electric heaters. Where such installations have been tried, the sentiment based upon experience is invariably in favor of their use.

PROGRESS ON NEW HAVEN ELECTRIFICATION.

It is anticipated that by June 1 electric freight, passenger and switching service will be in operation between New York and New Haven, Conn., and that many results of electrical operation throughout a complete engine stage will soon be available to the New York, New Haven & Hartford Railroad as a basis for further developments when the financial condition of the company permits expansive measures. A brief résumé of this famous electrification, which is of the trunk-line type despite its association with New York terminal conditions, is suggestive at this time.

The original electrification of the road between Stamford and Woodlawn, begun in 1905 and completed in 1907, embraced 21.5 miles of route and 110 miles of single track. As the New York Central & Hudson River Railroad had during the year previous electrified its track from the Grand Central Station to Woodlawn, where the junction with the New Haven tracks is made, this made the total route distance for the New Haven's original electric service, between the Grand Central Station and Stamford, 33 miles. The original electrification plant included, besides the overhead system of alternating-current distribution, the power station at Cos Cob and 41 electric locomotives. This equipment was sufficient to permit of full electric passenger service between New York and Stamford, where the transfer is still made between electric and steam operation.

After a considerable experience with the electric service between these points, it was decided to electrify the six-track Harlem River branch of the New Haven road, connecting Harlem River with the main line at New Rochelle, and subsequently to extend the electrification eastward from Stamford to New Haven. In these plans the final object in mind was the putting of all passenger, freight and switching service upon an electric basis. With this end in view, appropriations were made for an addition to the electrical output of the Cos Cob station, for additions to the main line, yards and siding electrification and for additional locomotives of the freight and switching type. The increase in the output of the Cos Cob station as provided for in these appropriations will permit of a very large percentage of complete electric service in the New York-New Haven zone as soon as the overhead contact and distribution system is ready. It will not, however, permit of 100 per cent of electric service—the abolition of every steam locomotive from the tracks—until additional generating facilities are available at the eastern and western ends of the line. For the time being such plants will not be built, and hence the full economic possibilities of the electrification in the New York-New Haven engine stage must be again left unrealized until the resources of the company enable the complete engineering development to be made, or until power can be advantageously purchased on the necessary scale for reliable and ample service.

SUPPLY OF ELECTRIC POWER TO LONDON.

London, the largest city in the world, is made up of a number of boroughs, most of which have at present separate central stations for supplying electric power, some of these being operated by the boroughs and others by private companies. Strict geographical lines constrain each of these stations to its own specific territory, with the result that none of the generating stations is very large in comparison to what may be found in other cities of the first magnitude. Attention has frequently been called to the disadvantages of such a system of electrical supply, but on account of the various interests involved, little has yet been accomplished towards consolidating these systems, although the project has been advanced a number of times and the best engineering talent has pointed out its desirability to the people of London.

Recently a report has been rendered by a firm of consulting engineers to the London County Council, a brief abstract of which will be found elsewhere in this issue. This report is in conformity with what every well informed engineer would expect. It recommends the establishment of one or more large generating stations along the Thames River outside of the city limits, with three-phase transmission at high voltage to substations in different parts of the city. This is an ultimate ideal whose adoption would result in a great saving in operating expenses—a saving which would more than offset the additional investment required for the new generating stations. It is an ideal, however, that can best be approached by successive steps rather than by the immediate abandonment of all the present generating stations within the city. It is an ideal towards which, no doubt, developments will be aimed, although how soon it may be realized is another question.

Many steps are necessary in the consummation of such a plan. First of all the consent of Parliament must be obtained for the consolidation of the present companies or the formation of a holding company which shall take over their interests. The consent of the existing companies, the franchises of some of which have a long period yet to run, must also be secured, and this, of course, can only be done by offering their stockholders something attractive in the way of outright purchase or exchange of shares in a consolidated company. The London County Council, moreover, has the option of purchase of certain of the present private companies, and this body seems at present uncertain as to whether to inaugurate a more extensive system of municipal ownership than now exists.

The advantages of a consolidated system would cover more than a decrease in operating expenses. The present heterogeneity of voltage, frequency, etc., in the various districts would ultimately disappear and advantage could be taken of the diversity of the load in the different sections of the city. Moreover, even if the present generating stations were not abandoned, the consolidation into one system with connections between stations for emergency supply in cases of breakdown would add greatly to the security and continuity of service.

THE PERCENTAGE SYSTEM IN ELECTRICAL CONTRACTING.

On other pages of this issue we present an article entitled "The Percentage System in Electrical Contracting." From the author's point of view this is one of the most important and interesting developments in the electrical contracting business. The advantages and similarly the disadvantages are pointed out and as clear a case as may be is made for the proposition.

Believing that there are many debatable points associated with an issue of this character, we sought an expression of opinion as to the merits of this method of doing business from a number of leading electrical contractors in the United States. As a result of their courtesy and co-operation we are able to publish in connection with this article the opinions of these leading electrical contractors, and while there is considerable variance, the drift of opinion generally is against the proposition.

Whether the percentage system is a good thing or not depends finally upon the attitude of the electrical contractor who decides to engage in business under its stipulations. It is a peculiar thing, however, that the percentage system is a good system when the contractor approaches a job on a business basis. Where he is not prepared to analyze thoroughly his overhead expense and the margin of profit to which he is entitled, he cannot fearlessly and logically insist upon a percentage and a method of figuring costs which will leave him the reward to which his brains and energy are entitled. If the discussion of this matter so far has developed anything at all, it is the further emphasis of the desirability, in fact, the absolute necessity, of the electrical contractor appreciating the fact that he is in a business that consumes time and talent, to say nothing of the most arduous labor, and that unless he capitalizes these factors in his business and exacts a return therefor, he cannot make a success under the percentage system or under any other system of doing business.

Chicago Vehicle Association Meeting.

The annual dinner meeting of the Chicago Section, Electric Vehicle Association of America was held in the Louis XVI Room, Hotel Sherman on May 5. After the secretary's report, Chairman Niesz delivered a short address in which he told of the activities of the section during the year. This was followed by the election of officers, the following officers being elected: Chairman W. J. McDowell; vice-chairman, L. E. Wagner; secretary-treasurer, F. E. McCall; executive committee, H. E. Niesz, C. B. Frayer, H. Salvat and D. C. Arlington. After a few remarks from the incoming officers, the president introduced J. F. Gilchrist, who, as toastmaster, introduced the speakers of the evening.

J. E. Hale, of the Goodyear Tire and Rubber Company, who was the first speaker, delivered a paper on tires. After tracing the development of the pneumatic tire from the early days of the bicycle to the present time, he called attention to some of the problems in tire design, including fabrication and compounding. Improved methods of manufacture have greatly increased the life of tires, but their design is still a compromise between those qualities giving length of service and those giving easy-running characteristics.

D. M. Simpson, of the Electric Storage Battery Company, then gave an illustrated talk on the Exide constant-potential system of battery charging for garages. After explaining the action of the negative plate of a battery during charging and discharging, he pointed out that by using a constant charging voltage of 2.3 volts per cell the battery can be charged in a comparatively short time without any attention, the charging current being great at the beginning of the charge and decreasing as the battery assumes its charge. Such a system of charging was said to cause no excessive peak loads in most cases as the arrival of cars in a garage for charging purposes is generally such as to distribute the great initial charging current required in this system over a long period of time. Inquiries in the city of Chicago had shown that the power bills for charging service have been reduced about 11 per cent by the adoption of this system.

Frank W. Smith, of New York City, president of the Electric Vehicle Association of America, then told of the work of the Association. Sections have recently been organized in Philadelphia, Washington, Cincinnati and San Francisco. Efforts are now being made to interest the postal authorities in the electric vehicle for parcel-post delivery.

Dean H. M. Raymond of the Armour Institute of Technology told of the intended inauguration of a night course in electric-vehicle engineering at the Institute next fall. W. C. L. Elgin, vice-president of the Philadelphia Electric Company, gave a very enthusiastic talk on confidence in electric-vehicle salesmanship.

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The National Electric Light Association Convention

A circular dealing with the plans for registration, transportation and hotel accommodations has been issued by the General Convention Committee of the National Electric Light Association. The convention will be held at the Bellevue-Stratford Hotel, Philadelphia, Pa., June 1 to 5, inclusive.

Registration will be handled as in previous years and the Convention Committee emphasizes strongly the importance of early advance registration. This will enable those in charge of the work to properly handle all of the details, particularly the preparation of badges, which are individual and require special attention.

The Transportation Committee, under the direction of George W. Elliott, master of transportation, reports the completion of arrangements for a number of special trains.

The "Green" special will leave Chicago over the Pennsylvania lines at 3:00 p. m., Sunday, May 31, arriving at Philadelphia at 12:00 o'clock noon, June 1. This train will be under direct personal charge of G. A. Freeman, 120 West Adams Street, Chicago.

The "Brown" special will leave Chicago over the Lake Shore Railroad at 10:15 a. m., Sunday, May 31, from La Salle Street station, arriving at Philadelphia at 10:15 a. m., June 1. This train will be under the direct personal charge from Chicago of H. N. Sibbald, traffic manager of the National Lamp Works, Nela Park, Cleveland, O.

The "Golden Poppy" special will leave San Francisco, Cal., from Oakland station, May 26, making stops at Salt Lake City and Ogden, where it will be joined by the Seattle and Pacific Northwest contingent, and at Denver, where the Colorado delegation will be attached. This train will arrive at Broad Street station, May 31, and will be in direct personal charge of E. B. Strong, publisher of the *Journal of Electricity, Power and Gas*, Rialto Building, San Francisco.

The "Magnolia" special will leave the terminal station at Atlanta, Ga., at 2:45 p. m., May 31, arriving at Philadelphia at 2:30 p. m., June 1. This train will be under the direct personal charge of A. H. Sikes, of the Athens Railway & Electric Company, Athens, Ga.

Representatives of central stations throughout the Southwest will leave Kansas City, Mo., for the National Electric Light Asscoiation's convention at Philadelphia in a special train, according to present plans. Members of the Association in the Southwest will assemble at Kansas City. They will be joined there by local electric light men and the entire party will then proceed on a special train. Kansas City alone will send 30 or 40 representatives to the convention.

There will be no New York specials, as there is excellent regular train service between that city and Philadelphia. The short time required makes unnecessary a special accommodation. The various railroad associations throughout the country have authorized reduced fares, with the exception of the Eastern Canadian Passenger Association.

The Exhibition Committee, H. G McConnaughy, secretary, announces the following list of exhibitors for the Philadelphia convention of the National Electric Light Association: American District Steam Company, American Ironing Machine Company, Barnes & Kobert Manufacturing Company, Bell Electric Motor Company, James G. Biddle, Century Electric Company, *Central Station*, Cooper-Hewitt Electric Company, George Cutter Company, Delta-Star Electric Company, Edison Lamp Works of General Electric Company, Edison Storage Battery Company, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, *Electrical World*, Electric Service Supplies Company, Electric Storage Battery Company, Federal Sign System (Electric), G & W Electric Specialty Company, General Electric Company, General Vehicle Company, Incorporated, Hubbard & Company, Hughes Electric Heating Company, Hurley Machine Company, H. W. Johns-Manville Company, Lombard Governor Company, Metropolitan Engineering Company, National Lamp Works of General Electric Company, Naugle Pole & Tie Company, Ohio Brass Company, Otis Elevator Company, Philadelphia Electrical & Manufacturing Company, Philadelphia Electric Company (Supply Department), Philadelphia Storage Battery Company, Pittsburgh Transformer Company, John A. Roebling's Sons Company, Rumsey Electric Company, Sangamo Electric Company, Simplex Electric Heating Company, Southern Exchange Company, Standard Underground Cable Company, Wagner Electric Manufacturing Company, Western Electric Company, Westinghouse Electric & Manufacturing Company, Westinghouse Lamp Company, Westinghouse Machine Company, Weston Electrical Instrument Company.

James D. Mortimer.

James D. Mortimer, recently elected president of the North American Company, has had a most exciting and one might say spectacular career. He is one of the conspicuous examples of what American engineering possibilities hold out to the man of culture, intellectuality, broad experience and high courage.

Mr. Mortimer, who is now but 35 years of age, was born in Elmhurst, Ill. He went to California with his parents in 1895, and entered Throop Polytechnic Institute at Pasadena, where he took electrical work. From 1896 to 1897 he worked on a fruit ranch at Riverside, Cal., for his parents. In the fall of 1897 he applied for entrance to the University of California in the scientific department, but was rejected because of his youth. However, the indomitable spirit, manifesting itself already, constrained him to begin going to the classes in the sophomore year without registering as a student. In the fall of 1898, after the faculty had discovered that he had been unofficially a student during the previous year, he registered as a junior and graduated with the class of 1900, being immediately appointed an instructor in engineering. In 1902 he was made superintendent of power of the Tacoma Railway & Power Company, and in 1903 he became engineer for Stone & Webster, of Boston, developing the Puyallup River power scheme, which supplies Tacoma and Seattle with power and light.

As engineer in charge of various electric light, gas, traction and water power enterprises for the Electric Bond & Share Company, of New York, in various cities from New York to California, he achieved a still greater reputation, and from 1904 to 1909 carried on a great work of reorganization, rehabilitation and development.

As a result of his work with the Telluride Power Company of Utah and Colorado, he was engaged in 1911 by the North American Company, and in 1911 was sent to Milwaukee as president of the Wisconsin properties of the North American Company with a title of vice-president of the general company. In 1914 he was elected president of the North American Company, when his sponsor, James Campbell, of St. Louis, became chairman of the executive board.

At Throop Polytechnic, Mr. Mortimer was an ardent student and during practically the entire course was a medal man, retaining his position at the head of his class in practically every study.

Mr. Mortimer came in contact with James Campbell, then president of the North American Company, in May, 1909, while investigating the condition of the Telluride Power Company. Mr. Campbell is known as the richest man in St. Louis, with extensive holdings in a number of big institutions. Mr. Campbell was impressed with the way Mortimer investigated the affairs of the Telluride Company, and decided that his own organization needed a man of the latter's caliber and capacity.

Mr. Mortimer now makes his headquarters at Milwaukee, Wis. In and about Milwaukee alone the North American Company controls the Milwaukee Electric Railway & Light Company, the Milwaukee Light & Traction Company, the Milwaukee Central Heating Company, the Racine Gas & Light Company, the Kenosha Gas & Electric Company, and the Watertown Gas & Electric Company. The company controls also the St. Louis Union Traction lines and owned the Laclede Gas Company until the Missouri anti-trust law forced the disassociation of the gas and electric lighting companies. The North American Company also owns coal properties in Kentucky, and has heavy holdings in the Detroit public utilities.

James D. Mortimer,
President of the North American Company

International Engineering Congress.

Rapid progress is being made in working out the final program of papers for the International Engineering Congress to be held in San Francisco in 1915. The first volume of the publication of the Congress will consist of a series of articles descriptive of the various technical features of the design and construction of the Panama Canal.

Subscriptions to the Congress are being received daily and on March 1 the number of enrollment was slightly in excess of 1,200, of which over 200 are from foreign countries and about 1,000 from the United States. Subscription blanks have been mailed through the various national societies to many thousands of engineers in this country and through the foreign societies to foreign engineers. The response already received is very encouraging, but it is trusted that all engineers interested in the success of the Congress will not fail to send in their subscriptions as early as possible. Delay in so doing renders the task of the Committee of Management more difficult, and makes it impossible to form any just estimate of the receipts which may be expected and the number of copies of the volumes which have to be published.

E. J. Dupuy is executive secretary of the Committee of Management. His office is in the Foxcroft Building, San Francisco, Cal.

Electric Club of Chicago.

Anderson Pace, industrial commissioner of the Chicago Association of Commerce, was the principal speaker at the meeting of the Electric Club of Chicago on April 30. Mr. Pace spoke on the subject of "Loyalty," showing how the tendency of employers today is to discourage rather than encourage the loyalty of employees. The best solution of the problem, he said, is to make employees selfishly interested in the firms for which they work, by making them stockholders and not impressing upon them that their places can easily be filled.

A smoker and entertainment was held on April 29 at the Hotel Sherman, with over 560 members and guests present. A seven-act vaudeville bill was provided and music was furnished by the Commonwealth Edison Company Mandolin Orchestra.

Cincinnati Jovian Meeting.

The recent monthly luncheon of the Cincinnati, (O.) branch of the Jovian Order at the Hotel Gibson was addressed by G. W. Hill, of Utica, N. Y., special representative of the National Electrical Contractors' Association, who advised the members to cooperate with all lines of trade in their work, and by President W. W. Freeman of the Union Gas & Electric Company, who also talked about co-operation. Mr. Freeman declared that Cincinnati is known all over the country as being well advanced in this respect, pointing to the small amount of friction resulting in consequence, between the various branches of trade which meet in electrical work. Statesman James S. Schrantz, local manager for the Westinghouse Electric & Manufacturing Company, presided.

These Monday luncheons have become very popular with the members of the organization, and are always well attended. There were about 60 present at the meeting referred to. Arrangements have been completed for a rejuvenation to be held on May 18, at which a large number of initiates will enter the Order.

Meeting of Chicago Jovian League.

At the meeting of the Jovian League of Chicago on May 4, W. S. Vivian, secretary Independent Telephone Association of America, delivered an interesting talk on "The Value of Associations," in which he emphasized the value of association with competitors and men engaged in other fields of an industry at luncheon tables and meetings.

E. C. Lewis, who for many years was prominent in the Independent Telephone Association, and now a "big brother" in the Elks, presided and introduced the speaker after making a few remarks on the big-brother movement.

Jovian League of Erie Organized.

The Jovian League of Erie was put on a permanent basis recently at a dinner held in the Reed House, Erie, Pa. Officers were elected and a constitution and by-laws adopted. The officers of the league are as follows: President, Edward Semmence; vice-president, Matthew Griswold, Jr.; secretary-treasurer, J. H. McCarthy; executive committee, F. B. Hofft, T. E. F. Payton, W. H. Wilson, C. H. Cropsey. Permanent quarters, to be known as the Erie Jovian Hall, have been engaged in the Reed House, and the first and third Mondays of each month have been set aside for regular meetings.

Meeting of Jovian League of Southern California.

J. H. Francis, superintendent of schools of Los Angeles, Cal., delivered an address before the Southern California Jovian League at the regular weekly luncheon Wednesday, April 29, at Christophers, Los Angeles, Cal. His subject was "Education and Life." Mr. Francis gave an interesting talk on modern education, explaining his progressive ideas, which built up for Los Angeles a school system second to none in the country. The Jovian quartet, composed of L. E. Darrow, C. Rand, S. A. Searle, and C. C. Young, made its initial appearance. The selections were well rendered and the quartet will no doubt be a permanent addition to the League. Carl C. Young acted as chairman of the day.

Chicago National Fire Protection Association Meeting.

The Chicago Chapter of the National Fire Protection Association of America met on Friday, May 1, in the Assembly room of the Insurance Exchange. Short talks were delivered by representatives of the municipal departments on the subject "Problems Confronting the Chicago Chapter."

H. King, of the Gas and Electrical Department, delivered an interesting talk on "Stray Electric Currents." Considering the subject from the point of view of fire hazard, he considered the stray currents on the return systems of the elevated and surface roads of most importance, while the stray currents of the telephone and power companies he claimed were of negligible importance. A number of incidents were given where the stray currents from the elevated systems in the business district had heated rivets in the structural steel work of buildings to a red heat. Attempts are now being made to reduce these stray currents by equalizing the potential drop along return systems. In cases where the voltage drop is excessive, insulated return conductors are being recommended. The city council recently adopted the limitation of one volt drop per 1,000 feet in the downtown district and one volt drop per 700 feet in the outlying districts.

V. H. Tousley, Chief Electrical Inspector of Chicago, then spoke on the work of the Electrical Inspection Bureau. Under the present system inspection is not only made of new buildings, but old buildings are inspected at frequent intervals. Pole lines, underground conduits, and electric signs are also inspected. By means of frequent inspection of motion-picture houses, the fire hazards in such theaters have been greatly reduced. Efforts are now being made to enforce the removal of wires passing over the roofs of buildings. In conclusion he emphasized the necessary for a life-protection association.

Expert Report on London Electrical Supply.

The future of London's electric supply is reported upon in great detail by Merz and McLellan, consulting engineers, in a document presented to the London County Council in April. Compared to other big cities of the world, the London area is notorious for its variety and multiplicity of generating stations and systems of supply. The necessity for more uniformity and for a new authority to control all of these undertakings is recognized.

Merz and McLellan do not advise any attempt to obtain long-distance electrical transmission from the coalfields at present, but recommend the concentration of the generating plants on sites along the Thames River. In order to carry out this policy with a minimum waste of capital, a high-voltage three-phase 50-cycle primary distribution system is recommended to be standardized for London as soon as possible. For economical and other reasons it is considered advisable not to extend low-pressure distribution networks, but to supplement these by standard three-phase networks. The establishment of a new undertaking with such powers as will enable it to gradually concentrate production, standardize distribution, and bring about the amalgamation of all the various undertakings, is recommended.

In considering economies in production, they say that a saving of not less than 18 per cent, or about $770,000 a year, after allowing for all capital charges, can be effected by shutting down all existing generating stations for the supply of light and power in the central zone and substituting therefor power obtained from sites on the Thames River. The initial capital outlay for this purpose, allowing for growth of demand during the next four years, would be between $27,300,000 and $32,000,000.

Chicago Section to Discuss Brightness.

At the regular monthly meeting of the Chicago Section, Illuminating Engineering Society, to be held on the evening of May 13, a paper will be presented by J. R. Cravath entitled "Brightness." W. A. Durgin will give a talk on "The Fundamentals of Illumination.'

Petition for Receiver for Standard Electric Denied.

The petition for an interlocutory receiver for the Standard Electric Car Company, of Jackson, Mich., referred to in our issue of May 2, was denied on April 27.

Electricity in Can Manufacturing.

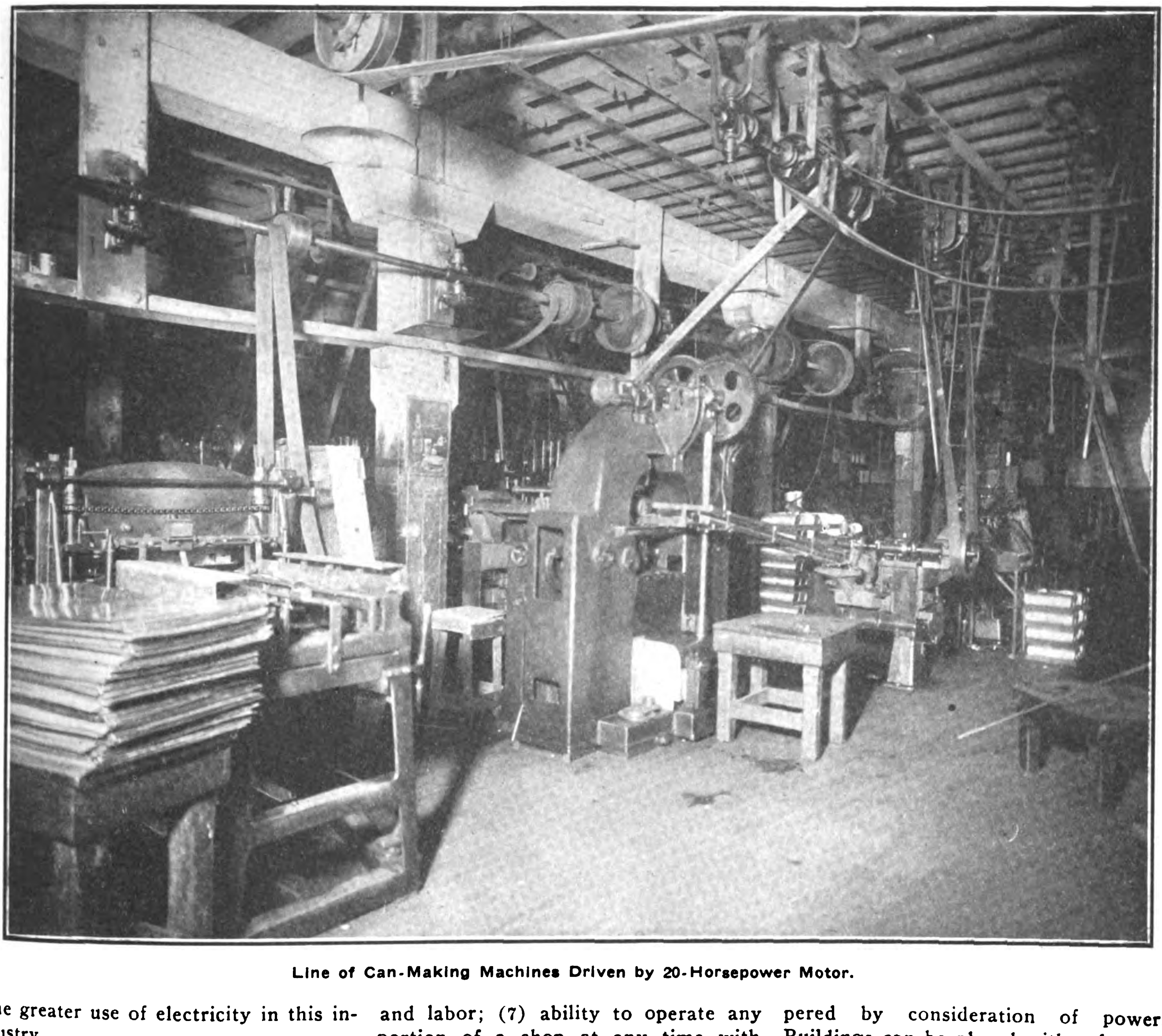
This article discusses the advantages of motor drive and central-station power to tin-can manufacturing, showing how the product of an establishment can be increased from 10 to 30 per cent by the application of a proper system of drive. Data are given on the motor installations of three typical plants.

There seems to be a hesitancy on the part of manufacturers of tin cans and boxes in applying motor drive because of the fact that group drive is usually necessary and it is erroneously thought that no economies could be effected by substituting group motor drive for the line shafting ordinarily used. As a matter of fact those plants that have made the change have increased their production from 10 to 30 per cent, without an increase in labor or machinery, and the many other advantages incident to the use of central-station service have had an important bearing on the greater use of electricity in this industry.

Briefly these arguments can be summed up as follows: (1) ease and economy of electric-power transmission; (2) flexibility of location of machines in the building; (3) accessibility of motor-driven machines; (4) wide choice of motors as to size, mechanical design, and operating characteristics; (5) perfect control, including readiness of starting, stopping and making speed adjustments; (6) economy of power and labor; (7) ability to operate any portion of a shop at any time with power consumption proportional to work done; (8) reduced hazard of accident.

Industrial work generally requires the application of power at distributed points. No form of prime mover is available which can economically develop power in small quantities at the points of application. The electric motor furnishes the nearest approach to this condition in that electric energy can be economically transmitted and transferred into mechanical energy at the point of application in any quantity desired. When compared with line shafting and belts, the installation of wires for carrying electric current is a very simple and inexpensive operation; in comparing the relative losses in transmission the electrical losses seems almost insignificant.

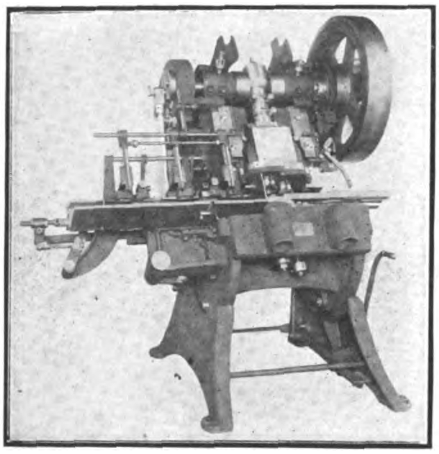
With electric drive the location of buildings and of the individual machines in a shop is practically unhampered by consideration of power. Buildings can be placed with reference to good labor and transportation facilities, convenience with reference to each other, safety from fires or other disasters, etc., in any case electric energy is easily brought to the required location, the necessary wires being easily installed in space not valuable for other purposes. The machines in a plant can be placed so as to require



Line of Can-Making Machines Driven by 20-Horsepower Motor.

minimum handling of material and to obtain most economical production; also better light and ventilation can be given proper consideration. No matter how remote or inaccessible the corner in which the work is to be done, the motor-driven machine can fill the requirements.

The flexibility extends to the re-arrangement of machines to conform to changing manufacturing requirements. A motor-driven machine can be moved from one location to another as a unit without disturbing or interrupting any other machines. The only changes required on account of the power supply are the disconnection of the electric conductors in the old location and their reconnection after the machine is moved. This process is extremely simple compared with that of relocating line shafts and belts. The best arrangement for maximum productive economy can thus be maintained, under changing manufacturing conditions.


Motor-Driven Punch Press.

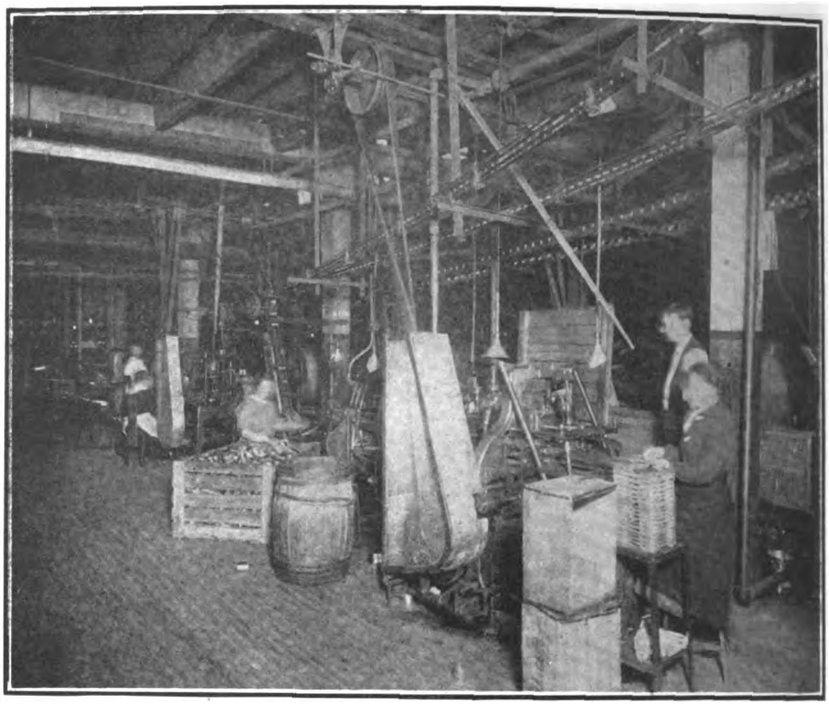
Additions to plants employing motor-driven machines and central-station service require very little consideration on account of power, other than the wiring.

With motor drive the machines become more accessible and the operators are unhampered by the close proximity of countershafts and overhead belts.

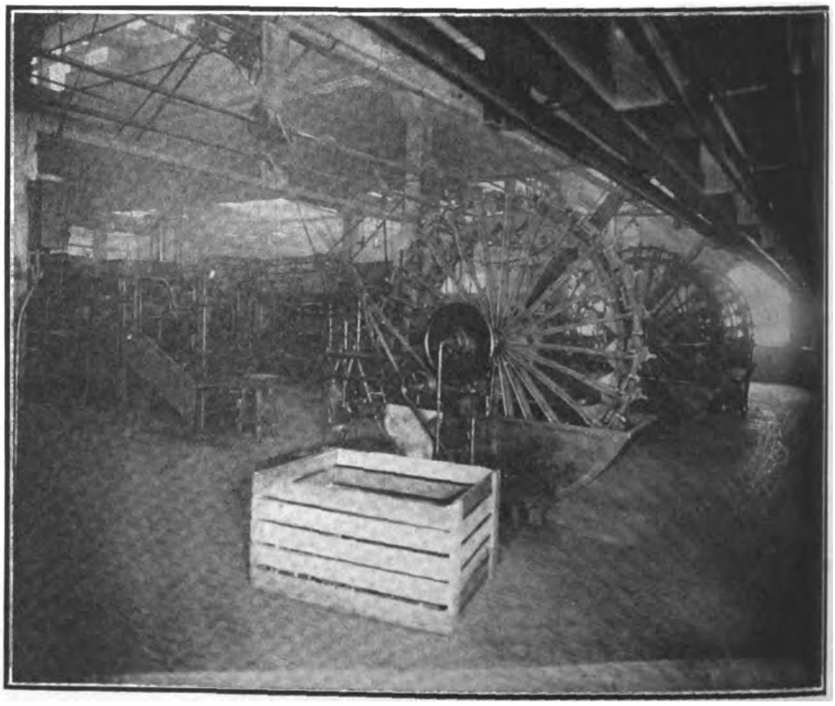
Electric motors are standardized in sizes, shapes and with operating characteristics suitable for almost every conceivable application.

By the use of the motor for each machine any machine can be shut down when not in use, thus stopping all wear and loss of power in friction. This is not the case with the line shaft drive, as the wear and the friction losses in the shafting are only slightly less when all the belts are on their loose pulleys than when all the machines are working.

Conditions that must be met by the power engineer in applying motor drive to can factories can best be illustrated by a description of a typical plant using purchased power. This plant operates only about seven months of the year, the production for this period aggregating approximately 6,000,000 cans. There are 35 men employed working 10 hours per day.


Group of Can-Making Machines Driven by 15-Horsepower Motor.

Group drive is used throughout, with the exception of a three horsepower motor which is belted direct to the mechanism of a 600-pound freight elevator. This motor runs at a speed of 1,120 revolutions per minute.


Battery of Can-Testing Machines, Motor Driven.

The total connected horsepower is 22.5, comprising Westinghouse squirrel-cage induction motors. The company receives three-phase 60-cycle alternating current from the local central station at a pressure of 220 volts.

There are five motors installed, including the elevator motor, and the machines are so grouped on these motors that minimum handling of material is necessary.

Group I comprises a five-horsepower motor, running at 840 revolutions per minute belted to a 35-foot line shaft with nine hangers and from this to

Can Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Tin-can factory manufacturing approximately 1,000,000 cans per month. These include lard pails, sheet-steel sanitary tanks and a general line of tin cans. There are 35 men and 5 girls employed, working 10 hours per day.

Total connected horsepower, 37.5. Total number of motors installed, 6. Average kilowatt-hours per month, 1,615. Average kilowatt-hours per month per horsepower connected, 43.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	395	May	1,344	September	1,889
February	1,564	June	1,409	October	2,122
March	1,435	July	2,121	November	1,919
April	1,561	August	1,710	December	1,903

Load-factor, 8 per cent; operating-time load-factor, 14.8 per cent.

The approximate electrical energy consumption per 1,000 cans manufactured is 1.61 kilowatt-hours.

Consumption figures given above do not include a five-horsepower direct-current elevator motor.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. All motors are of the squirrel-cage induction type.

No.	Horse-Power.	Speed R. P. M.	Application.
1	15	1,120	Belted to a 35-foot line shaft, 35 hangers, and two two-hanger countershafts driving one George A. Ohl seven-foot-wide sheet-metal press, driven flywheel 36-inch diameter, rim 7 inches by 4 inches; one Niagara No. 262 shear, driven flywheel 20-inch diameter, rim 4 inches by 2 inches; one Canedy Otto Manufacturing Company No. 15 20-inch drill; one Builders' Iron Foundry No. 12 double carborundum wheel, 8 inch by 1 inch wheels; and one Niagara No. 4 punch, driven flywheel 28-inch diameter, rim 4 inches by 2 inches. These machines are all used in the sheet-steel tank department.
1	7.5	840	Belted to an eight-foot shaft, three hangers, and 43 feet of countershafting, 15 hangers, driving one Garden City No. 2 positive-pressure blower, 156 revolutions per minute, furnishing air to a carbureter; one American 6 inch by 6 inch single-cylinder vertical air compressor, flywheel 28-inch diameter, rim 5.5 inches by 1.5 inches, speed 140 revolutons per minute, furnishes air to can-testing machine; one single-cylinder pump for supplying gasoline from underground tank to carbureter; one Torris Wold ribbon solder maker, two 18-inch by 6-inch rolls; one "end floater" which consists of two belt conveyors and a chain conveyor which carry cans past gas torches and a solder feed; one can elevator.
1	5	840	Belted to a 35-foot shaft, nine hangers, and five two-hanger countershafts driving one Stevenson Manufacturing Company punch for punching out one-inch diameter tin disks used for sealing ends of cans, flywheel 20-inch diameter, rim 3 inches by 1.75 inches; two Torris Wold solder hemming machines used for stamping a piece of solder around the circumference of the disks, pulley 24 inches by 4 inches, speed 40 revolutions per minute; one solder trimmer; three Mitchell tin slitters, two pulleys 16 inches by 3 inches on each machine; two Stevenson Manufacturing Company lock-seaming machines used for forming, seaming and soldering the body of the can, flywheel 24-inch diameter, rim 3.5 inches by 2 inches, speed 102 revolutions per minute, capacity 102 bodies per minute. Machines are never operated together.
1	5	1,120	Belted to a 30-foot shaft, eight hangers and 15 feet of countershafting, five hangers, driving five Slaysman & Company cutting presses used for cutting and pressing ends of cans, flywheel 20-inch diameter, rim 3 inches by 2 inches, speed 150 revolutions per minute; and one Stevenson Manufacturing Company can-testing machine, capacity 104 cans per minute.
1	5	840	Belted to a 15-foot line shaft, five hangers, and 14 feet of countershafting, seven hangers, driving one 20-foot chain conveyor; one crimping machine; two can elevators; one ending machine; one solder machine; and one 600-pound freight elevator.

Can Manufacturing Data—Sheet No. 2.

Tin-can manufacturing plant having a maximum capacity of about 1,500 cans per minute. There are 11 "lines" of can-making machines each having a capacity of 140 cans per minute. Plant operates 10 hours per day.

Total connected horsepower, 154. Total number of motors installed, 25. Average kilowatt-hours per month, 24,438.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	12,869	May	29,119	September	28,194
February	13,589	June	28,380	October	15,662
March	22,775	July	29,175	November	10,382
April	29,403	August	29,948	December	14,371

Load-factor, 28 per cent; operating-time load-factor, 61 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M.	Application.
1	20	840	Belted to three line shafts driving 11 body makers; 15 Mitchell tin splitters, two pulleys 16 inches by 3 inches on each machine; 11 headers; 11 crimping machines, used to tighten the seams in the ends of the can; and one vacuum pump.
1	30	840	Belted to two line shafts driving 15 Gann punch presses.
1	15	1,120	Belted to a line shaft driving one air compressor which furnishes air to can-testing machines.
1	15	1,120	Belted to a line shaft driving 11 Fladder machines; 22 can-testing machines; and 11 can-drying machines.
1	15	840	Belted direct to a suction fan for removing waste from machines.
1	10	1,120	Belted direct to mechanism of freight elevator.
1	10	840	Belted to line shaft driving two Torris Wold Company solder hemming machines, used for stamping a piece of solder around the circumference of the disks.
1	5	1,120	Belted to line shaft driving machine-shop equipment including two lathes; drill press; shaper; and emery wheels.
1	5	1,120	Belted direct to ventilating fan.
1	5	1,120	Belted direct to hot-air fan.
1	5	1,120	Geared to mechanism of freight elevator in warehouse.
1	5	1,120	Belted to a line shaft driving 20 single punch presses.
1	3	1,800	Belted direct to saw.
1	3	....	Driving gas machine.
1	2	1,120	Belted direct to can hoist.
10	0.5	1,120	Each driving portable can elevator.

Tin-can manufacturing plant manufacturing a complete line of small size tin cans and boxes.

Total connected horsepower, 20. Total number of motors installed, 3. Average kilowatt-hours per month, 1,590.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	828	May	1,337	September	2,338
February	944	June	1,901	October	1,876
March	547	July	2,685	November	1,521
April	741	August	3,629	December	841

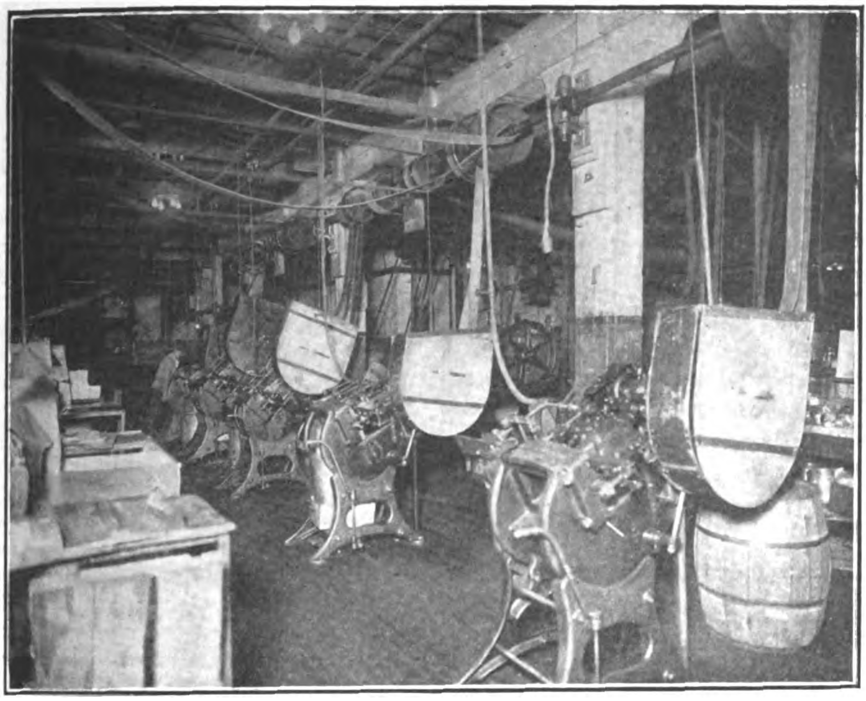
Load-factor 14.6 per cent; operating-time load-factor 30.5 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-Power.	Speed R. P. M.	Application.
1	7.5	840	Belted to a 35-foot shaft and three countershafts driving two Stevenson Manufacturing Company punches for punching out ends of cans; two solder hemming machines; one United Manufacturing Company ending machine; three Mitchell tin slitters; two can elevators; and two solder trimmers.
1	7.5	840	Belted to a line shaft driving six crimping machines; six heading machines; and one air compressor for furnishing air to can-testing machine.
1	5	1,120	Belted to line shafting driving six cutting presses used for cutting and pressing ends of cans; one Stevenson Manufacturing Company can-testing machine; two crimping machines for tightening seams in the ends of the can.

five two-hanger countershafts driving the following:



Group of Motor-Driven Punch Presses.

One Stevenson Manufacturing Company punch for punching out one-inch diameter tin disks used for sealing ends of the cans. The flywheel of this machine is 20 inches in diameter and the rim 3 inches by 1.75 inches.

Motor Driving Body Presses.

Two Torris Wold Company solder hemming machines, which are used for stamping a piece of solder around the circumference of the disks. The pulley of this machine is 24 inches by 4 inches. The normal operating speed is about 40 revolutions per minute.

One solder trimmer.

Three Mitchell tin slitters. There are two 16 inch by 3 inch pulleys on each of these machines.

Two Stevenson Manufacturing Company lock-seaming machines used for forming, seaming and soldering the body of the can. The flywheel of this machine is 24 inches in diameter, the rim 3.5 inches by 2 inches. The machine operates at a normal speed of 102 revolutions per minute and has a capacity of 102 bodies per minute.

There is also connected to this shafting a 12-inch Buffalo blower.

The next group comprises a two-horsepower 1,120-revolutions-per-minute motor belted to a 12-foot three-hanger shaft and 13 feet of countershafting, seven hangers, driving the following machinery.

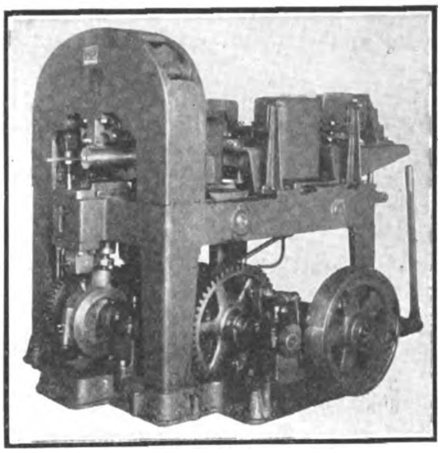
One special machine for applying soldering flux to the cans.

One United Manufacturing Company ending machine used for bending in the sharp ends of the body.

One crimping machine used to tighten the seams in the ends of the can.

Two can elevators, and one 20-foot chain conveyor for handling cans.

Group III consists of a 7.5-horsepower squirrel-cage induction motor operating at a speed of 840 revolutions per minute which is belted to an eight-foot three-hanger shaft and 43 feet of countershafting, 13 hangers, driving the following machines.



Flanging Machine.

One American 6 inch by 6 inch single-cylinder vertical air compressor having a flywheel 28 inches in diameter with a rim 5.5 inches by 1.5 inches.

One Garden City No. 2 positive-pressure blower, 156 revolutions per minute, furnishing air to a carbureter.

One single-cylinder pump for supplying gasoline to the above carbureter from an underground tank.

One Torris Wold ribbon solder maker, two 18-inch by 6-inch rolls.

One "end floater" which consists of two belt conveyors and a chain conveyor which carry cans past gas torches and a solder feed.

One can elevator.

The last group comprises a five-horsepower motor running at a speed of 840 revolutions per minute, belted to a 30-foot 8-hanger line shaft and a 15-foot 5-hanger countershaft driving the following machines.

Five Slaysman & Company cutting presses used for cutting and pressing ends of cans.

One Stevenson Manufacturing Company can-testing machine.

Commercial Practice
Management, Rates, New Business

SELLING ELECTRICTY TO LARGE USERS.

By S. N. Clarkson.

Mr. Clarkson, who is assistant sales manager of the Union Electric Light & Power Company, St. Louis, presents in this article some very valuable suggestions for central-station salesmen, especially those selling power to industrial plants. Such salesmen, to be successful, must have a capactiy for making detailed analyses of manufacturing plants and processes.

It has been said by many not in the electrical business that mere order takers could sell central-station service and that the competition and selling difficulties were not sufficient to require the services of real salesmen. Those in the business know that such is not the case, but it might be interesting to learn why these "order takers" must not only be good salesmen but engineers in the broad sense of the term as well.

Companies supplying electricity in any locality aim to distribute the energy from a minimum number of generating stations, and, as a consequence, have come to be known in the electrical industry as central stations. When most of the large St. Louis factories and skyscrapers were built, the central-station industry was in its infancy, and the owners had no alternative but to install isolated power plants to meet their requirements. Since that time, there has been a gradual reduction in the cost of purchased energy and a great increase in its use, until now the central station is in a position to advantageously serve the largest light and power consumers. At one time, many of the industrial power plants were larger than those of the supply companies furnishing service to the public in the neighborhood, but the central-station power plants have grown by such leaps and bounds that today few, if any, of the isolated plants in large cities have as much as three per cent of the capacity behind the metropolitan central stations. This is especially true of St. Louis which has unlimited fields of cheap coal and water power to draw on, and, as a consequence, has rates which compare favorably with those of Buffalo or any other city in the country.

It is only within the past two or three years that conditions have changed so materially in favor of the central station, and it is difficult for many of the isolated-plant operators to realize that the change has really taken place. A power salesman's first and often most difficult task is to make an isolated-plant operator realize the possibilities of central-station service for him, and no progress has been made towards a sale until the prospect has evinced a willingness to be shown. Interest up to the point of closing can sometimes be excited by referring to similar concerns who are well pleased with purchased power or by tactfully capitalizing special conditions at the right time. This is a good shortcut when effectively used, but nearly every man seems to think that his proposition is the first one of its kind on earth.

When a salesman's advances are met with rebuffs, it is of the utmost importance for him to know why. Many a "lost business" report has been turned into a most acceptable order by finding out the buyer's real objections and applying the correct antidote. Whatever he may say, the large manufacturer rarely has a good reason for believing that his private-plant service is more satisfactory and economical than that furnished by the central station, and the salesman must find out his hypothesis. By plying the prospect with questions and refusing to take "no" for an answer, the power salesman may learn of some peculiar condition, which makes the prospect believe the cost of central-station service to be prohibitive. On the other hand, he may say that so much exhaust steam from the engines is required for heating, and in manufacturing processes, that either the heat or the power costs nothing, because the same steam operates the engines and then furnishes the heat. Following up these admissions, a good salesman will probably soon find out that the prospect does not know the amount of energy being developed in his plant nor the amount of steam used for heating, and in a great many cases, does not even know the total power plant expense. It may seem strange that such conditions exist in modern commercial establishments, but it rarely seems to occur to the manufacturer that he should find out what he is getting for the money he puts into his power plant every year, and the natural tendency is to keep away from things one is not thoroughly familiar with.

Office buildings, department stores and hotels were for many years considered beyond the scope of the central station on account of their heating requirements. Careful investigation, however, showed that in common with most manufacturing plants, the heating requirements of these skyscrapers are heaviest in the early morning when the load on the engines is not sufficient to supply all the exhaust steam required, and, as a consequence, live steam must be used directly from the boilers. During the daytime, the electrical and mechanical load of the plant becomes heavy, while the steam heating requirements are so much lighter comparatively that much of the exhaust steam is wasted by being discharged to the atmosphere. Test curves of actual conditions showed the fallacy of the "heat or power for nothing" idea in a graphic manner, but it took years of plugging to make owners of St. Louis skyscrapers admit that they were not operating as efficiently as they thought, and that they could get better service by turning their plants over to the central station. Office buildings, hotel and department-store service is usually similar to that furnished by the supply company so the change-over cost is comparatively small except where old hydraulic or steam elevators are encountered.

In the industrial or manufacturing field, the situation is more complicated. In all probability, there will be a mill engine with endless belting and line shafts, or else an electrical installation which cannot be operated from the power company's service lines. As stated before, the plant owner may or may not have accurate data on his power costs, but almost invariably has no data on the power plant. He will usually take the rated engine horsepower and multiply by the hours of operation in order to determine the horsepower-hours used per year, although, as a matter of fact, the average load on the engine may not be 50 per cent of its normal capacity. He wants to know the probable cost of electric service, but cannot give the salesman anything definite to figure on. Here it is obviously to the advantage of both parties to get toegther and find out the true conditions of the light, heat and power requirements, and it is the policy of the company, with which I am connected, to conduct complete investigations for prospective customers without putting them under any obligation to purchase service.

A prospect will sometimes give the salesman permission to conduct an investigation, and says he will purchase central-station service if he is shown that it would be to his advantage to do so. It is very common, however, for the salesman to be told by the prospect to go ahead if he so desires, but that he has invested anywhere from $10,000 to $300,000 in his power plant, which is still giving very satisfactory results, and that he absolutely refuses to even consider scrapping it and spending anywhere from $2,000 to $60,000 to re-equip his plant electrically. This is, of course, a short-sighted policy, because if an additional investment will improve manufacturing conditions and earn a fair rate of interest on the total investment, it is a good business proposition. It often takes months and even years to make a prospect see it that way, and after all the work has been done to determine the conditions in the plant, the salesman sometimes learns that plans mapped out by those in control of the business—probably in some other city—preclude the possibility of his ever getting the business irrespective of the merits of his proposition. This is just one of the tests of a salesman's optimism, and unless he has implicit faith in himself, his proposition and in all things working together for good, he can never hope for a full measure of success.

The power salesman must be able to go ahead and conduct a complete investigation of the consumer's power conditions, determine existing operating costs, recommend whatever changes in equipment may be necessary, estimate the cost of proposed changes and figure out the cost of operation with central-station service. Unfortunately, there are no text books or university courses which in any adequate manner cover the problem that is now before the salesman, so the leading central stations have had to start schools to train their own men for this work. Even with a good engineering knowledge and a fund of common sense, it requires considerable experience in estimating power-plant costs and the energy requirements of different machines before the work can be done with any degree of accuracy. To gather all the information and compile it in a suitable form for presentation may take days, weeks or months, but it is time well spent, as the salesman will have learned the real weaknesses of the old system as well as the advantage of the new.

Central-station companies usually have a number of different rate schedules for the various conditions met with in practice, but there may be no schedule which can be advantageously applied in some particular instances. When such is the case, the central station adopts the broad policy that it is better never to have had a man's business than to be unable to hold him as a satisfied customer, and advises the prospect to continue the operation of his plant until either the rates or conditions change to their mutual advantage. As most progressive business houses are growing and the cost of electric service is decreasing, it may not be very long before the apparently dead prospect will be resuscitated and converted into a new consumer, who will recommend central-station service to all with whom he comes in contact.

It must not be inferred from what I have just said that central-station service must be cheaper than isolated-plant operation in order to receive favorable consideration, because that is not so. The power required in manufacturing may only cost from 2 to 4 per cent of the value of the finished product. It follows, therefore, that if central-station service permits of rearrangements in the factory, maintains constant speeds and economizes in space, which result in an increased factory output without additional overhead expense, then the profit from the increase in output will pay for a very large increase in power costs. This is a point overlooked by the salesman who can only sell on price, as is also the fact that many manufacturers are quite willing to pay an increase over their own plant costs in order to get the service which goes with central-station light and power, to be relieved of plant worries and to permit them to devote their entire time to producing a better and cheaper article. This is an age of specialization and the time is not far distant when manufacturers will no more think of making their own power than bakers do of grinding their own flour.

The central stations have been getting practically all of their power business by going in and proving, in each particular case, their ability to reduce power costs. The time is coming, however, when the power salesman will not always be able to do this, and he will then have to devote more time and attention to increasing factory outputs with corresponding reduction in unit costs in order to bring about the universal use of central-station service.

Industrial Plant Investigation.

It is best to start an investigation by listing all the power house equipment and the manufacturing machines. It is also advisable in this connection to make a plan of each floor, showing the line shafting and the position of the machines driven from it in order that any proposed rearrangement can be more readily explained to the prospective customer. The list of equipment for both power and manufacturing purposes must be supplemented with information, giving the work done by each machine or group of machines, the hours' use per day and the particular hours of the day during which they are used. This latter information is required to determine the maximum power requirements that will have to be furnished. In finding the use to which the different machines are put, cognizance must be taken of the sequence of operations from the raw material to the finished product, so that advantage may be taken of every possible rearrangement that will tend to facilitate handling en route.

The power being developed by the engine must be determined from calculations or tests, and this will generally show that one-half or more of the total energy developed is required to overcome the friction in the engine and shafting. The amount of coal being consumed must be estimated from the work being done by the engine, while the labor, overhead maintenance, supplies and repair costs must be judged from observations of conditions. Due to the human element in operation and maintenance and to the difference in load conditions, no two plants, even with identical equipment, will cost the same to operate, and, as a consequence, it requires considerable experience and judgment to arrive at the correct cost of these items without the assistance of complete records. Next to making a correct estimate of the energy that will have to be purchased, it is most important that the power costs under existing conditions should be accurately determined. With this figure approximately correct, the salesman knows whether or not he can effect a saving, and in cases where the prospect claims to have kept a record of his operating costs, it is a means of checking those figures to see that no items have been left out.

The salesman must now decide on the size, number and location of the motors best suited to the conditions. The entire plant may be driven from one motor as in engine drive, or every machine may have a separate motor. These are the two extremes, and in practice a compromise is usually found best in which some machines have individual motors and the others connected in groups of two or more to each motor. Just which arrangement should be recommended for each department depends on the initial outlay for motors, the price of energy, the method of operating the different machines with respect to one another and physical conditions about the plant. The capactiy of the different motors must be determined from the requirements of the machines that are operated underload simultaneously. The salesman should now be able to estimate the amount of energy his company would have to supply to meet the prospect's requirements, and having that, it is easy to supply his rates and arrive at the cost. The difference between the amount of energy to be purchased and that being developed by the engine represents the friction and other mechanical losses of transmission. Having compiled all the necessary data in a logical sequence, starting with a list of the equipment, then determining present costs, proposed equipment changes and their cost, electric energy requirements and cost and the cost of heating, it is time to compare the costs under present and proposed conditions and compile the report.

During the investigation it is advisable to keep in close touch with the man who is to pay the bill, so that the recommendations will be made in accordance with his ideas. There are many ways of arriving at the same end, and as long as the owner's wishes are not contrary to good engineering, it is always advisable to make recommendations in line with his suggestions. Every item of importance in the final report should have been thrashed out with the factory operator and owner beforehand, and, if possible, their support obtained. When this has been done, an appointment should be made to read over the entire report. As the whole thing has previously been discussed piecemeal with the prospect, he is able to understand the report without effort, and seeing recommendations, which he has already agreed to, thinks of them as his own, and looks upon the printed report as a confirmation of his own ideas.

One might think that the showing of a saving of from 10 per cent to 100 per cent on the investment would be sufficient to get the business, but such is far from being the case. There is a certain inherent inertia which induces a man to let well enough alone. Under most favorable circumstances it is very difficult to pry a steam plant away from a man and get him to invest in a new form of power upon which he has no guarantee as to cost. Prospects will often hold off and dicker for a better rate, and it is sometimes difficult to make them understand that central-station rates are fixed and under similar conditions the same to all. The central station can guarantee the cost of any given amount of energy, but it cannot guarantee the amount of energy that will be used any more than the grocer will agree to give unlimited supplies for a stated sum. The prospect may just pay for what he uses, and if he doubts the estimate of the power salesman, he can have this checked by disinterested parties. It is very easy to get highly trained consulting engineers, but it is not so easy for the prospect to find one who has had any experience in industrial engineering, so success in securing an order for central-station service often depends entirely on the amount of confidence the prospect has in the personal integrity and engineering ability of the salesman.

The actual closing of the contracts, however, requires all the enthusiastic persistency and skill that the salesman may possess, and presents the same problems that are encountered and solved by all good salesmen.

Fewer Accidents to New York Edison Employees.

The accident figures of The New York Edison Company for 1913 are now available and present some extremely interesting points in view of the employers' liability laws in New York and other states. Although the electrical industry is generally considered extremely hazardous, for the seven years ending with 1912, the Edison Company has lost less than one man yearly (killed) per thousand. In the territory under the jurisdiction of the First District Public Service Commission, the average figure for the years 1909-11 was 1.9, while in the Second District it was 5.3 during this corresponding period.

The total number of cases, 1,748, reported by the New York Edison Company is high because the company's safety system requires the reporting of every accident and mishap, no matter how trivial. Of the 1,748 cases on record, 1,024 represented no loss of time whatsoever; 364 injuries caused the loss of from one to three days' time; 139 meant one to two weeks lost; 40 cases two to three weeks; 19 cases three to four weeks; 15, four to five weeks; eight, five to six weeks and only eight cases eight weeks and over.

Time lost by the entire accident and disability list for 1913 was 5,308 days or fourteen years, six months and eighteen days. This is a great improvement over 1912 when the entire time lost was 22 years, 3 months and 9 days. The average time lost per case reported in 1913 was 3.04 days, while in 1912 it was 4.5 days. The entire cost of all accidents is met by the company, which nevertheless records the accidents as due to various causes. Of the total number reported, 1,516 resulted from negligence on the part of employees; 86 would have come under the old "fellow-servant" clause; the company was liable but for 123 and outside contractors for 23.

It is also interesting to note that the cost of careless accidents is still the highest per case; those classed as due to a "fellow-servant" have decreased in cost since 1912, as have also those for which the company is liable and those from purely electrical causes. Of the 123 accidents for which the company was responsible, only eighteen were due to electrical causes.

Such a record is the result of the company's earnest and persistent carrying out of a system inaugurated back in 1905. By this arrangement, as already pointed out, the company not only does its utmost to protect the men from accident, but assumes full responsibility whenever any such unfortunate occurrence takes place.

House-Wiring Campaign in St. Louis.

Liberal space is being used by the Union Electric Light & Power Company, of St. Louis, in all of the daily newspapers to advertise the house-wiring plan which the company has recently inaugurated. A base rate of $17.95 for the wiring of a five-room house, with one outlet in each room, is inducing many of the small residence owners to avail themselves of central-station service and the company reports that much new business is being obtained.

A charge of $1.80 is made for each additional outlet and fixtures are provided for as low as $0.70 each. The payments for wiring are spread over 12 months.

Puget Sound Company Acquires Plant at Buckley.

The Buckley Electrical Company, of which E. F. Osberg has been president and which had a 50-year franchise at Buckley, Wash., has been sold to the Puget Sound Traction, Light & Power Company. The business will hereafter be handled through the Seattle office of the latter company.

The Puget Sound Company has completed a 13,500-volt transmission line from the White River power plant at Dierringer, a distance of about 14 miles.

The Puget Sound Traction, Light & Power Company has closed a contract with the City of Everett, Wash., to light that city's streets with Mazda lamps. No arc lamp will be used whatever.

Electric Sign Data

Spectacular Electric Sign in Cleveland.

The sign photograph reproduced this week shows a spectacular electric sign recently erected by the A. & W. Sign Company in Cleveland, O. The flasher, which in this case has so much to do with the effects produced, is also reproduced, this being of Betts & Betts manufacture.

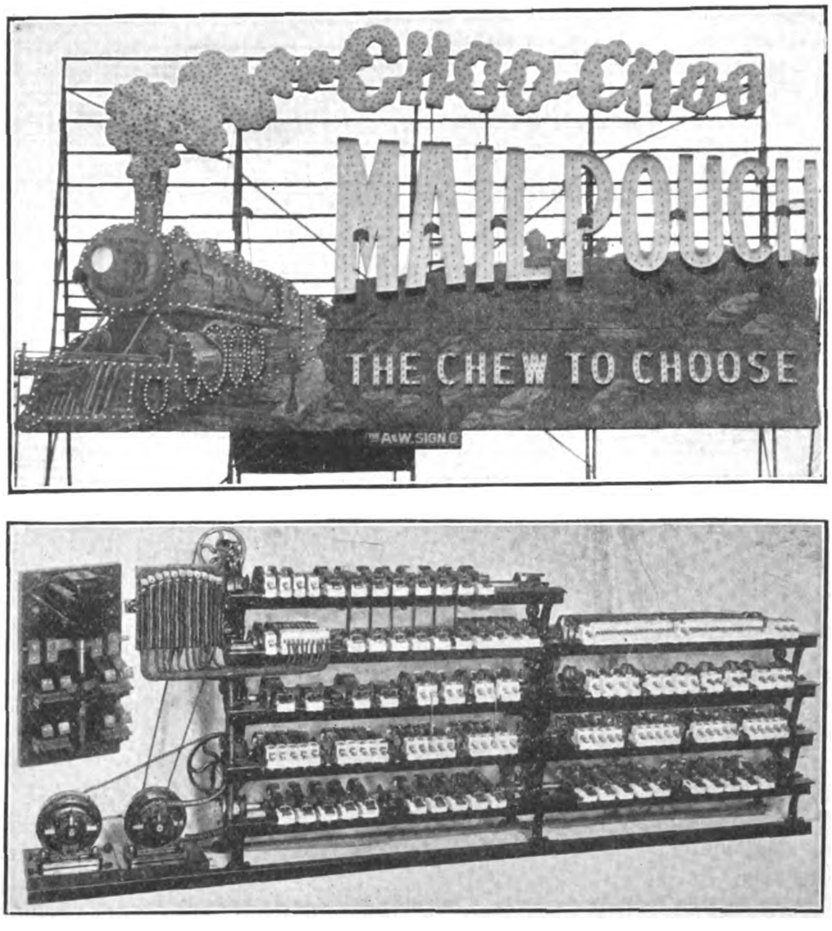
This sign is very similar to the one built by the Thomas Cusack Company in Indianapolis for the same people, which was operated by the same type of flasher. The sign is approximately 35 feet by 55 feet and contains about 2,000 lamps.

The action of the engine, like that of the Indianapolis sign, is very unique. The engine outline, wheels, and track come on, remaining stationary for a moment, then the wheels begin to revolve. At the same time the smoke rolls up out of the stack in regular puffs. It comes on a few lamps at a time and has the effect of drifting back to the letters "Choo Choo," which are brought on one at a time. The wheels and track continue speeding up to a point where the train appears to be running very swiftly. After this the words "Mail Pouch" come on, and then the line reading 'The Chew To Choose."

The speeding-up effect is accomplished by the use of a secondary motor and resistance coil, as will be noted by close observation of the flasher photograph.

The smoke forms are produced by a special form of wiring and lamping which gives the effect of rolling, waving smoke, which made the first one of these signs in Indianapolis famous. The smoke has the effect of puffing up out of the stack, spreading, waving, and rolling back.

When a sign manufacturer of ability has the co-operation of a flasher manufacturer with an engineer who is capable of developing each little detail as in this sign, it is a very simple matter to reproduce naturally moving effects.



Electric sign, with flasher, installed in Cleveland, O. Sign manufactured by A. & W. Sign Company, Cleveland, and the flasher by Betts & Betts, New York.

Sign measures 35 feet by 55 feet. There are 2,000 five-watt lamps.

Full details of flashing effect and color scheme are given in accompanying text.

One of the features of the electric sign campaign being carried on by the Toledo (O.) Railways & Light Company is the publicity given to each new sign customer. Much of the success of the campaign is attributed to this feature.

As soon as a sign is in operation a photograph of it is taken and published in the daily papers, advertising both the electric service and the place of business of the newly acquired sign customer. Distinctive signs are sold in all cases, the company operating on the theory that one original clever design helps to sell other signs to the competitors of the first purchaser.

Energy for sign lighting is sold on a flat rate, 9 cents per lamp per month, this price including lamp renewals, and all other necessary maintenance. The most effective talking point used in connection with this rate is the hourly cost of operation of the signs which the prospective customer seems to favor. This figure is usually considerably less than a dollar for an average sign, and such an advertising rate appeals to the merchant as low in comparison with other advertising mediums.

A census of the signs thus far erected shows that the average sign contains about 250 10-watt tungsten lamps.

The City of Sacramento, Cal., has recently acquired an effective slogan sign which greets the traveler as he nears the city. The display consists of a large red heart enclosing an outline of the State of California marked in natural lamps. Within this outline, the position of Sacramento is indicated by a small red heart. A flasher operation makes this sign very conspicuous and impressive, and with it comes the message, "Sacramento the Heart of California. Ask the Chamber of Commerce."

Electrical Construction

ELECTRICAL INSTALLATION FOR CHILD'S RESTAURANT, LOUISVILLE.

By F. F. Valinoti.

This is the first installment of what it is proposed to make a progress report upon the installation of the wiring for the lighting and power equipment of Child's restaurant, Louisville, Ky. The building, which is an old one, is being remodeled, and the electrical work is under the direction of the Harry I. Wood Company, of Louisville. As the work proceeds, Mr. Valinoti will decribe in detail the methods of handling the various phases of the work involved.

The specifications call for a complete conduit system for both power and lighting, the conduit for first floor to be concealed, and the basement conduit to be run exposed. The building is an old one, which is being remodeled. It is 50 feet wide and 110 feet deep. The height of the first-floor ceil-is 18 feet.

Fig. 1 shows the location of the various outlets on the first floor. The floor construction is of wood, the joists being placed from I-beam to I-beam. The I-beams run across the building, while the wooden joists run longitudinally.

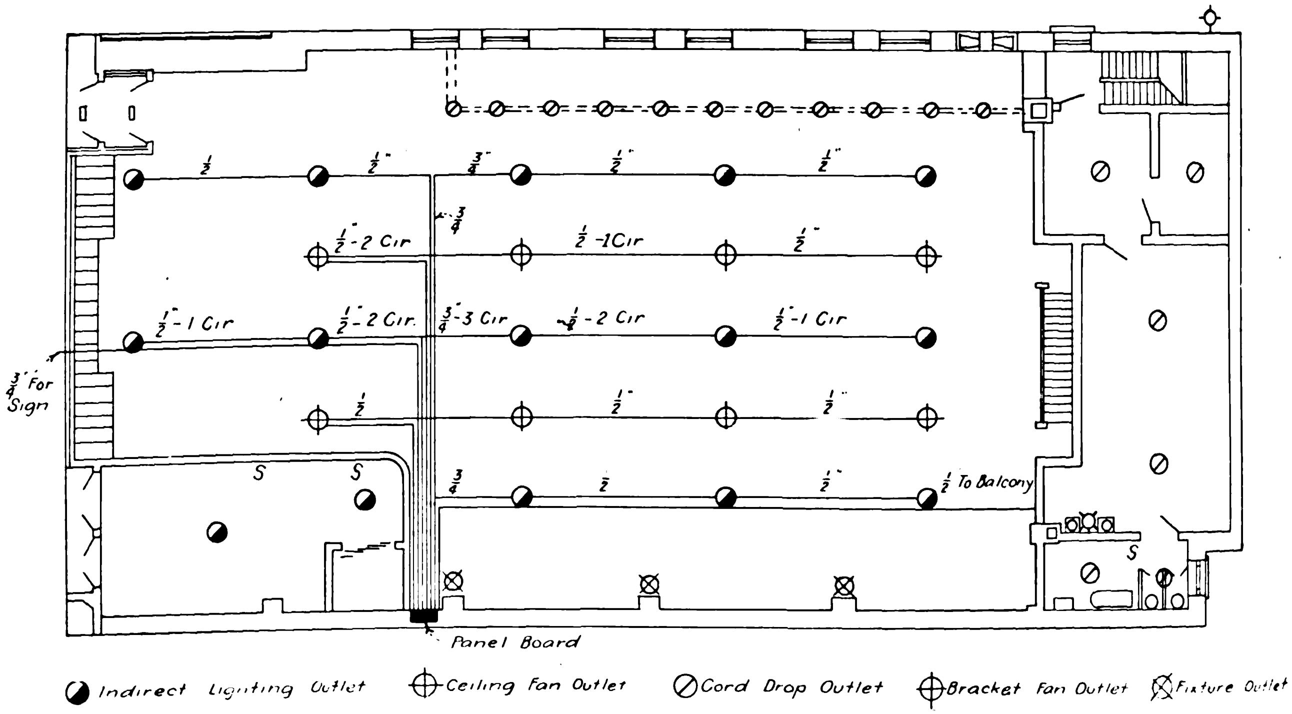


Fig. 1.—Plan of First Floor, Showing Outlets and Runs of Conduit.

The floor of the second story was taken up the full length of the building, in sections 30 inches wide. This gave us an opportunity to run the conduit between the two joists from one end of the run to the other, without using any flexible conduit, or fishing.

Fig. 2 shows the manner of running these conduits. From each longitudinal run a three-quarter-inch conduit was taken across the top of the joists, which were notched, over to the wall, and then down to the cabinet. A piece of 2-by-6-inch plank was nailed between joists to support each outlet box.

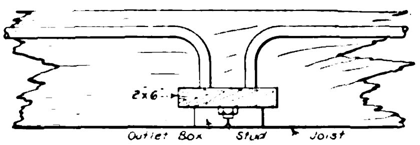


Fig. 2.—Mounting of Outlet Box.

As a few of the wire manufacturers have now paced on the market a No. 14 duplex wire, which has a very tightly woven braid, and is therefore smaller, we have pulled two circuits of it in the half-inch conduits, and three circuits in the 0.75-inch conduits. This was done also to keep down the running of a great many half-inch conduits, which would require more space and notching of joists. This new duplex works very well in the above combination, as it can be pushed from outlet to outlet very easily. We also find, from a standpoint of cost, that running three circuits in 0.75-inch beats four circuits in 1-inch conduit.

There are eighteen circuits supplying the ceiling, divided as follows:

One circuit to each individual fixture.

One circuit to two ceiling fans.

One circuit to balcony lights.

The circuit feeding the drop lights under the ventilator balcony on north side will be taken from the cabinet, across the basement ceiling, and up the north wall to a point seven feet above the floor, then around under the edge of balcony, condulets being used for each drop. This circuit has not been installed at this writing.

It required 180 feet of three-quarter-inch conduit, and 570 feet of one-half-inch conduit to rough in the first-floor ceiling. The labor required amounted to 36 hours each for wireman and his helper. This, however, does not include the taking up of floor, which was done by the carpenter contractor.

The south wall of building, which is of brick, was cut to receive the distribution cabinet, which is 24 by 57 by 4.5 inches. A channel 6 by 4 inches was cut both up and down from this point for the reception of the branch-circuit conduits, and the feeder conduit, which will be brought across the basement ceiling and up.

The Percentage System in Electrical Contracting.

By G. D. Crain, Jr.

With an Expression of Opinion Upon the Subject from Several Leading Electrical Contractors.

One of the most important and interesting developments in the electrical contracting business, as in other departments of building construction work, is the use of the percentage system. As the name suggests, this plan involves awarding business to the contractor on a basis of an agreed percentage above the cost of labor and materials.

The defects of the system of bidding are obvious. In the first place, there is an element of uncertainty which sometimes results in the contractor handling an important job at an actual loss. Unforeseen elements of difficulty may arise, and the delay and increased expense thus made necessary eliminate all possibility of earning a profit.

The average owner is willing that the contractor make a fair profit on his work; and it is also plain that if a contractor sees that he is likely to lose money on a job he will be tempted to "cut the corners" wherever possible for the sake of making his net loss as small as possible. This does not always happen, of course, for many concerns would rather lose money on a piece of work than risk losing the good-will of the customer. Nevertheless, the temptation to slight the quality when it is found that a bid which is too low to cover the cost has been made, is present, and it doubtless has its effect in a good many cases.

On the other hand, the very fact that the wise contractor appreciates the risk involved in bidding, since it is never possible to anticipate every feature which may arise, means that a larger margin must be allowed to take care of the unknown quantities than would be necessary if every point were covered by the bid. The contractor who would be willing to make 15 per cent "for sure" on every job will probably allow 25 per cent in bidding in order to cover the unexpected difficulties that may arise, and also to take care of other jobs where the net had been considerably below the expected profit.

That means that in some cases the owner pays more than a fair price for the job. He is helping to average up the general run of work, and his excess payment offsets the too small amount charged on an unprofitable job. This is obviously an inequitable system, and furnishes a legitimate argument for the use of the percentage system.

One of the chief advantages to the contractor is that he can get the benefit of accumulated good-will and the prestige which goes with a record of big jobs well handled. While it is not necessary that the architect let the contract in every case to the low bidder, the inclination is always in that direction, and thus the inexperienced and the unskilled, who know neither how to figure the cost of a job nor how to handle it to the best advantage, are likely to get work to which those who have proved themselves in previous jobs are really entitled. That is one of the glaring weaknesses of the present system. The lowest and best bidder is the man to whom the contract, in theory, should be awarded, but in actual practise it is the low man more often than the best who gets the business. Contractors have learned this, and know that only when their bid is pretty close to the bottom will they be given serious consideration.

The percentage system eliminates all this. It puts a premium on efficiency and high-grade work. If the Johnson Electrical Company did an excellent piece of work in wiring a storeroom for James Martin, architect, and Mr. Martin has another job in which particularly careful work is required, he would much rather be sure of Johnson getting it, by making a percentage agreement, than have to take bids and feel called upon to let the contract to the low man, irrespective of his previous record, and without regard to whether the architect himself had tried him out on other work. That makes the percentage plan easy and convenient for the architect.

Then, too, many an owner has a friend in the business whom he would like to favor. Under the open bidding system he does not feel justified in apparently throwing away money merely to favor a friend. Consequently if somebody else bids lower than the concern he is acquainted with, it is seldom he interposes a request to give the contract to the higher man. With the percentage system, he can do this without feeling that he is making the job cost him more than a fair price. He is sure of getting it at a proper charge, for labor plus material plus profit should be easy to figure.

It must not be thought, however, that the percentage idea solves all problems, and makes life's path easy for the contractor. There are difficulties and irritations involved here as well as under any other system, for no change in methods will change human nature. The contractor who is inclined to beat the owner under a bidding system will probably attempt the same thing under a percentage plan.

In fact, cases have been cited in which the contractor padded his expense bills, charging the owner the list price for material, without showing the discounts received. Time for labor was also increased, helpers being put in at mechanics' prices, and other features of that kind developing. Carelessness in buying and using material when the owner is footing the bills is also apparent in some jobs handled on a percentage plan, and when this occurs the system is given a bad name.

Another difficulty is determining just what the percentage should be. And, after all, here is an opportunity for bidders to be pitted against each other, for the man who agrees to do the work for the smallest percentage over and above the cost of the material and labor, other things being equal, is likely to get the job. So adopting this plan does not entirely solve the problem, by any means.

One large contractor in an Ohio Valley city believes that 20 per cent, plus a proper charge for supervision, is a fair basis on which to handle the business. He points out that he is entitled to a profit both on the material used and on the labor supplied, and that it likewise costs money to have the work properly supervised, supervision not being included in the labor item, as a rule. But sometimes he finds that other contractors are willing to eliminate the supervision charge, and also to shrink the percentage of profit, the incentive to the man who has no very high principles for the conduct of his business being so obvious that a good many of them will take the work for almost nothing in order to have an opportunity to make money by "faking" their bills.

"The percentage plan has been given undeserved unpopularity among certain owners and architects," said the head of the concern referred to above, "because of their experience in dealing with contractors who did not play fair. It might be said that under such a system the owner would be foolish to give his work to anybody except those he knows he can trust completely. But if one man is willing to work for a smaller margin of profit than another, he is likely to be given the work. The contractor of this kind may think that it is legitimate to make up for a narrow margin of profit by padding his bills, and get his profit in some other way; but we believe in laying all our cards on the table and stating in the beginning just what the charge is going to be, above the cost of labor and material."

A phase of the plan which seems to meet the objection that the contractor has no incentive to work out effective methods of cutting costs and reducing the expense of a job, in view of the entire cost being borne by the owner, is the award of a bonus. The architect figures an estimate, which is agreed upon as representing the probable cost of the job, and the contractor gets 50 per cent of any saving made in the work compared with the original estimate. This makes it worth the while of the contractor to reduce the expense wherever it can legitimately be accomplished, and gives him something to work for. This plan has been used successfully in a good many cases.

The percentage idea is undoubtedly interesting. It has its defects and drawbacks, but appears on the whole to mark an improvement over the typical system.

Ernest Freeman, President of Freeman-Sweet Company, Chicago, and President of the National Electrical Contractors' Association.

"The Percentage System in contracting, in my opinion, has no virtues and many defects. It does not eliminate competition, nor does it insure superior construction to an owner; but it does invite, or at least tempt, unscrupulous business methods on the part of the contractor. In a very large majority of cases, no matter how large or how small, *work* costs more than the purchaser thinks it should, and *settlements* often cause loss of money and friendships as well.

"For my own part, I would rather have a definite contract, carrying clearly defined obligations from both parties, with a predetermined price, than a percentage plan which is definite in no particular."

J. T. Marron, President Electric Construction and Machinery Company, Rock Island, Ill.

"About half our work is done on the percentage basis, and we find it works out very well.

"Referring to the last paragraph; we have also done considerable work under the fixed-sum basis and division of the savings. This is really the proper method of working. The contractor gets further pay for a special effort to hold the cost of the job down. The cost of promiscuous figuring on electrical plants is no small part of the contractor's overhead, and if there was more work done on the fixed-sum or percentage basis, the work could be done more cheaply for everybody concerned."

John C. Hatzel, President Hatzel & Buehler, New York.

"Personally I favor the Percentage System and in my opinion it is the ideal system for all concerned, including Owner, Architect, Engineer and Contractor.

"Mr. Crain sets forth both the advantages and disadvantages of this system; but it simmers down to awarding the work to an absolutely reputable contractor in whom the owner and architect have confidence. With the almost universal present-day system of placing electrical construction in the hands of a general contractor, abuses have crept in, which doubtless would be remedied by letting the work on a percentage system directly by the owner.

"Under the present system, the general contractor, with few exceptions, obtains numerous bids from electrical contractors indiscriminately, irrespective of their financial responsibility or otherwise; using the lowest bid, and even shading this in his estimates. Then he peddles the electrical work on the basis of a lower price than even the lowest bid, a competent and responsible contractor possibly being given the preference at the lowest possible figure. The result of this system has been exceedingly keen competition; work awarded at a price below actual cost, with the consequent lowering of the quality of the work; the contractor, naturally, also endeavoring to make up his loss or increase his possible small profit by overcharges on changes and additions which may occur.

"Under the Percentage System, these abuses would be remedied; the contractor would obtain a fair profit on his work, and the owner would obtain proper results and the full value for his money.

"The percentage over cost allowed the contractor on such a basis, of course, cannot be definitely established, this depending to a great extent on the localities, the average volume of work of the contractor, etc. On the net cost of labor and material, a fixed percentage should be allowed for administration expenses and supervision; this percentage, plus the net cost of labor and material, being considered the net cost of the work to which a percentage of profit should be added; this percentage, as before stated, depending on the locality and the size of the installation, or in other words the cost."

Joseph Fowler, President of the Jos. Fowler Electric Company, Memphis, Tenn.

"Theoretically the idea presents an utopian solution of some of the ills of electrical contracting. In practice I think it would fail utterly. Mr. Crain has given the best reasons why this plan will never be in general use.

"Primarily, the suggestion is offered as a preventative against the gambling propensity so prevalent in the electrical contracting field and as a safeguard to the buyer of electrical contracting. Mr. Crain proves that the probabilities are that it will do neither of these two very important things.

"Possibly the most noticeable failing among electrical contractors is their ignorance of overhead cost, and, if this be true, a competition on the basis of percentages would be as disastrous as the present method. What would prevent a contractor whose overhead is 25 per cent, but who knows it not, from bidding to undertake a commission at a gross profit of 10 per cent? It has been my experience that where a buyer is inclined to favor the percentage plan he first wants a guaranteed maximum cost. This is far worse than a flat bid and all the odds are in favor of the buyer.

"Again, the plan does not protect the buyer beyond the honesty of the contractor. As the author has pointed out, many contractors would deliberately estimate the percentage low with the intention of either slighting the work or manipulating the cost sheets or both.

"My concern would welcome the adoption of the percentage plan if the buyer could be brought to recognize our 25-per-cent overhead cost and our need for a 10-per-cent margin of profit. In the settlement of a recent commission of this sort we had difficulty in making plain to the owner that the 25-per-cent overhead was computed on the selling price and not on the labor and material cost of the work.

"The frailty of human nature is an insurmountable obstacle to the feasibility of this very excellent suggestion.

"How awful it is that contractors will persist in trying to fool themselves that they have no overhead, or of just simply putting their overhead at 10 or 12 per cent without looking the facts squarely in the face. We have all seen contractors figuring on how to charge this and that item to some other account rather than put it where it legitimately belongs—'The Overhead.' I think a lack of knowledge of a correct overhead rather than an incorrect estimate of labor and material cost is responsible for most of the losses in our business. It seems strange that the buyer who is, of course, a business man in some other line should turn pale when you talk to him about overhead. Surely he must be acquainted with the 'animal' in his own business. He demands that you keep an accounting force to keep track of the details of the work you are to do for him. He insists that you have a place of business and a telephone so that he can keep in touch with you. He forces you to advertise before he will recognize that you are on earth. He knows that you are not a very responsible concern if your establishment is not well lighted, heated and ventilated. He will not receive you in his office if you do not present a respectable appearance. Taken together what do all of these things constitute but overhead?"

R. G. Littler, President West Coast Engineering Company, Portland, Ore., and President Oregon Electrical Contractors' Association.

"This is a matter to which I have given considerable thought, and with which our firm has had a great deal of experience in actual practice. With all due respect to the author of the article, I wish to state frankly that it is good as far as it goes, but I do not think it comprehensive enough for such a subject, as it does not go into enough detail.

"Most of the work which our firm has undertaken on percentage basis has been with firms who have had the greatest of confidence in us, and I will frankly state that we do not want any percentage work under any other circumstances, as in any other case it is the most undesirable business that a firm could possibly take upon itself.

"In the first place, the basic principle of percentage contracting is for the owner or client to know absolutely, that he is getting the labor and materials at absolute cost. If he is not in a position to assure himself of this, and does not know that the integrity of the contractor is unquestioned, then he had better not enter into a percentage agreement, for the reason, as stated above; that is, the first principle is lacking.

"Another question: 'Is the owner entitled to the very best quantity price which the contractor is able, by his purchasing power, to get on the materials?' For instance, a contractor may buy his conduit by the carload, getting the best price there is to be had. 'Is the owner entitled to have advantage of this price, if his particular job requires the use, we will say, of only 5,000 feet?' I claim he is not entitled to any price except that which his quantity will command, for the reason that the contractor has bought at a carload price, has furnished the money to carry the conduit in stock, and is entitled to a return on that money, and that the goods should be sold by him in a percentage agreement at the price that each particular quantity commands.

"Another mistaken idea in percentage work is that a great many such agreements are made with a saving clause for the owner, in which the contractor guarantees that the work to be undertaken will not exceed in cost a certain fixed sum.

"Contractors who take work on percentage basis on such terms as this are making a great mistake. It amounts to nothing more or less than a contract with the added pleasure of the contractor assuming additional risks and giving the owner all the advantages. It seems to me that, when an owner asserts his willingness to award work on percentage basis, that he takes the stand that he is ready to take a contractor's chance, you might say, on saving money over what the work may have cost him had he let it on a contract basis. If he is dealing with a contractor whom he knows is honest, he knows that his work can only cost him in direct proportion to the cost of the labor and materials, plus the percentage agreed upon, and he knows that he will get a square deal. As I have stated before, if he does not know this as a fact, then there should be no percentage agreement made, for it will surely be unsatisfactory to one or both parties to the deal. The point I desire to submit is that the owner, under a percentage contract, should assume his share of the risk, which he can safely do if he knows his contractor, with the added advantage that if he orders any extras during the progress of the work, such extras will only cost him in proportion to the original agreement.

"In conclusion, I wish to say that regarding the amount of the percentage, this is a point which will be governed entirely by local conditions, the overhead expense of individual contractors, the efficiency of the organization, and many other points.

"It is for each contractor to figure these things out and when taking work, either on a percentage basis or otherwise, to be sure he is making a reasonable profit on his work."

J. C. Sterns, President J. C. Sterns Electrical Company, 259 Pearl Street, Buffalo, N. Y.

"I have taken the position as opposed to the percentage system on the ground that in most cases that are known the original cost of labor and material has been padded, and the owner or architect deceived. If one firm were to offer to do this work at 15 per cent above cost, and another 25 per cent, undoubtedly the man bidding 15 per cent would get the job. The man bidding 15 per cent intends to pad his, while the other does not. How is the owner going to know this? We have taken several jobs on a percentage basis, adding 25 per cent to our cost, but found in every case the owner was dissatisfied and the job would run more than we thought it was going to.

"For my part, I prefer a contract and add a fair profit to the same, and know what you are expected to do, and do it. This is my view of the percentage system."

Marshall L. Barnes, President Barnes & Payton, Troy, N. Y.

"Regarding the article written by Mr. Crain would say that if his ideas could be carried out, it would be a boon to the contractor. If a man could go on to a contract with the assurance that he was going to come out with from 10 to 20 per cent ahead on a job, he would surely feel that he had not missed his calling. The greatest trouble is that the contractor is so anxious to win out, that he too often takes a contract at pretty nearly cost with the expectation that he is going to make up on extras, but too often the owner will ask for figures from a half dozen contractors for the extras and another man is liable to come on the job and the original man steps out worse off than if he had kept off entirely.

"A man can be dishonest in anything, and could be on the percentage basis, but my idea is that it would tend to make him honest and furnish the proper material and labor, when he knew for a certainty that he was sure of the agreed percentage and could count the dollars that would surely be his at the end."

F. M. Grant, President The F. M. Grant Electric Company, Cleveland, O.

"Many of the jobs under my supervision have been done on a percentage plan and these jobs we can point to with pride, not only with regard to the quality of the work, but it is a fact that the customers were always satisfied. Many of the customers repeated their orders and were well satisfied with their bills.

"As to the rate to be charged, I would say that it should never be less than 25 per cent above invoice cost, this to cover overhead and profit.

"The main things to be borne in mind in doing percentage work are service and quality. No one objects to paying a fair profit if he gets prompt service and good material. It is seldom that one gets more than he pays for, and if the contractor's bid is below that which will bring a profit the customer is most often the one to suffer. The percentage plan, if faithfully carried out, assures the owner of a better and cheaper job, as the best is the cheapest in the long run, but unfortunately this system has been brought into disrepute by unscrupulous contractors.

"I would not recommend a bonus in connection with the percentage system, as it appears to me that this would lead to cutting corners. A straight percentage plan with no fixed limit allows the owner to add to or deduct from his original plans, and there are no resulting squabbles over extras or deductions."

C. E. Stapp, Peoria, Ill.

"Approximately 80 per cent of our business is done on the time and material system, or percentage basis. We believe that it is one of the fairest ways to do business, but, of course, you have to be equipped with an organization, particularly as regards the men employed, that will work in such a way with you as to make the proposition a fair one.

"If the electrical contractor today would give a little more attention to figuring out the best possible installation for a lighting equipment and for the distribution of power feeders, and spend a little time with the owner as a salesman instead of devoting so much of his time to scaling down the figures on the job, he would be a great deal better off. A job without a profit is a loss to any contractor.

"If the contractor will interest the owner in getting a good job done and convince him that he will work to the best advantage possible and charge him only for labor and material, according to the quantity purchased, he will come out all right.

"It is often the case that when the job is a large one the contractor may need some of the money before it is completed. We never make out a bill until we are through with the job, although we may ask the owner for a part payment. When the work is completed we figure up the material and make him the best possible price on the quantity-used basis, with a reasonable excess for overhead expense and a margin of profit.

"If some of our contractors would not run after a job so hard, particularly when they find another contractor is figuring on doing it on a percentage basis, I believe we would soon have most of the good work being done in that way. But, one of the worst evils we have to contend with in this class of work is the competitor who is always trying to get in on somebody's work and make it as unpleasant as possible for the man wanting to do a good job, giving the owner, incidentally, an opportunity to feel that when he makes a fair proposition to the legitimate contractor he is getting beat.

"Another thing. Something like 50 per cent of the jobs that are being installed today are not adequate for the building they are put in and the service that will be required of them. The contractor has a fine opportunity to convince the owner with regard to the proper number of switches and plug openings. He should show him fairly and squarely the advantage it would be to him to get a complete installation as an original proposition rather than put in a system that is going to be short of his actual requirements and saddle him later on with a heavy expense for an installation after the building is completed."

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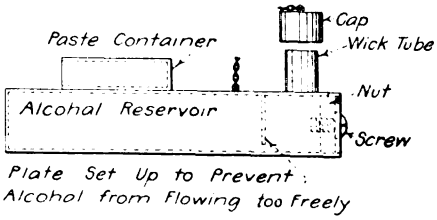
A Convenient Soldering Torch.

For some time I have been using an alcohol torch, which I find very convenient for light soldering, such as fixture wire, Nos. 12 and 14 gauge copper, etc. It is made as follows. Take a piece of three-quarter or seven-eighths inch square brass tubing about six inches long and in one end (about one-quarter inch from the end of the tube), solder a good-sized nut, into which may be fitted a screw which may be removed for filling the torch, and close up the other end entirely. On the side of the tube at the filled-end, drill a hole large enough for soldering in a gas tube about 1.25 inches long for the wick tube. Another gas tube with the outer end closed, may be slipped down over the wick, making a liquid-tight joint, when not in use.



Soldering Torch.

Fasten this cap to the torch with a small chain to prevent losing it. This torch may be carried in the pocket conveniently and when laid on top of a stepladder does not tumble off easily. In addition to this I use another short section of tube, open on one side only and soldered fast to the torch, for a container for soldering paste.

W. H. Best.

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Among the Contractors.

The firm of R. W. Keck & Company, of Allentown, Pa., has been handling an increasing number of electrical contracts to the mutual advantage of all parties concerned. Among these is the installation of 30 motors in the large planing mill of the Butz-Frederick Company, also the wiring of the handsome new store of the J. M. Grimley Company. During the three years that the firm has been engaged in electrical construction, it has built up a very attractive business, chiefly due to the personal attention that Mr. Keck has given to each job, small as well as large. Scores of new houses have recently been wired by Mr. Keck's men.

The Independent Electric Company has been awarded the contract for the electrical wiring of the warehouse now being erected by the Continental Oil Company at Salt Lake City, Utah.

In addition to its regular electrical contracting, supply and fixture business, the Electric Supply and Fixture Company, of Walla Walla, Wash., has recently added an engineering department in charge of G. B. Dunmore. This department will specialize in the installation of complete lighting plants of water, steam and gas-engine driven types, as well as pumping, irrigating and water-storage systems. The many large and prosperous wheat ranches in the vicinity of Walla Walla make this an attractive field for such business.

Electrical work, amounting to $900, for the Stanton Prentice $60,000 fireproof residence, at Columbus, O., has been let to Erner-Hopkins Company.

The Cortlandt Engineering Company, New York City, has been awarded the contract for electrical work in the new ice-cream manufacturing plant to be erected at Perth Amboy, N. J., by the J. T. Castles Ice Cream Company, Newark, N. J.

George W. Hill.

No one can gainsay the fact that within very recent times the electrical contracting business has been greatly improved, due almost entirely to initiative and effort from within. The notable work accomplished by the National Electrical Contractors' Association in putting the business on a business basis and in educating the members of the electrical contracting fraternity to look out for themselves while giving their clients and customers a square deal, is something that has not been paralleled in the development of an industry.

In carrying on the work of the National organization a good deal of the responsibility for its success has fallen upon the shoulders of its special representatives, whose function and duty it is to travel over the country instructing the member as to the value of membership in the Association, describing the advantages accruing therefrom, and acting generally as a diplomatic agent between the contractors themselves and between them and the other elements of the electrical industry.

The present special representative of the National Electrical Contractors' Association is George W. Hill. Hill is by talent and temperament well fitted for the job. His boyhood days were spent on a cattle ranch in western Nebraska, and with his father he was for a number of years in the stock-raising business in Nebraska until about 17 years ago when he sold out his interests and went to Illinois. His first employment in the electrical business was with W. R. Robb & Company, Rock Island, Ill. Hill afterward got a job with the Electrical Construction & Machinery Company, the head of which is J. T. Marron, one of the most favorable known and best liked men in the electrical business. Marron must have been mighty good to Hill, for what Hill has to say about Marron's fine qualities would fill a book. Mr. Hill rose from journeyman electrician to the position of superintendent of construction. While in charge of construction for the company he had a great deal of experience in the installation of large isolated plants, such as the locomotive works of the Rock Island Railway at Silvis, Ill.

As an employee of the electrical contractor, Mr. Hill states that he always believed that the contractor has a hard row to hoe. He also had an abiding faith that the time would come when the electrical contracting business would occupy the dignified position in the commercial world which it seemed entitled to possess. He believes that in the past the electrical contractor was the poorest paid man in the world for the amount of brains and energy required to conduct his business. Always a close student of conditions surrounding the business, he has felt confident that sooner or later the contractor would come into his own.

Hill is a believer in a big way in anything and everything that has for its object the betterment of conditions among the electrical interests. While about 90 per cent of the electrical contractors have arisen from the rank and file of the journeyman electrician, it is through intelligent co-operation and affiliation with one another that the business is being promoted as a commercial institution rather than merely a trade. Hill is a strong exponent of the idea of business and professional men belonging to some association that is working for the betterment of conditions in the particular line of business in which they are engaged. For this reason the electrical contracting business is 100 per cent better than it was five years ago, and there is no question in his mind but that this condition has been brought about through the National Electrical Contractors' Association, the spirit of Jovianism and the influence that the electrical journals have had in promoting this spirit.

George W. Hill.

As we said before, Hill is fitted by talent and temperament for the job. As he views it himself, a representative of an association of this kind must be a good fellow—not too good, but just average good fellow. He must have had experience which will place him in a position where he can reailze what the other fellow is up against. He must be a diplomat—not too much of a diplomat, but possess just average diplomacy. He must be progressive, and he must be willing to take a long chance to boost the other fellow's game. He should be a Jovian, a bookkeeper, an accountant, entertainer and electrical contractor, a journeyman-electrician, a helper or a cub, an engineer, and a mixer—but not of drinks.

Hill travels among the electrical contractors of the United States, helping them to form state and local associations, assisting them in getting the co-operation of other electrical interests, explaining books and forms recommended by the Association, and in many cases adjusting differences between them and fostering a proper spirit of harmony and good-fellowship. With the talent and the temperament, and the persistent desire to work hard and make good on the job, Hill finds that this is the most gratifying work that he has ever attempted, and hopes that he may remain in it until he can see the electrical interests of the country welded together as one great happy family.

Certificate Required in Kansas City.

An ordinance has recently been passed in Kansas City, Kans., through the efforts of the local association of electrical contractors, which requires that master electricians and journeyman electricians shall pass an examination and receive a certificate before they shall be permitted to engage in electrical work.

The Board of Examiners is to consist of three members, one of whom shall be the city electrician, the second a master electrician, and the third a journeyman electrician. The two latter are to be appointed by the Board of Commissioners for terms of two years.

The fee for an examination and certificate for master electrician is $5.00, and for a journeyman electrician, $2.00.

A penalty of $100 is provided for a violation of the ordinance.

Georgia Contractors' Association.

A meeting of the Georgia Electrical Contractors' Association was held at Atlanta, Ga., on April 15, and the following officers were elected.

President, R. M. Walker, of Rome.
Vice-president, H. E. Lowe, of Macon.
Secretary, J. M. Clayton, of Atlanta.
Treasurer, W. L. Bailey, of Atlanta.

It was decided to hold another meeting at Macon on May 26, when delegates to the national convention will be selected.

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The Prinz Electrical Company, of Walla Walla, Wash., is just completing the contract for the entire rewiring of the Walla Walla Hospital.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

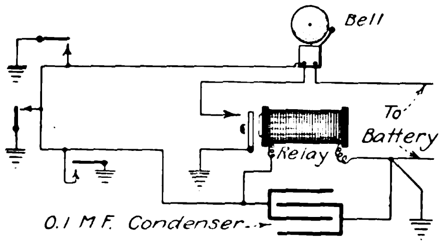
Testing Gas-Lighting Circuits.

In testing for a ground on an electric gas-lighting system, I disconnect the wire from one side of the spark coil and tap it against the terminal from which it was disconnected. If there is a ground on the system there will be a spark each time the wire is touched to the terminal, but if there is no ground there will be no spark.

M. J. Moriarty.

An Efficient Burglar Alarm.

The diagram which is given herewith shows an excellent scheme for a burglar alarm, especially when the alarm and the building under protection are separated, and the use of exposed line wires imperative. The relay shown should have a resistance of 500 to 1,200 ohms. The first cost is low, as is also the maintenance cost. Its advantages are: only two line wires are required, with the most simple type of alarm contacts; minimum operating current is required; and the cutting or grounding of either, or both, wires will cause an alarm to sound. Twisting the line wires together will not prevent operation.



Connections for Burglar Alarm.

H. E. Weightman.

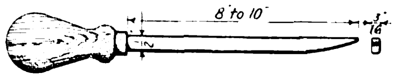
Overcoming Failure of Rheostat Handle to Fly Back.

Sometimes in the case of an ordinary direct-current starting rheostat the retaining magnet will not let go of the handle when the current is turned off and the motor stops, due to the fact that the iron retains sufficient magnetism to hold the handle, although the spring may be comparatively strong. To overcome this defect, file a fine slot in the retaining arm where is comes in contact with the magnet, or cover it over with a coat of paint. Both of these schemes work well in practice and the possibility of damage to the rheostat and motor due to failure of the rheostat handle to fly back is thus avoided.

Roy Dean.

Armature Coil Lifter.

In the course of my experience on armatures, I have often had occasion to lift one side of a number of good coils in order to replace one or more bad ones; and on account of the difficulty of doing this without injury to the good coils, have often been compelled to replace coils which, but for the injury done in lifting them, were perfectly good. As a result of my observations in this line, I devised the tool shown in the accompanying illustration, which I have found very convenient in armature work, not only in lifting coils, but in forming and packing the end connections and in driving them into place in the slot. As can be seen in the figure, it is simply a piece of flat tool steel about 3/16 by ½ inch, with one end shaped to fit in a handle and the other tapered an indicated. All corners and points are nicely smoothed with fine emery cloth to prevent cutting the insulation of the coils.

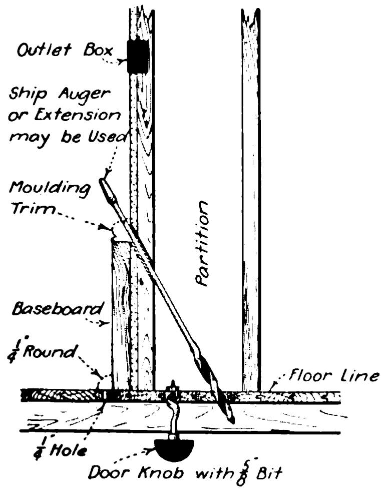


Coil Lifter.

W. R. Smith.

Wiring Old Houses.

The accompanying illustration shows two methods to be used in running wire for a side outlet in a finished house. Most houses have a strip of quarter-round at the bottom of the baseboard, which can be removed by punching the nails through. Then a quarter-inch or five-eighth-inch hole can be bored through the floor, a piece of floor taken up and a hole bored behind the wall by using a bit in a door knob. This is indicated in the figure.



Two Methods for Wiring in Finished House.

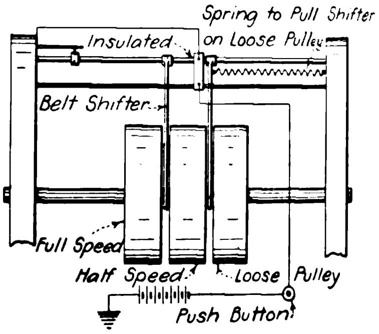
Another method is to remove the molding trim and drill through part of the baseboard and part of the plaster at such an angle as to strike the floor and bore clear through it, as is also shown in the illustration. In this way I have often fished from the center ceiling-outlet pocket without removing a board near the outlet. Both of these methods make a clean job and no traces of the work done are left.

Charles Becker.

Electric Stop for Warping Machine.

I recently had the problem of installing a stop-motion system on a new warping machine. After failing with other methods, the following was found to work satisfactorily.

An electric door lock was used and mounted on the belt shifter of the machine, which was made of insulating material. The catch prevented the belt shifter from moving, normally. There was also on the rod supporting the belt shifter a set screw which made contact with an insulated connection on one side of the lock. When current was applied to the lock, the catch released and a spring would pull the belt shifter over so that the belt was shifted to the loose pulley and the machine was stopped. The machine was wired so that if a thread broke the machine would stop. There was also a chain with a large link over a gear for measuring purposes. This was arranged to make contact and stop when a definite number of yards had been run off. The machine may also be stopped by using the push button shown in the diagram. The other stop contacts are wired to be in multiple with the push button. The frame of the machine is used as a ground to complete the circuit. The lock and catch are insulated from the machine.



Electric Stop for Warping Machine.

When half speed is required the lock and set screw are shifted to correspond to the half-speed pulley. An annunciator was also installed to indicate in which row the thread was broken.

William T. Estlick.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Pacific Gas and Electric Company. W. J. Freeman, of Madison, Wis., engineer with the Wisconsin Railroad Commission, has been chosen as the Arizona Corporation Commission's member of the board of appraisal in the case of the Pacific Gas and Electric Company. Recently the Commission and the gas and electric company agreed on rates for gas and electric service but there were a number of items left to be determined by a board of appraisal. The gas and electric company selected R. S. Masson as its member of the board and the two will select a third member.

CALIFORNIA.

Jurisdiction of the Commission. The Railroad Commission has petitioned the State Supreme Court to reverse its opinion in the Oro Electric Corporation case which denied the Commission the right to protect from competition a public service company subject to its regulation. Because of the importance of the issue affecting the jurisdiction of the Commission, the case will undoubtedly be taken to the United States Supreme Court if the state court refuses to change its position.

Rates Reduced. The Commission found that the rates of the Bakersfield Gas and Electric Company were unreasonable and established a lower schedule.

GEORGIA.

The Supreme Court has handed down a decision sustaining the contention of the Macon Railway and Light Company that contracts entered into during the competition with the Georgia Public Service Company are now void and that the advanced rates prescribed by the Commission, February 24, 1914, are now effective.

IDAHO.

The Washington Water Power Company was granted a certificate of public convenience and necessity authorizing the construction and maintenance of transmission lines along all the roads of Latah County, Idaho, for the purpose of transmitting electricity for electric light, heat and power purposes with the right to furnish persons situated along such roads with electricity.

ILLINOIS.

Municipal Utilities. It is alleged in the case before the circuit court of Sangamon County, that the city of Springfield in extending its electric lighting plant without securing permission from the Commission is violating the Public Utilities Act. This contention is made on the ground that the exception of municipal corporations from the control of the Public Utilities Commission is invalid, being in violation of the constitutions of the state and United States, and the municipal corporations must obtain a certificate of public convenience and necessity before beginning operation, the same as a private corporation.

The Spring Valley Utilities Company was authorized to construct and maintain an electric light plant and distribution system in the village of Mineral. A branch high-tension line is to be constructed from its main transmission line at a point west of the village of Buda, to Mineral, and the company has the right to furnish customers along this line and within the village of Mineral.

Ordinance of the City of Aurora. Upon petition of the city of Aurora, the Commission issued an order requiring the Chicago Burlington & Quincy Railroad Company, Western United Gas & Electric Company, Chicago Telephone Company, Interstate Independent Telephone & Telegraph Company, Aurora, Elgin & Chicago Railroad Company, Elgin, Joliet & Eastern Railway Company to make the necessary changes in their respective properties and equipment to comply with a city ordinance in the matter of elevation and separation of the tracks of the first named company.

MASSACHUSETTS.

Proposed Legislation. A bill is under consideration which would grant the Board of Gas and Electric Light Commissioners the right to determine what price should be paid for existing lighting plants upon purchase by municipalities. The only appeal allowed from the findings of the Board will be on questions of law.

NEW YORK.

The Syracuse Lighting Company was authorized by the Public Service Commission, Second District, to construct a transmission line in the village of Minoa, Onondaga county, for the purpose of furnishing and supplying electric light, heat and power in the village.

The Rockland Light & Power Company was authorized to issue $463,000 of its capital stock, to be sold at not less than par, the proceeds to be used for the following purposes: to acquire the entire capital stock of the Rockland Electric Company of New York; to acquire and discharge the notes of the Rockland Company of New York of the principal sum of $202,000; to acquire $12,000 par value of the capital stock of the Rockland Electric Company of New Jersey; to pay and discharge its notes or evidence of indebtedness of the principal sum of $15,000 incurred for capital purposes outstanding December 31, 1912; and to pay and discharge current obligations of the Rockland Light & Power Company incurred for capital purposes due and owing December 31, 1912.

The Peoples Electric Light & Power Company. The Commission dismissed the complaint against the Peoples Company of Silver Creek as to conditions of its overhead systems, it appearing that the company is without funds to make any improvements because of the limited income from its business, but that the company would continue to maintain its plant and equipment in a safe and usable condition.

New York Telephone Company. The complaint of residents of the village of Weedsport against the company in the matter of proposed increase in telephone rates was dismissed without prejudice to the renewal of the complaint upon good cause shown at any time the complainants may desire to reopen it.

The Commission dismissed the complaint against the New York Telephone Company, asking for extension of telephone line to serve complainants in Wheatland, Munroe county, and Caledonia, Livingston county, it appearing that the company is willing to make the extension necessary to furnishing such service.

Complaints Dismissed. Complaints of residents of Garden City, Long Island, against the Nassau & Suffolk Lighting Company and the Nassau Light & Power Company as to rates charged for gas and electricity were dismissed. The allegations contained in the complaints were not sufficiently specific and the complainants failed to submit an amended complaint as requested by the Commission.

The New York Gas Company applied for authority to transfer its franchises, works and system together with a contract with the Iroquois Natural Gas Company to George Clinton, Jr., for $8,500. The application was dismissed, it appearing to the Commission that such transfer would be contrary to the provisions of the law applicable thereto.

The Rochester Railway & Light Company was authorized to issue $642,548.80 par value of 5-per-cent 50-year consolidation mortgage gold bonds to be sold for not less than 97 per cent of par value and accrued interest, the proceeds to be used for the discharge and payment of underlying real estate mortgages.

OHIO.

The Eastern Ohio Telephone Company was ordered to make certain changes in rates and practice.

PENNSYLVANIA.

Municipal Corporations. The Commission has issued a ruling that a municipal corporation wishing to engage in public service work stands on the same plane as a private corporation, and must secure consent of the Commission before engaging in business.

WISCONSIN.

The Chippewa Valley Railway, Light & Power Company was authorized to issue $6,000 of preferred stock for the purpose of purchasing the property of the Inter-County Light & Power Company of Elmwood.

Duplication of Service. Objection was filed by the Theresa Union Telephone Company to certain of the proposed extensions of the Mayville Rural Telephone Company in the towns of Theresa and Herman. The complaint alleged duplication of lines. The Commission found that public convenience and necessity did not require the extensions where the lines of the two companies would parallel, but the Mayville Company was allowed to proceed with the other extensions planned in territory where there would be no duplication of service.

Changes in Telephone Rates. The application of the Ripon United Telephone Company to increase rates was granted in part only. The company wished to increase its charges in order to meet the additional expense which would be occasioned by changing its system from magneto to common-battery system. Certain changes were made regarding rural service rates and the charges to city subscribers were slightly increased.

The application of the Ettrick Telephone Company to increase rates was favorably passed upon by the Commission. In its petition the company sought to have different charges for subscribers and non-subscribers. The Commission points out that this is an unjust discrimination and the charges ordered in effect were modified so as to eliminate this discrimination.

Permission was given the Badger State Telephone and Telegraph Company operating at Niellsville, Granton and vicinity, to increase its telephone charges as shown in its petition except as to rural subscribers. The increase to the latter class of subscribers was not allowed in full. The rules of the company were also reviewed and certain modifications made.

Curtiss and Withee Telephone Company vs. The Owen Telephone Company. The Commission rendered a final decision in this case. An order had been previously entered compelling the respondent company to reconnect the petitioning company to its line until such time as the Commission could pass upon the merits of the dispute ever the charges to be made for such connection. The Commission now finds that the petitioner had agreed some years ago to transfer its property in the village of Owen to the respondent on condition that the respondent would give connection to the petitioner's subscribers at a flat rate per annum and an optional message rate. The Commission held that the rates then agreed upon were reasonable except the message rate, which was modified so as to bring about a decrease in the charge for service.

Telephone Security Issues Authorized. The Plankroad Telephone Company was authorized to issue $200 of stock.

The Marion and Northern Telephone Company was granted authority to issue $350 of preferred stock and $1,000 of common stock. The purpose of the issue is to secure funds for rural extensions and the purchase of telephone instruments.

The Ogema Telephone Company's application for authority to issue $3,500 of stock, the proceeds of which was to be used toward the payment of indebtedness incurred by the company in extending its telephone lines, was granted by the Commission.

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Germany now uses between forty and fifty million gallons of denatured alcohol a year, of which over thirty million gallons are sold to the general public for burning purposes. France uses about eighteen million gallons per year, the United States about ten million gallons, and the United Kingdom four million.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—Panama Canal Locomotives.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 219.—Reversing Electric Toy Train—Some electric toy locomotives are made to reverse by means of a reversing switch on the locomotive, but this requires stopping the train and changing this switch. Is it possible to arrange the outfit so that reversing can be done from the control station without touching the locomotive I have been told it would require four rails for each track. Can this be done with only the three rails usually provided?—D. H. S., Rockford, Ill.

No. 220.—Patentability of Combination Invention.—If a person invents an entirely new device by bringing about, after prolonged experimentation, a very difficult but successful combination of parts already in use, can a patent be secured on the new device? For example, I have been told that the new nitrogen-filled tungsten lamp cannot be patented because nitrogen and other inert gases had already been used during the early development of incandescent lamps and concentrated tungsten filaments have been employed in standard tungsten lamps for a year or more. Is this matter covered by the patent laws or has the practice been determined by the courts?—J. W. T., Toledo, O.

No. 221.—Quartz Lamps on Alternating-Current Circuits—Why can the ordinary quartz-tube lamp not be used on alternating-current circuits? Are any such lamps available for these circuits?—B. W., Denver, Colo.

Answers.

No. 213.—Electric Motorcycle.—Is there on the market at the present time an electrically propelled motorcycle or quick-delivery car? If so, please describe same briefly and give manufacturer's address.—A. J. L., Hazelton, Pa.

To the writer's knowledge, there is no electric motorcycle on the market today. There has been, however, an electric motorcycle developed by an actor who is at present living at the White Rats Club, New York City. The machine consists of a stage bicycle from which the pedals have been removed and a countershaft substituted, to which has been attached a Gray & Davis six-volt automobile-engine-starting motor, and two sets of three cells each of Vesta storage battery. The motor is capable of developing as high as 1.25 horsepower, and a simple double-pole knife switch serves to start and stop the motor, and is operated by foot. The inventor claims that the wheel can travel at 25 miles an hour for more than six hours. Due to the flexibility of the electric motor and the more nearly perfect torque as compared with the gasoline motor, as well as the lightness of the amount (with batteries it tips the scales at but 150 pounds), hills prove no obstacle, despite the low power of the motor.—E. J. R., New York, N. Y.

The only electric motorcycle that I ever heard of was through the Grand Rapids press a few years ago. If I remember rightly, it was made in Detroit, Mich., by a man named Woods. It carried a 30-volt storage battery set lengthwise of the machine. The motor was under the seat and was belted to the rear wheels. The machine weighed less than 200 pounds and was capable of making 20 miles an hour. Various speeds were obtained through a battery selector controlled by the grips on the handlebars.—C. S. K., Grand Rapids, Mich.

[In the Electrical Review and Western Electrician of August 12, 1911, a description was published of an electric motorcycle invented by F. E. Hatch and manufactured by the Electra Cycle Company, 313 North Ashland Avenue, Chicago, Ill. No trace of this firm nor of the inventor has recently been found, however.—Ed.]

No. 215.—Suction Street Sweeper.—Has the use of electrically operated suction street sweepers ever been tried out by any street-railway company to keep its tracks free from dust and dirt? The kind I have in mind would be operated from the trolley line just like a snow sweeper, but instead of throwing the dirt over the rest of the street would suck it up into a dust compartment.—V. B., Milwaukee, Wis.

In this part of the country the city takes care of the cleaning of the whole street, which does away with the necessity of the street-car companies doing any thing of that sort. There is no question, however, but what such a cleaner would be a success, as gasoline-driven cleaners are already in use and are proving very satisfactory.—J. H. M., San Francisco, Cal.

Although no street cleaners of the type referred to have been used to my knowledge, this is chiefly due to the fact that street-railway companies are prone to shirk any special cleaning of the tracks and will throw this burden onto the city, despite the saving that would be effected in the cleaning of the cars and the greater comfort to passengers from riding in cars free from dust pollution. The plan proposed by V. B. is entirely practical and could be carried out very successfully at relatively low cost. Storage-battery-driven street-cleaning and sprinkling machines have been used in several European cities with success, therefore similar machines operated by trolley current should be even more successful. If the track roadbed is kept quite free from ruts and bumps, a suction machine should be the ideal type of cleaner for this purpose. The additional power required to operate the suction machinery is not very great with a well paved track and is already available from the trolley line. Where the company is not obligated to keep its tracks swept, it might take over from the city this part of the street cleaning and derive some revenue thereby.—L. C. M., Chicago, Ill.

No. 217.—Telephone Generators.—Why will a 2,000-ohm telephone generator when turned 120 revolutions per minute make a 10-volt, 15-watt Mazda lamp burn up to about two-thirds candlepower while it will not make a six-volt Mazda lamp of any candlepower that I have turn even red? It will also make the low of a 110-volt Hylo lamp burn up to and over candlepower.—C. M., East Las Vegas, N. M.

Some telephone hand generators give a difference of potential of over 100 volts, on open circuit, when turned at normal speed. But owing to the high impedance of the armature, such generators cannot generate a current of more than a fraction of one ampere, even when short-circuited. A 110-volt Hylo lamp of the Mazda type requires only about 0.05 ampere, on low. The telephone generator will generate this volume of current at a sufficiently high voltage to light the lamp. A six-volt lamp requires a large volume of current in proportion to the watts consumed. For example, a 12-watt, six-volt lamp must have two amperes to make it burn at full candlepower. I doubt if there is a telephone hand generator made that will give more than one-third ampere. A 10-volt, 15-watt lamp requires 1.5 amperes at full efficiency and more than one ampere at two-thirds candlepower, so I think the party asking the question must be mistaken in regard to the rating of the lamps referred to.—W. F. H., Gordon, Neb.

It is assumed that the generator in question is of the magneto type, having permanent magnets for fields, and delivering alternating current at the terminals. The fact that such a generator will light the "low" of a 110-volt Hylo lamp and will operate a 10-volt, 15-watt Mazda lamp at about two-thirds candlepower, but will not light a six-volt Mazda lamp is due to the characteristic of the machine and the fact that the current necessary to light six-volt Mazdas of any candlepower is beyond the capacity of the generator. Generators of this type have a drooping characteristic, that is when run at constant speed the terminal voltage decreases along a curve as the load is increased. The shape of the curve will depend upon the design of the machine, but in all generators of this type it falls off very rapidly as the full-load output is exceeded, on account of armature reaction and the high impedance of the armature circuit. The normal current of a 10-volt, 15-watt Mazda is 1.5 amperes and its resistance when hot is between 6 and 7 ohms. As the lamp was operated at about two-thirds candlepower, the current was probably not in excess of 0.5 ampere and its resistance was probably in the neighborhood of 7 ohms. On these assumptions the voltage at the lamp terminals would be approximately 3.5 volts. The resistance of the six-volt Mazda would be less than 7 ohms and the voltage which the machine could maintain at the lamp terminals would be proportionately less than 3.5 volts and not enough to operate the lamps. The "low" of the Hylo lamp was operated at full candlepower because of the small current required and the high resistance of the lamp circuit.—H. S. P., New York City.

[Similar answers from C. E. R., Menominee, Mich., and H. E. W., Chicago.]

Choice of Electric Motors.

In a paper by E. F. Butler on "The Operation and Maintenance of Electric Motors," recently read before the Junior Institution of Engineers, the author pointed out that as regards maintenance the object was to run the plant with as few interruptions as possible and without excessive cost. A frequent cause of trouble was that installations were put in without taking account of the working conditions and the class of people by whom the machinery was to be handled. To get the best results the upkeep of the plant should be considered before it was installed, and the points to which special attention should be paid were suitability to the requirements, accessibility, the use of the smallest possible number of different sizes of motors, and standardization in every possible way, so that the number of spare parts and replacements which had to be kept in stock might be reduced to the utmost. In regard to the choice of motors and their control gear, the author enumerated the constructional features which should be found in a good machine and gave a series of practical hints for remedying faults.

THE EFFICIENCY OF ELECTRICITY TO THE HOUSEKEEPER.

By Helen L. Bartlett.

The problems of the household are more difficult today than they have ever been, for each advance in science, each modern invention, has brought in its wake new responsibilities and new duties. With the increase of modern conveniences has come increased care. Standards of living have changed as well, and greater perfection in all household service is demanded of the home-maker.

Much progress has been made, but even today the housekeeper is often a little slow in availing herself of the latest modern appliances. This is partly because of the common feeling that what our fathers and mothers knew is good enough for us, and partly because so much of the information is still locked up in more or less technical books. On the other hand there are those, like ourselves, seeking to apply every efficiency method to the home.

As a teacher of home economics, I am greatly interested in electric cooking. While the food question is by no means the one thing in housekeeping, as it is apparently so often considered, it yet is of real and vital importance.

The housekeeper who desires to make the most of her opportunities, to contribute her ability to the welfare of her family, should keep an open mind toward new knowledge. Now it is time for a new and better way—The Electric Way.

Electric cooking is as superior to fire cooking as the electric light is to the tallow candle.

First I wish to explain the installation; secondly, how to operate cooking utensils; and the most important of all, the advantages of electric cooking.

The expense of installing special wiring in houses already completed is far less than is generally supposed. The clever way electricians have of fishing wires between walls, makes the job much simpler than one would believe possible, and rarely occasions much noise or litter about the house.

Only appliances consuming more than 600 watts require special wiring, and can not be connected to a lamp socket, for example: the electric range or oven; all the others may be attached to the ordinary lamp socket.

When an electric cooking appliance of reliable make fails to produce satisfactory results, a voltmeter, applied while the maximum current is being used, will almost always show that full voltage is not being delivered.

The final connection to the appliance is usually made with a flexible cord or cable, with a plug on the end which is simply pushed into an outlet in the baseboard or wall provided for it.

Miss Bartlett is teacher of cooking at the Salt Lake High School, Salt Lake City. The article herewith formed the basis of a paper read before the Home Economics Section of the Ladies' Literary Club of Salt Lake City, and it was read later to the members of the Utah Electric Club. It was so favorably received and attracted so much attention from many quarters that it is believed that a great many of our readers will find some of its statements and suggestions particularly helpful in their new-business work.

Thus the portable feature of the appliances can be fully utilized, and they may be used in any room of the house.

One must know how to operate electric cooking appliances because electric cooking is different from fire cooking.

In fire cooking we have become accustomed to wasting over nine-tenths of the heat. In electric cooking one must learn to utilize the heat with as little waste as possible.

Be sure to shut off the current, when it has done its work; furthermore, the heat stored in the stove will keep the food boiling for some time after the current is shut off. Much current is saved by switching it off some time before the food is done, thus making the stove an excellent fireless cooker.

Do not expect food to heat up as rapidly as on a hot wood, coal or gas stove, in all of which, from 10 to 30 times the heat needed is wasted and naturally there is heat to spare—and food is often scorched. Use the high heat only long enough to bring the food to the boiling point, then keep it boiling on the medium or low heat.

For electric cooking use only utensils made of copper, aluminum, tin, steel or nickel ware. These materials are good conductors of heat and lose little by radiation. Do not use granite ware—granite is a heat insulator.

Never use utensils with a bulging bottom; it must be flat or slightly concave. Those that are made to fit and lock on, utilize all the heat, for there is a perfect contact of utensils with the stove; also there is no danger of the utensil being knocked off the stove. Keep the dish covered; that confines the heat and is better for the food.

Then there is the electric oven. Ovens in other stoves are ventilated to let the fumes and odors of the fire escape and they have heavy walls in which the heat is stored. The electric oven, on the other hand, is tight; the work of baking is done by clean hot air which must not be allowed to escape. Therefore, keep the oven door closed and watch the baking and roasting through the glass door.

Cooking by electricity is very simple because there is nothing complicated or fussy about it. There are no matches to strike. When you want heat you have it for the simple push of a button or turn of a switch; and when through, a turn of the switch stops it that second.

There are no fire combustions, therefore no smoke to dirty the operator or the walls and ceilings, no ashes, no burnt matches, no fumes.

The cooking utensils keep cleaner outside and are easy to clean inside because the food rarely scorches or sticks to the dish. Food seldom boils over, and if it does, there are no little holes or slits to clean, for electric stoves are simple in construction.

Electrically cooked food is healthful, for electric heat is perfectly clean. Electricity does not poison the air. An ordinary candle uses up almost as much air as a person. Compare a candle with the burners of a gas stove and think what they do to the air. Electricity does not leak, and if it could it would do no harm. Gas leaks out through the valves and from the joints around the stove.

Gas ovens must be ventilated to allow the fumes of the fire to escape. Not so with the electric oven, which needs no ventilation. Therefore, the oven is built tight and as a result the nutritive value of the food is conserved. Bread has a more tender crust, meats shrink less because the valuable juices are not dissipated, and all foods cooked in the electric oven are more palatable and digestible.

In cooking by electricity you do not speak of "working over a hot stove." The heat is confined to where it does its work; it is not wasted to heat up the room or the operator.

Electric cooking is safe because there are no matches. Matches cause over $3,000,000 fire damage every year. Matches are poisonous and a thousand children die each year from eating their tips.

There is no flame to burn you; it does not flare up nor does it go out when turned down low. Gas often does, and you know what happens then. Gas mixed up with air and ignited explodes and has caused many serious accidents.

Cooking by electricity is economical because the heat is applied where needed and nowhere else; very little of it goes to waste. Current is used only while actually needed and expense stops the instant it has finished its work. Most operations are completed with the stored-up heat, the current being turned off some time before finishing, as in the fireless cooker.

It saves the food, which is rarely lost by boiling over; it seldom scorches or sticks to the utensils. It saves the expense of redecorating, on account of cleanliness. The cost of refinishing a single room will pay for a large amount of current, to say nothing of the annoyance of painters and calciminers around. Electric cooking saves labor and time in the cooking itself, as well as in keeping the kitchen and clothing clean. It often saves the expense of a servant, for it means freedom from the hardship of working in a hot room.

It means that you can dress for dinner, cook it, serve it hot, and be in condition to sit down and enjoy it yourself.

Cooking by electricity is a pleasure because all of the drudgery is gone; it means better cooking with greater certainty as to results.

Therefore, the advantages of electricity for cooking are many, as it is simple, clean, healthful, safe economical and pleasant. It means working in a modern sanitary way—the science of housekeeping realized.

The British Wireless Chain—Particulars of Stations.

In the course of a paper on wireless telegraphy read before the North East Coast Institution of Engineers and Shipbuilders, England, in which the subject was covered generally and a comparison of different systems made, H. Fothergill on April 23 gave the following details of the stations which will form the British imperial wireless chain.

Six high-power stations are to be erected. One station in England for signaling in the direction of Egypt; a station in Egypt for communication in three directions—India, East Africa and England; a station in the East African Protectorate for communication in two directions—Egypt and South Africa; a station in the Union of South Africa for communication in the direction of East Africa; a station in India for communication in two directions—East Africa and Singapore; and a station in Singapore for communication in two directions, namely, India and Australia, where the erection of another high-power station is receiving consideration. These stations will be operated on the high-speed automatic system, and will be worked duplex.

The wave-lengths of all stations will be as great as possible within the limits of 15,000 and 50,000 feet (consistent with keeping the capacity, inductance and size of the aerials within reasonable limits) in order to ensure reliability of reception at all times of the day and night; but the wave-lengths transmitted from any one station will be in all cases at least 25 per cent different from those transmitted from other stations within its normal range, and with which it has to communicate. In all cases there will be a difference of five per cent between the wave-lengths emitted from any one station in order that each corresponding receiving station with which this station has to communicate may be able to tune out the waves emitted by the said station for the other station or stations with which it is also communicating. Where a station is required to communicate in more than one direction, a separate transmitting aerial and a separate receiving aerial will be provided for each direction The note of each station will be different from those of any other stations within its range, but the notes of each transmitting circuit in any one station will be identical.

The power plant at each station will be in duplicate, and will include two water-tube boilers, each capable of generating sufficient steam for the whole requirements of any one transmitting circuit. In the case of station required to send in two directions three boilers will be provided; and in the case of the station in Egypt, which is required to transmit in three directions at the same time, four boilers will be provided. The boilers will supply steam to turbines directly coupled to alternating-current generators which in turn will be coupled to revolving-disk dischargers. The total power, including spares and auxiliaries at the terminal stations will be approximately 1,300 horsepower, and the power at the intermediate stations will vary from 1,900 horsepower to 25,000 horsepower. Two auxiliary sets will be provided at every station, each consisting of a turbine coupled to a direct-current generator for supplying exciting current to the alternators and current for lighting and other auxiliary purposes.

The transmitting aerials will be of the multi-wire directional type and will consist of a number of horizontal parallel wires supported 300 feet high by 10 masts, each wire being composed of seven strands of No. 19 S. W. G. silicion-bronze wire and brought down at one end to the transmitting station. The masts will be of the sectional-steel tubular type, the aerial wires passing through insulators attached to triatics stretched between pairs of masts, each mast being capable of withstanding a permanent horizontal strain of not less than two tons at the head of the mast, in addition to windage calculated at the rate of 30 pounds per effective square foot. The center line through the horizontal portion of the aerial will coincide with the line of direction of the station with which it is desired to communicate, the free or elevated end of the aerial pointing directly away from the communicating station. The size of the aerials in each case will depend upon the length of wave emitted, but in no case will the length of each aerial be less than one-twelfth of the wave-length that the aerial is required to radiate.

The ground system will consist of a series of galvanized-iron plates buried in a symmetrical position relatively to the station house and connected to it by a system of radial conductors of galvanized-iron wire leading to each plate from another set of plates buried around the station building.

Each transmitting circuit at each station will be provided with five transformers and a condenser consisting of about 500 cells. The high-frequency transformer for each circuit will comprise a multi-stranded primary conductor forming part of the oscillatory circuit, and a secondary winding connected to the radiating circuit and consisting of a special solenoid of similar cable to the primary winding but of smaller size. These primary and secondary windings will be entirely separate and arranged to be moved away from each other so that the coupling of the two circuits may be varied. The disk discharger in the oscillatory circuit will consist of a studded wheel, the number of studs corresponding to the number of the alternator poles, so that the condenser can be discharged at the moment of maximum amplitude in each alternation of the current. The two side electrodes, between which the moving studs pass, are of special construction and consist of slowly revolving disks so as continually to present a cool surface for the discharge.

The receiving and operating stations will be less than 10 miles distant from the transmitting stations, and will be provided with balancing aerials so as to prevent interference by the waves radiated from an adjoining transmitting station. The receiving aerials will consist of one or more silicon-bronze, stranded conductors about 8,000 feet long and arranged similarly to the wires of the transmitting aerials. The operating room will be fitted with Morse hand keys and Wheatstone or other automatic transmitters of similar type. These will be connected by means of wires to the transmitting station which will be operated from the receiving station.

Electrical Convention in England.

English municipal electric supply engineers and committeemen forming the Incorporated Municipal Electrical Association, will hold their annual convention from June 15 to 20 at Birmingham, England. R. A. Chattock, city electrical engineer of that place, is president. W. A. Vignoles is to open discussion of the subject of "Commercial Development of Electrical Supply in Towns of Moderate Size"; J. H. Bowden will introduce "Standardization of Tariffs;" and S. E. Fedden will read a paper on "Design and Operation of Modern Boiler Plants."

ELECTRICITY AND MATTER.[1]

By Henry S. Carhart.

I am well aware that my subject is a difficult one; it does not lend itself readily to popular exposition and illustration. But it has intrinsic attractions, for men of philosophic mind have ever inquired into the nature and constitution of matter; not of forms and organisms alone, but of the ultimate nature of the material out of which the whole physical universe is made. I say the whole physical universe advisedly, for during the past century the spectroscope has revealed to us the existence in sun and stars of the same elementary substances that are present in the earth. Indeed, the discovery of helium in the sun preceded its discovery in the earth by 30 years, thus reversing in a most remarkable manner the order of identification of terrestrial and solar elements.

Interest in the inquiry relative to the nature of matter has been enormously stimulated by the revolutionary discoveries of recent years, made through the agency of electricity. In fact, more progress in this field has been made in the last 35 years than in any preceding century. The point of attack has been matter in the gaseous state, and the instrumentality, the discharge of electricity in high vacua. I hope to give in a brief way some of the successive steps by which these discoveries have been made.

It is now 35 years since Sir William Crookes made his epochal discovery of matter in what he aptly and prophetically termed the fourth, or ultra-gaseous, or radiant state.

The discovery of X-rays by means of Crookes tubes was announced by Roentgen in 1895. They are produced in some mysterious manner when cathode rays are suddenly stopped, especially by heavy substances like platinum. Their most striking properties are their ability to penetrate thin metallic sheets and other opaque substances, their effect on a sensitized photographic plate, and their power of exciting fluorescence in certain salts, especially plation-cyanides. It is by means of this fluorescence that we are enabled apparently to look through opaque bodies.

The activities of X-rays in promoting photographic changes led directly to the discovery of the radioactivity of uranium by Becquerel in 1896. Becquerel found that uranium salts give off spontaneously radiations capable of passing through black paper and thin sheets of aluminum foil, and affecting photographic plates, as X-rays do. These radiations are not modified in any way by the most drastic physical treatment of the uranium, whether of heat or cold or other physical changes. You know that Madame Curie in the search for other radioactive substances discovered the most remarkable element known to science; I mean radium. One of the striking properties of radium is its ability to promote the discharge of electrified bodies. This means that the radiations from radium are able to ionize the air, that is to resolve it into parts which are carriers respectively of positive and negative charges of electricity; for gases do not conduct electricity unless they are first ionized. The charged ions then move with their charges, thus conveying a current.

It is necessary at this point to make a slight digression for the purpose of describing the composite nature of the radiations from radium and similar bodies. There are three sorts of radiations from radium, which are known as alpha, beta and gamma rays or radiations. None of these are rays in the sense in which the word ray is used in light, with the possible exception of the gamma rays. The beta rays have been identified with cathode rays in a Crookes tube. They consist of minute particles carrying or composed of the same quantity of negative electricity, and they are called electrons. They are the same whatever their source, and they travel with a speed of the same order as the velocity of light.

Alpha rays are positively charged radiations, traveling with a much smaller velocity than that of the beta rays. They have now been definitely identified with the atom of helium. Alpha rays have only relatively slight penetrating power and are quickly absorbed.

Gamma rays are uncharged or electrically neutral radiations, and quite analogous to X-rays. Their penetrating power is immensely greater than that of either alpha or beta rays. Since they are not electrically charged, they are unaffected by either electric or magnetic forces.

Even beta rays may be resolved into many distinct groups which suffer different deflections under the influence of a magnetic field.

Some 30 years ago Aitkin made the discovery that fine dust particles serve as nuclei for the condensation of moisture and the precipitation of rain. Sudden expansion of saturated air causes a precipitation of a fog if dust particles are present; in their absence it was concluded that the expansion and consequent cooling must be carried much further than is necessary for condensation when dust nuclei are present. But when no cloud was formed in dust-free inclosed air by sudden expansion the heating to redness of a platinum wire in the inclosure was immediately followed by condensation. The scientific men of that day, including Sir Oliver Lodge, did not imagine that the hot platinum wire gave off anything but dust and invisible smoke. At that period the electron was not even known, much less its function in ionizing the air and thus furnishing nuclei for the condensation of moisture. It has now been abundantly demonstrated that alpha, beta and gamma rays all produce ionization of gases, and that these ions in turn condense moisture. Thus a way has been opened to make visible the track of electrons and alpha particles. C. T. R. Wilson, of England, has been most ingenious in devising methods of making visible the trajectories of flying particles and even of photographing them. So now we have lantern slides to bring to the eye evidence of the presence and efforts of these smallest known bodies of the physical world, these ultimate corpuscles of matter or electricity, whichever it may be.

The path of an individual alpha particle is shown by the condensation of water on the ions formed in its path, and is seen as a straight luminous trail, which was photographed.

A similar effect is produced by beta particles, but the trail is not so intense and is discontinuous, showing the condensation on individual ions, on account of the higher speed and smaller ionization of the lighter and swifter particles.

The number of ions produced in air at atmospheric pressure depends on the speed of the particles. For alpha particles it varies from 2,000 to 6,000 per millimeter of path, that is, between 50,000 and 150,000 per inch. The high-speed beta particles in general are much less efficient ionizers; they produce not more than 20 or 30 ions per millimeter of path, that is, 500 to 750 per inch. In most cases the number of ions produced is minute compared with the number of molecules present. It is possible to detect the presence of one or two ions in a cubic centimeter per second, while the number of molecules in a cubic centimeter at standard temperature and pressure is 2.7×10^{19}.

Beta rays, you will recall, consist of electrons. The electron is often called the "atom of electricity." It is probably the ultimate element out of which all matter is built, or at least, it enters into the structure of every atom of matter. Until recently the atom of hydrogen was supposed to be the smallest existing mass of matter. The atom, as the word signifies, was the ultimate mass indivisible by any known means. But the electron has a mass only 1/1800 as great as the atom of hydrogen, and all electrons are the same, whatever be their source. Thus the old "atom" of chemistry has lost forever its character as the ultimate body into which matter may be resolved. Instead of 60 or 70 elementary atoms, we now have one ultimate electron; even that may be only negative electricity, for its mass is not a constant, but varies with its velocity. If its velocity approaches that of light, its mass is nearly trebled as compared with a velocity one-third that of light. Even the constancy of the mass of matter is therefore brought in question by these latest discoveries on the borderland of matter. The change of mass incident to high velocity is too infinitesimal, except in the case of high-speed electrons, to affect in any appreciable degree the masses known to astronomy and the ordinary masses of physics and daily life.

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[1] Lecture delivered in extension course of Throop College of Technology.

The old alchemists sought in vain to transform one element into another. The object of their research was the production of gold and not pure science. Their failure has in it a lasting lesson for men of science. Not mere commercialism, but the love of discovery must be the chief stimulus and ruling impulse in scientific work. The marvel now is that in this new century the discovery of the spontaneous transmutation of one element into others in three or four stages has put to shame the fettered imagination and the commercialized search of the alchemists.

The oxide of uranium was discovered in 1789 in the mineral pitchblende, which is now the chief source of radium. It was not until 1840 however that metallic uranium was reduced from one of its ores. Uranium compounds are now manufactured in large quantities. They impart to glass a rich yellow-green color, which fluoresces in the light of a Geissler tube.

Uranium has the highest atomic weight of any known substance, namely, 238.5 times the atomic weight of hydrogen. It is ordinarily obtained from the mineral uranite, where it is always associated with the other radioactive substances, ionium, radium, and actinium. This association was suggestive of the transformation of an element of high atomic weight into others of successively lower atomic weight. Such has been found to be the case. Uranium is the parent of ionium, and ionium is the parent of radium. Uranium is thus the primary source from which radium is derived, and radium is a disintegration product. Further, radium gives off a gas known as radium emanation, which is also radioactive, that is, it emits alpha, beta and gamma particles. The radium atom disintegrates with the expulsion of an alpha particle, and the residue of the radium atom becomes the atom of the gaseous radium emanation. Now if this gas is sealed in a small spectrum tube and examined with a spectroscope, after a few days the characteristic spectrum lines of helium appear. Thus a known element is produced during the transformation of radioactive matter. The alpha particles expelled from radioactive matter, after losing their positive charge, become atoms of helium. It has been conclusively shown that alpha particles from all types of radioactive matter are identical and consist of helium atoms carrying two positive charges, each equal to the charge on a negative electron. Every radioactive substance, which emits alpha particles during its transformation, gives rise to helium in proportion to its rate of emission of alpha particles. As an example of successive atomic transformation we have the established series, uranium, ionium, radium, helium.

The disintegration of uranium results in the expulsion of eight atoms of helium. The atomic weight of helium is very nearly four, and the eight atoms therefore weigh 32. Deducting 32 from the atomic weight of uranium, 238.5, there is left 206.5. This is very nearly the atomic weight of lead, 207. Hence the suggestion that the end product of the disintegration of uranium is lead. The evidence derived from the study of uranium minerals makes it almost certain that lead is the final product of the disintegration of uranium. Much uncertainty remains relative to the end product of other radioactive substances. Atomic explosions result in a loss of alpha, beta and gamma particles, until the excess energy is exhausted and only the end product in each case remains.

The proof that negative electrons exist in all kinds of matter has given a great impulse to the study of the constitution of the atom. The evistence of atoms and molecules has been in no way changed by the discovery of electrons and their properties; but instead of pausing at the atom as the ultimate form of matter, the investigation is now carried further into the constitution of the atom itself.

One of the earliest hypotheses relative to the structure of the chemical elements was that they are built up of hydrogen. The atom has generally been supposed to consist of a number of positively and negatively charged particles held in equilibrium by electrical forces. These particles are no longer conceived to be hydrogen atoms, but the much smaller particles now known as electrons or aggregations of electrons. Thus the present prevailing view is that the atom consists of a sphere of positive electrification surrounded by a number of negative electrons moving around in minute orbits. Sir J. J. Thomson has investigated the several possible stable arrangements, and has found that different groupings differ widely in stability. Some may acquire an extra electron or two and yet remain stable. Others readily lose an electron without disturbance of their stability. The former would correspond to electronegative atoms; the latter to electropositive ones.

Atoms consisting of a number of revolving electrons may radiate energy very slowly, but the continuous drain of energy will finally result in a rearrangement of its constituent parts, or in the expulsion of electrons. This continuous loss of energy, which is known to take place in the case of radioactive bodies, may be the cause of their disintegration.

The great discovery of radiant matter by Crookes has been followed by the complete identification of cathode rays and beta particles from radium and other radioactive substances. They consist of electrons carrying or composed of the negative atom of electricity, and their mass is only 1/1,800 that of the hydrogen atom. They are thus the lightest bodies known to science. They are given off by electric force, by light, by heat, and even spontaneously in radioactive bodies.

Further, since the alpha particles from whatever source consist of helium atoms, and helium is widely distributed in the earth, the sun, and in many stars, as shown by the spectroscope, it would appear that helium is one of the more elementary substances from which the heavier atoms are built. It is significant in this connection that the atomic weights of a number of elements differ nearly by four, the atomic weight of helium. The positively charged center of the atom consists in part at least of charged helium and hydrogen atoms, though it is difficult to see how these parts are held together.

Nor is it at present conceivable in what manner the heavier atoms were originally built up from the lighter ones. The process of disintegration does not appear to be reversible. Enough mystery still remains in the constitution of matter to occupy the mind of man in its solution for generations to come. But it is the glory of this age that a great step in advance has been taken.

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The small cinders and fine dust which formerly issued to an annoying extent from the smokestacks of the Waterside stations of the New York Edison Company, New York City, have practically been eliminated by a flue-gas washing process with which the 114 boilers in the two stations have been equipped.

Exhibit of Northern White Cedar Association.

One of the most convincing examples of the tendency of manufacturers to cooperate in improving conditions in their particular field was the exhibit of the Northern White Cedar Association at the Forest Products' Exposition held at the Coliseum, Chicago, April 30 to May 9, inclusive. The object of this particular association is to establish grades of poles, posts, ties and shingles which will be standard, and to maintain these grades so that the purchaser may be sure of procuring material suitable for his purpose. The exhibition maintained in Chicago was for the purpose of demonstrating to engineers, architects, dealers and consumers the many advantages of Northern white cedar.

The space occupied by the Association was decorated in a very pleasing and appropriate manner. At the rear of the space was a stockade built with cedar poles of seven, eight and ten-foot lengths, with five-inch tops, and three sides of the space were inclosed by a cedar fence built of six-inch halves of seven and eight-foot lengths surmounted by a railing constructed of seven-inch quarters, the latter being the smallest sizes of posts manufactured.

A feature of the exhibition which attracted considerable attention was a pole line constructed by workmen of the Chicago Telephone Company, employing four six-inch by 25-foot poles in each corner of the exhibit space and one seven-inch 35-foot pole in the center. Particular attention was directed to the taper of these poles, which are so much more advantageous than straight ones.

In the center of the booth were two exhibits which also attracted considerable attention. One of these showed two standard railroad ties which were in use by the Chicago and North Western Railway continuously for 29 years. Cuts in the wood indicated no material deterioration just beneath the surface. The other exhibit was of a pole cut into sections which was installed in 1864 by the Western Union Telegraph Company in connection with a telegraph line between Green Bay, Wis., and Escanaba, Mich. After 50 years of continuous service this pole was removed and cuts made to determine the condition of the wood. Although one of these cuts was made at the ground line, the wood was found to be in excellent condition about one inch from the surface.

General products exhibited included samples of shingles, butts of various size poles and numerous samples of tops of poles showing how they are measured and classified by the producers. A quantity of cedar tow was also exhibited, this being shavings from cedar shingles, which is used in the manufacture of cheap mattresses and also to some extent by florists and nurseries.

A large number of photographs showing the evolution of the cedar pole from the forest to the completed product were shown, and also views showing the damaging effect on substitutes for cedar poles by severe storms. Several photographs taken during a snowstorm showing damage done to reinforced concrete poles were also on display. The members of the Northern White Cedar Association, 28 in number, each spent a portion of the time at the exhibit. The Exhibit Committee having charge of the display included E. L. Clark, chairman; I. S. Kirkpatrick, H. S. Gilhey, L. A. Page, Jr., and W. B. Thomas.

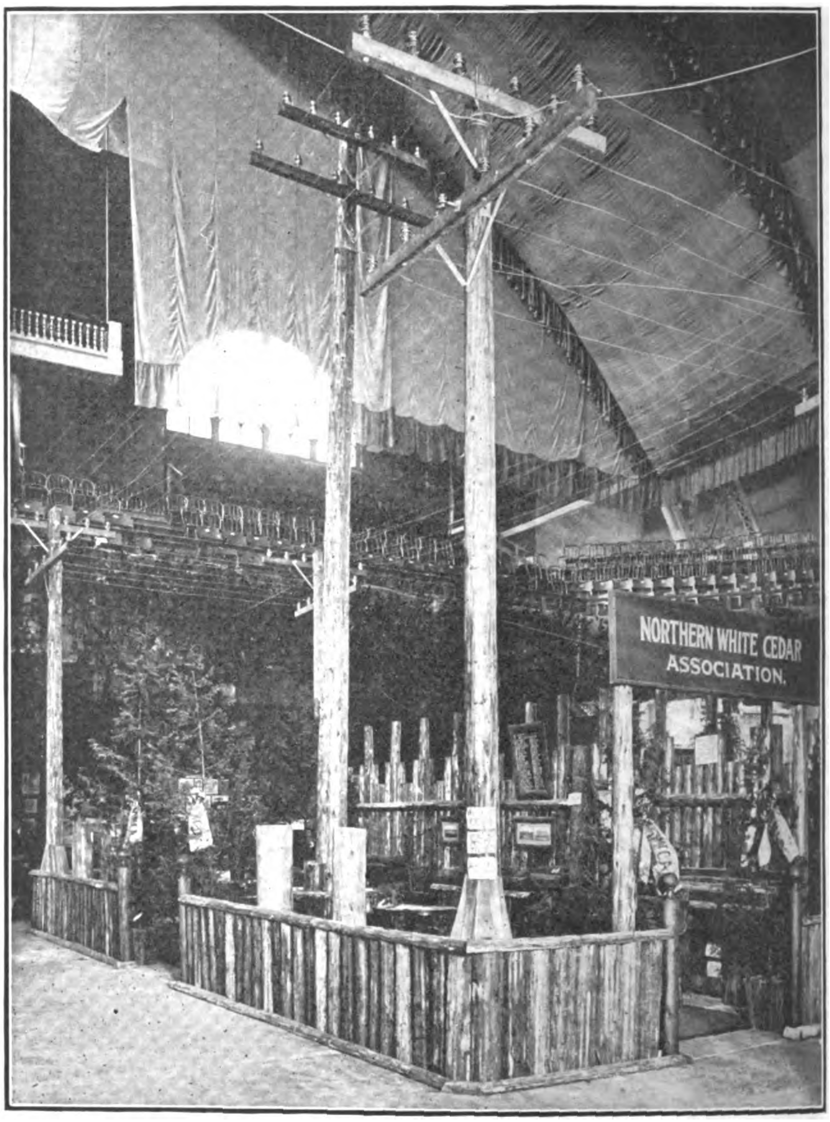


Photo by Lee J. Saylor, Chicago

Exhibit of Northern White Cedar Association at Forest Products' Exposition.

N. E. Boucher, of Minneapolis, is secretary of the Association, which includes the following member companies:

Bay de Noquet Company, Nahma, Mich., Bell Lumber Company, Minneapolis, Minn., Clark Pole & Tie Company, Bemidji, Minn., Cloquet Tie & Post Company, Cloquet, Minn., Crawford Cedar Company, Menominee, Mich., Curry & Whyte Company, Duluth, Minn., Duluth Log Company, Duluth, Minn., Erickson & Bissell, Escanaba, Mich., Finch Brothers, Duluth, Minn., Learned Cedar Company, Minneapolis, Minn., McCullough & Moss Lumber Company, Minneapolis, Minn., MacGillis & Gibbs Company, Milwaukee, Wis., Martin Brothers, Duluth, Minn., Maloney Brothers, Spooner, Minn., National Pole Company, Escanaba, Mich., Naugle Pole & Tie Company, Chicago, Ill., Page & Hill Company, Minneapolis, Minn., T. M. Partridge Lumber Company, Minneapolis, Minn., Pendleton & Gilkey, Minneapolis, Minn., St. Croix Pine & Cedar Company, Blackduck, Minn., I. Stephenson Company, Trustees, Wells, Mich., W. C. Sterling & Son Company, Monroe, Mich., Torrey Cedar Company, Clintonville, Wis., Valentine-Clark Company, Minneapolis, Minn., Western Electric Company, New York City, N. Y., White Marble Lime Company, Manistique, Mich., Wisconsin Land & Lumber Company, Hermansville, Mich., C. H. Worcester Company, Trustees, Chicago, Ill.

COPPER PRODUCTION AND PRICE IN 1913.

By John B. C. Kershaw.

The annual statistical circular relating to the world's supplies of copper in 1913, prepared by Messrs. H. R. Merton and Company, of London, has just been published, and a summary of the leading figures is given below.

Total World Supplies of Copper in 1913.

The aggregate output by the leading countries of the world in 1913 in English tons (2,240 pounds) of line copper, amounted to 986,375 tons—a decrease of a little under 20,000 tons, when compared with the record output of 1,006,110 tons in 1912.

TABLE I. TOTAL WORLD'S OUTPUT OF COPPER, 1900-1913.

Year	Output in Tons of 2,240 Pounds	Increase or Decrease
1900	479,514	7,270
1901	516,628	37,114
1902	541,295	24,667
1903	574,775	33,480
1904	644,000	69,225
1905	682,125	38,125
1906	714,100	31,975
1907	713,965	—135
1908	754,180	40,215
1909	839,425	85,245
1910	864,271	24,850
1911	871,920	7,645
1912	1,006,110	134,190
1913	986,375	—19,735

Table I contains the figures for the world's total output of copper from the year 1900 onwards, with the relative annual increase or decrease in the production. Only once previously during this period (in 1907) has a decrease in the production been recorded. Following upon the enormous increase of the year 1912, the decrease of 1913 was not unexpected or unforeseen. It indicates that supplies have once again overtaken the demand, and that producers are slackening off the activity of mining and smelting operations, in the hope of preventing any sudden collapse in price, such as that which occurred in 1900, and again in 1907. So far, this policy of restricting the output appears to have been moderately successful, and on December 31 the price of G.M.B. copper in London was $316.60 per ton, as compared with an average of $331.80 for the whole year.

The Relationship Between the Output of Copper for United States and World.

Table II contains the figures illustrating the relationship between the output of the United States mines and that of the remaining countries of the world, during the period of 1900-1913.

The proportionate output of the United States mines is seen to have remained unaltered at 55 per cent during the past three years, 1911-1912-1913. Although there have been slight variations in the percentage from year to year in the period 1900-1910, the percentage of the total world supplies of copper coming from American mines was the same in 1913 as in the year 1900, when the aggregate output was less than one-half the present total.

TABLE II. RELATIVE PRODUCTION OF COPPER BY THE MINES OF THE UNITED STATES AND THOSE OF OTHER COUNTRIES, 1900-1913.

	United States		Other Countries	
Year	Tons	Percentage	Tons	Percentage
1900	263,500	55	216,012	45
1901	265,250	51	251,378	49
1902	292,870	54	248,425	46
1903	307,570	53	267,205	47
1904	365,050	56	278,950	44
1905	389,120	57	293,005	43
1906	409,650	57	304,450	43
1907	392,520	55	321,445	45
1908	423,300	56	330,880	44
1909	490,280	57	349,145	43
1910	484,935	56	370,750	44
1911	483,865	55	388,064	45
1912	554,360	55	452,750	45
1913	548,575	55	437,800	45

The Copper Output of the Leading Countries.

Table III gives Merton's figures for the copper production of the twelve leading countries (excluding United States) in the years 1900-1913, and is interesting, since it shows how Mexico, Japan, Russia, Australasia and Canada have come to the front in recent years as producers of the red metal.

The falling-off in the production of the Mexican mines in 1913 is due partly to the fall in price of the metal, but chiefly to the disturbed state of the country. The twelve countries named in these tables rank in the following order, when placed according to the importance of their copper output in 1913: Japan, Spain and Portugal, Mexico, Australasia, Chili, Canada, Russia, Peru, Germany, Africa, Norway and Servia.

Fluctuations in the Price of Copper.

Table IV gives the average price of standard bar copper in the period 1900-1913, compared with the output, and with the increase or decrease in production over the previous years. A close study of these figures reveals the fact that there have been three periods of high prices, and three periods of depression, during the 13 years, and that, judged by the previous experience of the copper market, the restricted output of 1913, is the prelude to another sharp fall in the price of the metal.

TABLE IV. THE WORLD'S OUTPUT OF COPPER COMPARED WITH THE AVERAGE PRICE FOR THE PERIOD 1900-1913.

Year.	Total Output.	Increase or Decrease.	Aver. Price Per Ton.
1900	479,514	7,270	$357.40
1901	516,628	37,114	330.30
1902	541,295	24,667	255.90
1903	574,775	33,480	281.60
1904	644,000	69,225	285.50
1905	682,125	38,125	339.60
1906	714,100	31,975	419.21
1907	713,965	—135	428.60
1908	754,180	40,215	291.70
1909	839,425	85,245	286.09
1910	864,275	24,850	277.80
1911	871,920	7,645	271.20
1912	1,006,110	134,190	355.10
1913	986,375	—19,735	331.90

The relationship that exists between the output of copper by the producing companies, the stocks of the metal, and the price, was discussed at some length by the writer in an article published in the issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for May 17, 1913. The last two paragraphs of that earlier article are reproduced below, for they summarize once again the writer's forecast of the situation, as regards prices, at the commencement of another year.

"The price of copper is subject to periods of boom and depression which are found, in their turn, to be dependent upon the relation between supplies and demand. When trade is good, the demand for copper increases; activity in the electrical engineering and shipbuilding industries especially, creating a great demand for the red metal. The varying level of the stocks at the refineries, and in the metal-brokers' warehouses, is the best guide to the relationship between supply and demand, and therefore to the price of copper. A study of the stock and price variations during the past three years brings out this feature of the copper market clearly.

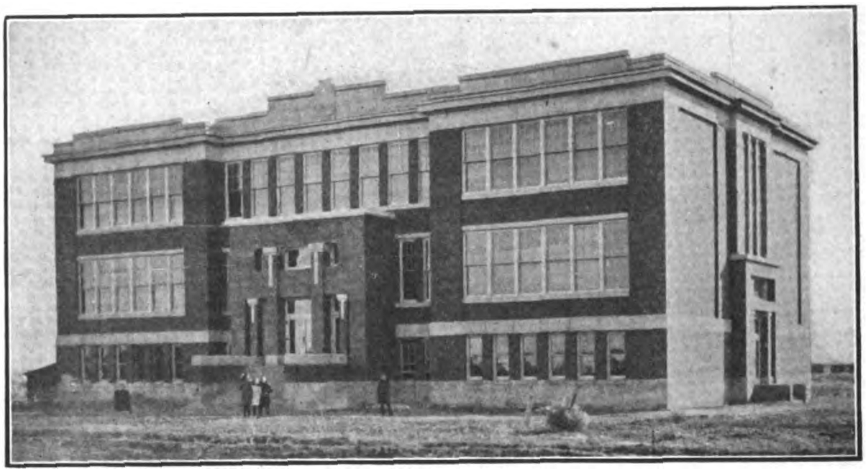
"At the present moment the tendency is for stocks to increase, and for the price to fall, and the writer is of opinion that this tendency will become more pronounced, as the year advances. Consumers of copper generally, and the electrical engineering industry in particular, would therefore be wise to adopt a hand-to-mouth pol-

TABLE III. THE COPPER OUTPUT OF THE LEADING FOREIGN COUNTRIES FOR THE PERIOD 1900-1913.

Year	Mexico	Japan	Spain and Portugal	Australasia	Chili	Canada	Russia	Peru	Germany	Africa	Norway	Servia
1900	22,050	27,840	52,872	23,020	25,700	8,500	6,740	8,220	20,410	6,720	3,935	.....
1901	30,430	27,475	53,621	30,875	30,780	18,800	8,000	9,520	21,720	6,400	3,375	.....
1902	35,785	29,775	49,790	28,640	28,930	17,485	8,675	7,580	21,605	4,450	4,565	.....
1903	45,315	31,360	49,790	29,000	30,930	19,320	10,320	7,800	21,205	5,230	5,915	.....
1904	50,945	34,850	47,035	34,160	30,100	19,185	10,700	6,755	21,045	7,775	5,415	.....
1905	64,440	35,910	44,810	33,940	29,165	20,535	8,700	8,625	22,160	7,740	6,305	.....
1906	60,625	42,740	49,320	36,250	25,745	25,460	10,490	8,505	20,340	6,980	6,120	.....
1907	56,565	48,935	49,675	41,250	26,685	25,615	15,000	10,575	20,490	6,800	7,010	.....
1908	39,990	43,000	52,585	39,500	38,315	28,570	20,085	15,000	20,200	6,880	9,190	2,140
1909	56,325	47,000	52,185	34,400	35,785	24,105	17,750	16,000	22,455	14,945	9,080	4,480
1910	61,515	46,000	50,255	40,315	35,235	25,715	22,310	26,945	24,710	15,205	10,425	4,845
1911	60,905	55,000	50,930	41,840	29,595	24,930	25,310	28,050	22,010	16,980	9,420	6,885
1912	72,455	65,500	58,930	47,020	37,305	34,710	33,010	26,065	25,220	16,370	10,980	7,240
1913	51,980	72,000	53,835	46,580	39,385	34,365	33,240	25,310	24,910	22,510	11,610	6,275

icy in their purchases of this metal, and to keep their stocks of copper at the lowest possible limit, consistent with the requirements of their business."

The tendency for stocks to increase was held in check up to October, 1913, but since that month, when the total visible supplies in Europe and America amounted only to 40,365 tons, there has been a decided rise in stocks and fall in price, and at the moment the outlook for the producers and holders of the metal is less favorable than it was 12 months ago. Whether the sharp fall in the price of the metal from its high level of $355.60 on October 31, 1913, to $306.10 on March 31 of the present year, will be continued for another six months, remains to be seen, but with the declining trade and political complications in more than one country consuming large quantities of the metal, it would not be surprising if copper fell to the low level of 1911 before the close of the present year, and could be bought for under $300 per ton.



Rupert High School.

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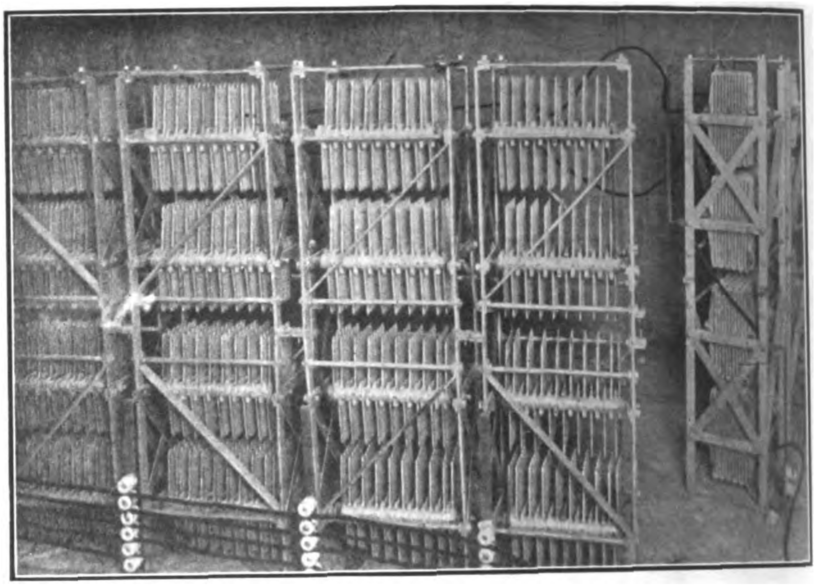
The Electrically Heated High School at Rupert, Idaho.

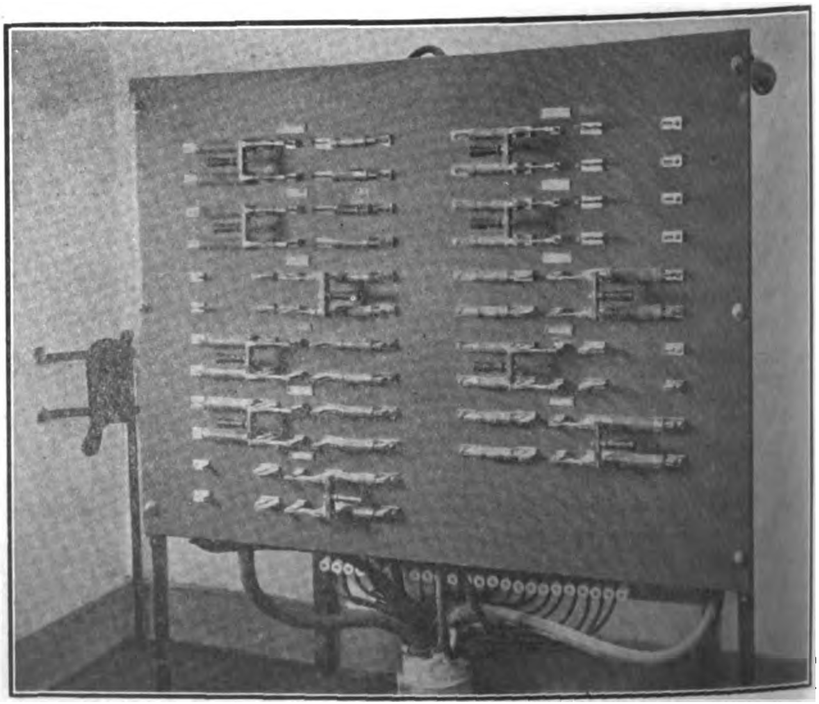
The Rupert High School building is a two-story brick structure with a large basement. It contains a good-sized auditorium, a gymnasium 39 by 70 feet, lockers, shower baths, etc., and 14 class rooms, including a thoroughly electrically equipped domestic-science room and chemical and other laboratories.

The heating system is probably the most interesting feature of the building and is attracting great attention because it is entirely electrical. It is probably the only system of the kind installed in the United States and consists of 22 units of resistance grids, a type peculiar to the manufacturer, the Simplex Electric Heating Company, of Cambridge, Mass. These grids are installed in a small room in the basement and the air from outdoors is taken through them by the use of a large Sturtevant blower, having a capacity of 20,000 cubic feet per minute.

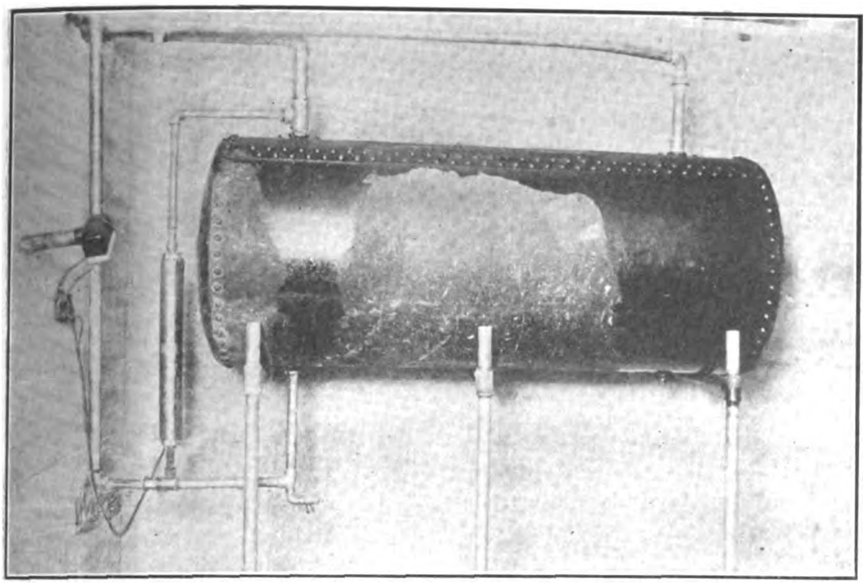


Electric Heaters, Showing About One-Half of Total Installation.

The temperature of the room in which these heaters are installed does not run above 78 degrees Fahrenheit and the different class rooms into which this warmed air is blown are maintained at an average temperature of about 70 degrees Fahrenheit. After it passes through the heaters, the air is carried into another small room, which has about six inches of water in a pit on the floor; the air striking the water is thus washed and the proper humidity given to make it most comfortable in the class rooms. The air is distributed through metal ducts in the basement and brick risers in the walls, and both fresh and foul air ducts are provided for each room, thus combining the heating and ventilating systems.



Panel Controlling 400-Kilowatt Heating Installation.



Water Heater and Hot-Water Tank Holding 250 Gallons.

These air ducts are so arranged that the entire capacity of the heating plant can be diverted into either the auditorium or the gymnasium, or these two rooms can be cut off when not in use and any portion of the heated air diverted to any part of the building.

The control of the heating units is obtained through a switchboard located in the superintendent's office. It is possible to use as low as 9 kilowatts and any amount above this up to 400 kilowatts, which is the total capacity of the plant, thus giving 40 heat variations.

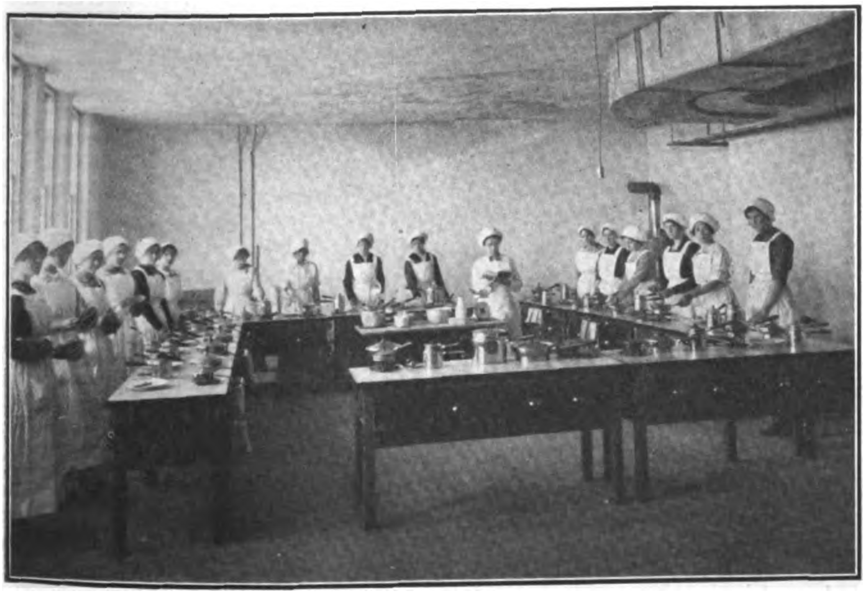
A 400-kilwatt Westinghouse transformer is located in a special room at the right side of the heaters and double-throw switches on the switchboard allow the use of 440 volts when the blower is running; an electric device will trip the oil switch of 400-kilowatt capacity and thus cut off the entire heating system, if for any reason the blower ceases to work. After school hours, when the blower is idle, the switches are thrown onto the other side of the circuit giving 220 volts, thus providing against overheating of the units, as well as eliminating the necessity of constantly running the blower.

Hot water is provided for the school house by means of a Simplex three-kilowatt circulating water heater attached to a 250-gallon tank; this is proving ample for all requirements of the building, including the shower baths, domestic-science department and laboratories.

The domestic-science department has an equipment for 20 pupils; it consists of 4.5-inch Simplex disk stoves, and with each stove is a frying pan and a double boiler. The domestic-science teacher in commenting on this equipment states, "The utensils are very pretty and the girls enjoy them very much." She further states, "I know that electricity is much cleaner and so far as my experience goes here I believe it is just as quick when used with the Simplex stoves, which have a locking device which makes them heat very quickly anything in their own utensils." As many of the pupils come from long distances, the Board of Education has provided also a cafeteria where luncheons are served to the pupils.

The school and its electric heating plant have been in operation since early in the year. The equipment is proving highly satisfactory in every respect. Although the capacity of the heating system, as above stated, is 400 kilowatts, the average power consumption in cold weather has been less than 300 kilowatts.

A feature of this installation that merits special notice is the fact that the heat is available instantly and continuously at all times. This makes the building especially available for a general meeting place or "community building."



Domestic Science Room.

Additions to Staff of Society for Electrical Development.

The Society for Electrical Development, Incorporated, in selecting its staff has chosen, among others, John P. Mallett, a member of the American Institute of Electrical Engineers, whose duties will be to investigate the application of electricity for the various industries and to suggest further applications. The information thus gathered will be filed and indexed for the benefit of the members of the Society.

Mr. Mallett is a graduate of Tufts College, where he took a course in electrical engineering. His experience includes six years with the Westinghouse Electric & Manufacturing Company, eight years as chief engineer of the Northern Electrical Manufacturing Company, and five and a half years as engineer in charge of the department for the development of special apparatus for commercial and government work at the Diehl Manufacturing Company. His experience qualifies him for the important work which the Society is entrusting to him.

The information collected by Mr. Mallett, together with all other available information on the subject of the uses of electricity for light, heat and power, will be taken care of by the Commercial Exchange Bureau, which will be in charge of Theodore Dwight, who will conduct the correspondence upon such subjects, both with the members of the Society and with the general public seeking information. Mr. Dwight was formerly assistant to General Griffin and was for some years assistant secretary of the American Institute of Mining Engineers, during which time his work has been of such a character as to render him particularly competent to take charge of the Society's Commercial Bureau.

James Smieton, Jr., has been engaged as office manager and acting secretary-treasurer of the Society.

Other members of the staff are being secured and the Society expects to commence its active work immediately.

BOOK REVIEWS.

"Switchgear and the Control of Electric Light and Power Circuits." By A. G. Collis. New York: D. Van Nostrand Company. Cloth, 85 pages (4x6½ inches), 47 line illustrations. Supplied by the Electrical Review Publishing Company Incorporated for 50 cents.

This book deals with English practice. It was written by the author of "High and Low-Tension Switch Gear Design." There are four sections. Two deal with direct-current practice and two with alternating. It is a popularly written, pithy, little treatise containing practically no mathematics, although some relatively simple formulas are used for explanatory purposes in the text and there are a couple of pages of general electrical formulas at the back. The book was, evidently, particularly written for those who occasionally purchase and for those who operate switchgear. It recounts certain fundamentals upon which the selection, arrangement and operation of switching and control apparatus must be based. It briefly outlines the operating principles and construction of the more important switchgear components such as switches, relays, instruments, fuses and the like. Complete switchboard and control outfits are given some attention. Some of the suggestions relating to mining installations are particularly good. While, as suggested, the book deals exclusively with English and possibly Continental practice, there is much information in it that should prove useful to the practical electrical man in America. Terrell Croft.

"The Universal Electrical Directory." Thirty-third Edition. London: H. Alabaster, Gatehouse & Company. Cloth, 1,548 pages (6x9½ inches), illustrated. Supplied by the Electrical Review Publishing Company Incorporated for $5.00.

The 1914 edition of this valuable reference volume contains 34,515 names. It contains alphabetical and classified directories for Great Britain, Continental Europe, United States, and Colonial and general, covering the remainder of the world. There is also a geographical directory in the British section. The volume is of especial value for the British section. The list of central stations in this portion has details as to the nature of the supply, system of distribution, capacity of plant, frequency, voltage, and name of chief engineer. The portion of the directory dealing with the United States will not be of much value to American readers, as it is less complete. The classified section is ludicrously incomplete, some of the largest manufacturers in the various lines being omitted from the list; some entries are absurdly inaccurate. A complete revision of the American section is highly desirable before another edition is published.

"Electric Toy Making." By T. O'Conor Sloane. Twentieth edition, revised and enlarged. New York: The Norman W. Henley Publishing Company. Cloth, 210 pages (5x7 inches), illustrated. Supplied by the Electrical Review Publishing Company Incorporated for $1.00.

This volume is intended for amateurs and covers the more simple devices that can be made from electrical and magnetic elements. Effects depending upon alternating or rotating fields are not included. Many of the toys described are, nevertheless, interesting and amusing and the boy who is not very familiar with electrical matters will find much help in the instructions given. Several new chapters have been added since the last edition and the particular instructions given will probably be suggestive of other things to the reader.

"Craig's 'Q & A' Book. Questions and Answers About Electrical Apparatus." Rewritten and revised by James W. Craig and William P. Woodward. Third Edition. Pittsfield, Mass.: Berkshire Technical Publishing Company. Flexible leather, 254 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company Incorporated for $1.50.

This volume puts in the form of questions and answers a great deal of information regarding electrical matters and illuminating engineering. There are 13 chapters with the following headings: Systems, Illuminating Engineering, Incandescent Lamps, Arc Lamps, Direct-Current Motors, Alternating-Current Motors, Constant-Potential Transformers, Constant-Current Transformers, Mercury-Arc Rectifiers, Meters and Instruments, Interior Wiring, Exterior Wiring, Central-Station Operation and Apparatus. The material is comprehensive and well written and the information is dependable. Many practical questions that come up to the electrician not familiar with some one of these particular fields are answered in an understandable way. The present edition has been much enlarged and revised and should prove of great value in its field.

"Gear Cutting in Theory and Practice." By Joseph G. Horner, Manchester, England: Emmott & Company, Limited. Cloth, 392 pages (5½x8½ inches), illustrated. Supplied by the Electrical Review Publishing Company Incorporated for $2.00.

This book will be of value to the machinist, designer and mechanical engineer. The 18 chapters are grouped in four sections dealing respectively with Principles of Design; Methods of Cuttng; Machines; and Materials, Manufacture and Strength. An appendix contains useful tables of pitch, pitch angles, etc. The illustratoins are profuse and mathematics has been largely avoided, the aim of the author evidently being to cover practical points rather than the theory of design. Practice and principles have been related, however, and recent developments in practice covered. The typography is excellent.

"Bill's School and Mine." By W. S. Franklin. South Bethlehem, Pa.: Franklin Mac Nutt and Charles. Cloth, 98 pages (4¾x7 inches). Supplied by Electrical Review Publishing Company for 50 cents.

This is a collection of essays which should interest every one concerned with our educational methods, and especially in the regeneration of our public schools. The introductory essay, giving title to the volume, contrasts present conditions with a generation ago when the boy had greater opportunities for outdoor activities and especially for contact with nature. An essay on the study of science deals more especially with technical education. This essay is intended to convey some idea as to the necessity of rigorous thinking in modern human affairs, and to lead young men to a point of view from which this necessity looms up as the biggest thing that confronts them in their chosen field of science and technology. The exactions which are placed upon young men by the technical school are by no means artificial and unnecessary, they are demanded by the conditions of modern life and it is impossible to escape them.

The Solution of Terminal Freight Congestion.

At the April meeting of the Electric Vehicle Association of America, Fred A. Hortter, car accountant of the Boston and Maine Railroad, called attention to the inefficient means of handling and delivering freight at terminals in a paper entitled "The Problem of Terminal Freight Congestion and Its Solution." His observation of the terminal yard teaming in the Boston and Maine railroad yards in Boston showed that in one day 10,264 horse-drawn vehicles handled freight to the outbound freight houses, the average load on a five-ton vehicle being 0.36 ton.

Electric vehicles are replacing horse-drawn teams in many cases but it is merely an improvement in means without change in the methods. The necessity for some systematic method of handling this freight is apparent. This he believes can best be accomplished through a consolidation of the railroads and trucking interests as recommended by Metropolitan Improvement Board of Boston in 1907. By establishing clearing stations in the business sections and by arranging schedules so that trucks will always be reasonably loaded, a greatly improved efficiency can be obtained.

New Electrical and Mechanical Appliances

Effective Electric Window Displays.

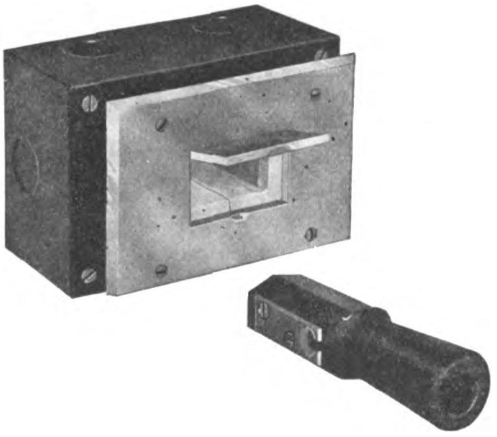
The Western Electric Company has been keeping the windows of its store at Cincinnati, O., busy helping to advertise the company's goods, either generally or specifically. An instance of the latter sort was a recent clever display featuring electric fans. Several of these were so placed in the window and turned on as to keep in constant motion a large quantity of white confetti, which was piled in the window, the effect being that of a very realistic snowstorm. The suggestion of coolness was irresistible and, although the weather was still rather cool, many people were moved to purchase fans against the warmer times coming. Another device being used by the company regularly is an electric scoreboard, by means of which passing baseball enthusiasts are enabled to keep tab on the way the game is going when the Cincinnati "Reds" are playing. There is an illuminated blank for each inning, which is filled in with the number of runs made, or with an illuminated zero, as the case may be.

New Ralco Receptacle, Box and Cover.

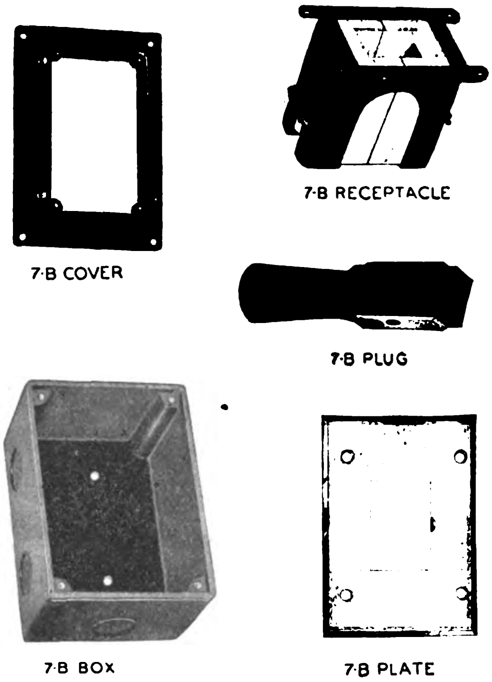
To meet the demand for a flush power plug and receptacle suitable for vacuum cleaners, washing machines, heating appliances, stereopticons, etc., the Central Electric Company has added to its Ralco line a new design known as the No. 7B flush receptacle and plug. This is rated at 30 amperes, 250 volts.

The box is made of gray cast iron and has ample room for quick installing of the conduit. It is arranged with four knockouts for three-fourths-inch conduit. The cover is a gray iron casting and is three-fourths-inch deep in order to make easy its installation. The front of the box is lined up with the outside surface of the studding, and the cover is of the usual thickness of wood lath and plaster or baseboards. Special covers for metal lath and plaster work are furnished on request.

The receptacle consists of the well known 30-ampere Ralco nonreversible porcelains and contact that are rigidly held in place by suitable yokes. The face plate seats into the cover, and when seated is flush with the plastering. A suitable flush brass plate is then attached to the cover. Special plates can be finished to match the hardware.



New Ralco Receptacle and Plug.



Parts of the New Ralco Outfit.

As an opening for the plug, a door is cut into the flush plate which closes by gravity. These plates can be equipped with hasps and padlocks, if desired. This receptacle was designed so that in installing, all work is done from the front. The plug used is of the No. 2 nonreversible type.

The manufacturer, Central Electric Company, 326 South Fifth Avenue, Chicago, Ill., has given much attention to the development of its Ralco line of heavy-current plugs and receptacles and is prepared to furnish on request literature relating thereto, now in course of preparation.

British Telephone Activity.

Electric cable-making firms in England are enjoying a boom at present. This is partly due to some exceptionally large contracts for railway cables for Australia and Argentina, but it is largely accounted for by British Government telephone developments. Official information shows that the post office has on order telephone cables containing 28,550 miles of single wire for London and 369,400 miles for the provinces, the value being $6,630,000. For London, 146 miles of single underground conduit, and for the provinces 1,869 miles, are on order, to cost $2,165,000. Central-battery equipments for London $1,200,000, and for the provinces $550,000, as well as automatic for London $21,900, and for the provinces $750,000, are other matters placed by the post office in connection with works in progress.

Telephone Between London and Berlin.

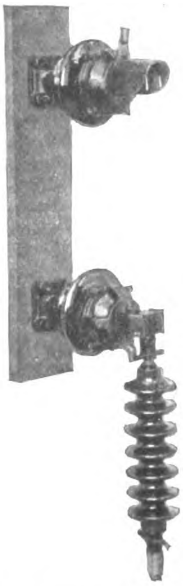
It is expected that telephone service between London and Berlin will become possible when the submarine telephone cable between England and Holland has been laid. This cable will be 79 miles long, of the four-core Pupin loaded type. Its terminals will be at Aldeburgh and Walcheren. It will be the longest submarine telephone line yet laid.

Electrotechnical Commission.

The International Electrotechnical Commission will meet at San Francisco in 1915 and in St. Petersburg in 1917. The various committees meet in Madrid this year.

New Type of Small Outdoor Substations.

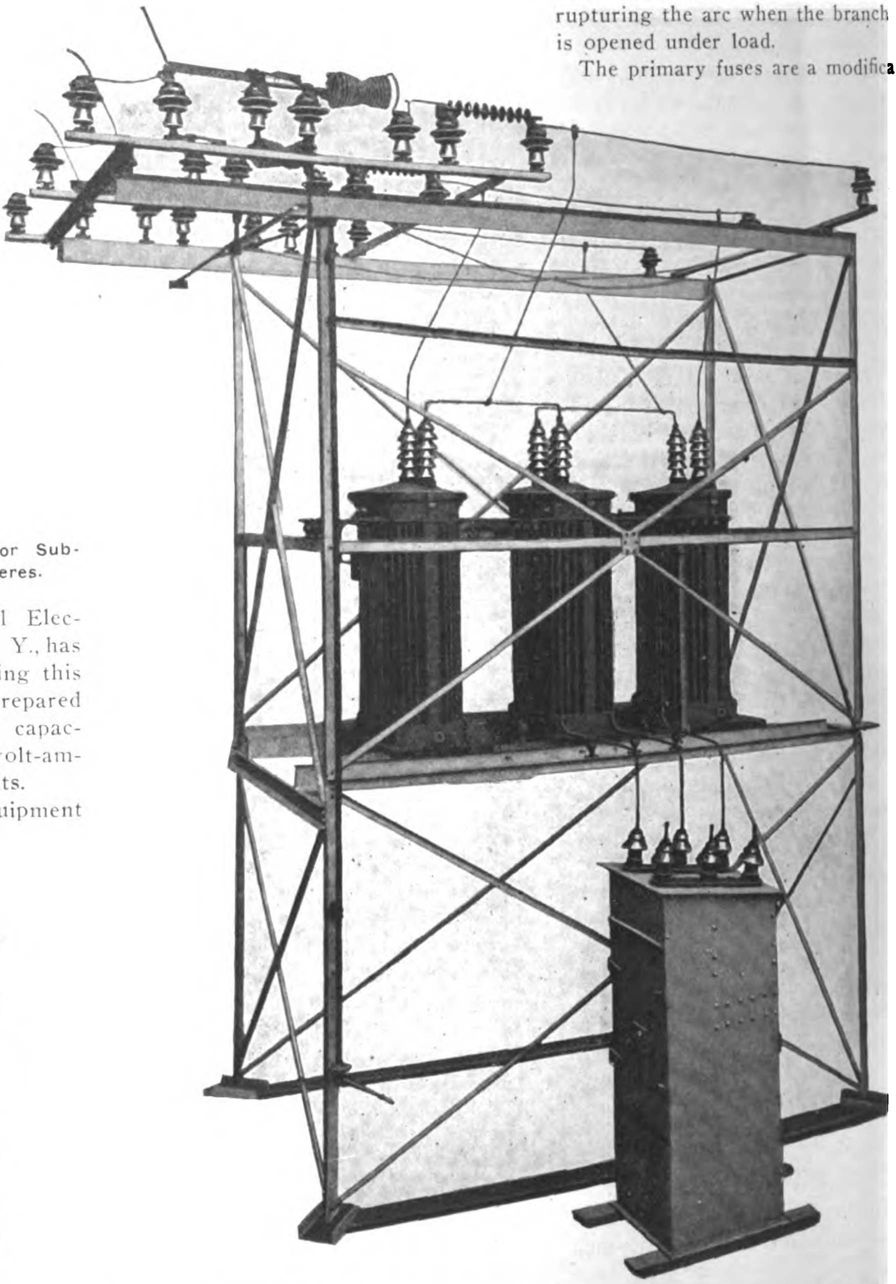
The possibility of increased revenue for central-station systems from taking on the small consumer located in the vicinity of transmission lines has brought into existence the small outdoor substation. The General Electric Company, Schenectady, N. Y., has devoted much effort to perfecting this type of apparatus and is now prepared to furnish such equipments in capacities ranging from 3 to 40 kilovolt-amperes from 2,300 to 110,000 volts.



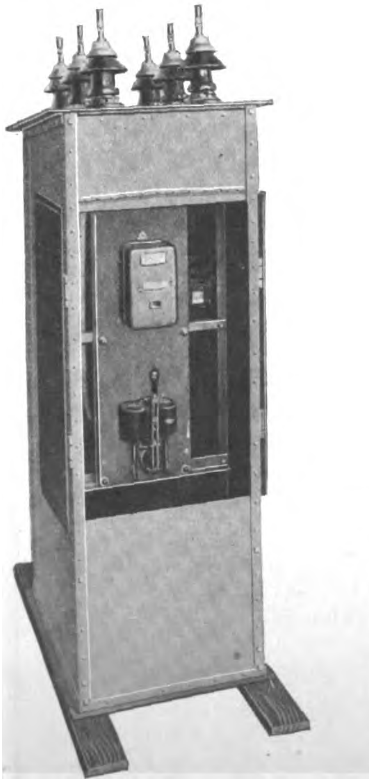
Expulsion Fuse Block for Outdoor Substation, 15,000 Volts, 50 Amperes.

The initial expense of the equipment has been made as low as possible without sacrificing dependability. The maintenance charges have been cut to a mimimum by the use of rugged and simple parts in the design.

These equipments are made in a great variety of designs and can be mounted on wooden poles, wooden towers, or steel towers, according to the requirements imposed by the capacity and voltage of each installation. The substations usually include, on the primary side, switches, choke coils, fuses, and transformers; while, on the secondary side, the equipment varies from one comprising oil switches, watt-hour meters, current and potential transformers to that of merely a lever switch with fuses.



Outdoor Substation Complete for Distributing 220 Kilovolt-Amperes from 35,000-Volt Transmission Line.



Steel Housing for 2,300-Volt Secondary Switch, Meter, Etc.

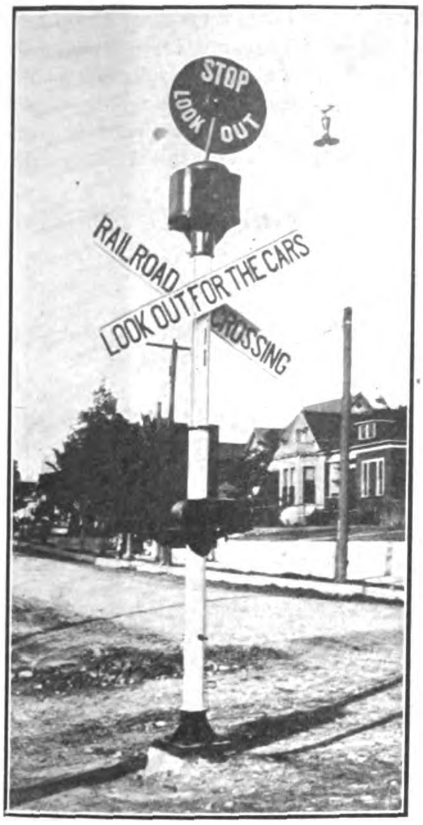
The primary switches are of the air-break type and are made up in three designs; one in which the switch opens upward and is operated by hand or by a motor located below the switch blades, usually at the bottom of the pole; another where a lever switch opens downward, being operated by the usual switch hook; a third type whose contacts move in the direction of the line, and which is operated manually or by a motor. The high-voltage switches have horn deflectors which assist in rupturing the arc when the branch line is opened under load.

The primary fuses are a modification of the expulsion type and are designed either to take the place of the primary switch, being mounted vertically and making contact with clips in closing like the ordinary knife switch, or are for horizontal mounting without the switch feature. They are made up in three-pole units and are operated from the ground by a rod or a rope.

The transformers are single-phase and designed especially for outdoor service. The choke coils are of the hour-glass type, or of a new design known as the suspension type.

For the secondary circuit the oil switches, watt-hour meters, etc., are of standard construction for indoor service suitable for mounting on a panel in a wooden or steel house and are furnished completely wired.

Two styles of houses are avilable. In the one, a slate or steel panel carries an oil switch provided with a series trip coil for protection from overloads and also a watt-hour meter, the current and potential transformers being mounted on the side walls and the buses attached to the roof. In the other style (used for 440-volt distribution) a comparatively small house, suitable for mounting on a pole of the transmission line, is used. This house contains a small panel mounting a lever switch and inclosed fuses, the latter for overload protection.



Electrically Operated Automatic Flagging Device.

A pole-type regulator can be supplied with the above equipments, if desired, to maintain constant potential.

◆

The Automatic Flagman.

The "Automatic Flagman" is a device to protect railway grade-crossings by giving effective warning of the approach of trains. In these days of automobiles, something more than the old "Stop, Look and Listen" sign is necessary. Such signs are too unobtrusive to attract the attention of the motorist going at 60 miles an hour, and at night they are practically of no real value.

But the "Automatic Flagman" cannot be accused of being too modest. At the approach of a train it rings a loud gong and waves a bright red disk by day and a red lamp by night. So sensitive is the human eye to red and to motion, that such a warning can hardly escape notice.

As shown by the illustration, this device consists of a weatherproof case containing the operating mechanism and the signal disk upon which are mounted standard ruby-red switch lenses with an incandescent lamp between. Energy is supplied by a small Westinghoues electric motor which operates the mechanism that rings the gong and waves the disk.

The motor receives its energy from storage batteries, lighting circuits, or trolley circuits, depending on the character of the installation. On steam roads, the track is insulated and bonded for the desired distance away from the signal and is charged with current from a small battery. The train on entering this block completes the circuit and operates a relay, which connects the motor with the power circuit. When the train leaves the block, the circuit is opened and the motor disconnected. On electric roads, the motor is connected to the trolley circuit by a contactor which is mounted on the trolley wire or third rail and is operated by the car as it passes; a second contactor disconnects the motor when the car passes the signal.

The device is manufactured by the Automatic Flagman Company, Los Angeles, Cal., and the illustration shows an installation on the Pacific Electric Railway at Los Angeles. This particular machine, which is one of several hundred "Automatic Flagmen" on the lines of this railway, operates about 300 times a day.

◆

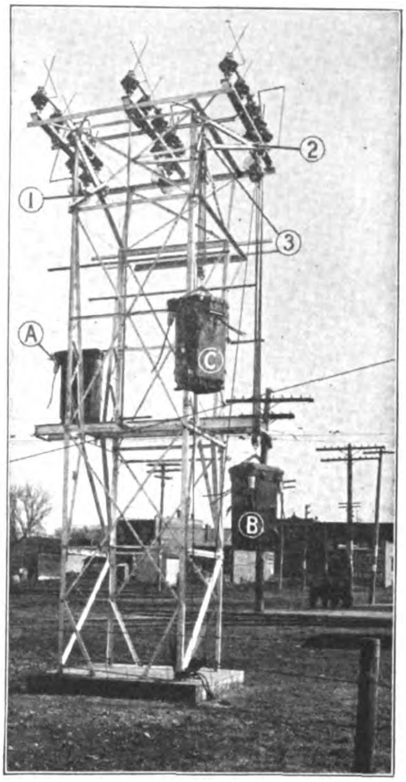
Handling Transformers on Steel-Tower Substations.

One of the problems confronting the central-station managers using steel-tower outdoor high-tension substations is the economical handling of transformers. However well a station may be designed to control and protect transformers, it falls short of commercial requirements if the method of handling transformers is difficult. This is especially true in case of transformer failure when service is interrupted and customers inconvenienced.

The latest development in outdoor stations to meet conditions as encountered in commercial practice is shown in the accompanying illustration. The switching and protective units are of standard form. The method of handling transformers, however, is unique, effective and low in cost.

This station is equipped with a transformer platform provided with a transfer truck, which can travel the full length of the I-beam supports. Near the top of the front corner posts are pivoted single and double jib cranes indicated as *1, 2, 3*. These jib cranes which have a large radius of action are provided with steel U-bolts to take the tackle hooks. The method of handling transformers is well shown in the accompanying illustration.

Assuming that the middle transformer *B* has failed and must be removed, the end transformer *C* is first raised by means of the No. 3 jib crane, swung around out of the way and left hanging on the tackle. The transfer truck with the middle transformer *B* is next rolled to the end of the platform, the transformer being raised with jib No. 2, swung around and lowered to the ground.



Handling Transformers on Outdoor Substation.

To restore service transformer *C* is swung around and lowered to the platform, the station now operating in open delta until the defective transformer can be repaired or another substituted. By this combination of transfer truck and jib cranes, transformers of any weight up to 4,000 pounds can be handled.

The particular installation shown has been started with three 30-kilowatt, 22,000-volt, 25-cycle transformers, and when the load increases sufficiently three 50-kilowatt units will be used, in place of the transformers now in service. These outdoor substations are manufactured by the Delta-Star Electric Company, Chicago, Ill.

A TIME-SIGNAL TRANSMITTER.

By Alfred Gradenwitz.

The International Time Conference which met in Paris in October, 1912, decided that from July, 1913, the radiotelegraphic international time signals should be altered in accordance with the scheme in Fig. 1. As however such a long series of signals could not possibly be given out with sufficient accuracy by an operator observing a clock and handling at the same time a manipulator, special apparatus had to be devised to actuate automatically and with a maximum of precision the wireless stations entrusted with the time service.

The Paris Observatory therefore approached Edouard Belin of the same city, who designed the apparatus described below which has been in operation since July last. It is based on a principle which has long been used successfully for other applications, and is mainly designed on the following lines:

The apparatus is always ready to work, but so far from being a clock or time-keeper, it is an automatic mechanism set in motion by the accurate control of a master clock, or a synchronized intermediary clock, provided with convenient disengaging devices. It normally requires no time adjustment and depends for its accuracy entirely on the controlling clock.

This merely mechanical apparatus is synchronized at ten seconds interval, by a clock producing a current break every two seconds. The transmission of signals is produced by the sudden opening of a high-precision interrupter, the working of which only requires a negligible amount of energy. When the transmission of signals has come to an end, the motive weight is automatically wound up again by an electromotor, the apparatus returning of its own accord to its initial position. At this moment all the circuits are opened and the apparatus, adujsted for the next set of signals, does not use up any energy in the meantime. The adjustment can be effected with remarkable precision (to about one-thousandth of a second), and the duration of signals can, if required, be altered by means of a micrometer button. The working of the apparatus is kept up by two small storage batteries, having a capacity of 20 ampere-hours, which need only be charged two or three times per month.

Master Clock. When the master clock is used alone, it serves, on the one hand, to disengage the signal distributor at the proper moment, and on the other, to ensure a uniform working of the apparatus by a convenient synchronizing arrangement. The former effect is obtained by an arrangement similar to that of the Leroy clocks used for the transmission of signals from the Observatory to the Eiffel Tower.

The hour hand, the minute hand and finally the second hand release in succession a set of levers which are so arranged that the first prepares the working of the second, while the second allows the third to fall into a notch just at the proper moment, thus closing a working circuit.

The synchronizing effect is generally produced by an electric contact controlled by the motion of the pendulum. However, in order to insure the accuracy desired, the synchronizing current is, in the present case, only sent out every two seconds.

The disengaging and synchronizing contacts both act on the same sensitive relay, no current passing through the circuit before the beginning of working.

At 55 minutes 56 seconds, the disengaging contact is closed, thus preparing the passage of the current to be produced one second later by rupture of the synchronizing contact. The relay is then actuated for the first time and the armature of an electromagnet releases the stop, liberating the apparatus and allowing the motive weight to begin working.

When ten seconds later, the second stop arrests the apparatus, the disengaging contact has long been broken and the synchronizing current, due to the automatic closing of an interrupter controlled by the working of the apparatus, acts for the second time, thus leaving between each two actions a strictly constant interval of ten seconds.

The disengaging contact acts by closure, because of its length and the fact that its origin requires no absolute precision; the synchronizing contact, however, acts by rupture, its action being both very short and precise.

Signal Transmitter. The signal transmitter mainly comprises a steel cylinder carefully centered on ball bearings. On this cylinder is traced a square thread of spiral shape which comprises relief parts just corresponding to the signals to be given out.

On this horizontal cylinder or distributor and on a guide constituted by two V-shaped steel bars, there moves a carriage comprising a projection fitting into the square thread. The rotation of the cylinder thus imparts to the carriage a rectilinear motion in exact correspondence with its own.

The carriage carries an interrupter or translator constituted by a light plate resting on a micrometer contact and carrying a very hard point. This interrupter is normally closed, but when a complete projection passes in front of the point, the plate is lifted very slightly from the micrometer contact and the circuit—or at least the corresponding branch—is opened. As soon as the projection has passed the interrupter closes again, experience having shown this organ to work with a precision exceeding all expectation.

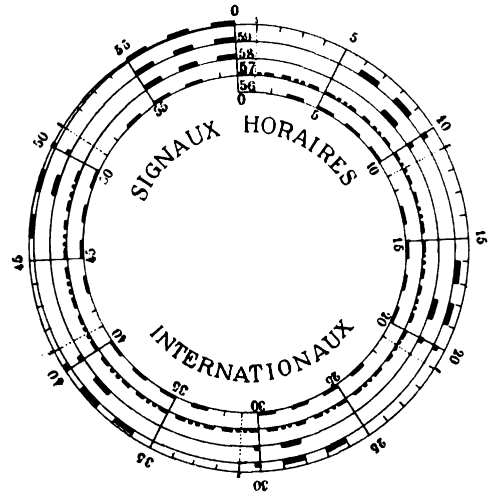


Fig. 1.—Scheme of International Time Signals.

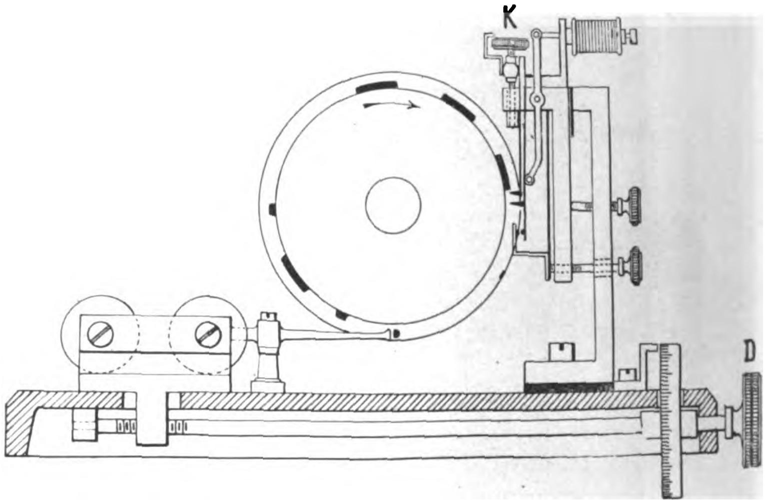


Fig. 2.—Cross Section of Distributor and Translator.

As a matter of fact, the translator comprises not one, but two light plates parallel to one another and connected up in parallel. One of these plates is immovable, whereas the other can be raised or lowered by means of a micrometer screw. As each plate carries a sapphire, three cases have been provided for:

First, when the two points coincide with the same generatrix of the distributor, they will act like a single one.

Second, if the movable plate is in advance of the fixed plate it will finish all signals commenced by the latter,

Third, if the movable plate lags behind the fixed one, the opposite will be the case.

This allows the absolute duration of signals to be regulated with extraordinary accuracy.

The translator could be mounted direct in series with the line and the relay of the radiotelegraphic station. Since, however, the required current intensity is 100 milliamperes, the breaking spark would deteriorate the contact very quickly, thus getting the apparatus out of order. This is why a relay has been inserted at the starting station and arranged to be controlled by the translator alone, the local current of this relay actuating that of the radiotelegraphic station.

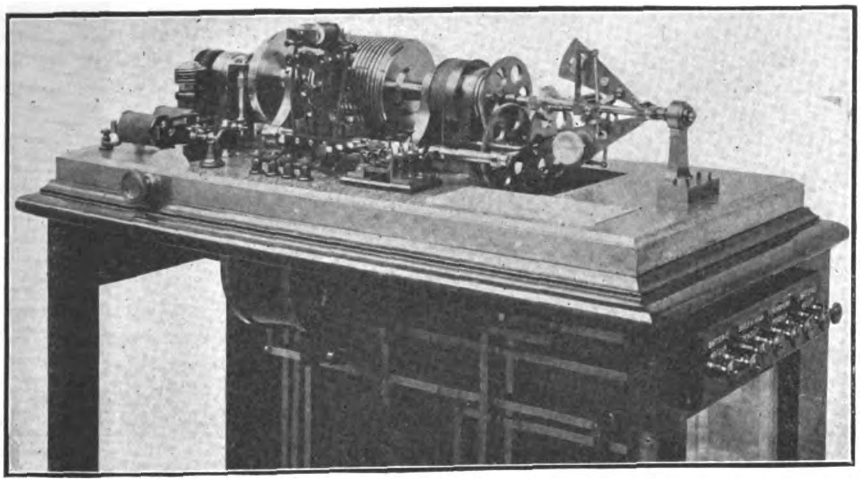


Fig. 3.—View of Distributor and Translator.

While this first relay could be connected up in series with the translator, M. Belin has thought it preferable to adopt an arrangement increasing considerably the safety of working of the (polarized) relay.

The translator, shunted through a resistance of 250 ohms, is arranged in place of the resistance to be determined in a Wheatstone bridge, the three other branches of which are each of 10 ohms, the relay being substituted for the galvanometer. When the closed translator short-circuits the 250-ohm resistance, the current traversing the relay under these conditions has a given positive intensity, and when the translator is opened, the current takes an equal but negative intensity.

This current reversal by mere rupture constitutes, as it were, an electric antagonistic spring which only exists as long as it is needed. This doubles the sensitiveness of the relay and insures an absolutely reliable working. The synchronizing relay is arranged in the same manner.

The distributor is actuated by a weight, its uniformity of working being warranted by a proper regulator. However, since an absolute uniformity cannot possibly be obtained, the accumulation of accidental errors is prevented by synchronizing.

To this effect the cylinder axle carries a plate fitted with two stops striking against the armature of the electromagnet, which is traversed by the local current of the first relay. The motion of this armature under the action of the controlling clock disengages every ten seconds, the apparatus being stopped for a negligible time.

The exact time of the beginning of signals, of course, depends on the relative position of the distributor and the translator points. If the armature of the synchronizing electromagnets be lagging, the cylinder will be fast, until the synchronizing stop has been arrested by the armature. If the opposite is the case, the cylinder will be slow.

The synchronizing electromagnet and its armature are fixed on a small plate, arranged to advance or recede slightly in a very precise guide. This motion is controlled from outside by means of a tangent screw and an axis carrying a graduated drum, each division of which corresponds to an advance or lag of one one-thousandth of a second. The weight is wound up by means of a small electromotor of precision, working under a tension of six volts.

The apparatus has been arranged to give out, whenever required, all sorts of additional optical signals during the minute preceding transmission of the time service.

Work on the Caimito Radio Station.

The footings for the 600-foot steel towers of the Darien radio station at Caimito, C. Z., are about half completed. Tower No. 1 will be about 1,500 feet east of the east banks of the Panama Canal; two No. 2, approximately 896 feet north of No. 1; and No. 3, approximately 765 feet from No. 2, and about 982 feet from No. 1. The depth of excavation for the footings has varied from 12 to 28 feet below the surface of the ground, the concrete bases themselves being rectangular in plan, 16 by 20 feet, and 10 feet deep. Each tower is triangular in cross-section, each side of their bases being 150 feet in length. The location and details of the power house, operating building, and quarters for the officers in charge are subject to further consideration before approval. The contract for the fabrication and erection of the steel for the towers at Caimito, was awarded to the Penn Bridge Company, of Beaver Falls, Pa., the subcontract for the erection of the towers being awarded by the Penn Bridge Company to the Central American Construction Company.

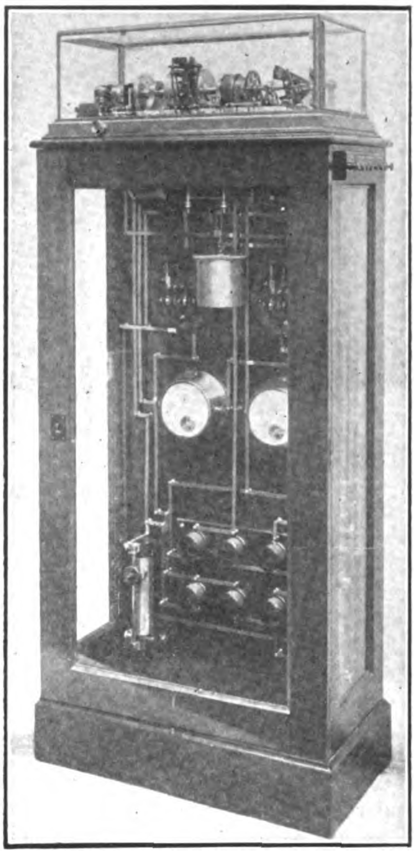


Fig. 4.—General View of Time-Signal Apparatus.

Inverse-Time-Element Relays.

Alternating-current power relays close their contacts under conditions of overload or of reverse power. They are of three different characteristics each having the inverse-time-limit feature: (a) overload and reverse power; (b) overload only, instantaneous or adjustable definite minimum time at heavy overloads; (c) reverse power only, instantaneous or adjustable definite minimum time at heavy overloads.

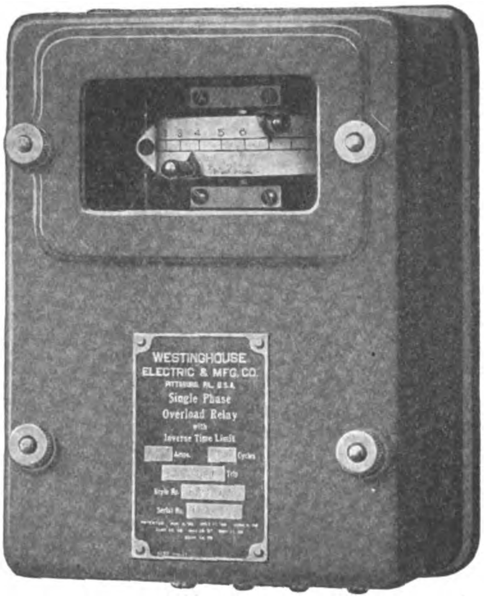


Fig. 1.—Overload Relay Complete.

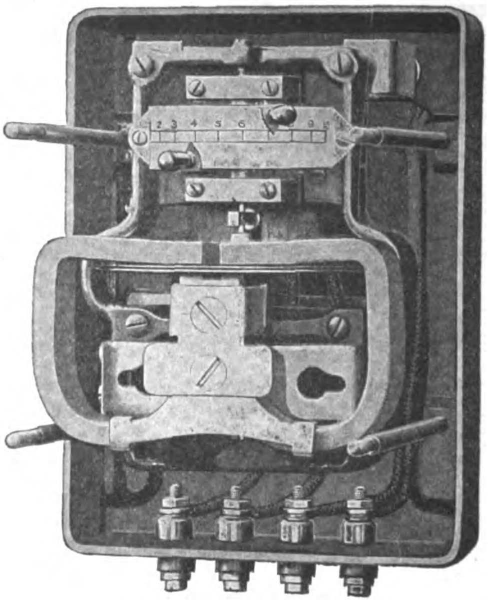


Fig. 2.—Overload Relay without Cover.

In principle the overload-and-reverse-power relay consists of contacts closed by an induction-type alternating-current instrument, in which are combined the functions of ammeter and wattmeter, tripping at heavy overloads and on low reversed power. At zero voltage the relay acts as an ordinary current-actuated overload relay, and therefore low power-factor or absence of voltage does not prevent it from tripping.

The relay is operated from voltage and current transformers of 100 volts and 5 amperes on the secondary. The contacts close a direct-current tripping circuit. This has an adjustable inverse-time-element. The maximum time-element setting for any given tripping-load setting is about ten seconds and the minimum about one second, the maximum having instantaneous tripping action at heavy overloads.

Three adjustments are provided, one for regulating the ratio of the reverse to the overload tripping current, one for regulating the absolute values of these quantities, and the third as described above for regulating the value of the time element. The relays can be adjusted to operate at from 6 to 14 amperes in normal direction and from 0 to 4 amperes reverse power with normal voltage.

The plain overload relays, Figs. 1 and 2, are similar in principle to the overload-and-reverse-power relays, but the voltage connection is omitted. The instrument, therefore, acts as an induction ammeter. In Fig. 3 curve *A* shows the time-element characteristic of these relays. The definite minimum, curve *B*, is obtained by means of Westinghouse "torque compensators" used as an auxiliary to the overload relay. The torque compensator reduces the torque of the relay at heavy overloads without reducing the torque at light overloads and by using it with the relay, the latter can be adjusted for any definite minimum time from 0 to 2 seconds at heavy overloads in the standard relays. Fig. 4 shows the minimum and maximum time-element curves of the overload relay. These curves are modified in the manner shown in Fig. 3 by using in connection with the relay a torque compensator.

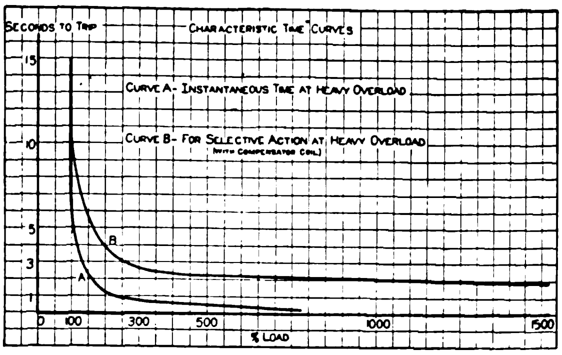


Fig. 3.—Characteristic Curves of Type C Relay.

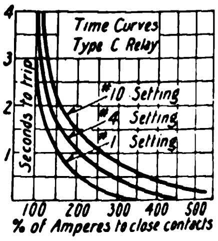


Fig. 4.—Curves of Time-Element Adjustment.

Two adjustments are provided, one for regulating the value of the time element between the limits shown in Fig. 4, and one for determining the minimum current at which the relay is to operate. The minimum current at minimum time setting can be adjusted from 3 to 5 amperes, and at a maximum time setting for from 3 to 8 amperes.

The relay for reverse power only is a combination of the overload-and-reverse-power relay movement with a selective wattmeter element that keeps the trip circuit open when power is flowing in the proper direction. This removes the overload feature of the main relay and allows the instrument to close the circuit only on reverse power. It does this, even should the voltage or power-factor drop to two per cent of normal, in other words, even if the true watts in the reverse direction drop to two per cent under short-circuit conditions. Power flowing in the normal direction equal to two per cent or more normal prevents the relay from tripping. The time-element characteristics of the reverse-power relays are the same as those of the plain overload relays, and the same adjusements are provided.

An important feature of all these relays is their inherent accuracy in time characteristics. Relays controlling circuits operated in service can be safely set one-half second apart and will act selectively even at extremely high overloads. The operating characteristic of many circuit-breakers will allow this setting to be as close as one-third second. The resetting feature is so well worked out that should the overload in any relay be interrupted for 1.25 second short of the time the relay is set to operate, the movement will return to its starting position without closing its contacts. These features, combined with the wide range of time characteristics, make selective action feasible in a manner entirely impossible in other forms of relays.

The relays described above are manufactured by the Westinghouse Electric & Manufacturing Company.

Wireless Telephone Communication With Moving Train.

On May 1 a very successful test of wireless telephone communication between the Lackawanna Limited train and the Scranton, Pa., station was effected while the train was rushing on at a speed said to be about 50 miles an hour. Communication was maintained until the train reached Stroudsburg, Pa., 53 miles from Scranton. The wireless equipment used included an amplifier invented by Lee de Forest, which is said to make possible amplification of speech 50 times above normal. L. B. Foley, superintendent of telegraphs of the Lackawanna system, is continuing the tests and hopes to be able to greatly extend the range of wireless telephony with trains.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTO-STARTERS.—Wagner Electric Manufacturing Company, 6400 Plymouth Avenue, St. Louis, Mo.

"Wagner" 110-550 volts up to 100 horsepower. Types 40DA, 60DD, 60DC, 120DD, 120DE.

Oil-immersed switches and air-cooled transformers mounted in metal cases. In the off position the switches disconnect the motor and transformer windings from the line.

Approved April 3, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

A combination outlet bushing and coupling, catalog No. 911, for use with armored cable at switch boxes. A copper-plated steel sleeve with a prong formed at one end is secured under a screw in the center of the box. The other end is formed into a split clamp collar with a binding screw for securing the cable. (See cut.)

Approved March 25, 1914.

CUTOUT BASES, Cartridge Fuse.—E. H. Freeman Electric Company, Trenton, N. J.

"Freeman," porcelain base.

0-30 amperes, 250 volts; catalog Nos. 403, 410, 412, 420, 422, 425, 427, 429.

31-60 amperes, 250 volts; catalog Nos. 404, 411, 413, 421, 423, 426, 428, 430.

61-100 amperes, 250 volts; catalog Nos. 405, 414, 415.

Approved March 27, 1914.

FIXTURE WIRE.—Atlantic Insulated Wire & Cable Company, 120 Liberty Street, New York, N. Y.

Marking: Green and black threads crossing in braid, or, green and black threads parallel to wire under braid.

Approved April 3, 1914.

RHEOSTATS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Motor starters, direct current; bulletin Nos. 2110, 2120, 2125, 2130, 2140, 2150, 2170, 2171, 2180, 2190, 2210, 2220.

Alternating current; bulletin Nos. 9110, 9113, 9120, 9125, 9130.

Speed regulators; direct current; bulletin Nos. 3110, 3130, 3140, 3150, 3230, 3235, 3240, 3250, 3260, 3320, 3340, 2310, 2350, 8520.

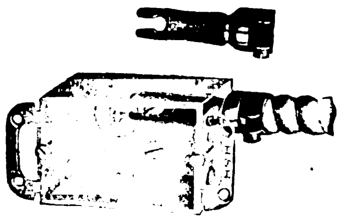
Alternating current; bulletin Nos. 9300, 9320, 9375.

Starting and regulating "Compound" type, direct current; bulletin Nos. 2230, 2240, 2245.

Controllers; bulletin Nos. 4100, 4110, 4130, 4140, 4200, 4210, 4220, 4230, 4240, 4250, 4300, 4310, 4320, 4330, 4340, 4350, 5900, 9335, 9340.

Field regulators; bulletin Nos. 1110, 1130, 1140, 1150, 1160.

Theater dimmers, "Simplicity"; bulletin Nos. 8500, 8502, 8505.



Outlet Bushing and Coupling—Hart & Hegeman Manufacturing Company.

Resistance plates, "Iron Clad"; bulletin No. 1250.

Treadle controllers; bulletin Nos. 8625, up to 0.25 horsepower, 125 or 250 volts.

Spot-light dimmer; bulletin No. 8515.

Battery charging; bulletin No. 8540, 8560, 8570; protective devices for same; bulletin No. 8550.

Approved March 27, 1914.

SIGNS, Electric.—Robert K. Witz, 1215 North Robey Street, Chicago, Ill.

Show-window sign, consisting of an inclosure in which are mounted receptacles for four incandescent lamps and provided with a door with slides in which lettered glass plates may be inserted. A junction box is provided in which connection may be made to supply circuit.

Approved March 30, 1914.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Push-button stations, for use with automatic controllers, bulletin No. 8645.

Approved March 25, 1914.

SWITCHES, Combination Cutout.—Barkelew Electric & Manufacturing Company, Middletown, O.

"Star," equipped with clips for standard cartridge fuses mounted between cross bar and hinge clips. All capacities, 250 volts, direct-current and alternating current; 500 volts, alternating current and direct current.

Approved March 18, 1914.

SWITCHES, Combination Cutout.—E. H. Freeman Electric Company, Trenton, N. J.

Service cutouts with porcelain base, knife switch and cartridge fuses, 30 amperes, 250 volts; catalog No. 1801, 1803.

Approved March 26, 1914.

WIRES, Rubber-Covered.—Atlantic Insulated Wire & Cable Company, 120 Liberty Street, New York, N. Y.

Marking: Green and black threads crossing in braid, or, green and black threads parallel to wire under braid.

Rubber-covered wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters' Laboratories, have labels attached to each coil.

Approved April 2, 1914.

WIRES, Rubber-Covered.—Canada Wire & Cable Company, Limited, 1160-70 Dundas Street, Toronto, Canada.

Marking: One red thread woven in the braid, or, white threads crossing in red braid.

Rubber-covered wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 31, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

NEW YORK, N. Y.—Columbia Mills Power has been incorporated with a capital of $500,000 to engage in the business of electric transmission. G. H. and W. R. Hees, T. D. McChesney are the incorporators.

HIGH BRIDGE, N. J.—The Hunterdon Electric Light & Power Company is considering the extension of its transmission lines to Hampton and Glen Gardner to furnish electrical service to these towns. Knox Taylor is president.

JOHNSTOWN, PA.—Work will begin at once upon an extension of the Southern Cambria's railroad system from Woodland Park, near Ebensburg to Nant-y-Glo, the first step by the traction system to tap the rich mining field in the Blacklick region of which Nant-y-Glo and Twin Rocks are the centers. Address P. J. Little, president, for desired information.

PHILADELPHIA, PA.—The Philadelphia Electric Company has decided upon plans for a new substation to be erected at Germantown and Moreland Avenues. N.

POTTSVILLE, PA..—The Union Knitting Mills, of which J. I. Reed is proprietor, will install in the near future, their own electric power plant.

SCRANTON, PA.—Close to $1,000,000 will be used by the Scranton Electric Company in making improvements in Scranton and the Valley during the year, the American Gas & Electric Company, which controls it, having acted favorably upon the recommendations of Vice-president and General Manager Duncan Campbell for the 1914 appropriation.

SOUTH ATLANTIC STATES.

RICHMOND, VA.—A charter has been granted the American Water Works & Electric Company with a capital of $25,000,000. The concern is empowered to own, operate and to build water and electric plants along with other broad powers. H. Hobart Porter, New York, is president; Henry H. Pierce, New York, is secretary; Charles L. Scott, Hempstead, L. I., is treasurer.

NEW ZION, S. C.—The New Zion Telephone Company has been incorporated with a capital stock of $1,500 by E. B. Gamble, W. C. Plowden, P. M. Gibbons and others.

TURBEVILLE, S. C.—The Turbeville Telephone Company has been incorporated with a capital stock of $15,000 by M. J. Morris, D. L. Green and others.

EATONTON, GA.—On June 8 an election will be held to decide the question of issuing $25,000 for purchasing and developing waterpower at Griffin Mill on Little River, and installing an electric lighting system. Address M. A. Shivers, chairman of Special Committee of Light and Water Boards.

WEST PALM BEACH, FLA.—The City Council has accepted the bond offered by holders of a franchise for building and operating an electric railway, it being provided that not less than $10,000 shall be expended for construction of the line within a year. Address C. N. Newcomb.

NORTH CENTRAL STATES.

CINCINNATI, O.—The County Commissioners of Hamilton County, O., are preparing to issue $500,000 of bonds for the purpose of erecting a new courthouse, which will be wired throughout for the use of electricity. Electric elevators will also be required for the courthouse. L.

CINCINNATI, O.—The United Light Company has been incorporated by Willard H. Odell, William R. Divers, Albert D. Alcorn, Grace Divers and Frank A. Cooper, for the purpose of dealing in electric and gas supplies. The capital stock is $5,000. L.

COLUMBUS, O.—Electricification of the pumping equipment at the central sewage pumping plant and the Main Street station is contemplated by Jerry O'Shaughnessy, superintendent of water works.

DEGRAFF, O.—Extensive repairs are needed at the electric light plant. Address J. S. Doane.

DELAWARE, O.—This city has disposed of bonds to the value of $41,400, at a premium of $983, the proceeds to be used among other purposes for the construction of improvements and additions to the electric light plant. The mayor can give information regarding the work contemplated.

MARION, O.—Additional cluster lights may be placed. Address the city clerk.

LA FAYETTE, IND.—Lafayette & Northwestern Railroad Company has been incorporated with a capital of $100,000, to operate interurbans. O. L. Brown, G. J. Thomson, O. A. Cummins, A. P. Rainier are the incorporators.

MARTINSVILLE, IND.—Electric lights for outlying sections of the city have been ordered by the City Council, which also has provided funds for the installation of cluster lights at the city hall. G.

ANDERSON, IND.—City Engineer Funk has completed specifications and estimates for the system of street lighting to be provided for the uptown district. His estimate is that 308 ornamental posts with five lamps to each cluster will be required and that the cost of installation will be $30,000.

COLUMBUS, IND.—An overhauling and an enlargement of the municipal lighting plant is provided for in an order recently given by the City Council. G.

HAVANA, ILL.—Negotiations will shortly be taken up between the Havana Commercial Association and the Illinois Central Electric Railway, looking toward the electrification of the Havana line of the Burlington, from Lewiston to West Havana.

SHELDON, ILL.—A municipal light plant will be established here. Address F. S. Willand, city clerk, for particulars.

CLARA CITY, MINN.—A special election will be called to decide the question of issuing $5,000 electric light bonds. Address the city clerk for general information.

PILLAGER, MINN.—The Clover Land Telephone Company has been organized here. The line will run to Pillager and Motley. Roy Jacquith and Charles Wright are interested.

CEDAR RAPIDS, IOWA.—The State Railroad Commission has granted a franchise to the Iowa Railway & Light Company, of Cedar Rapids, to build a transmission line from Cedar Rapids to Tama, as part of a proposed line to Marshalltown.

DENNISON, IOWA.—The voters have voted to buy or erect a municipal lighting plant. Address the city clerk.

DES MOINES, IOWA.—New street lamps carrying street signs may be installed by the city after May 1, when the ten-year contract with the Welsbach Lighting Company expires. Address the city clerk.

SHELLSBURG, IOWA.—At a special election held here the question of granting a franchise for an electric lighting and power plant carried and a franchise has been granted to F. J. Cross, who expects to have the plant in operation sometime this summer.

JOPLIN, MO.—The Century Engineering Company will build a trolley line between Columbus, Kansas, and Miami, Okla. Address George D. Thayes, secretary, for information.

ST. LOUIS, MO.—Electric Light & Power Company of Sullivan has been incorporated with a capital stock of $25,000 by Richard Zinkmann, E. W. Illien and W. E. Anderson.

SPENCER, S. D.—The Spencer Light & Power Company has been incorporated with a capital stock of $10,000 by William Hoese, H. C. Sleuth and others.

WINNER, S. D.—The Ideal Telephone Company has been organized here. W. W. Lenker is president and L. J. Auble secretary.

BLUE RAPIDS, KANS.—The Marshall County Power & Light Company will increase its capitalization to $50,000 and make numerous improvements. A 300-foot cement retaining wall will be constructed, and combined water wheels and generators of 220 horsepower installed. B. F. Eyer is general manager of the company. N.

VERMILLION, KANS.—A transmission line will be built from Vermillion to Frankfort at a cost of $7,000. Bonds were voted at a recent election for this purpose. M.

SOUTH CENTRAL STATES.

BURGIN, KY.—Construction and operation of an electric light and power plant is projected for Burgin. The project is being led by W. H. DeBaun, of Perryville, Ky. G.

FULTON, KY.—Improvements and extensions made or projected by the Fulton Electric Light & Power Company will be taken care of by a bond issue which will be put on the market in a short time. The plant was recently rebuilt by the National Light & Power Company, of St. Louis, and the same concern is similarly interested in an electric plant at Hickman. G.

GREENSVILLE, KY.—A hydroelectric plant on Green River, near here, will be one of the results of the successful financing of the project for the building of the Central City, Greensville & Drakesboro Electric Railway to connect those western Kentucky towns. The plant will supply not only the power for the operation of the railway but will be in position to supply the towns in its locality with electric current for all purposes. G.

HARRODSBURG, KY.—Improved electric lighting is proposed. Address J. G. Pullman, mayor, for general information.

LOUISVILLE, KY.—Under its charter, the Southern Utilities Company, recently incorporated here with a capital of $10,000, is authorized to build and operate electric light and power plants, hydroelectric plants and to construct and operate other public utilities. At the present time the company has negotiations up with several towns in Kentucky, though none of these has as yet assumed definite proportions. M. H. Thatcher, formerly Federal Governor of the Panama Canal Zone, is attorney for the company and one of the incorporators. Other incorporators are J. F. Taylor and W. G. Dearing. G.

FRIENDSHIP, TENN.—The plant of R. T. Coffman will have to be increased to meet the demand for lights.

KNOXVILLE, TENN.—A complete double-track line will be constructed at Fountain City, by the Knoxville Railway & Light Company.

LENOIR, TENN.—Plans for the development of power on the Yadkin River, in Tennessee, are being prepared in a tentative way by David R. Shearer, consulting engineer, of this place. G.

McMINNVILLE, TENN.—The Home Telephone Company has been incorporated with a capital stock of $5,000 by L. B. Gilbert, W. C. Lorance and others.

NOLENSVILLE, TENN.—The Farmers Exchange Telephone Company has been incorporated with a capital stock of $3,000 by J. A. Williams, D. R. Gooch and others.

LITTLE ROCK, ARK.—The Little Rock & Pine Bluff Interurban Company will build a line 25 miles in length, according to the promoters, C. C. Kavanaugh and E. W. Jackson.

CORPUS CHRISTI, TEX.—John J. Runk, of this city, is interested in an electric line to be constructed to Ward Island, a distance of eight miles, where an amusement park is to be established.

DALLAS, TEX.—The Dan Sonnenthiel Company will extend its car line east of the city. Address Dan Sonnenthiel, general manager.

EL PASO, TEX.—Another addition is going to be built to the El Paso Electric Railway Company's plant to cost $20,000.

HOUSTON, TEX.—The Houston Harbor Board, Jesse H. Jones, chairman, will soon adopt plans for developing terminals at the turning basin of the Houston ship channel. Engineer J. F. Coleman has submitted tentative plans including the erection of an electric power plant and other equipment, in addition to the warehouses, docks, etc. D.

WESTERN STATES.

PHILLIPSBURG, MONT. — The Roya Basin Mining Company has decided to erect an electric power plant on Flint Creek, a short distance below the town of Maxville. U.

HURLEY, N. M.—The Chino Copper Company will enlarge the capacity of its electric power plant here. D.

BOISE, IDAHO.—Acting on the permission given him by the Federal Court recently to spend $220,000 in the completion of the Oxbow power plant on the Snake River, Receiver Ferris, of the Idaho-Oregon Light & Power Company, has put a crew of men at work. The plant, when complete, will furnish 5,000 horsepower. When it is found feasible a dam will be constructed across the river, and 32,000 horsepower will be developed. O.

CUL DE SAC, IDAHO.—W. J. Morrow, of Couer d'Alene, has petitioned the City Council for an electric lighting and power franchise. He purposes constructing a dam across Lapwai Creek about this city, to bring water in a pipe line to drive the electric dynamos. The plans made public provide for a complete light and power system, and it is expected a franchise will be granted without opposition.

LEWISTON, IDAHO.—Purchase of the power transmission lines of the Lewiston-Clarkston Improvement Company, from Leon Station, NezPerce County, Idaho, to Moscow, Idaho; Pullman, Uniontown and Colton, Wash., has been made by the Washington Water Power Company, of Spokane. Surveys have been made to Troy, Kendrick and Julietta, and it is understood lines will be built into that territory during the coming summer.

LEHI, UTAH.—The City Council has granted a 50-year franchise to C. W. Earl, of Salt Lake City, to construct, maintain and operate in this city an electric distributing system for the purpose of supplying the city with electrical energy for lighting, heating and power purposes. U.

SALT LAKE CITY, UTAH.—Mr. R. S. Campbell has presented an application to the City Commission for a franchise to construct and lay conduits throughout the commercial district for a heating and power distribution plant and system. Mr. Campbell claims that he and his associates will incorporate a company to be known as The Citizen's Public Utility Company to install and operate the system. U.

GLOBE, ARIZ.—The cost of a municipal light plant as estimated by Consulting Engineer H. L. Sawyer would be $89,800. Of this amount he figures $15,600 for the distributing system and the remainder for power plants, equipment, etc.

NOGALES, ARIZ.—An election will be held here on May 25 to decide upon the granting of an electric light and power franchise to S. S. Proto and M. M. Mansfield.

PARKER, ARIZ.—Articles of incorporation have been filed for the Colorado River Electric Railway Company, with a capital stock of $250,000, by Thomas Taylor, David Connor, J. E. Beck, W. H. Thorpe, I. W. Wallace and William Drury. The company proposes to construct electric railroads, and to maintain telephone and telegraph business in and around Parker and through the Colorado River Indian reservation. D.

TUCSON, ARIZ.—Work on construction of a power line through the Rillito River section will be started in a short time by the Tucson Gas, Light & Power Company.

BUCKLEY, WASH.—Puget Sound Traction, Light & Power Company, of Seattle, will begin work in the immediate future of constructing a transmission power line from the power station at Dieringer to this city. A 24-hour service will be inaugurated. O.

WENATCHEE, WASH. — Representatives of the Chicago, Milwaukee & St. Paul Railroad recently purchased a large amount of land on both sides of the Columbia River, below Priest Rapids, having in view the construction of a dam across the River, about 15 miles below Beverly, where, it is reported, a monster power plant will be constructed for the purpose of securing current to electrify its lines in this section. From an authentic source comes the information that the power plant will be erected as soon as the necessary permission is granted. O.

CANYON CITY, ORE.—David A. McKeown of Prairie City has filed an application for a permit to appropriate additional water from Strawberry Creek, in order to develop additional power to the extent of 1,527 horsepower.

ROSEBURG, ORE.—The California & Oregon Power Company has applied for permission to use the public roads in Douglas County for the construction and maintenance of poles and wires for the transmission of electric current.

REDDING, CAL.—The sum of $1,500 has been subscribed to build a telephone line from Watson Gulch, Ono and Igo to Redding.

ESCONDIDO, CAL.—Steps have been taken by the directors of the Escondido Mutual Water Company for the issuance of bonds on the system for $200,000 for the installation of electric light and power plants, the raising of a reservoir and other important improvements.

SACRAMENTO, CAL.—Plans are being completed for a sub-electric station to be erected here. Address E. M. Wilder, Commissioner, for particulars.

SAN MATEO, CAL.—Articles of incorporation are being drawn by the attorney of the San Mateo County Development Association for the holding company which is to obtain the requisite rights of way for the proposed independent electric railroad, which will extend 30 miles down the peninsula from San Francisco to Palo Alto. The directors of the company will be Terence Masterson, of San Mateo; D. G. Doubleday, of Millbrae, H. C. Tuchsen, of Redwood City; F. A. Cunningham, of South San Francisco; E. M. Moores, of Burlingame; and M. B. Johnson, of Montara, the Association's president.

FINANCIAL NOTES.

Articles showing the New York Edison Company has increased its capital stock from $50,549,400 to $66,349,400, have been filed at Albany, N. Y.

The Ohio Public Utilities Commission has approved the application of the Cincinnati & Suburban Bell Telephone Company, for permission to issue $637,150 stock, the proceeds of which are to be used as follows: completing new building, $400,000; switchboard, $50,000; extension of cable and conduit systems, $187,150.

Arrangements have been practically concluded for the purchase of the $1,500,000 first-mortgage fifteen-year six-per cent bonds of the United States Light & Heating Company by a New York-Pittsburgh banking house. Announcement of the sale will shortly be made. Holders of about $600,000 of the $610,000 short term notes, which mature July 1 next, have agreed to exchange their notes for the new bonds. This means, practically, an extension of these notes for at least three years, as that is the earliest maturity of any of the new bonds.

Dividends.

	Term	Rate	Payable
Am. Dist. Tel. of N. Y.	—	1 %	May 15
Detroit United Ry.....	Q	1.5 %	June 1
Mid. West Util., pf....	Q	1.5 %	June 1
Mobile Elec., pf........	Q	1.75%	May 15
Pac. Gas & Elec., pf..	Q	1.5 %	May 15
Tampa Elec.	Q	2.5 %	May 15

Reports of Earnings.

AMERICAN GAS & ELECTRIC.

American Gas & Electric reports for the year ended December 31, 1913:

	1913	1912
Gross earnings	$3,811,292	$3,338,770
Net earnings	1,024,715	915,439
Available for int......	994,403	930,369
Surplus after chgs.....	680,303	616,269
Preferred dividends ..	99,690	99,057
Bal. for com'n stock..	*580,613	517,212

*Equivalent to 16.59 per cent on $3,500,000 common stock.

ELECTRIC BOND & SHARE.

Electric Bond & Share Company reports for the year ended December 31, 1913:

	1913	1912
Gross income	$1,554,403	$1,556,979
Net income	1,129,395	1,226,657
Preferred dividends...	277,900	160,932
Balance for common..	*851,495	1,065,725
Common dividends ...	363,000	225,333
Surplus	488,495	840,392

*Equivalent to 17.29 per cent on $5,000,000 common stock.

CAROLINA POWER & LIGHT.

	1914	1913
March gross	$ 49,166	$ 40,105
Net after taxes	17,511	16,119
Other income	12,500	10,000
Surplus after charges.....	17,780	16,080
Twelve months gross....	553,523	464,182
Net after taxes...........	197,227	153,340
Other income	52,500	40,000
Surplus after charges.....	107,930	88,926

MASSACHUSETTS ELECTRIC COMPANIES.

The report of the Massachusetts Electric companies for the quarter and nine months ended March 31, compares as follows:

Quarter:	1914	1913
Gross	$2,029,027	$2,027,976
Expenses	1,439,344	1,461,772
Net	589,683	566,204
Charge snd taxes......	484,234	450,045
Surplus	105,449	116,159
Nine months:		
Gross earnings........	7,196,463	7,028,306
Exp. and Winter exp. fund	4,818,879	4,549,792
Net earnings	2,377,584	2,478,514
Int. and other chgs. (inc. txs.)	1,482,439	1,400,968
Net div. inc............	895,145	1,077,546

PROPOSALS.

ELECTRIC WIRING, ETC.—Bids will be received until May 14 for furnishing electric wiring, conduits, lighting fixtures, lamps and bells in the new Swinney School, to be built in Kansas City, Mo. J. B. Jackson, Jr., is secretary of the Board of Directors of the School District of Kansas City.

SWITCHBOARDS.—Sealed proposals will be received at the office of the General Purchasing Officer, Panama Canal, Washington, D. C., under Canal Circular 851, until May 23 for furnishing switchboards. Blanks and general information can be obtained from any of the assistant purchasing officers located in the large cities of the United States.

ELECTRIC CABLE.—Sealed proposals will be received at the office of the General Purchasing Officer, Panama Canal, Washington, D. C., under Canal Circular 848, until May 16 for furnishing electric cable, etc. Blanks and general information can be obtained from any of the assistant purchasing officers located in the large cities of the United States.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., for interior lighting fixtures until June 1 of a two-story building for the post office at Brigham City, Utah; until June 4 of a one-story building for the post office at Newport, Ark., and of a two-story building for the post office at Arkansas City, Kans.; until June 9 of a two-story building for the post office at Chico, Cal., until June 10 of a one-story building for the post office at Lake City, Minn.; until June 11 of a two-story building for the post office at Bennettsville, S. C., all in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites named or the office of the Supervising Architect.

ELECTRICAL APPARATUS. — Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 26 for furnishing two electrically heated baths, as per Schedule 6722, for delivery at the Navy Yard, Newport, R. I.; 810 feet four-way vitreous conduit, as per Schedule 6731, for delivery at Navy Yard, Washington, D. C.; five electrically operated potato peelers, as per Schedule 6746, for delivery at Navy Yard, Norfolk, Va.; six ammeters, hot wire, unshunted, direct-reading, 0-40 amperes, and 2,600 feet interior communication cable, soft steel, galvanized, leaded or armored, four-conductor, both for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6740; also 4,000 feet armoring and leading single conductor, plain 150,000 centimeter cable, as per Schedule 6737, for delivery at the Navy Yard, Brooklyn, N. Y.; also 800 feet electric cable, 500,000 centimeters, as per Schedule 6731, for delivery at the Navy Yard, Washington, D. C.

NEW INCORPORATIONS.

OAK LEVEL, KY.—The Oak Level Telephone Company has been incorporated with a capital stock of $1,000 by R. C. Cox, Dr. Joe Woodall and others.

NEW YORK, N. Y.—Singer Electrical Company has been incorporated, capitalized at $5,000, to deal in electrical fixtures, etc. The incorporators are John H. Singleton, Andrew F. Bittner and Patrick J. O'Reilly, all of New York City.

AUBURN, N. Y.—The Stephenson Supply Company, Incorporated, has been incorporated with a capital stock of $7,200. The incorporators are David M. Osborne, Charles D. Osborne and Robert J. Stephenson, all of Auburn.

NEW YORK, N. Y.—Elk Manufacturing Company, Incorporated, has been incorporated to deal in electric terminals. The capital stock is $2,000 and the incorporators are Jacob S. Elkin, Ernest Heynemann, and Marie I. Bloomfield, all of New York City.

PHILADELPHIA, PA.—Crescent Engineering Company has been incorporated with a capital stock of $100,000 to carry on a general mechanical and electrical engineering business. The incorporators are F. R. Hansell, Philadelphia; George H. B. Martin, S. C. Seymour, Camden, N. J.

CLEVELAND, O.—The Elwell-Parker Electric Company, recently organized here with a capital stock of $100,000, will manufacture and deal in electric apparatus of all kinds. The incorporators are S. Q. Kerruish, W. M. Kerruish, G. E. Hartshorn, George W. Spooner and X. I. M. Harrivel. L.

BUFFALO, N. Y.—The Interstate Hydrostat Company has been incorporated with a capital stock of $200,000. The directors are Charles B. Sherwood, of this city; Michael Owen, Anthony J. Eckel, William Eckel and Dr. S. A. Lenhard, of Detroit. The company will manufacture and deal in electrical machinery.

CANAL DOVER, O.—The Braun-Hoff Electric Company has been incorporated with a capital of $50,000, to manufacture and deal in electric motors, generators and electric appliances and devices. William A. Braun, Jesse D. Baker, S. L. Holmes, C. E. Kreiter and G. A. Keyser are the incorporators.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 4	April 27
American Tel. & Tel. (New York)............	121¼	119
Commonwealth Edison (Chicago)............	133½	133½
Edison Electric Illuminating (Boston)	247	245
Electric Storage Battery, common (Philadelphia)	49	49¾
Electric Storage Battery, preferred (Philadelphia)	49	49¾
General Electric (New York)	147⅛	140
Kings County Electric (New York)........	120	120
Manhattan Transit (New York)........	1	1
Massachusetts Electric, common (Boston)	9½	9¼
Massachusetts Electric, preferred stamped (Boston)........	57	58
National Carbon, common (Chicago)	105	106
National Carbon, preferred (Chicago)	119	119
New England Telephone (Boston)	136	135
Philadelphia Electric (Philadelphia)	25½	25¼
Postal Telegraph and Cables, common (New York)........	76½	75
Postal Telegraph and Cables, preferred (New York)	76½	67
Western Union (New York)	61½	60
Westinghouse, common (New York)	74	71
Westinghouse, preferred (New York)	119	117

PERSONAL MENTION.

MR. W. A. MOSER, of the local office of the Westinghouse Electric & Manufacturing Company, Salt Lake City, has been called to the factory at Pittsburgh, Pa., to spend a couple of months on some special work.

MR. GRIGSBY, managing director of The Benjamin Electric, Limited, London, E. C., England, sailed April 24 to make an eight-weeks' trip in the United States in the interests of his company. Mr. Grigsby is an associate member of the Institution of Electrical Engineers.

MESSRS. CHARLES W. GREEN and NORMAN OSANN have been advanced to the grade of assistant professors in electrical engineering, and MR. DEWITT M. TAYLOR to the grade of assistant professor in mechanical engineering by the Massachusetts Institute of Technology.

MR. JAMES P. DUSENBERRY, who has been treasurer of the Public Service Corporation, Newark, N. J., since its organization, has resigned. He will be succeeded by MR. PERCY S. YOUNG, comptroller of the corporation. Mr. Dusenberry has been connected with the gas and electric lighting interests of Newark for 44 years.

MR. E. A. WHARTON was elected president of the Marshall County Power & Light Company at the stockholders' meeting at Blue Rapids, Kans., on April 30. Others officers elected were MESSRS. W. E. HAM, vice-president; WILLIAM HUNTER, secretary-treasurer; B. F. EYER, general manager, and J. G. STRONG, local manager.

MR. JAMES R. KEARNEY has resigned from the Western Electric Company to accept a position as special representative with W. N. Matthews & Brother, St. Louis, Mo. Mr. Kearney has been in the electrical business for many years and has been connected with the Western Electric Company for nearly three years. He leaves that organization with many regrets.

MR. H. D. CURRAN, of the Curran Electric Sign Company, Spokane, Wash., was a Salt Lake City visitor last week. Mr. Curran has recently made a complete tour of the East, inspecting all of the sign manufacturers and signs of importance, looking for ideas to put into his work into Spokane. He was accompanied by Messrs. Eades and Russell, of the Washington Water Power Company, who are returning to Spokane from a trip East.

MR. CORLISS KEMERY, assistant manager of the Shenango Valley Electric Light Company, Sharon, Pa., has been appointed to succeed MR. J. C. CHESTNUT as superintendent when the latter goes to New Castle to become the head of the New Castle Electric Company, a subsidiary of the Mahoning & Shenango Valley Electric Company. Mr. Kemery has been with the Sharon office for the past six years. He is well and favorably known and his many friends are pleased to learn that he has been advanced.

MR. BEN S. READ, general manager of the Missouri & Kansas Telephone Company, with offices in Kansas City, Mo., was on May 1 appointed second vice-president of the Southwestern Bell Telephone Company, with headquarters at St. Louis, Mo. Mr. Read succeeds MR. E. D. NIMS, who was made first vice-president, in place of MR. E. S. BLOOM, who has been appointed one of the receivers for the Central Union Telephone Company. Mr. Read, who is 38 years old, has been with the Bell system for about 24 years; during which time he has been located at Louisville, Nashville, New Orleans, and elsewhere. He went to Kansas City as general manager in November, 1912. MR. P. H. HOPKINS, formerly general commercial superintendent, has been appointed acting general manager in Kansas City.

MR. ALLEN C. MORSE, for many years engaged in engineering work, has been appointed resident engineer and manager of the new office which has been opened at Cleveland, O., by McMeen & Miller. The latter company for more than 10 years has been conducting a general engineering practice with headquarters at Chicago. In its Cleveland office, McMeen & Miller will continue to serve not only public service corporations, municipalities and commissions as may be required, but will devote particular attention to the rehabilitation of plants, the making of appraisals, the establishment of proper systems of records, and to any other work in which they may serve the interests of their clients.

Allen C. Morse.

OBITUARY.

MR. CHARLES B. HEWITT, a Philadelphia electrical contractor, died suddenly in his home in that city recently.

MR. THOMAS W. IRVIN, secretary of Cates & Shepard, electrical contractors, Philadelphia, Pa., died at his home in that city on Sunday, April 24, of heart disease. Mr. Irwin was a member of the Y. M. C. A. and Masonic Fraternity.

MR. WALTER WELLHOUSE, father of Fred Wellhouse, a well known electrical engineer of Boston, Mass., died at his home at Topeka, Kans., on May 2. The elder Mr. Wellhouse was secretary of the Kansas State Board of Horticulture.

MR. GEORGE H. POTTER, president of the Bradford Electric Light and Power Company, died at his residence in Bradford, on April 27. Mr. Potter was born at Rockford, Ill., July 12, 1847. At the age of 17 he enlisted in the United States navy and served about a year on the *Winnebago* of Admiral Farragut's fleet, and took part in the battle of Mobile Bay. After the war he went to the oil regions and located at Petroleum Centre. At the time of his death, besides holding the office of president of the Bradford Electric Light and Power Company, Mr. Potter was president of the Bradford Garage Company, vice-president of the Bradford Hospital Association, and a director of the Bradford National Bank. His widow and one daughter survive.

DATES AHEAD.

Electric Supply Jobbers' Association. May meeting, Chalfonte Hotel, Atlantic City, N. J., May 12-14. General secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

The Gas, Electric and Street Railway Association of Oklahoma. Third annual convention, Oklahoma City, Okla., May 13-15. Secretary, H. V. Bozell, Norman, Okla.

American Institute of Electrical Engineers. Annual meeting, New York, N. Y., May 19. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29.

American Institute of Electrical Engineers. 296th meeting, Pittsfield, Mass., May 29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 22 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 22-26.

National Electrical Contractors' Association. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18.

With the Electrical Manufacturers

Rome Wire Company, Rome, N. Y., has recently issued an attractive calendar for May, 1914.

The Multi Refillable Fuse Company, Chicago, Ill., announces its removal to new and larger quarters at 723 West Fulton Street.

Bridgeport Brass Company, Bridgeport, Conn., has issued a circular giving some good reasons for the steadily increasing demand for Phono-Electric trolley wire.

K. McLennan & Company, Chicago, Ill., sole manufacturers of Gale's commutator compound, have moved their offices from the Manhattan Building to 412 South Fifth Avenue, where more commodious headquarters have been established.

Lotz & Scheible, patent attorneys, announce that the growth of their practice has obliged them to move their offices into larger quarters; consequently the address has been changed to Suite 1063 McCormick Building, 332 South Michigan Boulevard, Chicago.

King Foundry Company, St. Joseph, Mo., has published a very handsome catalog entitled the "King White Way". This describes and illustrates the extensive line of King ornamental lamp standards and also details of a merchandising plan which has been widely accepted throughout the country and proven very popular and profitable.

Cresson Eectric Machine Company is constructing a machine shop and two auxiliary buildings at Cresson, near Johnstown, Pa. A specialty of the company will be the repair of electric mining machinery. The promoters are Messrs. Kirsch of Cherrytree, Indiana County, Pa., who have been conducting a similar plant at that place.

The Ohio Distributing Company, Chicago, Ill., announces the removal of its office and warehouse from the Hearst Building to 220 Lomax Place. The company is now representing the Western Conduit Company, Steel City Electric Company, National Electric Porcelain Company and the Bourn Rubber Company in the midde western territory.

Hazard Manufacturing Company, Wilkes-Barre, Pa., has recently issued a booklet containing the specifications for Hazard 30-per-cent para rubber and Hazard high grade wires and cables. In addition to giving the specifications for these wires and cables, this bulletin also contains several tables giving the results of various insulation tests.

Harrison Safety Boiler Works, Seventeenth Street and Allegheny Avenue, Philadelphia, Pa., is sending out a well illustrated circular calling attention to some of its steam-plant auxiliaries for the promotion of safety and economy. Among these are the Cochrane steam separator, oil separator, multiport safety valve, open feed-water heater, metering heater, water-softening equipment, etc.

The United States Light & Heating Company, Niagara Falls, N. Y., announces that its offices at 30 Church Street, New York City, will be moved on May 20 and will be located thereafter at the company's plant at Niagara Falls, N. Y. This transfer will result in bringing together the administrative sales, engineering and production departments, and will insure the most effective conduct of all in the interests alike of patrons and stockholders

The Jefferson Glass Company, Follansbee, W. Va., will open a handsome display room in Chicago about May 15, occupying a five-room suite in the new building known as the Michigan Boulevard Building at Michigan Boulevard and Washington Street. An elaborate display of illuminating glassware will be exhibited. R. A. L'Ecuyer, who has been Chicago manager of the company for some time, will be succeeded by Albert W. Boulton, who will be in charge of the new offices and display room.

Westinghouse, Church, Kerr & Company, New York City, has been engaged by the Taylor Wharton Iron & Steel Company for the design and construction of a plant for the William Wharton, Jr., Company, to be erected at Easton, Pa. The plant will cover 25 acres and will include machine and grinding shop, blacksmith shop, foundry, pattern shop, storage buildings, office buildings and power plant. Construction work is to begin at once. The plant will be completed and in operation within one year.

National Lamp Works of General Electric Company, Cleveland, O., announces that its physical laboratory which formerly was known as the Physical Laboratory of the National Electric Lamp Association, will hereafter be known as the Nela Research Laboratory of the National Lamp Works of General Electric Company. Dr. Edward P. Hyde is director, as heretofore. The Laboratory's *Abstract-Bulletin* and other publications will continue to be issued from time to time by the Nela Research Laboratory.

Central Electric Company, Chicago, Ill., has recently issued a very attractive bulletin entitled "Ideal Lighting" which illustrates and describes Alexalite indirect and semi-indirect fixtures for offices, banks, salesrooms, hotels, hospitals, residences, public buildings, etc. Numerous excellent reproductions of various types of Alexalite fixtures are shown, each being accompanied by a full description together with the list price. The reflectors are all coated with a porcelain enamel and are so suspended as to be easily cleaned. The last 12 pages of the bulletin are devoted to news and lists of installations in various types of buildings.

The Robbins & Myers Company, Springfield, Ohio, announces with a good deal of pride that its basket ball team has carried off the championship in the Springfield Industrial League. Beside the Robbins & Myers Company the companies represented were the International Harvester Company, American Seeding Machine Company, the Kelly Motor Truck Company, Bauer Brothers Company and the Crowell Publishing Company. The Robbins & Myers team won every one of the 12 games in which they participated. The team was composed as follows: W. E. Bauer, C. A. Slack, H. I. Smeltzer, C. A. Stirling, W. A. Lubbers, O. C. Burmeister, J. P. Lafferty and O. B. Littick.

The Koerting & Mathiesen Company, New York, N. Y., the removal of whose plant and offices to 49-53 East Twenty-first Street was announced last week, states that this move has been made necessary due to the increase of business and also because of the fact that the company is now handling additional lines and is placing upon the market various forms of long-hour lamps for both interior and exterior use. The company will treble its facilities both in offices and stores. It is also announced that a line of motors and dynamos to meet the requirements of the American market will shortly be available. The offices will be handsomely fitted up and a showroom provided where models of all the apparatus and materials handled will be displayed.

Western Electric Company, New York, announces an alliance which has been formed between the Conlon Washing Machine Company, of Chicago, and the Western Electric Company. The entire line of Conlon electric washing machines will be marketed exclusively by the Western Electric Company under the trade name of the "Western Electric-Conlon." The selling arrangement involves no changes in manufacturing, and ample stocks will be carried at the 28 Western Electric distributing houses located at shipping centers throughout the United States. The Western Electric Company is planning a sales campaign, a feature of which will be a complete merchandising plan which will enable central stations and electrical dealers to aggressively push the sale of this machine.

The Electric Storage Battery Company, Philadelphia, Pa., has recently issued a booklet on the Exide charging system for garages. This system is an application of the constant-potential system for boosting. Under this system, for daily or regular charge, the voltage of the charging source is fixed and the batteries hence receive their charge without further attention. As a fully discharged battery will take very high current at first, the charging time will be comparatively short but the voltage is such as to cause no injurious gassing. Four curve sheets are given showing the charging characteristics of various types of Exide batteries at the constant potential recommended and under various discharge states. A fifth curve shows the available capacities of the batteries after being charged under this system.

Beardslee Chandelier Manufacturing Company, Chicago, Ill., has recently issued catalog No. S-3 which is devoted to a description of various types of electric-light fixtures, fittings, etc. This catalog contains almost 800 plates, each illustrating a number of varieties of fixtures. Plain and ornate, direct, indirect and semi-indirect, electric and combination fixtures are described. Numerous ornate art-glass fixtures are also illustrated together with a color plate showing the colors in which art glass is furnished. The catalog covers a full line of ceiling and bracket fixtures suitable for the illumination of all types of buildings. The list prices of the fixtures are given in three columns. The first column gives the cost of unwired fixtures; the second, of wired fixtures; and the third complete with all glassware, sockets, etc., excepting lamps. Directions for ordering and a trade-discount sheet are included. The company is prepared to ship all chandeliers listed in the catalog within 24 hours after receipt of the order.

Edison Lamp Works of General Electric Company, Harrison, N. J., has recently issued bulletin No. 43,600, devoted to 750 and 1,000-watt nitrogen-filled Mazda lamps having efficiencies of 0.65 and 0.60 watt per candlepower. This is a preliminary bulletin on the subject and points out the high efficiency, high candlepower, superior color of light, simplicity and adaptability of these lamps. It is necessary that fixtures for these lamps be ventilated and when used outdoors they should protect the lamp from the weather. Bulletins Nos. 43,400, 43,401, and 43,402 have also been issued, being devoted to the lighting of wood-working plants, clothing factories and machine and metal-working plants. All of these bulletins are well illustrated by views of installations. Each bulletin considers the three methods of lighting namely, general illumination, localized general illumination, and combined localized and general illumination and the proper applications for each in the industries covered by these bulletins. Edison Mazda lamps for standard lighting service are listed in each bulletin and recommendations are made for the intensity of illumination which will be found most satisfactory for a number of operations. The May number of the *Edison Business Builder* which is now published as a monthly magazine, has also appeared. In addition to editorials of value to lighting companies and agents, it has several articles on lighting practice, magazine advertising, and co-operative publicity.

Record of Electrical Patents.

Issued by the United States Patent Office, April 28, 1914.

1,094,440. Timing Device. H. S. Hatfield, Brunswick, Germany. A liquid timing device for electric circuits.

1,094,441. Block Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co., Swissvale, Pa. Signals automatically controlled by presence or absence of train in block.

1,094,467. Method of Preparing Asbestos Fiber for Insulating Purposes. H. L. Owen, assignor to General Electric Co. Consists in carding, taping and winding the fiber for applying to wire.

1,094,472. Apparatus and Method for Counteracting the Inductance Disturbances in Telegraph Lines. C. Priest, assignor to Commercial Cable Co., New York, N. Y. Includes a compensating cable.

1,094,479. Switch Plug. H. R. Sargent, assignor to General Electric Co. A rotary snap-switch plug (See cut.)

1,094,487. Ship's Course-Recording Device. F. Spalazzi, Rome, Italy. Has electric means for transmitting and reporting compass movement.

1,094,494. Electric Railway. L. H. Thullen, assignor to Union Switch & Signal Co. Covers bonding of tracks and circuits for signal system.

1,094,495. Signaling System for Railways. L. H. Thullen, assignor to Union Switch & Signal Co. A modification of the above.

1,094,505. Purification of Asbestos. W. R. Whitney, assignor to General Electric Co. Consists of subjecting asbestos containing magnetite to the action of a solution of oxalic acid.

1,094,506. Electric Iron. H. Wicks, Cleveland, O. Covers mechanical and electrical details.

1,094,514. Calculating Apparatus. C. A. Bishop, New York, N. Y. Employs electromagnets.

1,094,528. Spark Plug. A. J. Champion, assignor to Champion Ignition Co., Flint, Mich. For internal-combustion engines.

1,094,530. Temperature - Indicating Device. M. S. Clawson, New York, N. Y. Electrode and metal retort form thermocouple controlling the galvanometer.

1,094,534. Electric Switch. R. Howard Conrad, Oakland, Cal. Knife blades held by electromagnetic lock.

1,094,539. Process of Producing 1-3-Butylene-Glycol. K. Delbrück and K. Meisenburg, assignors to Farbenfabriken Vorm. Friedr. Bayer & Co., Elberfeld, Germany. Comprises electrolytic reduction of aldol in acids.

1,094,540 and 1,094,541. Fan. H. J. Dilg, assignor to Eck Dynamo & Motor Co., Belleville, N. J. A combination motor-driven oscillating and ceiling fan.

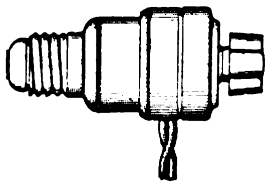
1,094,562. Electric Switch. O. H. H. Heins, Edgewater, N. J. A key-operated switch.

1,094,563. Collector. A. Helfenstein, Vienna, Austria-Hungary. A flexible third-rail contact member.

1,094,564. Safety Device for Electric Cars. J. E. Henderson, Birmingham, Ala. An electrically operated fender.

1,094,578. Duplex Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co. Covers details of apparatus for duplexing.

1,094,584. Signaling Device. M. S. Morse, Oakland, Cal., assignor to two-fifths to J. R. Watson, Jr. A single contact operated by the vibration of rails due to the passage of cars.



1,094,479.—Switch Plug.

1,094,591. Automatic Controlling Means for Reversing Combustion Engines. L. J. Le Pontois, New Rochelle, N. Y., assignor of one-half to B. Hurd. Ignition reversing means.

1,094,689. Indicating System for Turrets. F. W. Wood, assignor to Charles Cory & Son, Inc., New York, N. Y. Electric tell-tale system for showing the position of three turrets.

1,094,690. Switch. F. W. Wood, assignor to Charles Cory & Son. A cam-operated quick-break switch.

1,094,691. Electrical Switch. F. W. Wood, assignor to Charles Cory & Son. A multiple-contact switch.

1,094,693. Oil Switch. J. M. Andersen, assignor to A. & J. M. Anderson Mfg. Co., Boston, Mass. Insulating material placed between contact members.

1,094,694. Oil Time Switch. J. M. Andersen, assignor to A. & J. M. Anderson Mfg. Co. A modification of 1,094,694 having timing device.

1,094,699. Safety Device for Overhead Electric Lines. E. F. Bourdil, assignor to Société Anonyme Apicea, Paris, France. Includes means for preventing longitudinal movement of live wires.

1,094,700. Mine Finder. F. Bündgens, Kiel, Germany. Has lamp signal device.

1,094,704. Sound and Image Producing Apparatus. H. H. Clubb and R. A. Whitehead, assignors to Picture Disc Co., Los Angeles, Cal. Electrically illuminated display auxiliary to a phonograph.

1,094,711. Electric Motor. F. M. Fraser, Yonkers, N. Y. A rotatable-field electric motor with rope pulley.

1,094,714. Reciprocating Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Electric heaters and electrically controlled reciprocating means.

1,094,717. Coupling for Electric Conductors. J. L. Hinds and J. J. Dossert, assignors to Crouse-Hinds Co., Syracuse, N. Y. A lug and clamping arrangement.

1,094,718. Electric Condenser and Method of Constructing the Same. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Process of manufacturing coiled condensers.

1,094,728. Electrolytic Apparatus. I. H. Levin, Newark, N. J., assignor to International Oxygen Co. Includes means for supplying electrolyte and controlling pressure.

1,094,732. System of Distribution. E. W. Lyle, assignor to General Electric Co. For reducing effects of variable line voltage by combining resistances having positive and negative temperature coefficients.

1,094,733. Electric Regulator. F. W. Lyle, assignor to General Electric Co.

An incandescent lamp containing hydrogen and a composite filament containing boron.

1,094,743. Street or Station Indicator. J. Lamburt Olson, St. Paul, Minn. Electrically operated and controlled.

1,094,745. Electric Incandescent Lamp. J. W. Phelps, assignor to General Electric Co. Has high and low candlepower filaments.

1,094,771. Electrically Heated Oven. H. P. Ball, assignor to General Electric Co. Has heat-insulated walls and a pivoted heating unit.

1,094,774. Process of Making Incandescent Electric Lamps. A. Berliner, assignor to General Electric Co. The glass parts are manipulated to form the bulb, etc., and the lamp is exhausted while still hot.

1,094,778. Vapor Electric Apparatus. A. Churchward, assignor to General Electric Co. Covers details of controlling means for a rectifier.

1,094,798. Safety Switch for Motor Vehicles. W. MacGlashan, assignor to Studebaker Corporation, South Bend, Ind. Auxiliary to the controller of an electric vehicle.

1,094,806. Switch. W. J. Newton, Lynbrook, N. Y., assignor to Metropolitan Electric Mfg. Co. A combination plug and wall switch.

1,094,829. Electrical Insulator. J. W. Aylsworth, assignor to Halogen Products Co., West Orange, N. J. Contains liquid chlorinated naphthalene having an anhydride dissolved therein.

1,094,839. Flashlight Device. R. M. Eaton, assignor to Niagara Searchlight Co., Niagara Falls, N. Y. Pocket battery lamp.

1,094,851. Electric-Resistance Device. W. S. Hadaway, Jr., New York, N. Y. A strip of resistance material inclosed in a metallic casing with slots for the terminals.

1,094,852. Insulator Pin. J. L. Hecht and J. C. Gapen, assignors of one-half to Electric Service Supplies Co., Philadelphia, Pa. Special bolt connection between the pin and crossarm. (See cut.)

1,094,855. Reed Hook. W. L. Keith, Milltown, Me. The handle has an electric light, shield and reflector.

1,094,870. Trolley Guard. J. H. Boyd, Carlisle, Pa. Guard arms on each side of the trolley wheel.

1,094,890. Trolley-Wheel Mount. W. Ficzek, Jersey City, N. J. Special harp construction.

1,094,894. Block Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co., Swissvale, Pa. Relay-controlled alternating-current system.

1,094,903. Storage-Battery Electrode and Process of Manufacturing It. H. C. Hubbell, Newark, N. J. The active material is made by converting ferrous hydroxide into iron monoxide by heating without exposure to air, cooling and applying to the pockets of the plate.

1,094,907. Locking Device for Electrical Contacts. J. de R. Kielland, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. A lamp lock with spiral spring engaging the threads of the lamp base. (See cut.)

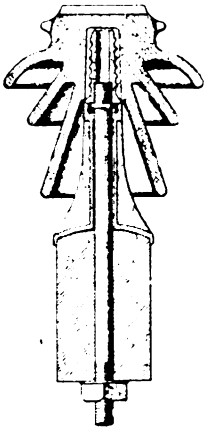
1,094,910. Corrugated Welding Strip. L. S. Lachman, assignor to Universal Electric Welding Co., New York, N. Y. A series of contact faces for electric spot welding are united by a metal strip.

1,094,912. Electric Furnace. T. Levoz, Heer, Belgium. For manufacturing steel electrolytically.

1,094,913. Block-Signal System. J. W. Murphy, Akron, O. Electrically controlled by selectors.

1,094,968. Telephone-Call Register. W. G. Bell, Newton, and W. H. Vinto, Boston, Mass.; said Vinto assignor to said Bell. For use at a pay station.

1,094,973. Vehicle Controlling Apparatus. T. Bodde, Brant Rock, Mass., assignor of one-half to A. G. Shaver. Includes a dynamo whose poles can be magnetically shunted.



1,094,852.—Insulator Pin.

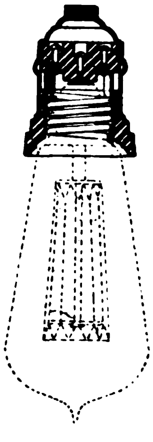
1,094,977. Supporting Bracket. R. B. Cable, Jr., Ridgwood, N. J. Adjustable support for lamp socket.

1,094,990. Branch Box. M. Havens, Jr., Albany, N. Y. The closure for the open side of the box has two plates holding insulating bushings for the wires.

1,094,991. Thermostat. R. E. Hinson, Hillsboro, Tex., assignor to one-half to S. Quayle. Governs an electric circuit.

1,095,007. Blind-Shaft Bearing for the Driving Means of Electric Locomotives. G. Lundholm, Vesterås, Sweden. The blind shaft is connected by double cranks to the motor shaft above it.

1,095,084. Signal Apparatus. V. J. Crettol, Chicago, Ill. Electric alarm for a mail box.



1,094,907.—Lamp Lock.

1,095,112. Annunciator System. T. A. Haugaard, Cheyenne, Wyo. The hands of a chronometer actuate a circular series of switches arranged around the dial.

1,095,114. Device for Controlling Elevators. W. E. Brown, New York, N. Y. Includes a solenoid controlled by the elevator hand rope.

1,095,118. Device for the Production of Induced Currents in Magneto Machines and Dynamos. A. Keller-Dorian, Lyon, France. Covers details of an ignition magneto.

1,095,121. Cooling Device for Röntgen Tubes. J. A. Mannheim, Hamburg, Germany. A cooling rod is adapted to be set within the anticathode tube.

1,095,128. Method of Recording Musical Tones. C. F. Stoddard, Boston, Mass. Includes electrical control.

1,095,135. Fuse Holder. H. W. Young, Chicago, Ill. Covers details of construction of the cartridge casing.

1,095,138. Push Switch. C. A. Bates, assignor to Bryant Electric Co., Bridgeport, Conn. A pendent push-button switch.

1,095,170. Alternating-Current-Rectifying Apparatus. C. P. Steinmetz, assignor to General Electric Co. A mercury-vapor rectifier is arranged to supply the direct-current circuit continuously with a predetermined amount of current; means are provided for returning energy from this circuit to the supply system.

1,095,175. Mercury-Vapor Lamp. R. Küch, assignor to General Electric Co. Shaped like a dumbbell.

1,095,178. Mechanism for Controlling the Speed of Turbines or Other Prime Movers Connected in Parallel. H. E. Warren, assignor to Lombard Governor Co., Ashland, Mass. The combined load of the generators is made to affect the pressure of the fluid supplied to the turbines.

Patents Expired.

The following United States electrical patents expired May 4, 1914.

581,706. Electric Switch. G. T. Evanson, Philadelphia, Pa.

581,715. Electric Cable. M. Guilleaume, Mulheim-on-the-Rhine, Germany.

581,718. Electric Cigar-Lighter. H. M. Handshy, San Antonio, Tex.

581,769. Electric Railway. H. C. Reagan, Jr., Philadelphia, Pa.

581,802. Aero-Electric Whistle. C. R. Alsop, Middletown, Conn.

581,815. Telegraphy. C. F. Eaton, Jr., Santa Barbara, Cal.

581,840. Tool for Appliance for Use in Truing Up Commutators of Dynamos, Electric Machines, Etc. W. T. Adams, London, England.

581,873. Electric Transformer. E. Thomson, Lynn, Mass.

581,932. Carrier for Signal Wires. J. Chalmers, Jr., Pittsburgh, Pa.

581,997. Electric Arc Lamp. M. S. Okun, New York, N. Y.

582,036. Electrical Fuse Cutout. W. C. Bryant, Bridgeport, Conn.

582,102. Controller for Electric Cars. A. Schmid and H. P. Davis, Pittsburgh, Pa.

582,107. Selective Signaling Circuit, Apparatus and System. G. W. Whittemore and J. A. Barrett, Brooklyn, N. Y.

582,111. Switch for Electric Circuits. A. J. Wurts, Pittsburgh, Pa.

582,114. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

582,115. Method of and Means for Controlling Electric Motors. H. P. Davis.

582,120. Astatic Galvanometer. A. Frank, Berlin, Germany.

582,131. Alternating-Current Regulation and Distribution. B. G. Lamme, Pittsburgh, Pa.

582,132. Alternating-Current Motor. B. G. Lamme.

582,149. Electric Switch. J. A. Spiker, Grand Island, Neb.

582,157. Telegraphic Apparatus. C. F. Easton, Jr., New York, N. Y.

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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COMPRISING

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ELECTROMAGNETIC THEORY AND ELECTRICAL ENGINEERING.

To anyone who heard Prof. M. I. Pupin lecture before the American Institute of Electrical Engineers, Maxwell's theory of electromagnetism must have seemed a very simple matter indeed. Like most things which seem complicated when new, familiarity with their application has at least made the fundamentals of the Maxwellian theory seem almost commonplace. And yet nearly a generation was required for the significance of Maxwell's theory to be recognized and for the important secrets which were contained in it to be appreciated and applied.

Apart from its bearing upon the subject of light and radiation in general, Maxwell's work served not only to put the then known facts regarding electrical phenomena into a comprehensive shape, but it enabled deductions to be made for which the experimental evidence was not then at hand. It indicated, for instance, the existence of electromagnetic waves, yet the world waited for Hertz to demonstrate the physical existence of such waves and for Marconi to apply them commercially.

Professor Pupin's exposition of the Maxwellian theory, a synopsis of which will be found elsewhere in this issue, was based upon the application of the third law of Newton to electric and magnetic phenomena. This law, which was formulated with respect to the motions of ordinary matter and the forces acting upon it, states that every action is opposed by an equal reaction. The realization that in the case of electromagnetic phenomena, mechanical forces often come into play to which there is no reaction in the purely mechanical sense, has led many persons to believe that Newton's law finds here an exception and that it is not valid in this realm. In order to retain it we must adopt the conception of space having such attributes that it can possess momentum and energy. The conception of a mass which varies with the velocity is another that does violence to our mechanical ideas based upon the Newtonian philosophy. The student of electrical phenomena nowadays must be prepared to modify the old ideas along such lines as this, just as the chemist has been compelled recently to abandon the idea that the atom of matter is indivisible, and that one chemical element may not be transmuted into another.

As Professor Pupin pointed out, it is not sufficient for the electrical engineer to confine his attention only to that portion of electromagnetic theory which deals with conductors. His field is concerned with phenomena in which the electron plays an important part and if he is to understand all the phenomena which are to be applied in engineering work, it is necessary for him to keep abreast of the latest developments in physical science which bear upon electric and magnetic phenomena.

USE OF FAN MOTORS FOR VENTILATING SLEEPING APARTMENTS.

The balmy days of spring are now fully at hand and, while they inspire many to thoughts of poetry and love, they also suggest to the more practical among us that torrid and sultry days are not far off and that with them will come the urgent need for the delightfully cooling breezes of the electric fan. The use of the fan motor as a cooling agent has become so fixed in the public mind that it has even been mentioned in popular midsummer songs. Not so well known, however, is the use of this fan as a ventilating means.

In but relatively few houses is any positive ventilation equipment provided, dependence being placed almost entirely on opening of windows. Wind is the most active natural ventilating agency, but at the same time the most uncontrollable and therefore unreliable. In cold weather, when there is a considerable difference between outdoor and indoor temperatures, natural convection currents will bring fresh air in at the bottom of a window and remove vitiated air at the top. Such currents will provide more or less perfect ventilation, depending upon the conditions; they serve in the absence of wind or may co-operate with wind. In warm weather, when the difference between outdoor and indoor temperatures is very small or negligible, convection currents fail and reliance must be placed entirely on wind, since diffusion through the restricted areas of most windows, even when wide open, serves to improve the quality of only that air close to the windows. This is the time to use the electric fan to bring in fresh air when the wind is absent or in the wrong direction.

There are many days in summer when there is practically no breeze. Even when there is more or less breeze. rooms on the leeward side get no appreciable benefit from it, as a rule. The result is that such rooms become stuffy and uncomfortable. This is particularly noticeable during damp or sultry weather, even when the outdoor temperature is not excessively high. The habitability of all kinds of rooms can be improved when these conditions prevail by placing an electric fan on or close to the sill of an open window and turning it so that it will blow fresh air into the room. In bedrooms this plan his been found to work out particularly well, since its use permits refreshing sleep for even those who cannot avail themselves of the luxury of an open sleeping porch.

In using an electric fan in the manner suggested above, some precautions are necessary. One of these, which is self-evident, is to be sure that the window curtains are well draped to the sides of the window so as to avoid entanglement in the fan if a gust of wind should suddenly spring up. Another is to use a fan of such size and to run it at such speed as will not produce a chilling draft. For a very small room an eight-inch fan will usually suffice; for larger rooms a twelve-inch fan is generally needed. Nonoscillating fans serve very well, since the fan should be so directed as to produce a gentle but steady breeze. The fan should not be too near the sleeper, if the latter is subject to catching colds. All that is needed is to bring a steady current of fresh air that is strong enough to reach the breathing zone. A long cord is usually necessary to permit placing the fan on or close to the window sill and a feed-through switch placed in the cord so as to be readily reached without getting out of bed is a convenience for stopping the fan if a natural breeze springs up. The fear that some may have of possible noise from the fan is unwarranted if a quietly running fan is used; in fact, the very slight hum of the fan running at low speed has been found quite soothing.

The cost of operating a fan all night under these conditions is so small compared to the benefits it brings in sound and restful sleep that no one should hesitate on account of expense. To the central-station companies, on the other hand, the revenue derived from having a large number of fans operating all night will be welcome.

THE PAGEANT AND MASQUE OF ST. LOUIS.

Elsewhere in this issue there is given a description of the electrical details of the huge three-day Pageant and Masque of St. Louis. A temporary installation for electrical illumination and effects in a natural amphitheater of the size of the one on Art Hill, represents a problem of no mean proportions, yet no pains are being spared to eliminate unsightly wires and to remove all glare from the illumination.

It is interesting to note that the designers of this installation have recognized the excellent adaptability of the searchlight for general illumination, and have, at the same time, made provision for the failure of one or more of the main searchlights, by so directing the rays of the lamps that they overlap. The shielding of the two auxiliary 18-inch searchlights by installing them in pits, is a feature which is in line with the present tendency to shield light sources from view.

The stage illumination also presents a number of unique features in that it was obviously objectionable to use an overhead system of illumination wherein the lamps would be visible to the audience. The problem was solved by supplementing careful study of the requirements with experiment. When it was discovered that all types of footlight reflectors were objectionable for the purpose at hand, the designers did not, as so often happens, select the least objectionable, but developed a suitable reflector. Similarly, when it was found that theater dimmers in the large capacities required, would be prohibitive on account of their cost, water rheostats were substituted.

The simplicity of the wiring layout is also noticeable, the control being centralized at one point on the stage. From this point directions can be given to the various searchlight operators by telephone, and an assistant stage manager in the audience can, by the same means, communicate to the stage a knowledge of any deficiencies in the electrical effects.

COLORADO AND CONSERVATION.

Recent events in Colorado lend strong support to a federal policy of retaining federal control over such natural resources of the country as now constitute public lands. By permitting coal mining, timber cutting, the development of water powers and other utilizations of natural resources under contract or lease rather than by turning title over to individuals or corporations the Federal Government may retain control and prevent such abuses as have become evident in the Colorado coal fields. It has been maintained by those who clamor for state rights and local control that the state is amply able to protect the public welfare and that it is better for the Federal Government to relinquish all control and keep hands off. No one has been more insistent upon this side of the question than the officials of Colorado, and yet it is in that state that we find the most manifest inability of the state administration to carry out the statutes which have been enacted for the public welfare.

If anyone doubts the failure of the state government of Colorado to properly perform its function he may find plentiful evidence in official records. Evidence presented before the investigating committee of the United States Congress was to the effect that a number of the demands for which the coal miners struck are already required by state law, but that the state laws are ignored by many of the mine operators and are not enforced by the state executive. A meeting of newspaper editors representing 25 of the leading papers of Colorado on November 13 last, in Denver, adopted resolutions asserting that four of the seven demands made by the miners were already required by statute. The report of the deputy state labor commissioner to the Governor of Colorado in 1911 contains the following statement referring to the Colorado Fuel & Iron Company: "It has been the policy of this company to violate all the laws on the statute books of Colorado that have for their purpose the protection of the wage earners."

Similar evidence regarding many of the coal-mining operations in the state are to be found in the reports of the state factory inspector and the Bureau of Labor Statistics.

It is not only employers and employees who have an interest in such conditions. Not only is there a public interest in the interruption of supply of such an article of general use as coal, but inconvenience, damage and financial loss have been incurred by large numbers of noncombatants. The question is, therefore, a larger one than merely that of securing the legal rights of those most directly involved in the conflict lately raging.

At about the time that the Ludlow massacre was taking place, the Governor of the state was in Washington and spoke for two days against the bill providing for the leasing of coal lands now included in the public domain, and almost in the same breath he called for the assistance of the Federal Government to maintain public order in the territory where trouble is largely due to his failure to enforce state laws. If the Government retains control of the present public lands it will not in future be necessary to send troops upon them in order to suppress disorder resulting from the development of those resources under conditions which are prohibited by law.

The coal miners of Colorado consist largely of ignorant immigrants. Their first contact with industrial conditions in their new country reveals the open violation of the laws by their employers with no redress upon their side, except through the medium of violence. The violators of law are immune from punishment because of their participation in politics and control not only of the chief state offices but also of the local government. Conditions could not be better selected for the breeding of anarchists. When anarchists occupy public office and manage the corporations having large property interests and dominating industrial operations, can we be surprised at their rapid development in the ranks of the workers? The Governor of the state is not personally so greatly to blame as might seem upon the surface, and his proposed impeachment would do little to improve conditions so long as politics are dominated by interests which do not want the law enforced. It is the meddling of powerful corporations in politics which is largely responsible for the ever increasing demand for government ownership rather than the question of whether better service and rates will be attained under the one or the other control. Unless the officials of large industrial corporations and utility corporations stop interfering with the enforcement of law and set an example as law-abiding citizens, they can hardly expect a temper among the electorate which will much longer regard the protection of property as one of the chief aims of organized government. The best means of preventing the spread of either anarchistic or socialistic ideas is to eliminate the causes that naturally give rise to them.

While the Federal Government has not been entirely free from domination by large interests, the liability of its action being so controlled is much more remote than in the case of individual states. It would, therefore, seem obvious that such conditions as now exist in Colorado can be much more easily obviated by retaining federal control of the public domain and providing for development of its resources without giving up federal title. At present only three per cent of the known coal lands of Colorado are privately owned. The state controls a large acreage, and title to about 11,000,000 acres resides in the Federal Government. Under present conditions it does not seem desirable to turn this over to either private or state ownership.

Electrical Exports for March.

The bureau of Foreign and Domestic Commerce has issued its monthly summary of the imports and exports of the United States for March. From this report are taken the following facts relative to the electrical exports for that month.

Although the total value of electrical shipments was larger in March than during the preceding month, a considerable decrease is evident as compared with March of last year, due largely, no doubt, to the practical cessation of exports to Mexico, which has heretofore been a good market for American electrical goods. The number of articles shipped in March in the four classes for which the numbers are reported were: fans, 3,662; arc lamps, 171; carbon-filament lamps, 79,301; metal-filament lamps, 56,429.

The detailed figures are given in the following table, together with those of the corresponding month in 1913, as far as the latter are available.

Articles	March, 1914	March, 1913
Batteries	$ 47,304	....
Dynamos and generators	376,985	$ 136,812
Fans	54,718	43,460
Insulated wire and cables	154,696	....
Interior wiring supplies, etc. (including fixtures)	50,182	....
Lamps—		
Arc	2,686	9,186
Carbon-filament	14,697	19,423
Metal-filament	14,188	26,085
Motors	292,991	381,583
Static transformers	92,903	....
Telegraph instruments (including wireless apparatus	6,062	17,774
Telephones	59,295	120,181
All other	937,625	1,734,870
Total	$2,104,332	$2,489,374

◆

May Meeting of Electric Vehicle Association of America.

An important meeting of the Electric Vehicle Association of America is scheduled for Friday, May 22, at 8:15 p. m. This meeting is to be held in the new Auditorium, through the courtesy of the Consolidated Gas Company, 130 East Fifteenth street, New York City, and will be devoted to the subject "The Electric Vehicle in Parcel Post Service for Economy and Reliability."

The general subject will be presented by S. G. Thompson, of the Public Service Electric Company, of Newark, N. J. Frank W. Frueauff, chairman, Parcel-Post Co-operative Committee, will present the workings of his committee, discussing the subject from the viewpoint of the electricity-supply companies. James H. McGraw, chairman, Parcel-Post Delivery Committee, Electric Vehicle Association, will, in indicating the work accomplished by his committee.

A number of the prominent persons identified with the electric vehicle industry will discuss the subject and a large representative attendance is expected. The meeting is open to all.

Owing to the greatly increased interest in electric vehicles, and the great volume of work to be disposed of, three days will be allotted to the fifth annual convention of the Electric Vehicle Association, which will be held in Philadelphia, October 19, 20 and 21. Heretofore, Electric Vehicle Association conventions have been confined to two days, and it now seems that difficulty will be experienced in crowding the work into even three days.

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Southwestern Convention.

The tenth annual convention of the Southwestern Electrical & Gas Association will be held at the Hotel Galvez, Galveston, Tex., on May 20 to 23. A number of general sessions, at which will be discussed matters of interest to all of the various utilities represented in the Association, will be held. There have also been arranged several separate sessions for gas, street and interurban, and electric-light and power interests; these latter sessions have been arranged so as not to interfere with each other, so that it will be possible for members to attend all of them if they so desire.

The tentative program arranged for the main sessions of the convention will contain relatively few formal or highly technical papers with the object of presenting fewer subjects, but these of greater importance, so as to leave time for ample discussion. Among the more important features on the program are a symposium on the "Safety-First" movement, in which will participate a claim agent, a superintendent of transportation, a master mechanic, a manager of electric-light and power plants, a gas superintendent, and possibly one or two other gentlemen. A paper dealing with "Fire Prevention versus Fire Protection" will be presented by the general manager of a combined railway, light, gas and water plant. A paper on "Public Policy of Public Corporations," will be presented by the general superintendent of a corporation controlling over 20 utility plants in the Southwest. A paper will be presented by the general manager of one of the largest light and power properties in Texas which will deal with the practical side of new-business work. A symposium on rates will be presented by a number of prominent gas and electric men who have made a special study of the subject. A superintendent of a railway system will present a paper on "Economy in the Use of Power in the Operation of Electric Cars."

A number of entertainment features for the ladies attending the convention, as well as for the active members of the Association, have been arranged for. The secretary of the Association is H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Society for Electrical Development Makes Changes in Publicity Department.

The Society for Electrical Development has engaged H. C. Spaulding to take charge of its news and advertising department. Mr. Spaulding is a graduate of the Massachusetts Institute of Technology, a member of the Technical Publicity Association, was formerly manager of the Thompson-Houston Company, afterwards manager of the electrical department of the Blake & Knowles Pump Company, and New England manager of Siemens & Halske Electric Company, assistant sales manager of the Triumph Electric Company and district manager of the Yale & Towne Manufacturing Company. Mr. Spaulding has had wide experience in publicity work and has been a frequent contributor to the technical papers. H. C. Plummer has been engaged by the society to assist Mr. Spaulding in his department. Mr. Plummer has had several years' training in active newspaper work and has been a writer on engineering and technical subjects for technical papers, popular magazines and daily newspapers. He has made a specialty of presenting in popular form subjects of an academic character. With Messrs. Spaulding and Plummer in charge of this department, the Society for Electrical Development is fitted for doing high-class publicity work.

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Electric Club of Chicago.

At the meeting of the Electric Club held in the Hotel Sherman, Chicago, on May 7, Dr. G. Frank Lydston, professor of surgery at the University of Illinois, spoke on "The Social Awakening." He touched on a wide range of social disorders, particularly crime. In this country about half a billion dollars is spent annually in the apprehending, prosecuting and punishing of criminals. Despite our civilization, crime is not appreciably diminishing. Our attempts to cure it by punishment are futile. Crime is a social disease of degenerate or otherwise abnormal persons. The best way to handle it is to prevent it. Among the preventive measures Dr. Lydston advocated are sterilization of diseased, defective and criminal persons to check propagation of a degenerate posterity; improved standard of living through the selfish realization by employers that increased wages and better conditions of employment make for increased efficiency and productiveness of their employees; study of the psychopathic history of criminals; segregation of minor offenders from hardened criminals, etc.

Dr. Lydston has consented to speak to the club again, touching on other aspects of the problem.

Newcomb Carlton.

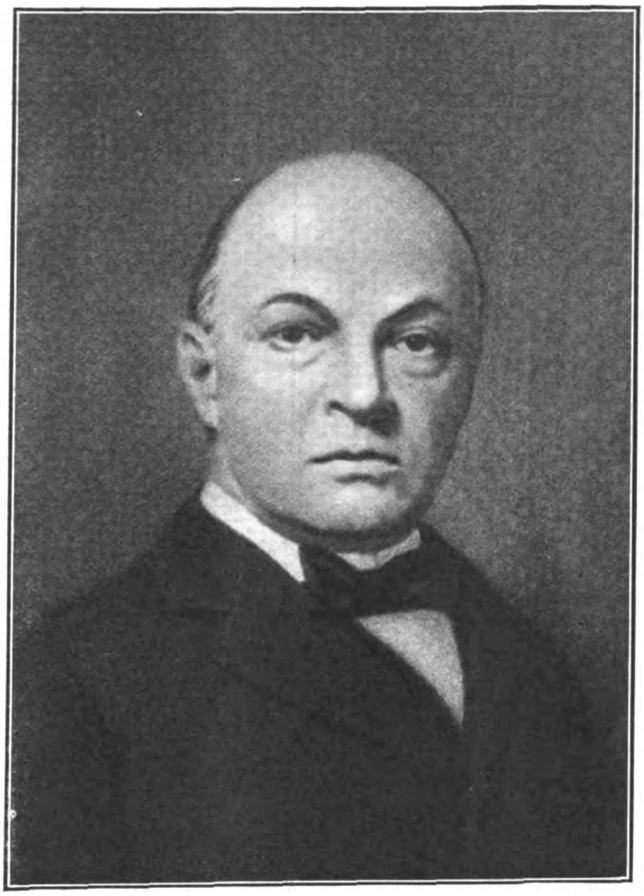
Newcomb Carlton, the newly elected president of the Western Union Telegraph Company, although a comparatively young man, has had a varied and interesting career in electrical work. A graduate of Stevens Institute of Technology, Mr. Carlton was active as a mechanical engineer in Buffalo, N. Y., until 1899, when he became director of the Pan-American Exposition in that city. When the Exposition closed he accepted the vice-presidency of the Bell Telephone Company of Buffalo for two years. In 1904 he accepted the vice-presidency of the Westinghouse Electric & Manufacturing Company, of Pittsburgh, and in 1906 he took charge of the British Westinghouse Electric & Manufacturing Company, of London, as vice-president and managing director, remaining in London until 1910.

Upon the request of Theodore N. Vail, he became the executive head of the Western Union Telegraph Company, as vice-president and director; and upon Mr. Vail's retirement, was the unanimous choice of the directory of the Western Union Telegraph Company for the presidency of that organization. Mr. Carlton has distinguished himself by his capacity for large-organization work and quick executive decision. His work for the Western Union has already been of great advantage to that company, and his choice as president is in every way an admirable one.

Mr. Carlton is a great admirer of Mr. Vail, the former president of the Western Union, and president of the American Telephone and Telegraph Company. In a recent interview Mr. Carlton said:

"In my opinion Mr. Vail's was the most remarkably constructive mind that has been brought to bear on the affairs of any public utilities corporation. The policies of the company are outlined by the board of directors, but Mr. Vail made suggestions which have been accepted as policies of the company and which, in my opinion, will stand for a generation. Of course, there may be modifications, as exigencies require, but in my opinion the broad lines drawn by him will remain until the present officers of the company are dead."

Mr. Carlton's one diversion is yachting. He is a member of the New York Yacht Club and also of the Century Club, of New York City. He is a native of New Jersey, having been born at Elizabeth in that state in 1869.



Newcomb Carlton,
President of the Western Union Telegraph Company.

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Electric Wave Investigation During Eclipse of the Sun.

An investigation of the effect on the propagation of electric waves of the total eclipse of the sun on August 21 next is to be conducted by the special Radiotelegraphic Committee of the British Association for the Advancement of Science. It is considered that the forthcoming eclipse affords an exceptional opportunity of adding to existing knowledge of the propagation of electric waves through air in sunlight and in darkness, and across the boundaries of illuminated and unilluminated regions. The eclipse will be total along a strip extending from Greenland across Norway, Sweden, Russia and Persia to the mouths of the Indus.

Two main points calling for investigation will be: first, the propagation of signal-bearing waves through air in the umbra and penumbra will probably obey laws different as regards absorption and refraction from those obeyed in illuminated air; second, the strength, frequency and character of natural electric waves and of atmospheric discharges may vary. The variations may occur either because the propagation of natural waves from distant sources is facilitated or impeded by the eclipse, or, possibly, because the production of natural electric waves or atmospheric discharges is for some unknown reason affected by the eclipse.

The committee says that to investigate the propagation of signals across the umbra it will be necessary to arrange for wireless telegraph stations on either side of the central line of the eclipse to transmit signals at intervals while the umbra passes between them. This transit of the umbra occupies about two minutes so it is desirable for Scandinavian and Russian stations to transmit frequently throughout several minutes before, during, and after totality. But stations other than those in proximity to the central line are asked to keep a complete record of the variation of signals during the eclipse. Ships in the Atlantic and fixed stations in Eastern Canada and the United States will probably be affected by the penumbra in the early morning. It is stated that the investigation of strays is of as great interest as that of signals, and the greatest changes produced in strays by the eclipse will probably be experienced at stations in Scandinavia and Russia, to reach which the waves must cross the path of the umbra.

The Radiotelegraphic Committee (whose secretary is Doctor W. Eccles, University College, London), proposes to circulate special forms for the collection of statistics of signals and strays, also a simple program of work for the authorities controlling stations near the central line.

◆

Use of Electricity in Fighting Cancer.

The New York Skin and Cancer Hospital, New York City, has issued a statement describing the treatment of cancer by electricity and announcing the success of such treatment, not only in the alleviation of pain but also as an aid to the restoration of health.

Three methods of treatment are mentioned. These are known as fulguration, thermoradiotherapathy and electrocoagulation. These indicate, respectively, a starvation, a heating and a cooking of the cancer cells.

Convention of National District Heating Association.

The sixth annual convention of the National District Heating Association will be held at the Seneca Hotel, Rochester, N. Y., May 26, 27 and 28. Among the papers to be presented are the following: "Use of Bleeder Turbines in Connection with Steam Heating," by R. D. De Wolfe, Rochester, N. Y.; "Manufacture of Welded Iron and Steel Pipe," illustrated by moving pictures; "Hot Water Heating Under Forced Circulation," by Thomas Donahue, Lafayette, Ind.; "Expense of Operating Centrifugal Pumps Versus Double Acting Pumps," by A. C. Rogers, Toledo, O.; "Some Effects of Utility Regulation as Affecting District Heating," by D. L. Gaskill, Greenville, O., and H. Almert, Chicago, Ill.; "Effects of Superheated Steam on Heating Systems," by Davis S. Boyden, Boston, Mass.; "District Heating for Small Towns and Cities of 10,000 Population and Under," by L. T. Mason, Hornell, N. Y.; "Heat Losses from Buildings of Latest Construction," by H. Byers Holbrooks, New York City; "Preferred Practice in Heating Building," by E. L. Wilder, Rochester, N. Y.; "Advantages of Central Station Heating Over Individual Plants," by N. M. Argabrite, Elwood, Ind.; "Customers' Steam Heating Systems," by H. R. Wetherell, Peoria, Ill.; "Commercial Steam Heating in New York City," by George W. Martin, New York City. President S. Morgan Bushnell, of Chicago, is also scheduled for an address. A. D. Spencer, Detroit, Mich., will report for the meter committee; A. P. Biggs, Detroit, Mich., for the record committee; D. S. Boyden, Boston, for the educational committee, and Byron T. Gifford, Grand Rapids, for the station operating committee. Mr. D. L. Gaskill, Greenville, O., is the secretary-treasurer.

On May 29, the entire convention will go to Niagara Falls on a special Pullman train, as the guests of the American District Steam Company, of Tonawanda, N. Y. A stop will be made at Lockport, N. Y., for the purpose of visiting the first district heating plant installed. Luncheon will be taken at the Tonawanda works of the company and the afternoon spent in sight seeing at Niagara Falls. This will be followed by a dinner at the Clifton Hotel, the convention returning to Rochester in the evening.

Annual Meeting of the American Institute.

The 295th meeting of the American Institute of Electrical Engineers will be held in New York City on the evening of May 19. The Board of Directors will present its annual report and the result of the election of officers will be announced.

Following the annual business meeting, a technical session will be conducted by the Committee on the Use of Electricity in Marine Work. Two papers will be presented: "The Future of Electric Heating and Cooking in Marine Service," by H. J. Mauger; "Electricity the Future Power for Steering Vessels," by H. L. Hibbard. The usual smoker will follow.

Institute Meeting at Pittsfield.

The 296th meeting of the American Institute of Electrical Engineers will be held in Pittsfield, Mass., on May 28 and 29, under the auspices of the Pittsfield Section. Headquarters will be at the Maplewood Hotel.

The general subject for discussion is to be "Relative Advantages of Star and Delta Connections." Sessions will be held on Thursday afternoon, Friday morning and Friday evening, at which the following papers will be presented: "Experience with Line Transformers," by D. W. Roper; "Experience of the Pacific Gas and Electric Company with the Grounded Neutral," by J. P. Jollyman, P. M. Downing and F. G. Baum; "Influence of Transformer Connections on Operation," by Louis F. Blume; "A Study of Some Three-Phase Systems," by Charles Fortescue; "Harmonic Voltages and Currents in Star and Delta-Connected Transformers," by R. C. Clinker; "Relative Merits of Star and Delta Connection for Alternators," by T. S. Eden.

On Thursday evening members of the Institute are invited to participate in the annual dinner of the Berkshire County University Club. Friday afternoon will be devoted to recreation, and arrangements will be made for golf, boating, tennis and other sports.

Program of Michigan Section Convention.

As previously announced, the Michigan Section of the National Electric Light Association will hold its convention this year aboard ship en route to the Thousand Islands of the St. Lawrence River. The start will be made from Detroit on the evening of June 17, arrivving in Buffalo the morning of June 18, where another steamer will be boarded for Ogdensburg, returning to Toronto on June 20. A special train will be run over the Canadian Pacific from Toronto to Detroit, arriving at the latter destination about 2:30 p. m.

The complete program has not yet been decided upon, but announcement has been made of several important papers and addresses which are assured. These include a paper entitled "Relation of Public Utilities and Returns Allowed Thereunder," by Halford Erickson, of the Railroad Commission of Wisconsin; an address by James V. Oxtoby, of Detroit; a paper entitled "Water Power in Michigan," by G. W. Bissell, of the Michigan Agricultural College; a paper entitled "The Gas-Filled Lamp," by J. R. Colville, of the National Lamp Works; a paper, the subject to be announced later, by William J. Norton, of Chicago; a paper entitled "Interior Illumination," by M. Luckiesh, of the National Lamp Works; a paper entitled "Outdoor Substations," by A. Meyer, of the Edison Illuminating Company, of Detroit; a paper entitled "Description of an Automatic Substation," by James W. Bishop, of the Edison Illuminating Company, of Detroit; and a paper entitled "Depreciation and Obsolescence," by H. A. Fee, of Adrian, Mich. Requests for papers of the same high standard as above have been sent out to some 20 members of the Association, so that it is confidently expected that a full program of interesting subjects will be provided.

It is also announced that a rejuvenation of the Jovian Order will be held on shipboard on one of the nights, this being an innovation in rejuvenations. President H. C. Sterling, of the Michigan Section, has recently been appointed statesman for Michigan, and will conduct the ceremonies.

Philip P. Barton, vice-president and general manager of the Niagara Falls Power Company, has invited the Association to inspect the plants of his company on both the American and Canadian sides during the visit at this point.

Herbert Silvester, 18 Washington Boulevard, Detroit, Mich., is secretary of the Section, and all reservations should be made directly to him prior to June 1.

Proposed Federal Tax on Power Developed on Government Sites.

An annual federal tax of 25 cents per horsepower on all power developed by hydroelectrical corporations on government water-power sites, was recently urged as an amendment to the water-power bill now before congress by M. O. Leighton, an engineer formerly with the Reclamation Service. Mr. Leighton appeared before a House committee and told the congressmen that such a provision should be provided for in the bill and not left to the Secretary of Interior as at present.

Cleveland Municipal Plant Begins Operations.

The new municipal electric light plant of Cleveland, O., was put into operation on May 2. The plant has cost the city about $900,000. It has about 5,000 customers connected to its lines. The maximum rate charged is three cents per kilowatt-hour and the minimum one cent per kilowatt-hour.

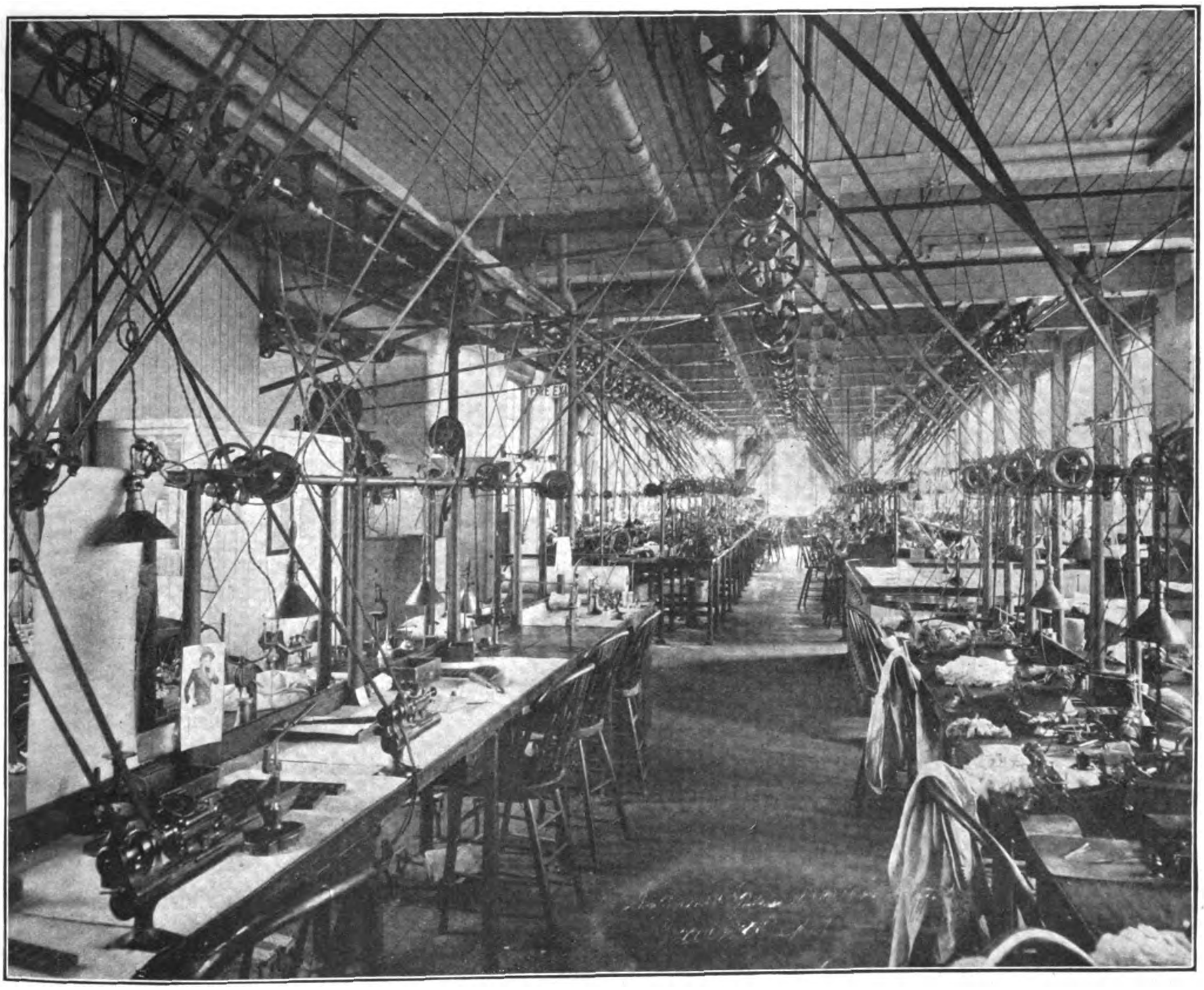
Electricity in Watchmaking.

Because of the extreme accuracy demanded in watchmaking the use of electric drive has become almost universal, due to the uniform speed possible and the ease with which the various machines can be controlled. This article discusses some of the more important advantages of electric drive, giving figures on the cost of replacing an isolated-plant equipment in a typical case with central-station service. Data on the motor installation in two other factories are included in the data sheet.

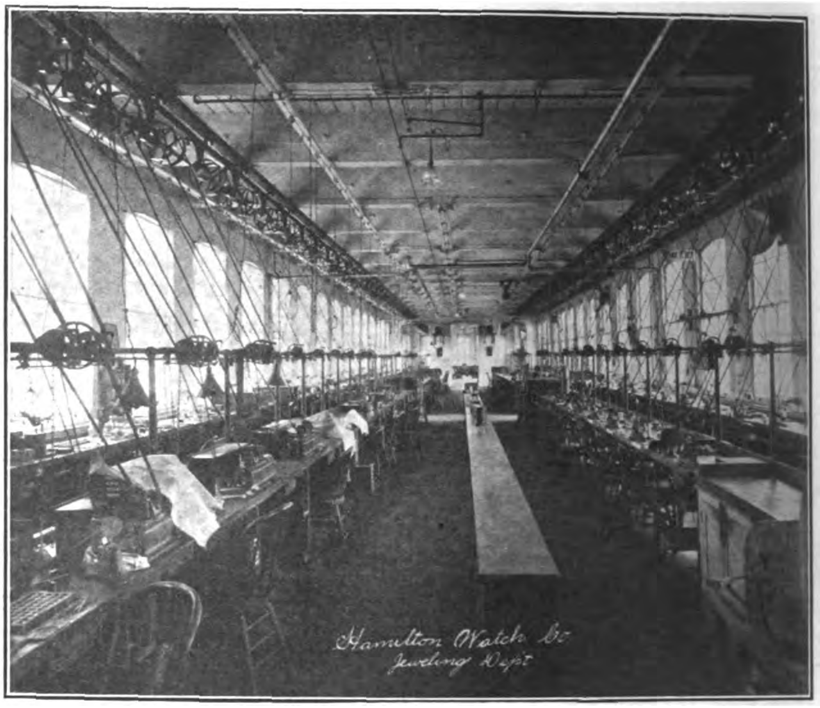
The extreme accuracy necessary in the manufacture of watches and clocks makes the question of power supply of decided importance, as accuracy depends to some extent upon uniform speed of the driven machines. The tendency in the older establishments in this industry was to drive by means of line shafting from a main engine, and sometimes when energy was purchased from one large motor. It was argued, in connection with the latter, that inasmuch as individual motor drive was out of the question the most economical arrangement was to connect all machines to line and countershafting and drive from one unit.

This practice is fast disappearing, however, and the well equipped plant will be found with a motor for each of the various departments with individual drive on a few of the heavier machines. This not only improves the quality of the product and increases the output but where power is purchased from a central station effects considerable savings in the power bill as it is seldom that all departments of a factory are in operation at the same time during the entire year and with the group drive referred to only that power which is actually used in producing is paid for. This arrangement also permits of overtime operation of isolated departments without affecting any other portion of the plant and with power costs proportional to the actual work done.

One of the most important phases influencing the successful conduct of any manufacturing establishment is the amount of output obtainable with a given personnel, tool equipment, floor space and working time. Without increasing any of these factors, the substitution of mechanical drive by the installation of electric motors has variously augmented the productive capacity of different factories from 5 to 100 per cent. In other words, a greater amount of work is produced per operative machine per day, due to maintenance of speed under varying conditions of load; the ease with which the maximum cutting speed can be sustained throughout a given operation; the advantage gained by better arrangement of machines in regard to natural or artificial lighting facilities, as well as in the readier access to and sequence of material from the unfin-



Motor Drive in Train Department of Hamilton Watch Works, Lancaster, Pa.



Two Five-Horsepower Motors Driving Machines in Jewelling Department, Hamilton Plant.

ished to the finished state; finally, because the greater cleanliness, purer air and generally better hygienic surroundings of the motor-driven shop re-act favorably upon the health, cheerfulness and activity of the operatives.

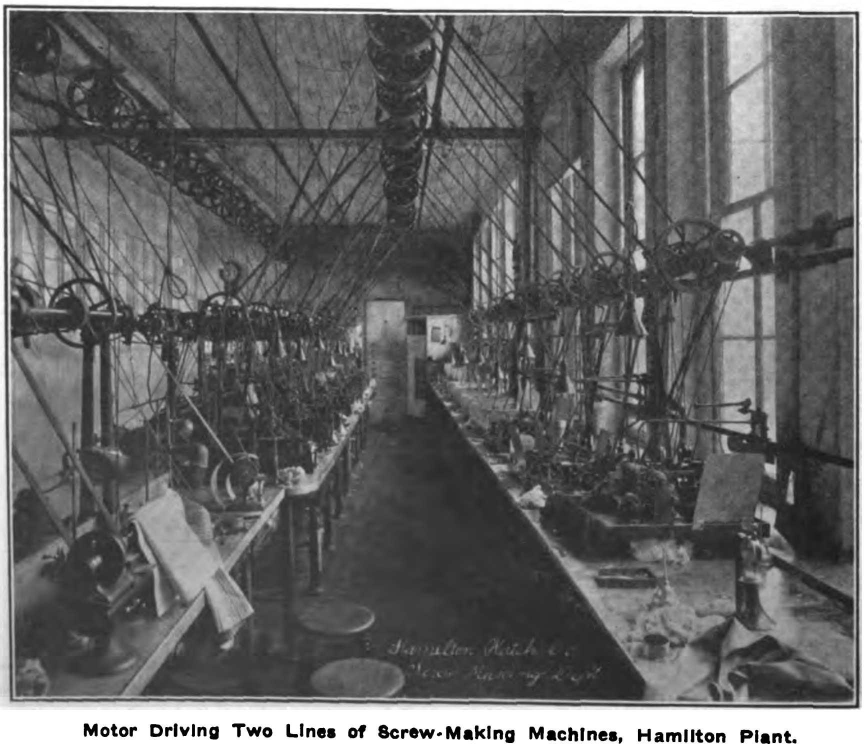
While increased production is obviously the most important result attained by the installation of electric drive, it is also true that direct economies are very frequently effected in the power costs. This was the case in a small clock factory in the Middle West, which, previous to the adoption of central-station service, operated a 50-horsepower isolated steam plant. After several unsuccessful attempts the central-station management obtained permission to make a detailed engineering investigation of the isolated-plant operating conditions and the results indicated that a substantial saving in power costs could be effected by the installation of electric motors and the use of central-station power.

The original equipment of this factory comprised a 50-horsepower slide-valve engine supplied with steam from a 90-horsepower horizontal return-tubular boiler. No traps were used in the steam piping which supplied various parts of the factory with heat. As is true of many plants operating under these conditions, considerable annoyance was experienced, especially in the winter, at the slowing down of some of the machines, polishing apparatus and steam-driven blower equipment, production being greatly diminished under mechanical driving. Since the installation of electric motors the production in these departments has been increased 13 per cent and in addition the uniform speed of the motor-driven machines has greatly improved the quality of the work.

Squirrel-cage induction motors, aggregating 32.75 horsepower, operating at 220 volts, three-phase, 60 cycles, were installed throughout, as follows:

One three-horsepower motor, 1,200 revolutions per minute, driving scratch-brushing and coloring equipment, including two direct-current plating dynamos; three scratch-brushing heads, and one 13-inch exhaust fan.

One 7.5-horsepower motor, 1,200 revolutions per minute, driving automatic screw machines, wheel-cutting machines, etc.



Motor Driving Two Lines of Screw-Making Machines, Hamilton Plant.

One two-horsepower motor, 1,200 revolutions per minute, driving a duplex power pump located in the engine room.

One 7.5-horsepower motor, 1,200 revolutions per minute, driving a line shaft which operates machinery in train and balance departments.

One 0.5-horsepower motor, 1,800 revolutions per minute, belted to a line shaft driving two high-speed drills, and three small lathes.

One 0.25-horsepower motor, 1,200 revolutions per minute, driving a tub-cleaning machine.

One one-horsepower motor, 1,800 revolutions per minute, driving a double emery wheel, 10 inches in diameter.

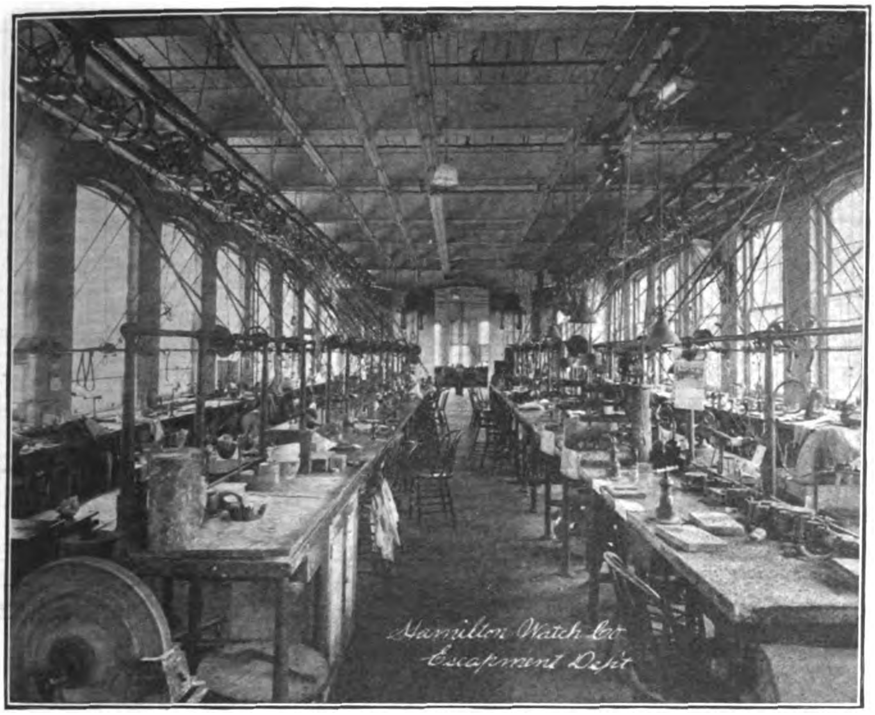
One five-horsepower motor, 1,200 revolutions per minute, belted to a line shaft driving two drop hammers, 450 pounds and 300 pounds; two 200-pound and two 75-pound drop hammers; one power press, and one rotary shear.

One two-horsepower motor, 1,800 revolutions per minute, driving a machine-shop equipment comprising two engine lathes; one shaper; one emery wheel; one cut-off saw; one grindstone, and one milling machine.

One two-horsepower motor, 1,800 revolutions per minute, belted to a line shaft driving four power presses and 16 small bench lathes.

One two-horsepower motor, 1,800 revolutions per minute, driving a No. 3 American gas-furnace blower.

The estimated cost of electric energy for this factory was $66 per month, based upon a 10-hour day and service used 300 days per year. The average monthly consumption of energy was 2,200 kilowatt-hours, the average rate being three cents per kilowatt-hour. In



Two Five-Horsepower Motors Driving Machines in Escapement Department.

soliciting the business of this factory, the fact that central-station power would be available at all times was emphasized; also it was pointed out that a licensed engineer or fireman would not be needed so long as the steam pressure was kept below 15 pounds per square inch, since steam was not to be used for developing mechanical power. In this case is was simply necessary to equip the boiler with a sealed safety valve set at 15 pounds per square inch to eliminate the services of an employee receiving $150 per month.

The total cost of operation, as estimated by the central-station company, excluding fixed charges, was $1,444.50, the items being as follows: electric energy, $792; coal for heating, 59 tons at $4.50, $265.50; coal for commercial uses, $207; attendance, one quarter of the time of one man at $60 per month, inspecting motors, firing boiler, etc., $180; total, $1,444.50. As a matter of fact, this estimate was high, the cost of operation averaging less than $1,444.50. The management of the factory is highly pleased with the economies being effected and with the numerous advantages of electric drive that have been realized in this instance.

The total cost of equipping the factory for motor drive was only $920, divided as follows: motors, complete, $668; wiring, fittings, switches, etc., $160; pulleys, belting, shafting, hangers, etc., $80; drying boxes connected to vats, piping and labor, $12: total, $920.

In this factory, as in many others where isolated plants are to be converted, the question of heating was an important factor. The heating hours were as follows: January, 419; February, 378; March, 334; April, 279; May, 170; September, 170; October, 287; November, 323, and December, 419, making a total of 2,779. The condensing factor of radiation was taken as 0.35 or 0.35 pound of steam per hour for every 100 square feet of radiation, giving a total of about 385 pounds of steam condensed per hour. On this basis it was found that about 59 long tons of coal were required for the heating season of nine months.

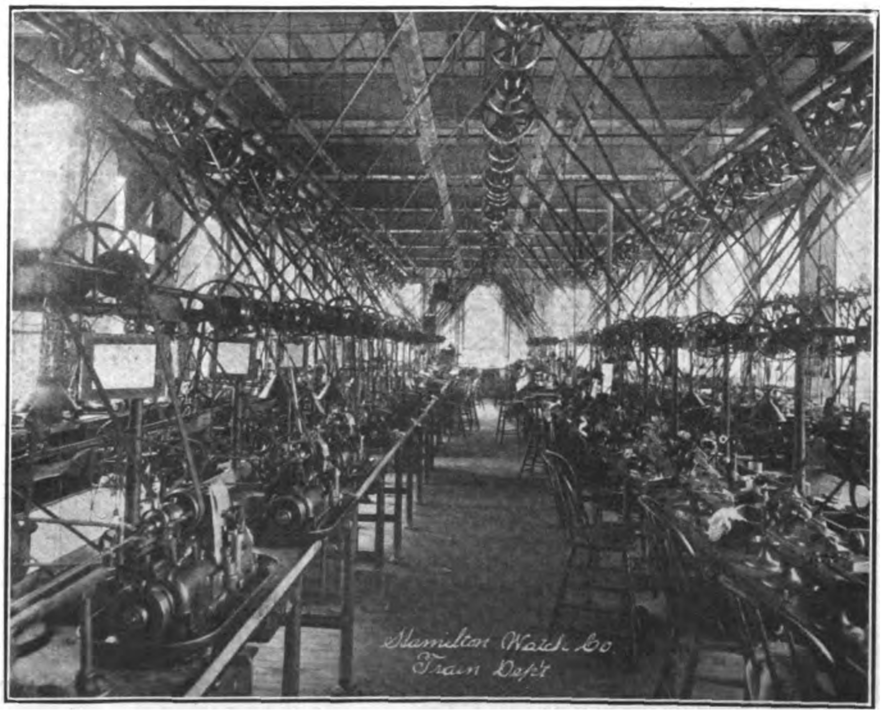
Considerable steam is also required for commercial purposes, the requirements for the entire plant being summarized as follows:

Coloring room	347,400 pounds.
Vat in sink	6,192 pounds.
Steam acid blower	206,400 pounds.
Pickling vat (first floor)	86,850 pounds.
Vats in sinks (first floor)	86,850 pounds.
Sinks (second floor)	86,850 pounds.
Total	820,542 pounds.

On the basis of an evaporation of eight pounds of water per pound of coal, there would be required for this work a yearly fuel consumption of 102,567 pounds of coal, or 46 tons of 2,240 pounds each.

In soliciting the adoption of central-station service by watch and clock factories emphasis should be placed on the possibility of securing greater accuracy because of the uniformity of the speed of motor-driven machines and the ease with which these machines can be controlled. No specific recommendations can be made regarding the application of motors to watch making machines or the approximate horsepower requirements of these machines as every plant differs materially in the work performed and the type of machines used.

In general, however, it may be stated that the requirements of the individual machines are so small that there is practically no limit to the number that can be driven by an average-size motor. The operations in watch and clock making are classified into several distinct departments which are entirely independent of each other. It has, therefore, become common practice to at least provide a separate motor for each department. This arrangement, while capable of improvement, at least allows each department to operate without reference to the others, which is



Motor Drive in Train Department, Hamilton Watch Company.

Watch Manufacturing Data.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant manufacturing a high grade of watches. Plant operates 9 hours per day.

Total connected horsepower, 93. Total number of motors installed, 17. Average kilowatt-hours per month, 12,308.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	11,450	May	5,040	September	16,070
February	17,120	June	5,040	October	17,530
March	16,600	July	6,030	November	17,200
April	4,040	August	15,900	December	11,450

Load-factor, 24.3; operating-time load-factor, 56.5 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	850	Belted direct to blower.
1	3	1,120	Belted to line shafting driving one plating dynamo; 15 brushing machines; and stoning plates.
1	5	850	Belted to line shafting driving 12 buffing machines; 12 damaskeaming machines; and four small emery wheels.
1	5	850	Belted to line shafting driving 15 damaskeaming machines.
1	10	850	Belted to line shafting driving wheel-cutting machines; stamp lathes; pinion-cutting machines; and bench lathes.
1	3	1,120	Belted to line shafting in the dial department driving drilling and grinding machines. There are four electric furnaces installed in this department.
1	7.5	850	Belted to line shafting driving 30 automatic screw machines. These machines are each equipped with electric signal lamps indicating when more stock is needed.
4	3	1,120	Each belted to line shafting driving variety of small cutters, grinders, etc., in jeweling department.
2	5	850	Each belted to line shafting driving machine in balance department, including bench lathes; pinion cutters; grinders, etc.
1	7.5	850	Belted to line shafting driving machines in plate department.
2	7.5	850	Each belted to line shafting driving 18 bench lathes; 8 engine lathes; small drills; milling machines; saws; etc.
1	10	850	Belted to line shafting driving machine-shop equipment comprising nine Blake punch presses; one drop hammer; one engine lathe; two shapers; and two drills.

Small watch and clock factory operating 10 hours per day.

Total connected horsepower, 32.75. Total number of motors installed, 11. Average kilowatt-hours per month, 2,200.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,400	May	1,900	September	2,460
February	1,600	June	1,670	October	2,560
March	1,410	July	2,310	November	2,650
April	1,600	August	2,390	December	2,540

Load-factor, 12 per cent; operating-time load-factor, 25.8 per cent.

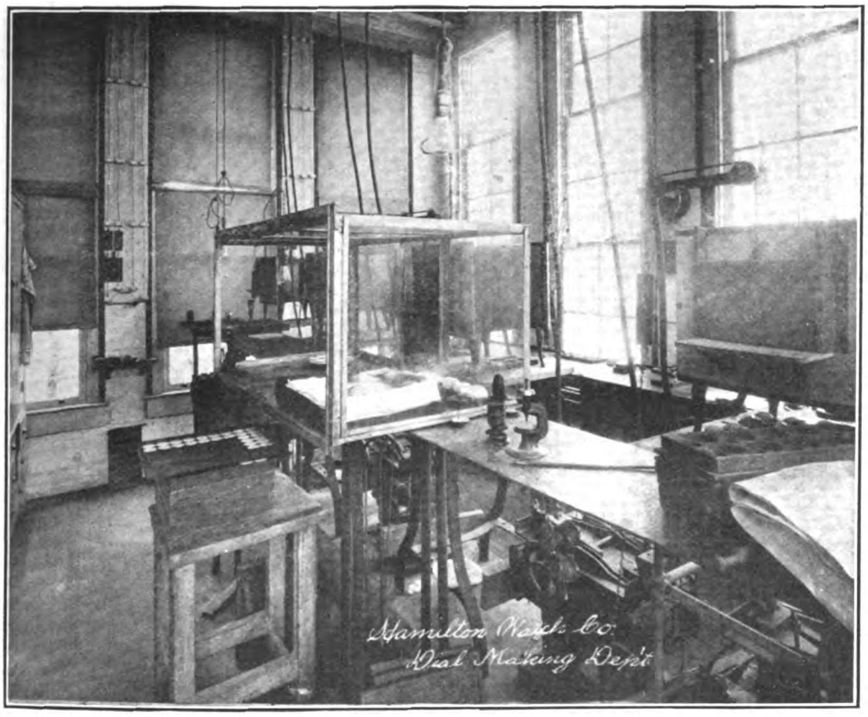
Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. Squirrel-cage motors are used.

No.	Horse-power	Speed R. P. M.	Application.
1	2	1,800	Belted direct to a line No. 3 American gas-furnace blower.
1	2	1,800	Belted to a line shaft driving four power presses; and six high-speed lathes.
1	2	1,800	Belted to line shafting driving two engine lathes; one shaper; one emery wheel; one cut-off saw; one grindstone; and one milling machine.
1	5	1,200	Belted to a line shaft driving two drop hammers, 450 pound and 300 pound; two 200-pound hammers; one 75-pound hammer; one power press; and one rotary shear.
1	1	1,800	Belted direct to one 10-inch double emery wheel.
1	0.25	1,200	Belted direct to one tub-cleaning machine.
1	0.5	1,800	Belted direct to a line shaft driving two high-speed drills; and three jeweler's lathes.
1	7.5	1,200	Belted to a line shaft driving jeweling machines; grinders; and brushers.
1	2	1,200	Direct-connected to duplex pump.
1	3	1,200	Belted to line shaft driving two direct-current plating dynamos; three scratch-brushing heads; and one 13-inch exhaust fan.
1	7.5	1,200	Belted to line shafting driving 18 bench lathes; 18 pinion cutters; 20 automatic screw machines; 8 stamp lathes; and 12 wheel-cutting machines.

particularly economical during dull seasons or when overtime work is necessary.

The machines used in manufacturing watches and clocks occupy such small space and need such good illumination that the usual practice is to arrange the machines in long lines along the windows; in two or more lines if the lighting facilities permit. In such cases two methods of drive are commonly employed. One method is to attach a motor to each of such lines; another method is to divide the lines in the center, if two are installed, using extended-shaft motors and connecting by belt to both shafts. The latter method permits of obtaining better alinement of the shafts than when one long shaft is employed. Local conditions, of course, govern the method to use.



Electric Furnaces at Hamilton Plant.

The accompanying illustrations of motor drive in the factory of the Hamilton Watch Company, at Lancaster, Pa., are typical of plants in this industry. In several of the departments of this establishment four lines of machines are located in a room. These are driven by two motors, installed on platforms, belted first to the shaft farthest from the motor then from this shaft to the one nearest the motor. In departments where only two lines of machinery are installed, extended-shaft motors are used, each motor driving one-half of both shafts.

The equipment in the Hamilton plant, described more fully in the accompanying data sheet, includes four electric furnaces which have proven particularly suited for this class of work. Two are used for tempering and two for hardening and the company states that their operation is thoroughly satisfactory in every way. The working conditions in the hot weather in this department are greatly improved and the cost of operation compares very favorably with the gas furnaces which they displaced.

Lighting.

The difficulty experienced in attempting to outline any specific requirements for lighting is due chiefly to the diversity of work performed. Allowing somewhat for the difficulty thus encountered, these requirements, in a general way, are as follows:

Workmen should be able to perform their duties and more around, not only with comparative ease, but with small accident risk as far as it depends on artificial illumination. In many cases this result may be obtained by the use of a low degree of general illumination. It may be here recorded, however, that in general a higher degree of artificial illumination is warranted in most of the buildings than has been the case in the past, or than will possibly be admitted in the near future as economical. This refers to a sufficient intensity to permit the performance of work at any portion of the floor space without respect to location of the lamps. Obviously, this can be obtained to the best advantage by means of the so-called overhead method of lighting.

Where there is a choice between low and high mounting the lamps should in general be mounted at the higher point in order to avoid the blinding effect, which has of late been given the name of "glare," not only produces eye strain, but reduces the effectiveness of the artificial light, because a man can never see to the best advantage when his vision is intercepted by the bright rays of light from a lamp approximately in the line of vision.

Lighting and motor circuits should be kept entirely separate. This will ordinarily insure reliable illumination, and the operation of the lamps is thus made far superior to those cases where the attempt is made to operate both lamps and motors from the same circuits.

From the nature of the case, numerous instances will be found where the artificial illumination must be sufficient without the use of individual hand lamps. This is due to the nature of the work, which makes impracticable the handling of incandescent lamps by the workmen, but without sufficient light from overhead lamps it is impossible to realize the best results. Thus, in the average case it may be an actual handicap for the workmen to be encumbered with extension lines in the performance of their work. It is imperative, therefore, if the conditions are to be such as to promote the highest standard of efficiency under the conditions of natural darkness, that light be furnished from lamps mounted overhead and sufficiently out of the line of vision.

From the engineering standpoint, the kind and size of the lamp should be consistent with the mounting height and also with the class of work under consideration. That is, for high ceilings large lamps should be used, while for low ceilings lamps of relatively small candlepower should, in most cases, be employed.

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Cheap Gas Stimulates Electricity Sales in Louisville.

The commercial department of the Louisville (Ky.) Gas & Electric Company, of which Robert Montgomery is manager, is meeting with success in its dual proposition of natural gas for heating and electricity for light and power. Natural gas at 35 cents a thousand to heat a small boiler, sufficient to run the steam heating plant in a building, and current bought of the company, it has been shown, will cost less than a great many Louisville concerns are paying now for the generation with steam power of their own electricity, the boilers being utilized in the heating of the building. Such service is being supplied by the company now to a number of local concerns and Mr. Montgomery is negotiating, with every prospect of success, for such installations at the Y. M. C. A. Building, the City Hall, the Atherton Office Building, the Willard Hotel and some half dozen other enterprises of like character.

Commercial Practice Management, Rates, New Business

Special Meeting of the Ohio Electric Light Association.

As a result of an order issued by the Public Utility Commission of Ohio requiring all utilities of the state to submit an inventory and appraisal to that body by August 1, 1914, a special meeting of the Ohio Electric Light Association was held at Columbus, O., May 6, to which representatives of all utilities of the State were invited. The Executive Committee of the Association met on the day preceding the meeting and prepared a set of resolutions dealing with questions of policy involved in obeying the order of the Commission, which were presented at the session on Wednesday. The meeting was held at the Chittenden Hotel, with representatives from 65 central stations in attendance.

J. C. Martin, president of the Association, called the meeting to order at 10 a. m., and presented to the delegates the reasons for issuing a call for a special meeting. He stated that the order of the Commission is probably the most important one that has yet been issued and in order that it may be complied with in the proper manner it is necessary, he said, that the utilities of Ohio have definite information and some understanding of what is desired. He explained that the Commission is more particular as to the inventory than it is to the valuation to be placed thereon ,and it is the intention of the Commission that his inventory as filed be kept up from time to time by supplementary reports to be made by the utilities and to be a basis which can be resorted to by the Commission in determining just and reasonable rates when occasion arises.

It was stated that the attitude of the Commission toward the utilities is very cordial and all time necessary will be given to file the schedules required.

The report of the Executive Committee, which was presented by Secretary Gaskill, provides for the appointment of an Accounting Committee which also was requested by the Commission, and also an Appraisal Committee, the latter to act as consulting engineers, to advise and consult with all utilities of the state regarding the filing of inventories and appraisals and to review all schedules before they are presented to the Commission so that uniformity will be obtained. This committee will also prepare and supply to the utilities of the state forms to be used in making inventories and appraisals, and in this connection is empowered to employ such expert advice and assistance from outside as may be necessary. To defray the necessary expenses of these committees a special assessment of one-twentieth of one per cent of the annual gross income of the companies participating was proposed. The delegates assembled unanimously approved of the recommendations proposed and as a result committees were appointed as follows: Appraisal Committee: F. M. Tait, of Dayton; F. W. Milliken, of New York; Robert Lindsay, of Cleveland; F. J. Derge, of Toledo; and W. W. Freeman, of Cincinnati. The Accounting Committee appointed comprises L. K. Funkhouser, of Dayton; J. Scobel, of Cleveland; M. Kalisch, of Cincinnati; R. Stevens, of Youngstown, and F. W. Dreger, of New York. Permanent quarters will be obtained in a local office building.

In the discussion preceding the adoption of the resolutions proposed by the Executive Committee, F. W. Milliken, of the American Gas & Electric Company, New York, called attention to the importance of including intangible items in arriving at a fair valuation of a property. Such costs as contractors' profits, liability insurance during construction, etc., are too often lost sight of when preparing an estimate of the value of a property, but are equally as important as the "bare bones" cost.

President Martin stated that there is some hesitancy on the part of utility companies including all intangible items in making valuations, because of their fear that these valuations will be used by the Tax Commission in assessing taxes. He stated that this practice should be discouraged, as only one valuation can be honest and equitable, whether made for the Tax Commission, Public Utility Commission or for any other purpose. In the end, rates will be earned on the total valuation.

Judge W. P. Matthews, of Dayton, called attention to another evil in making different valuations for different purposes. He stated that from the legal standpoint, after having made a low valuation for the Tax Commission, it would be impossible to increase this if it was desired to issue securities. He emphasized the point made by Mr. Martin that only one valuation can be correct.

Following the discussion on the Commission's order, Secretary Gaskill was called upon to give some details regarding the forthcoming annual convention of the Ohio Association. He stated that a departure will be taken from the practice of previous years of holding sessions only in the morning. There will also be fewer technical papers and more addresses by prominent speakers. Among those already accepting invitations to address the Association are Halford Erickson, of the Wisconsin Public Service Commission, who will speak on indeterminate franchises, and F. W. Darlington, of the Iron and Steel Institute, who will talk on welfare work. Mr. Gaskill also called attention to the *Monthly* issued by the Association, which at the time of the convention in July will have written advertising contracts in excess of $5,000. He asked for the co-operation of the members in making the publication useful, editorially.

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Double Taxation of Utility Income Opposed.

The Cincinnati Gas & Electric Company has filed suit in the Federal Court at Cincinnati, O., against the collector of internal revenue for $44,847.89 alleged to have been paid in taxes under the corporation excise tax provision of the 1910 tariff law, which the company believes should not have been paid. The ground set up for the return of the taxes is that the company's revenues are derived solely from its lease to the Union Gas & Electric Co., which pays a tax on its income, and that payment of another tax on the same income under the same law should not be required. The fact that the company is not engaged in business, save by its lessee, is another factor upon which stress is laid.

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House-Wiring Campaign in New Albany, Ind.

The Insull property in New Albany and Jeffersonville, Ind., the United Gas & Electric Company, has recently begun a house-wiring campaign in a small way in those southern Indiana cities. It is meeting with pleasing success and will be pushed later in the season, it is understood.

WIRING SPECIFICATIONS AND SCHEDULE OF PRICES

LOCATION	Ceiling Outlet	Bracket Outlet	Wall Switch Including Snap Switch	3-way Snap Switch (Pair)	Base Recpt. inc. Snap Recpt.	M. M. Bracket Brick Wall	M. M. Snap Swt. Brick Wall	Concealed B X Bracket Brick Wall	Concealed Flush Swt. Brick Wall	Open Work per Outlet	Snap Swt. Basement
PRICE EACH	$2.50	$2.50	$2.75	$6.00	$3.00	$3.50	$3.50	$4.50	$5.65	$1.50	$1.50
Porch,											
Vestibule,											
Reception Hall,											
Reception Room,											
Living Room,											
Library,											
Dining Room,											
Lavatory,											
Pantry,											
Kitchen,											
Basement,											
Rear Hall,											
Upper Hall,											
Upper Rr. Hall,											
Bath,											
N. E. Chamber,											
S. E. Chamber,											
N. W. Chamber,											
S. W. Chamber,											
Chamber,											
Chamber,											
Closets,											

Flush Switches and Flush Base Board Recpts. $1.00 extra each,

Four, Five or Six, Outlet Contract, at $3.00 per Outlet,

Application for Electric House Wiring.

Louisville, Ky. ...., 191....

The undersigned, ...

....

hereby make application to..

hereinafter called the "Contractor," for wiring the premises and installing fixtures as listed herein, at No. ....in accordance with the specifications and schedules endorsed hereon and attached hereto, which are incorporated herein, and agree to pay therefor at the office of the Contractor the sum of .... Dollars ($..................) as follows:

Twenty-five (25%) or ....Dollars ($..................)

on completion of work and the balance in twelve (12) equal monthly payments, or.. Dollars ($..................) on or before the first of each month following, until the whole amount has been paid. Failure to meet payments when due shall render the deferred payment feature of this contract void, and the remaining payments on said contract shall become due and payable at once.

A discount of ten per cent. (10%) from the above contract price will be allowed, provided full payment is made within ten (10) days from the date of completion of installation.

It is mutually agreed that in event of any modification of the installation specified herein, the amount of this contract shall be revised in accordance with the Schedule of Prices incorporated herein.

The Contractor shall wire said premises and install fixtures as herein specified with forty (40) Watt Mazda or Tungsten lamps, including all labor and material necessary to do the work, covered by the General Specifications and Schedules incorporated herein and made a part hereof, in a thoroughly substantial manner, according to the Rules and Regulations of the National Board of Fire Underwriters as interpreted by the City Electrical Inspector, complete and ready for service.

The Contractor shall save harmless the Applicants from any and all damage or expenses that may arise during the performance of this contract by reason of injury to persons or property resulting from negligence or carelessness on the part of the Contractor in the performance of this contract.

The Contractor agrees to commence work within .... days of the acceptance of this contract and to complete same without unnecessary or unreasonable delays.

.... Tenant. } Applicants.
.... Property Owner. }

Accepted the..................day of.., 191......

.... Contractor.

Forms Used by Louisville Gas & Electric Company in House-Wiring Campaign Being Conducted.

House-Wiring Results in Louisville.

The house-wiring campaign which is being conducted by the Louisville Gas & Electric Company, and which was described fully in our issue of April 25, 1914, has to date resulted in a total of 720 contracts for the wiring of old houses. These contracts were all signed by the company's own solicitors and it is estimated that independent contractors have obtained as many more. The contracts brought in by the company's solicitors average about 70 a week.

It is estimated that there are approximately 40,000 residences in Louisville and that, of these, there are 15,000 at present connected to the company's lines. Assuming that 50 per cent of the remainder is prospective, there are approximately 12,500 old unwired houses which are considered prospective lighting customers.

It is the intention of the Louisville Gas & Electric Company to keep this campaign going for at least a year, or until practically every home is wired or connected to the company's lines should it be found that some of these houses are already wired but not connected.

The application form and schedule of prices which are being used in this campaign are shown herewith.

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House Electric at Washington, D. C.

Until recently the Potomac Electric Power Company, of Washington, D. C., has equipped and maintained a display of things electrical in a private residence, along the lines adopted by the Boston and Baltimore companies, which has resulted in greatly stimulating the use of domestic appliances in the National Capitol. Recently the house, which was only temporarily leased by the company, was sold by the owner and the display removed, but the success of this venture makes it practically certain that another house will be selected.

The house just vacated was suituated at Mt. Pleasant and Hobart Streets, the end house of a row of dwellings erected by a local builder. The building was completely furnished and decorated and, in fact, was ready for occupancy.

The drawing room contained an electric luminous radiator in the fire place and an electrically operated Steinway piano besides a couple of stand lamps and the permanent lighting fixtures in the room.

In the entrance hall there was large standard which, together with the ceiling fixture, made a very bright effect.

The dining room contained an electric coffee percolator, samovar, chafing dish, toaster and an instantaneous water heater.

The kitchen was, of course, equipped with an electric range, fireless cooker, waffle iron and a coffee percolator.

On the second floor the library was attractively lighted. The bath room contained a luminous radiator and shaving mirror; in the bed rooms were found the reading lamps and heating pads, electric curling iron and comb combination outfits and massage machines.

The third floor was used for demonstrating purposes for vacuum cleaners, sewing machine motors, portable lamps of various types and styles and other devices that can not conveniently be carried in the other parts of the house.

In the cellar there was an electric refrigeration machine, electric washing machine, electric irons, and a lamp and meter board which had been fitted up for the purpose of demonstrating to the public the comparative amounts of current required by different sizes and kinds of lamps and the operation of the electric meter. A special feature in the cellar was an electric incubator and in this connection the company had a guessing contest, under the rules of which, the three parties guessing nearest the time of the birth of the first chicken would receive electrical devices as prizes.

In the yard was a portable garage containing an electric vehicle and the necessary charging equipment both for charging electric-vehicle batteries and also for charging ignition batteries. In this garage there was also a tire pumping outfit.

The attendance at this "House Electric" was very gratifying. The average attendance for week days was about 400 to 500 and on Sundays the average attendance was approximately 1,100.

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Central Station Conditions at Fulton, N. Y.

The Fulton, N. Y., Light, Heat & Power Company has 1,092 residences conected and its patrons have in use 1,093 electric flat irons. This speaks volumes for the character of the service the company is giving and the energy of its management and new-business department.

The Fulton Company has a new steam turbine plant, two units each of 625 kilovolt-amperes capacity, connected with the New York Central and the New York Ontario & Western Railroads by a private switch which permits the dumping of coal from the cars to the boilers. During the month of February, the plant consumed an average of 3.49 pounds of coal per kilowatt-hour.

Increasing Business Makes Extensions Necessary in Twin Cities.

Permanent improvements and extensions for 1914 to the Minnesota properties of the Consumers Power Company of that state, all of the stock of which is owned by Northern States Power Company, are already in progress under the engineering supervision of H. M. Byllesby & Company. Most of the materials and machinery have been ordered and the Coon Rapids hydroelectric development on the Mississippi River near Minneapolis is being completed. The first 2,100-horsepower unit of this new water power, which will add 10,500 horsepower to meet the rapidly increasing electrical demands of Minneapolis is expected to be in operation August 1.

Construction work authorized for the Minneapolis Division within the City of Minneapolis includes enlargements to substations, additions to the 13,000-volt underground systems and extensions to the distributing lines in various parts of the city. These improvements will enable the company to serve a large amount of new business which will be added by next fall and to properly distribute the output from Coon Rapids.

Another important construction will be a transmission line 33 miles long from St. Paul south to a point three miles east of Northfield, where it will connect with the hydroelectric network of the Faribault and Mankato divisions comprising 100 miles of transmission lines. This line will be of Byllesby standard construction designed to carry 60,000-volt pressure. It will roughly parallel the Chicago, Milwaukee & St. Paul Railway and proceed via Farmington, Westcott, Rosemont and Castle Rock, opening a number of additional rural markets for service. Connection of the distributing systems of the Twin Cities and the Faribault and Mankato Divisions will insure further reliability and quality of service, and will give to a considerable section of Southern Minnesota an interurban electric light and power service matched by few other communities. Five water-power plants with 36,500 installed electrical horsepower and six steam stations with 29,500, or a total of 66,000 horsepower will be connected to the system. During the present year a number of short extensions will probably be made to serve additional cities and towns.

Power contracts covering a total of 784 horsepower were secured by the Minneapolis General Electric Company during the week April 20 to 25. Of this amount 600 horsepower was with the Northern Dredge & Dock Company, which has a contract with the Park Board for dredging one of the new lakes. The power will be used about eight months of the year for 20 hours each day and the revenue to the company will be approximately $20,000. The work will require four or five years to complete.

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Ornamental Lighting as a Business Booster.

Merchants on Penn Avenue between the Monongahela River wharf and Eleventh Street have adopted street illumination as a business stimulant. Heretofore this thoroughfare, although one of the main traffic arteries in the city, has been so dark that at night it has been consistently avoided. An association of the merchants took the matter up with the city, with the result that an illumination system claimed to be unequalled in Pittsburgh has been installed. In the retail district from Fourth Street to Eleventh Street 70 arc lamps, suspended from brackets on the iron trolley poles, have been placed. This gives each block ten lamps and a total candlepower of from 85,000 to 90,000. The lamps are 15.5 feet above the street level. The arms or brackets are ornamental and are a radical departure from the old types of lamp-hanging. The system used is new in Pittsburgh and has made a favorable impression on electrical engineers. The Penn Avenue merchants have shown their appreciation of the new system by installing brilliant electric displays in their show windows and by putting up electric signs.

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Aggressive Central-Station Campaign in Topeka.

By way of launching an aggressive campaign to increase the use of electricity, the Topeka, Kans., Edison Company has announced a marked reduction in minimum charges. The former minimum was $1.50 a month during the winter and 75 cents in summer. This has been cut to 40 cents per month, the new rate to be effective during the entire year. In addition, the company is stimulating the use of electricity by extending an exceptionally liberal offer to local residents whose houses are not wired for electricity. Such residents may have the wiring done through any recognized contractor, the company bearing the cost and securing a refund in six equal monthly payments. The maximum amount, however, on any one job of wiring will be $75. The easy-payment plan will apply only to unwired, completed structures, and not to those in course of construction.

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The Second International Congress of Consulting Engineers is to be held in Berne, Switzerland, from July 15 to 22. The first was held last year in Ghent, Belgium. It is proposed to hold the third in San Francisco in September, 1915.

Electric Show at Alliance.

The new-business department of the Alliance (O.) Gas & Power Company, under the direction of W. E. Quillin, manager, recently held an electric show that established a record in attendance and in business stimulated.

Although the population of Alliance is but 17,000 the total attendance during the show period was in excess of 20,000. This was accounted for by the fact that the show was very interesting and a great many people came back the second and third time and some were seen there every day during the show.

Household appliances and commercial illumination were featured. A great many appliances were sold during this show but the greatest results were obtained from the commercial exhibit, for, the merchants have received a new idea as to lighting up their stores; that is, the value of well-lighted windows and efficiently and well-lighted interiors.

Exhibits at Alliance Electric Show.

The commercial display consisted of a complete display of Holophane reflectors in small booths, each one showing the results obtained from the use of reflectors, and a model show window also demonstrated the value of properly placed reflectors. A view of the exhibit is shown in the accompanying illustration.

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Classification of Accounts Practically Agreed on in Missouri.

A tentative agreement on a classification of accounts for members of the Missouri Electric, Gas, Street Railway and Water Works Association was reached at a meeting of the committee recently appointed, held in Kansas City on May 6 and 7. The committee conferred with J. M. McShane, statistician of the Missouri Public Utilities Commission, and rapid progress was made during the two-day session. Phillip J. Kealy, of the Kansas City Railway & Light Company, presided. The classification originally recommended by the Missouri Public Utilities Commission was taken as a basis for negotiations. Amendments were proposed as each provision was reached, and thorough harmony and satisfaction marked the sessions. Many minor changes were made, though no radical departures were recommended. The tentative agreement will be presented to the Missouri Association at its annual meeting on May 21 for its endorsement.

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Los Angeles Decides on Municipal Operation.

An election was held in Los Angeles, Cal., on May 8, to decide whether the municipality should issue $6,500,000 in bonds for the purpose of acquiring and constructing a system for supplying electricity in the city.

The water supply of the city is brought down from the mountains through an aqueduct constructed in recent years by the city. It is proposed to generate current from this water at suitable points along the aqueduct, transmitting it to the city and there distributing it.

The proposition for distribution of power by the city was strongly opposed by the present utility companies, and a forcible article entitled "The Truth About the Power Bonds" was prepared by R. H. Ballard, of the Southern California Edison Company, which was distributed prior to the election. The companies maintain that it would be to the best interests of the city to supply the power in bulk to the present companies and let them utilize it over their present distribution lines.

A two-thirds' vote was necessary to authorize the bonds and the issue was carried by 56,199 to 23,179.

There are now three companies serving the city of Los Angeles. It is said that the present program of the city is to acquire one of the existing systems by condemnation.

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New York Edison Ball Team Starts Practice.

The New York Edison ball team, three-time champions of the electrical industry recently held its first practice. The biggest out-of-town game will be at Philadelphia during the National Electric Light Association Convention in June. Teams from the Philadelphia Electric Company, the Baltimore Gas and Electric Company and the Commonwealth Edison Company of Chicago, representing the East, the South and West will meet in an elimination series. The team will be captained by M. Donovan, short stop. H. C. Fling is the manager and the schedule is being arranged by Albert Goldman of 362 East 149th Street, New York City.

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Timeliness in Central-Station Advertising.

Eugene B. Palmer, handling the advertising of Walker Bros., bankers, of Salt Lake City, in his address May 8, before the Salt Lake Ad Club on the subject, "New Applications of Advertising" commended the Salt Lake public utilities, particularly the telephone company and the Utah Light & Railway Company, on the progressive advertising policy which they were pursuing. As an illustration of timeliness in advertising, he threw on the screen a slide of an advertisement run by the Utah Light & Railway Company the day following the attempt of the black-hand gang in Ogden to blow up the residence of David Essles by planting a dynamite bomb under the front porch. The advertisement depicted a front porch light thrown on and a suspicious looking character slinking away into the bushes to escape the light, and was headed, "Burglars and Black-handers Shun the Light." The reading matter pointed out how this attempt to destroy life and property could have been avoided by the regular burning of a porch light each night.

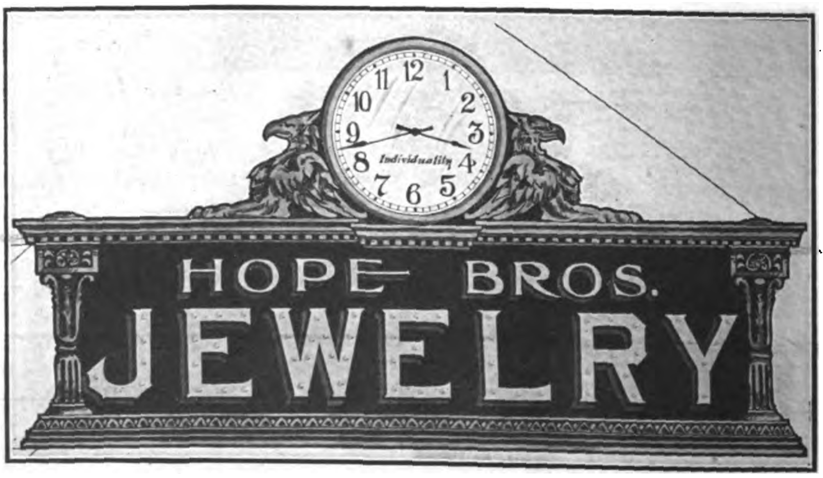
Electric Sign Data

New Sign Installations at Louisville.

Something of a departure in the way of electric signs is that just erected in Louisville, Ky., by the Federal Sign System (Electric) for the Majestic moving picture theater. The sign, elevated, stands in an otherwise vacant corner lot at Second Street and Broadway, a large transfer point, the intersection of two largely traveled streets and a corner that many of the country cars on the interurban lines pass as they enter the city. The sign is the design of James L. Thomas, of the company, and is attracting much attention. The theater it advertises is three squares away.

The design of the sign, with outside dimensions of 20 by 25 feet, provided for the name "Majestic" in 24-inch sectional letters while below is a large bill board, 8 by 15 feet, on which there is room for ten or a dozen lithographers' sheets calling attention to the attraction at the theater. It is a straight light proposition all around and takes 150 lamps.

Mr. Thomas has received a most complimentary letter from E. M. Walbeck, manager of the Kentucky branch of the Surety Coupon Company, congratulating him and the company on a large electric sign erected at Fourth and Market Streets, in Louisville. The sign is designed in the form of the company's wreath trade mark and to carry out the copy required 500 five-watt tungsten lamps. It has been set up only since the first of May and is giving entire satisfaction to the Surety Coupon people. Another new overhead sign in Louisville is that put up on Fourth Street opposite B. F. Keith's vaudeville theater for Old Clover Sour Mash Whiskey. It uses 400 five-watt lamps, measures 10 by 15 feet, and displays the name of the whiskey, the words "Sour Mash" flashing off and on.



Sign sketch contributed by the Greenwood Advertising Company, Knoxville, Tenn., of a design built for the Hope Brothers Company.

The feature of this sign is the double-face clock with glass dials located in center of sign. This clock is equipped with Betts & Betts "Baby" type self-winding clock mechanism, the capacity of which is clocks 30 inches in diameter.

There are 116 receptacles for 10-watt lamps, which are arranged to flash first on one side, then on the other.

The Duquesne Light Company, of Pittsburgh, has begun a system of "reciprocal advertising" that is attracting wide attention among newspaper readers. The lighting company has taken merchants, who have been liberal users of electricity for advertising, and featured them in display advertising as examples of success. W. S. Brown, who is known throughout Western Pennsylvania as "The Gunman," was one of the pioneers in electrical advertising and has done some startling things with electric signs. Brown and electric illumination have always been closely associated in the minds of the people. The Duquesne Light Company, in one of its newspaper displays, says: "W. S. Brown, the gun merchant of 523 Wood Street, is not only a progressive merchant, but a public spirited citizen. He is usually in the front rank of those who are ever advancing the interests of Pittsburgh. He is a believer in electric signs and by their use he has made his name and business so well known that the sportsman's first thought, when he needs firearms, fishing tackle, cutlery or athletic goods, is of Brown, who burns his name into the public mind with an electric sign. Here is what W. S. Brown writes us of our electric-light-service: "'Business men should surely appreciate the development in electric sign advertising, which has now become of such general use. We have found that it calls attention equally of those who know and those who do not know our place of business and we feel that it has been productive of good results. We are sorry there is not more public lighting on our streets and believe it would be of benefit to our city.'"

The remainder of the ad follows: "Electric signs not only benefit the merchant using them, but they benefit the general public by giving better illumination to the streets. It is the well-lighted city which is attractive to strangers, and usually wide awake and progressive. The merchant who hangs out an artistic electric sign not only helps himself by increasing his business, but he is considered one of the live wires who is always foremost in his community."

Writing of the value of slogan signs, Stuart C. Irby, of the Hattiesburg Traction Company, says: "Two years ago we gave to the city a 1,200-lamp slogan sign, which advertises the fact that Hattiesburg is the center of a circle formed by the cities of Meridian, Mobile, Gulfport, New Orleans, Natchez and Jackson.

"From every standpoint the sign has proven an excellent investment. It has acted as a great stimulator for the sale of electric signs and has strengthened the friendly relations between this company and the public."

Electrical Construction

LIGHTING DETAILS FOR ILLUMINATION OF PAGEANT AND MASQUE OF ST. LOUIS.[1]

By Arthur I. Jacobs.[2]

This article describes the large temporary electrical installation of the huge Pageant and Masque of St. Louis, which will be held from May 28 to 30. The installation is noteworthy as it involves the temporary illumination of a great stage area in an efficient manner without an excessive initial cost. Several difficulties were experienced in finding apparatus of a suitable nature for the illumination of the stage; and in the case of the footlight reflectors, extensive experimenting resulted in the development of a special reflector.

The site in Forest Park, which has been selected for the production of the Pageant and Masque of St. Louis, which will be held from May 28 to 30, inclusive, to celebrate the 150th anniversary of the founding of the city, is probably the most wonderful natural amphitheater adapted to such purposes. It is formed by a concave hillside, known as Art Hill, extending from about 200 feet north of the north facade of the Art Museum, at the top, down to the south bank of the main lagoon, over part of which has been built the enormous stage. This hillside forms the seating area for the audience and commands an unobstructed view of the stage below from any part of it. This area embraces about 330,000 square feet or 7.6 acres and spreads out before the stage in the form of a huge fan, 530 feet wide at the bottom and 1,100 feet wide at the top, and having a length of 440 feet. In this fan will be placed seats for 43,000, and there will be standing room for 50,000 more.

Illumination of Amphitheater and Lagoon.

The main objects sought for in illuminating this large area were fair uniformity of illumination, absence of glare in the eyes of the audience and the minimum of obstructions in the shape of lamp standards or wires. These objects have been attained by the use of 24-inch searchlights placed on the roof of the Art Museum about 200 feet back of the slope. There will be four of these searchlights, about 50 feet above the top of the slope and spaced approximately 110 feet apart. They are nominally of 10,000 candlepower each, having Mangin mirrors instead of the ordinary silvered copper reflectors. The doors are made of a series of linear plano-convex lenses, set vertically in front of the case, their purpose being to spread the light uniformly in a horizontal direction. The angle of diversion and the spacing of lights is such that the rays from adjacent lights overlap, making the illumination more uniform and providing against the possibility of total darkness at any point on account of the failure of any one of the projectors. Energy for these lights will be taken from a single-phase 2,300-volt underground line serving the Art Museum from the Union Electric Light & Power Company's main on Skinker Road. A 25-kilowatt motor-generator set comprising a 220-volt alternating-current, single-phase Wagner motor and 115-volt direct-current generator, has been installed in the basement for obtaining the direct current needed for the searchlights.

The main lagoon at the foot of the slope is 275 feet wide by 920 feet long, north and south. Near the southern end, that is, nearest the amphitheater, there is a branch on either side approximately 45 feet wide, running east and west. The bank of the main lagoon at the foot of the slope is circular in form and between it and the front of the stage which is built over the lagoon, there is left a body of water about 120 feet wide approximating the crescent of the Mississippi in front of St. Louis.

This stretch of water measures about 920 feet in length, 500 feet of which will be illuminated by 133 250-watt tungsten lamps spaced two feet apart at the center and five feet apart at the ends. Boats will come out of darkness, becoming better and better lighted until they reach the landing where the illumination is the most intense. The effect will be heightened by the use of dimmers, described later, by which the lamps can be brought gradually from darkness to full brilliancy and vice versa. The lamps will be placed in white-enameled steel reflectors, mounted along a timber frame built against the steep bank of the lagoon about three feet above the water, and out of sight of the audience. The reflectors are of very odd shape, and are manufactured by the Benjamin Electric Manufacturing Company for illuminated sign work, but their distribution is such that by reversing them they are peculiarly adapted for this use. Supplementing the 250-watt lamps, there will be two 18-inch searchlights on the south shore. These lights will be set in pits, the roofs of which will be flush with the ground surface and unseen by the audience while the front facing the water will, of course, be open. These lights, like those on the roof of the Art Museum, will be equipped with diverging lenses. The lens doors are, however, removable and when required by the action of the Masque, the searchlights will be used without them for throwing intense lights on the principal characters. The energy for both the searchlights and tungsten lamps will be brought across the water in separate lead-covered cables from the switchboard on the stage, as shown in Fig. 1.

Illumination of Stage.

The stage is 320 feet wide in front, 510 feet at the rear and is 200 feet deep. It is built on piles driven into the soft bottom of the lagoon and has a slope from front to rear of four feet. On each side of the stage is a tower seven feet by 12 feet at the base by 40 feet high, which corresponds to the proscenium arch in a theater. In one of these towers will be stationed, during the performance, the pageant masters, stage director and electrical director. Here also will be placed the switchboard from which all stage and lagoon illumination will be controlled.

The immense size of the stage and the absence of any overhead structure from which to support top lights, made the matter of proper illumination of the stage a vexing problem. Any overhead system of suspension wires fastened to towers and back drop would, in order to bring the lamps where needed, be not only more or less complicated, but would be unsightly and is actually needed; this rigid fixtures in front of the lamps, would interfere with the view of the stage from the higher portions of the amphitheater.

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[1] Paper delivered before the League of Electrical Interests on April 28.

[2] Chairman Lighting Committee.

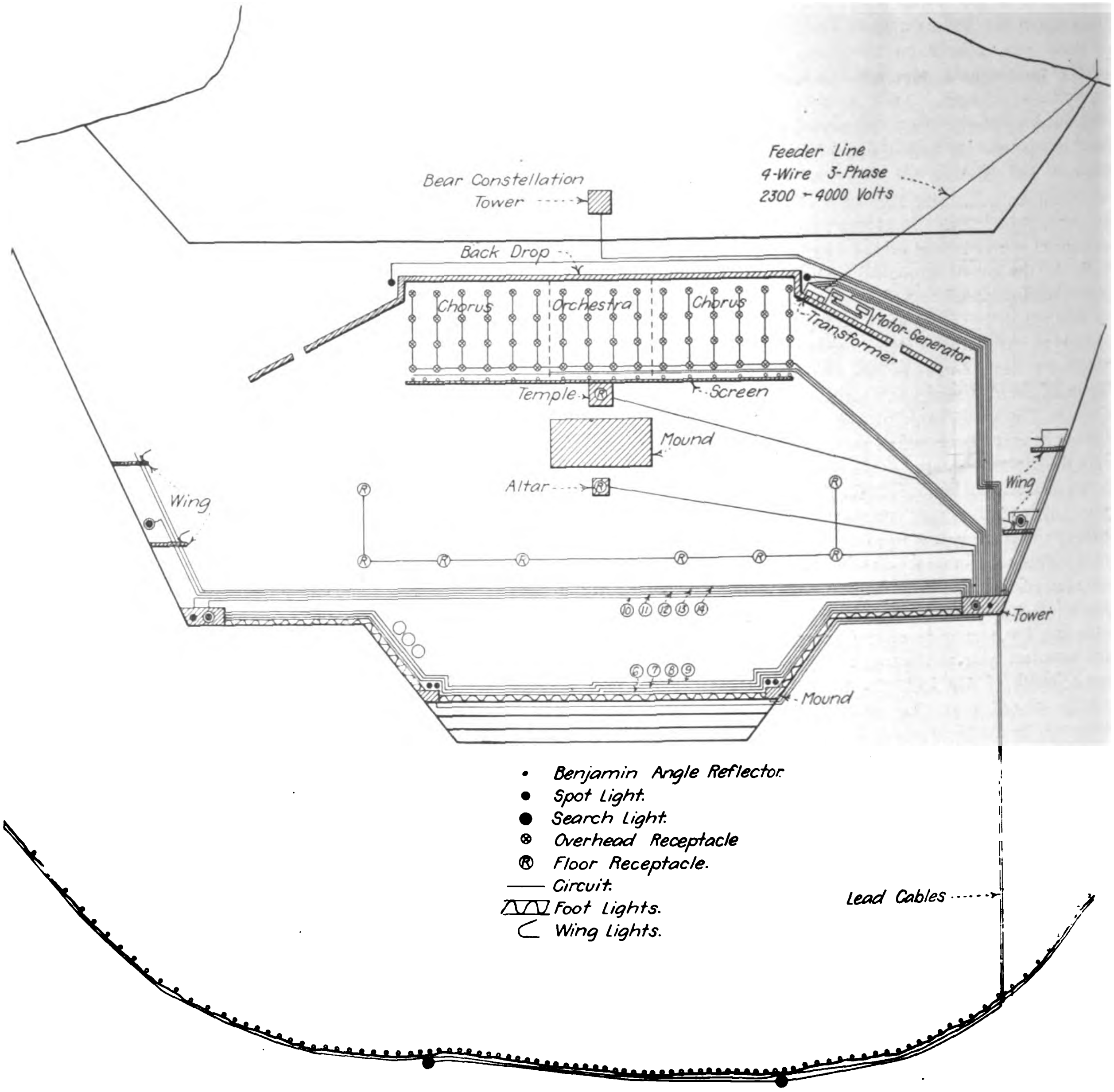

Bear Constellation Tower
Feeder Line 4-Wire 3-Phase 2300 – 4000 Volts
Back Drop
Chorus
Orchestra
Chorus
Transformer
Motor-Generator
Temple
Screen
Mound
Altar
Wing
Wing
Tower
10 11 12 13 14
6 7 8 9
Mound
Lead Cables
• Benjamin Angle Reflector
● Spot Light
● Search Light
⊗ Overhead Receptacle
® Floor Receptacle
—— Circuit
Foot Lights
Wing Lights

Fig. 1.—Layout of Circuits.

The plan, as finally adopted, consists of foot and wing-lights consisting of special 18-inch searchlights and of standard theater spot-lights. The footlight reflectors are different from the ordinary theater footlights both in design and application. It was imperative that all the light be thrown directly across the stage on account of the absence of any overhead drops to reflect the light back on the stage and on account of the great distance of the back drop from the front of the stage which would cause any light thrown upward beyond a small angle to be totally lost. Several short sections of differently shaped reflectors were made and many photometric observations of each were taken by means of a Sharp-Millar illuminometer to determine their distribution-of-light characteristics. By this means a very efficient reflector was developed and knowing its characteristics, the total illumination at any point due to any given length of reflector was readily calculated. Fig. 3 shows the construction of the reflector which was developed, while curve 3 of Fig. 2 shows the light distribution as obtained with this reflector in comparison to that obtained with two earlier types of reflectors. The reflectors are of polished tin held in wooden frames 28 inches apart. They set entirely above the stage, but on account of the rise of the stage from front to rear, and the fact that the lowest seat in the amphitheater is several feet above the stage, these reflectors will offer comparatively little interference with a view of the stage. The lamps are 250-watt, placed 14 inches apart with the filaments parallel to the reflector surface. There are three colors, clear, amber and red, each color being on a separate three-wire circuit connected to dimmers. The clear lamps are divided into two circuits, the lamps on each half of the stage being independently controlled. The intensity of illumination obtained with an 800-foot length of clear footlights is about 4.5 foot-candles at a distance of 50 feet from the reflectors.

Wing-lights having 15-foot polished tin reflectors of same design as the footlights and equipped with 250-watt clear lamps, will be placed back of each wing. One 18-inch searchlight will be placed on a platform back of each tower, 30 feet above the stage, and one of the same size will be placed on a 10-foot platform back of the first wing on each side of the stage. These will illuminate the area not adequately taken care of by the footlights and will provide the light from above as necessary for proper illumination. At the same time they will tend to soften the shadows from the footlights. Each will be equipped with a diverging lens and color screens. For picking out principal characters six 6-inch standard theater spot-lights with color wheels will be used. Three will be placed on each side of the landing at the front of the stage.

The background will be iluminated from the top of a screen shielding the orchestra and chorus in the back part of the stage from view. For this purpose 15 250-watt lamps having the same type of reflector used around the lagoon will be employed. Only a dim illumination is required for this purpose. Lighting for the orchestra and chorus will be by 60-watt lamps in conical metal reflectors strung between the screen and background. There will be 50 lamps above the chorus averaging 0.6 watt per square foot of floor area and 28 lamps above the orchestra averaging 1 watt per square foot of floor area.

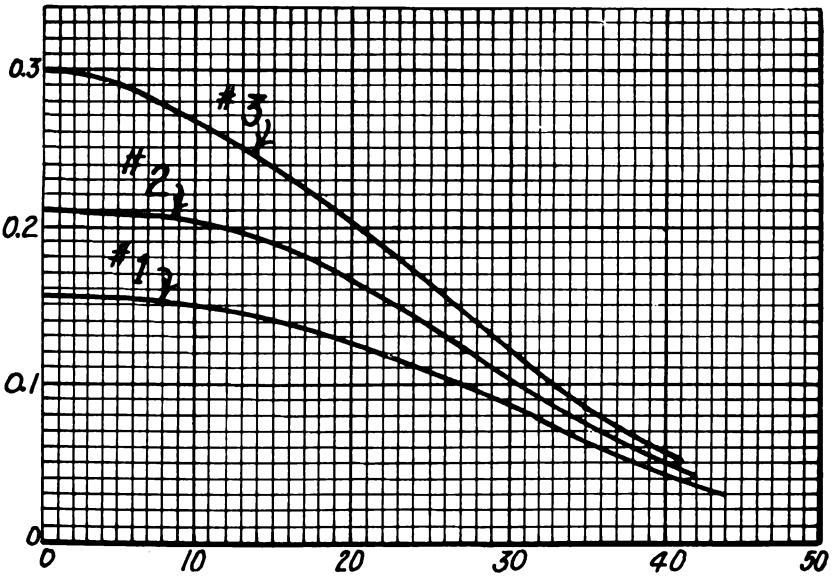


Fig. 2.—Footlight Reflector Intensity Curves.

Many receptacles will be used on the stage for special lighting purposes, among which will be eight receptacles for bunch lights on standards. The latter will be used for zone lighting for separate groups of dancers. In addition there will be several special electrical effects, among which may be mentioned the constellation of the Great Bear, 40 feet high, showing the outline of the Great Bear by about 200 four-candlepower carbon lamps and the stars of the Big Dipper which will consist of seven 60-watt tungsten lamps, set in cupped reflectors to give the effect of radiating rays of lights. The stars will be made to flicker by means of a flasher run at high speed. There will also be a five-foot flaming sword which is brought up the river with the child "St. Louis." It is carried to the mound where it is planted in the earth to the confusion of all the enemies of St. Louis, who attempt to wrest its rightful heritage from it.

Energy for the lagoon and all stage lighting will be brought to the northeast corner of the stage by a three-phase, four-wire, 2,300-4,000-volt line on temporary poles from the Union Electric Light & Power Company's line at DeBaliviere and Lindell Avenues. Secondary alternating-current distribution for incandescent lamps will be by three separate single-phase three-wire, 115-230-volt lines to the switchboard shown in Fig. 1.

The searchlights and spotlights require direct current for proper operation and for this purpose a motor-generator set, consisting of a 75-horsepower, three-phase, 220-volt Wagner motor belted to a 115-volt, 55-kilowatt generator will be installed as previously described. The transformers and the motor-generator set will be placed on the stage back of the east wing of the background.

The switchboard will be located in the east tower. It will be in two sections, the upper section for direct-current control and the lower section for alternating-current control. Each of the three main single-phase circuits will control a separate color. There will be 61 circuit switches, placed on the board in the same relative position as the arc and lamp groups which they control. With the exception of the three main switches on the alternating-current lines, all alternating-current switches will be double pole, the neutral being carried through solid.

There will be two sets of buses for each main alternating-current circuit, a dimmer bus and a straight-through bus. There will be four sets of dimmers, one set to each of the three main alternating-current circuits and a separate one for the shore-circuit inserted between the main switches and the dimmer buses. The straight-through buses are connected directly to the main switches. Every branch circuit which requires dimming is connected through a double-pole switch to each set of buses. As each main circuit controls a separate color, any color may be dimmed separately or any two or all three may be dimmed simultaneously or in any order desired. By means of the switches on the straight-through buses any or all branch circuits may be thrown in directly across the line, while other circuits of the same color are being dimmed. In fact, all combinations but that of different degrees of dimming of two circuits of a single color at the same time may be obtained. The latter combination will not be required.

The ordinary form of theater dimmers, on account of the immense cost entailed for the large capacities required, were out of the question. Water rheostats will be used instead. One terminal will lie at the bottom of the barrel while the other will be suspended from a cord pressing over a pulley and counterweight. The movable terminal will be a grate casting so as to enable it to drop readily through the water. A set consists of two barrels, one on each outside wire, the neutral running straight through.

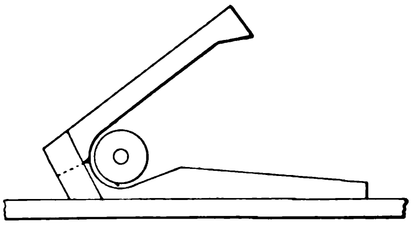


Fig. 3.—Footlight Reflector.

For the proper co-ordination of all the activities of such an enormous production an extensive telephone system will be installed. All arc-light operators will wear head telephones. The four searchlight operators on the roof of the Art Museum will be on one circuit, and the twelve or more operators on the stage will be on two other circuits. By grouping the two transmitters on the stage circuits close together, orders to any two or more operators may be given at the same time and will be heard by all. It can readily be seen how greatly this will facilitate the giving of orders and cues. In addition, a 20-line board will be installed with telephones in the wings and dressing tents and distributed at vantage points on the grounds. There will also be a telephone set in the audience from which an assistant stage director may communicate with the stage.

ELECTRICAL INSTALLATION IN A LARGE CLOTHING FACTORY.

New Kuppenheimer Plant in Chicago.

The manufacture of clothing is one of those industries in which close competition is necessitating careful attention to efficiency, so as to reduce production costs to the lowest point consistent with quality of product. This is bringing about the liberal use of electricity in plants of this kind. A good example of this tendency is the new factory of B. Kuppenheimer & Company, manufacturers of men's and boys' clothing, at Twenty-second Street and Western Avenue, Chicago. Many features about the electrical equipment of this factory are unique and therefore of special interest to the electrician.

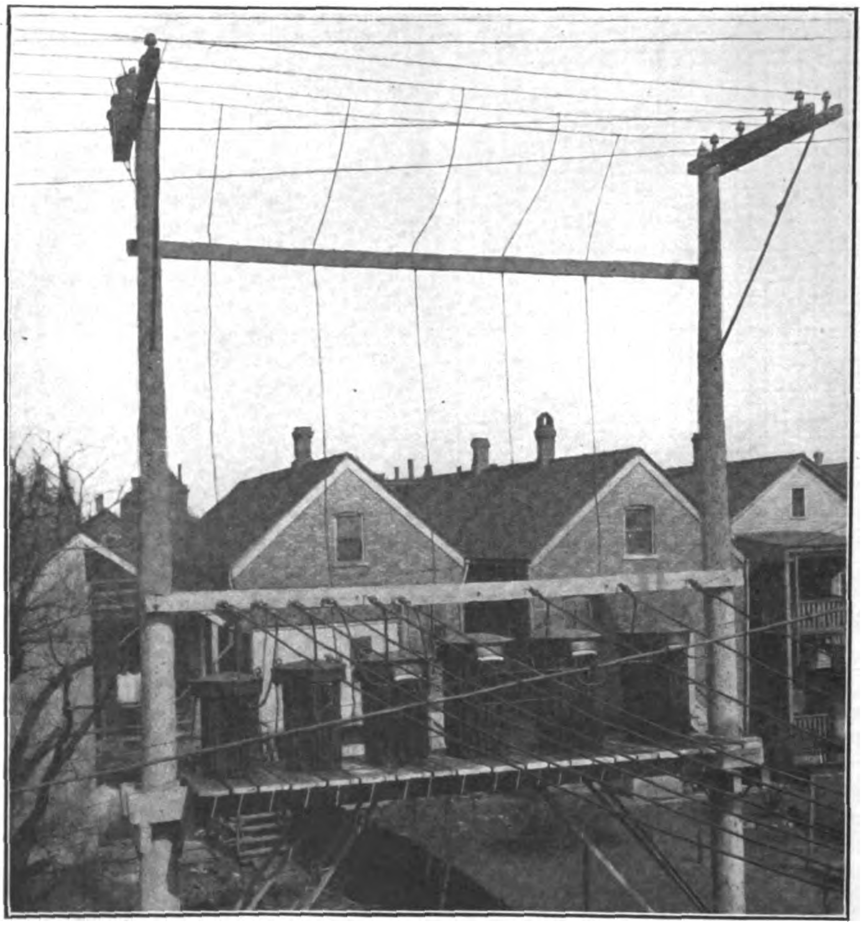


Fig. 1.—Lighting and Power Transformers for Kuppenheimer Factory.

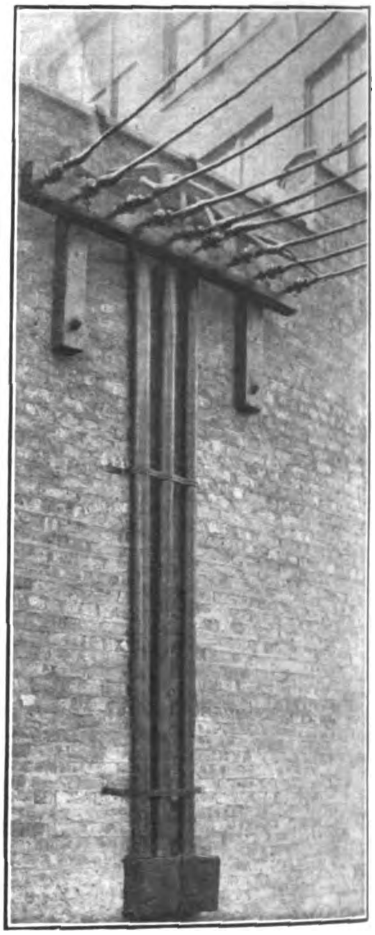


Fig. 2.—Service Cables for Building.

Three of the ten former clothing factories of this firm have been consolidated in the new building, which accommodates about 2,500 employees. The building is four stories high and on the ground floor about 250 by 125 feet in area. The dimensions of the upper floors are about 250 by 48 feet, with a central wing to the north 66 by 77 feet. Mill construction is used throughout. In practically all parts of the building the walls are faced with white glazed brick, which with the liberal window area makes the rooms exceptionally light. The welfare of employees is provided for by a large dining room and kitchen, rest rooms and a hospital room on the ground floor, as well as ample toilet and locker rooms on each of the four floors.

Central-station electrical supply was adopted and a contract was closed with the Sanitary District of Chicago for three-phase 60-cycle current at 220 volts for power and 110 volts for lighting. In the alley back of the building two banks of step-down single-phase transformers were especially installed for the plant by the Sanitary District, as shown in Fig. 1. The three transformers seen on the right are for power, while the three on the left are for the lighting supply. Three delta-connected 220-volt, 400,000-circular-mil feeders carry the power current and six independent 110-volt 500,000-circular-mil feeders carry the lighting current to the service entrance of the building, as shown in Fig. 2; the simpler plan of connecting the lighting transformer secondaries in delta right at the transformers was intentionally not used because it would have required larger and more unwieldy feeder cables. Gillette-Vibber Universal service fittings are used at the top of the three large conduits on the rear wall. At the bottom of these conduits junction boxes were placed to facilitate bringing the heavy cables through the wall.

Fig. 3 shows how these cables emerge on the inside of the boiler-room wall directly into the upper portion of the steel cabinet for the service switches. The 600-ampere power switch is at the right. At the left is the 1,200-ampere lighting switch to whose fused terminals the six individual cables from the transformers are delta-connected in pairs. The polyphase lighting meter is to the left of the steel cabinet and on each side of it is a current transformer connected in the standard manner for measuring three-phase loads. The two cables from each of the outer phases are spliced before reaching their current transformers and then are again run as two cables in parallel, passing through conduit under the floor to the large distributing cabinet in the adjoining room. The power meter and its current transformers are seen at the right, the connections here appearing to be simpler because only single cables are used.

Since this factory has no isolated generating plant, an elaborate switchboard was decided to be superfluous. There is provided instead the large distributing board shown in Fig. 4. This is at the south end of the pump room and is mounted in a steel cabinet. This cabinet is one of the largest ever built of this type and when empty can hold five men with room to spare. It is made of standard No. 12 sheet steel and is mounted on and braced with angle irons. Double hinged doors with vault handle and lock permit closing and sealing the cabinet against tampering with the switches or fuses.

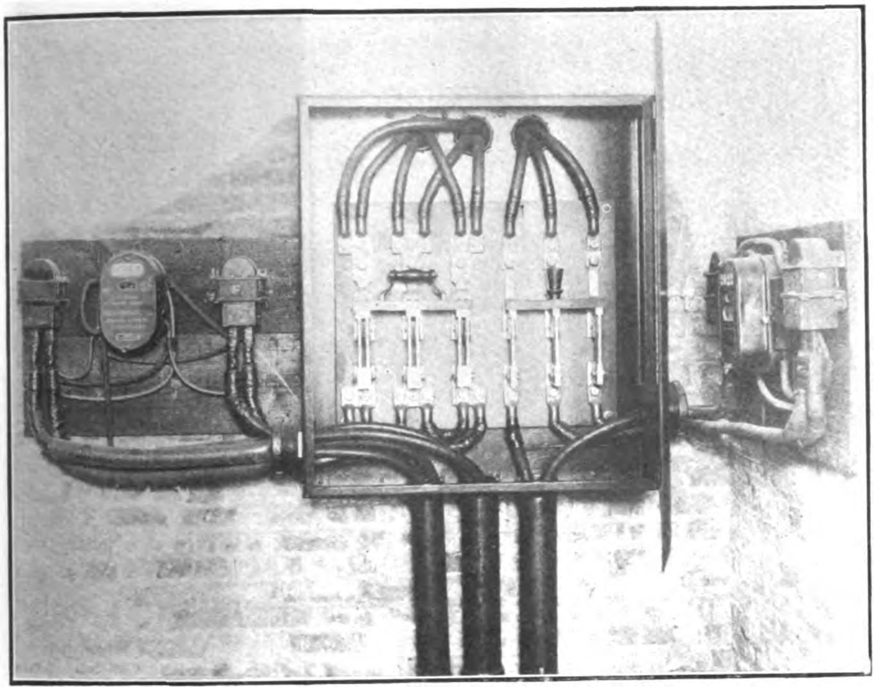


Fig. 3.—Service Switches and Meters.

The left side of the board is for the power circuits. The main power switch has a capacity of 600 amperes, as has the first branch-circuit switch which controls a 300,000-circular-mil feeder that is carried in 2.5-inch conduit running up as a riser to all of the floors and supplying motor circuits for sewing machines and any other machines used in the clothing manufacture. A 100-ampere reserve switch is provided for possible future power needs. The other switches are one 60-ampere for the sprinkling-pump motor, one 20-ampere for the house-pump motor, one 15-ampere for the vacuum-cleaner motor, and a 10-ampere switch for the ejector-pump motor.

The right side of the board controls the lighting circuits, which were all laid out originally, according to the specifications, as 220-110-volt three-wire single-phase circuits; therefore fuses were omitted in the middle or neutral wire; subsequently three-phase supply was brought in for lighting as well as power, but the original layout of circuits was approved. The main lighting switch has a rating of 1,200 amperes. Five main branch feeders are tapped from the buses through as many 300-ampere switches. Two of these lighting feeders are run as 300,000-circular-mil cables and the other three as 250,000-circular-mil cables, all of them being in 2.5-inch conduit running as risers supplying five distributing cabinets on each of the floors. The small switch shown on the top of the right side of the distributing board supplies a lighting-circuit cabinet in the boiler room, from which the lighting of this and the adjoining machine shop, pump room, and store rooms is controlled. It will be observed that the outer poles of the main lighting switch are equipped with double fuses in parallel. Each of these fuses is rated at 600 amperes. The branch circuits are led from the sides of the board into conduits run upward from the top of the cabinet, as shown in the illustration. This board was laid out by E. Miller, superintendent of the contracting firm of J. L. Burgard. Mr. Miller is seen standing at the right in Fig. 4. The work of assembling and installing the board was in charge of John Foster, Mr. Burgard's foreman, who is seen at the left in the illustration.

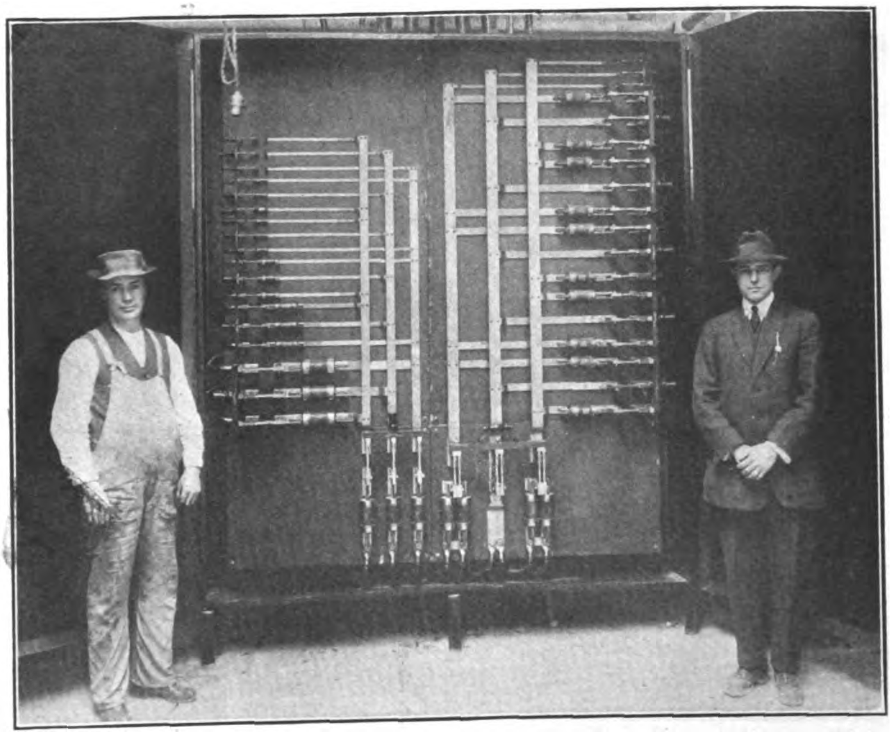


Fig. 4.—Main Distributing Board in Steel Cabinet.

In laying out the entire electrical installation very liberal provision was made in the main feeders for carrying considerably more than the present connected load or that immediately in prospect. Consequently it will be possible to add greatly to the number of lighting circuits and to the motors and to install other electrical equipment without requiring alterations on the distributing board or feeders. The specifications provided for a total of 408 lighting circuits, of which probably over one-third will be in reserve; the power load likewise will likely be below the total provided for.

All of the wiring in the building is in Buckeye rigid iron conduit which is neatly run on the ceilings parallel with or at right angles to the walls. Marion New-Code rubber-insulated wire is used throughout. Appleton Unilet fittings are generally used instead of bends; these greatly facilitated the installation. Porcelain-covered three-wire Unilet fittings are placed at the ends of all motor conduit runs. All wall switches, and outlets and all ceiling outlets are in Unilet boxes.

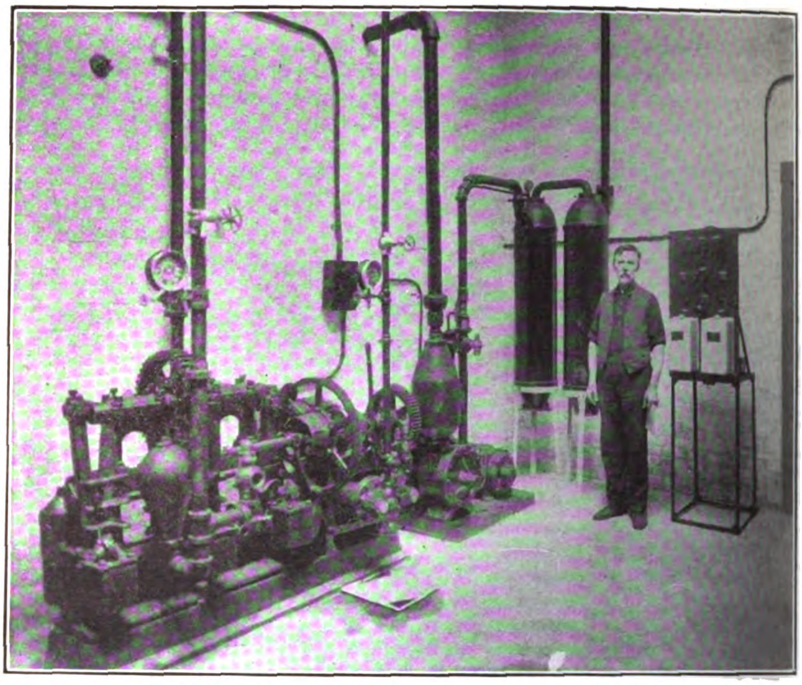


Fig. 5.—Motor-Driven Pumps and Ozone Water Sterilizer.

Another corner of the pump room is shown in Fig. 5. At the left is a 3.5-by-5-inch triplex sprinkler pump gear-driven by a five-horsepower motor for operating the Globe automatic sprinkler system with which all parts of the building are equipped. Adjoining it is a suction pump chain-driven by a three-horsepower motor for the Richmond vacuum cleaning system. At the right is the control board for a 110-volt, six-ampere Held ozone water sterilizer. All of the drinking water is first filtered, then treated with ozone from this sterilizer and circulated to the drinking fountains on each floor. Aside from steam-driven boiler-feed and vacuum pumps, there is also a three-horsepower motor-driven Yeomans house pump automatically controlled by a float switch at the roof tank with a relay at the motor. The machine shop has a five-horsepower motor. The freight elevator is driven by a 15-horsepower motor at the top of the shaft. There is also a motor-driven mixing machine, a potato-peeling machine and an electric dish-washing machine in the kitchen.

The clothing-machine power feeder referred to above is run as a riser along one of the five lighting-circuit feeders and at each floor there is placed on it a steel junction box, as shown at the right in Fig. 6. From this box a branch feeder is run to a motor-circuit cutout cabinet. On account of lack of room the one shown in Fig. 6 had to be placed at the left of the lighting cabinet. The use of Unilet angle fittings mentioned above is well shown in this illustration. From this motor cutout box five branch circuits are run down in conduit to the ceiling directly below the floor and from there as many motor groups are supplied. At each motor outlet a junction box is placed near the ceiling and a short piece of conduit is run up through the floor to the motor terminal fitting. The wires pass through this to the 30-ampere fused motor switch, which is inclosed in a steel box. Fig. 8 shows the arrangement. Group drive is used

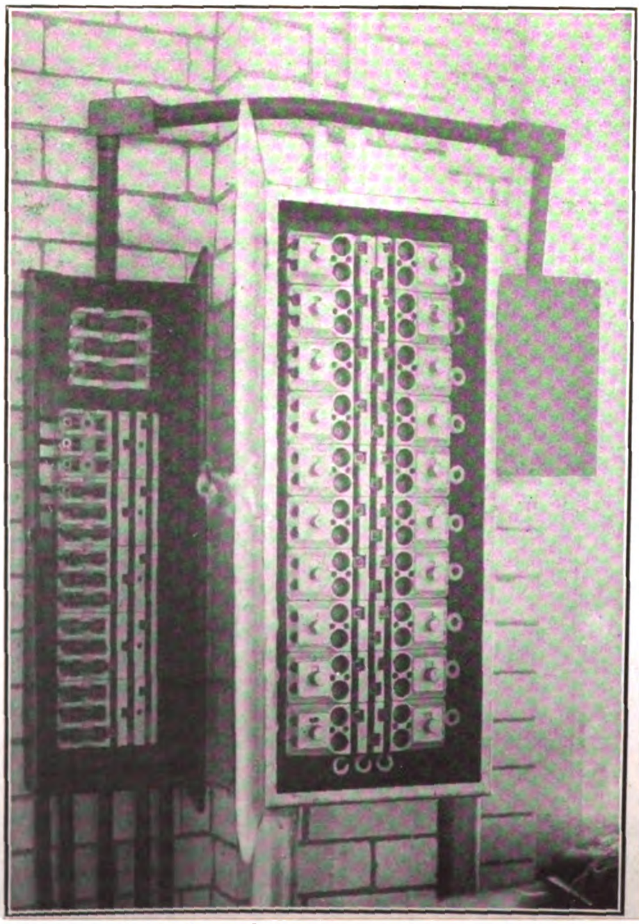


Fig. 6.—Motor and Lighting Cutout Cabinets.

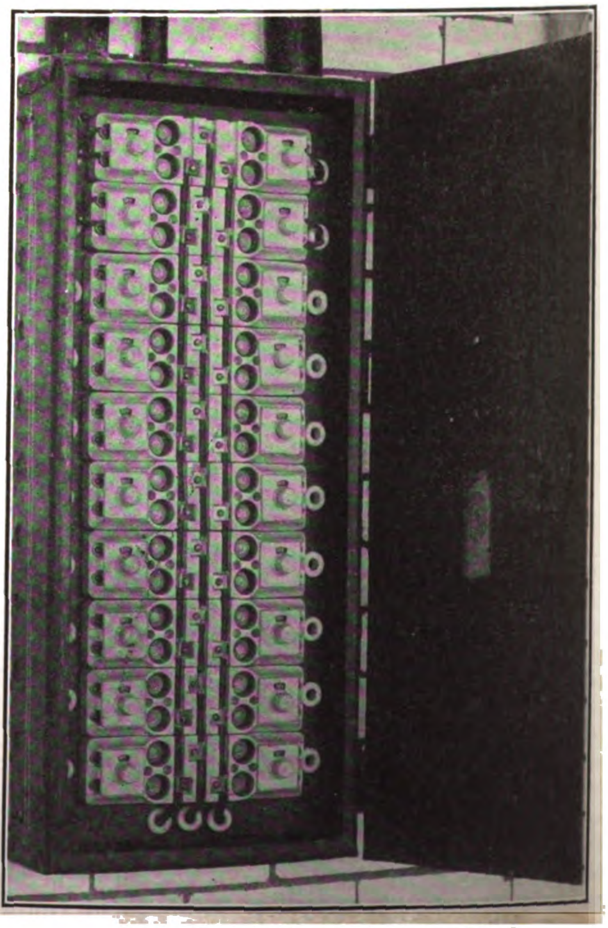


Fig. 7.—Closer View of a Lighting Cabinet.

for all sewing-machine tables. The motor drives the line shaft continuously and the individual machines are started and stopped by pedal control of a belt shifter. Various numbers of machines up to 17 are connected to one motor; the sewing-machine motors are General Electric three-phase induction motors and vary from one to three horsepower in size; 25 of them have been installed, most of the machines being on the top floor.

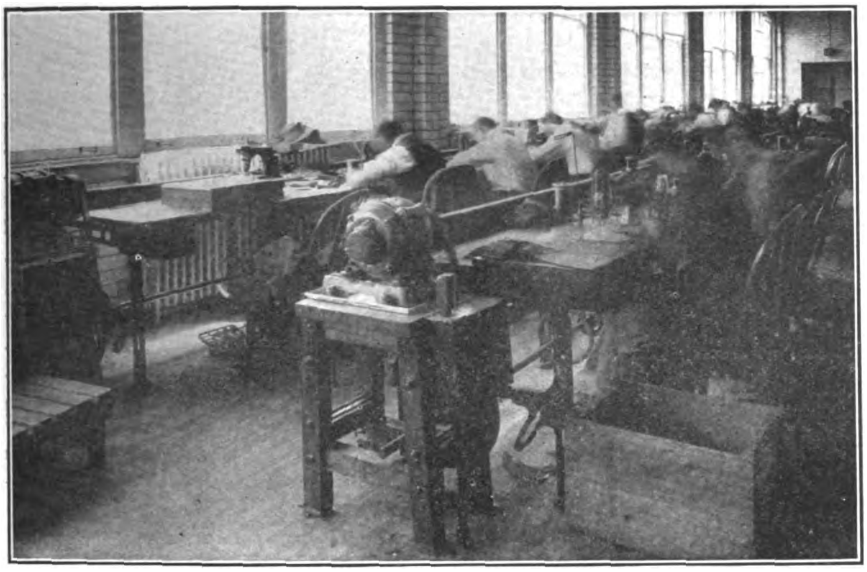


Fig. 8.—Motor Drive for Sewing-Machine Tables.

Although the building has been occupied nearly two weeks, none of the lighting fixtures has yet been installed. All the circuits for general lighting have been completed, however. This general lighting is provided for in nearly all cases by a single-lamp fixture at the center of each bay. In the large work rooms the bays are 16 by 22 feet in dimension and each will have a 250-watt tungsten lamp in a Maxolite enameled-steel socket reflector mounted about 9 feet 6 inches above the floor. In the pressing and sponging departments 110-volt, 350-watt, alternating - current Cooper Hewitt lamps with reflectors will be used, since it has been found that mercury-vapor lamps show up creases better than other lamps; some of these lamps will have color-correcting reflectors. About 40 mercury-vapor lamps will be installed.

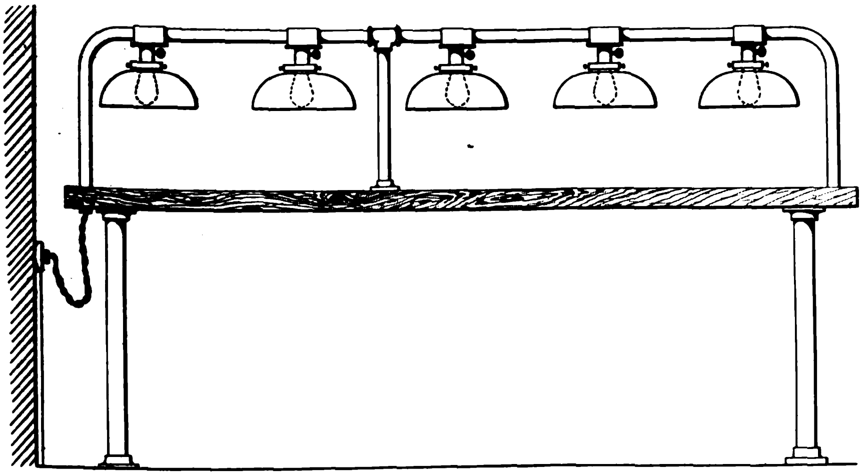


Fig. 9.—Scheme of Lighting for Handwork Tables.

The circuits for general lighting are laid out almost entirely so as to have only two lamps per circuit, 250-watt lamps being assumed for this service. These circuits for general lighting are the upper ones in each of the lighting cabinets, of which there are five on each floor, four in the long work room and one in the north wing. One of these cabinets is shown in the middle of Fig. 6; a better view is that in Fig. 7. These steel cabinets are very neatly arranged, being made up of Perkins porcelain panelettes with indicating snap switches mounted on sheet-steel plate with a three-inch wiring compartment in the rear. The branch circuits pass through porcelain bushings into this compartment and then proceed in conduit to the lighting outlets. Each cabinet has provision for 20 branch circuits, of which only four or five are now connected for general lighting.

In all clothing factories it has been found that operators working on dark materials, such as most men's clothing, insist on local lighting where close work like sewing is required. For this purpose it is planned to provide considerable special lighting of work tables, for which most of the as yet unwired branch circuits shown in the cabinets will be used. The conduit runs for this table lighting will be placed on the ceiling directly beneath the floor, being arranged much like those for the sewing-machine motor circuits described above. Many of these tables for finishers and button-hole stitchers are placed at right angles to the outer walls. The conduit will be brought through the floor to a Unilet box with Hubbell wall receptacle, from which a plug and short flexible-cord connection will be used to the lighting equipment on the table.

Fig. 9 is a diagram of the proposed lighting of these tables, which are 14 feet long by 18 inches wide, accommodating five persons on each side. It will be observed that a simple and inexpensive, but very effective, arrangement has been devised. Standard conduit and fittings are used. For most of the tables five 40-watt lamps will be mounted over the center line, each lamp being equipped with an 18-inch enameled-steel dome reflector to throw the light well over the laps of the operators on each side of the table. For the button-hole finishers individual 20 or 25-watt lamps will be provided by having a short piece of conduit run at right angles from the center condut line so as to bring the lamp and steel reflector directly over the handwork being done. Keyed sockets of the screw-cap type will be used. The mounting height of the lamps, as well as the general arrangement has been studied out with great care so as to throw the light where it is actually needed; thus rigid fixtures can be used, since there is no need for adjustment with its attendant loosening and wear of the fixture parts.

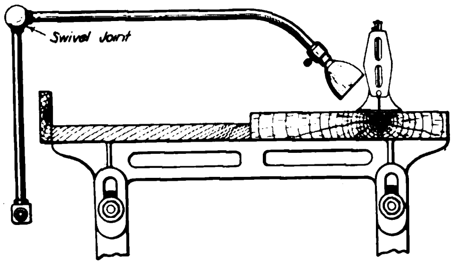


Fig. 10.—Scheme of Lighting for Sewing-Machine Tables.

The special lighting of the sewing-machine tables is made clear from Fig.

10. The conduit is run under the floor to the nearest end of the table, then through the floor and continued underneath the rear edge of the table about two feet above the floor to eliminate vibration. At a point opposite each individual machine a tap is made with a Unilet fitting and one-half-inch conduit is brought up along the edge of the table to a swivel joint at the top, from which a gooseneck arm leads so as to bring the lamp and its enameled-steel reflector close to the needle. The swiveled arm can be swung to one side 90 degrees, so as to bring it entirely out of the way; otherwise the fixture is rigid. About 250 of these fixtures will be used. It is believed that this fixture arrangement will be found very satisfactory, being low in first cost and maintenance, while bringing the light exactly where it is needed; vibration will probably not be be serious enough to affect the life of the tungsten lamps to be employed.

Aside from the power and lighting equipment installed and contemplated, there has been put in service an Edwards fire-alarm system with 15 pull boxes and gongs in various parts of the building. Although of the low-voltage type and operated by batteries, all the wiring for the system has been run in three-fourth-inch conduit with standard Unilet conduit fittings to insure keeping the wiring intact. An annuniciator has also been installed in the boiler room, equipped with call bell and connected to all floors and the elevator.

The architect of the building was Samuel N. Crowen. The plumbing, heating and heavy electrical work was laid out by John Small, of Hyland & Green, consulting engineers. The installation of the sewing-machine motors, as well as the local lighting of the tables was designed by M. E. Ames, who acted as consulting engineer on these matters. All of the electrical work in the building was installed by the firm of J. L. Burgard, 753 West Fifty-fourth Place, Chicago, Ill.

Cincinnati Contractors Form New Organization.

A new organization of electrical contractors in Cincinnati is in progress of formation, as a branch of the Jovian Order. In response to a recent appeal by Mayor Spiegel, delivered in an address at a Jovian meeting, for closer relations with the city on the part of the electrical trades, it was stated that the new organization, composed exclusively of men handling construction work, had for one of its purposes close co-operation with city officials, and that this purpose would be fully carried out.

New Wiring Rules in Louisville.

New rules applying to electric wiring in Louisville, Ky., were promulgated recently by the Louisville Electrical Clearing House. These rules became effective on May 1, and applied to all work figured after April 23, provided all jobs before then were listed with the electrical inspectors. The additional rules, are as follows:

Bath Rooms.—Fixtures and drop lights not controlled by switches must be equipped with porcelain key sockets or insulated pull-chain sockets.

Motors.—All alternating-current motors of over one horsepower must be equipped with double-throw spring switches with running fuses, when not equipped with approved starters which have the above mentioned protection.

Loop System.—All concealed work must be wired under this system, with boxes at each outlet except on front porch ceilings.

The order, which was addressed to all electrical contractors operating in Louisville and Jefferson County, Ky., was over the signatures of E. L. Kopf, electrical inspector for the Kentucky Actuarial Bureau, and Gus Ansbach and E. J. Theobald, city electrical inspectors. E. C. Knoop, bookkeeper for the Kentucky Actuarial Bureau, is secretary of the Clearing House. Its meetings are held on the second Monday of each month. The third monthly meeting (the Clearing House is of recent organization) was held on May 11. The meetings are of educational nature and are open to all those who are interested in electrical work.

Among the Contractors.

The Cumberland County Court House at Carlisle, Pa., will be completely wired for electric lights by Greybill & Company, a contracting firm of York, Pa. The installation will be supervised by A. E. Harris, in charge of the local branch of the firm.

The L. G. Robbins Electric Company, of Salt Lake City, Utah, has recently moved its place of business from 67 East First South Stree: to 138 East First South Street.

Kohler Brothers, Chicago, have recently been awarded the contract for installing two switchboards, a 200-horsepower generator, a number of incandescent lamps, and 17 motors totalling 190 horsepower in the plant of the Illinois Vinegar Manufacturing Company, at 213 West Forty-eighth Street, Chicago.

The contract for installing 21 motors totalling about 582 horsepower in the plant of the Lincoln Ice Company, at 4628 Greenview Avenue, Chicago, Ill., has been awarded to C. Grunhow, electrical contractor, Chicago, Ill.

The Counties Gas & Electric Company, of Norristown, Pa., has awarded a contract to F. J. Boas, a contractor, to erect a new power house in Norristown.

Electrical service of the new "Old Kentucky Home Hotel," in Bardstown, Ky., near which stands the original "Old Kentucky Home," will be of metropolitan proportions, according to present indications. The hotel is nearing completion and soon will be open for business. The electrical work is being done by Matthew & Allen, electrical contractors of Bardstown.

The Aitken Electric Company, general electrical contractors, Cleveland O., has been incorporated with a capital stock of $10,000, by S. E. Wilson, R. M. Zimmerman, George R. Aitken, S. M. Aitken and S. E. McFarland.

The Baker Electric Construction Company has secured the wiring contract on the new Whittier School annex in Kansas City, Mo.

The Pocatello Electric Supply Company, Pocatello, Idaho, of which H. G. Shafer is manager, has just commenced work on the wiring, fixtures and intercommunicating telephone system in the new Fargo apartment house. Another contract just begun is that for the wiring and fixtures for the new Kiscikia office building. This company has also recently completed the wiring of the two transfer sheds, each 490 feet in length, and the combined freight house and offices, 392 feet in length, for the Oregon Short Line Railroad at Pocatello. This work was in conduit throughout and included fixtures and panelboards.

Lloyd Donaldson, electrical contractor of Boise, Idaho, has recently moved from 221 South Tenth Street to an attractive and well located store at 305 North Ninth Street. Among the contracts completed by Mr. Donaldson in Boise were the wiring for the Auditorium Theater and that for the Grand Hotel.

The Avery-Loeb Electric Company, of Columbus, O., has the contract for installing 18 or 20 motors, with necessary wiring, for the Godman Shoe Company, of that city, which runs factories at Columbus and two nearby towns. The contract amounts to about $1,500.

The work of putting in 20 motors for the North Columbus Lumber Company, Columbus, O., has been let to the Sackett Mine Supply Company, of Columbus, O., at a bid of $2,000.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

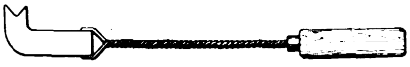
Replacing Springs on Rheostats.

To replace a spring in an ordinary controller-type rheostat; put the spring in place on the handle, place the handle in place on the rheostat with one end of spring on handle, put a strong cord or wire on other end of spring and pull the spring into place, pushing its end into the retaining hole by means of a screw-driver. This will save the trouble of taking stop off the box when replacing a spring.

Roy Dean.

Soldering Iron.

I have found that a very handy soldering iron can be made from a copper terminal of an old arc lamp as shown in the accompanying illustration. A groove is filed in the short elbow, and the terminal attached to a twisted wire stem and handle. This iron is very handy for soldering joints in wires as the groove acts as a cup distributing the heat and solder very evenly.



Soldering Iron.

C. E. Brown.

To Renovate An Old-Time Fixture.

Eight or ten years ago the old type of cluster fixture was much used for the illumination of store buildings and halls, but today people consider these fixtures objectionable both on account of appearance and on account of the glare that emanates from so much concentrated light. These fixtures can be converted into a semi-indirect type with little trouble. The large pancake shade which usually hangs above such a fixture can easily be removed, together with the usual 16-candlepower lamps. When tungsten lamps are inserted in place of the old carbon lamps and a glass-bowl reflector is hung below the fixture at such a height as to cover the lamps, an indirect fixture of pleasing appearance and good light distribution results.

L. E. Darling.

Cutting Holes in Cutout and Service Boxes.

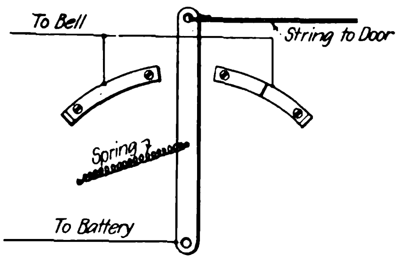
In cutting small holes in steel cutout or service boxes, I use a hole punch such as tinsmiths use. Holes made in this way will be burred on one side of the box but this burr can easily be removed by hammering. I found this method much quicker and less laborious than drilling. Fred Husar.

Prying Up Floor Boards.

In taking up old floors it is often difficult to prevent the old boards from splitting. I have found that by prying up the grooved side of the board first, the bottom edge of the groove will split off and the board can be replaced in apparently as good condition as before. H. W. Hanna.

Burglar Alarm.

The accompanying illustration shows a burglar alarm for use with a chicken coop or other outbuildings. It is arranged so that the opening of a door causes the string to pull the lever over where it will make contact with the metal piece on one side. After being pulled into this position, it will catch and remain there. On the other hand, if the string is broken or cut the spring will pull the lever back until it makes contact on the opposite side. The two contacts on the board are connected together behind the board, so as not to interfere with the motion of the lever. The position of this device may be made to suit one's convenience and the string may be adjusted over pulley to suit.



Burglar-Alarm Connections.

William T. Estlick.

Joining Copper Tubing.

On inside work with high-tension currents copper tubing about 0.5 inch in diameter and in about 10-foot lengths is frequently used in place of the ordinary wire. For long runs the joining together of the tubes sometimes presents something of a problem, if neatness and mechanical strength are both desired. Having some pieces of hard-drawn copper trolley-wire a little larger in diameter than the inside of the copper tubing available, I threaded a four-inch length of the trolley wire with an ordinary stock and die. Similar threads were made on the inside of the copper tubing at the ends with a tap of corresponding size, the ends of the tubing being first squared off with a file. The piece of trolley wire was screwed half its length into the end of one of the pipes, the process being facilitated by the fact that the trolley wire was not round in cross section but one of the commercial grooved types, thus making the gripping of the wire with a wrench an easy matter. The end of the other tube was then screwed onto the piece of trolley wire which now projected from the first tube. The trolley wire hence served as a nipple, making a rigid joint that was hardly visible a few feet away, and one which did not depend on a soldered joint for rigidity. Solder, however, should be used to insure good electrical contact. L. E. Darling.

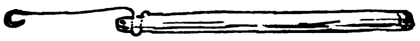
Protecting Conduit Threads.

On a recent job I had to make a number of offsets or bends in some pieces of conduit near the end of the pipe, and to avoid damaging the thread I took a piece of coupling of the same size and screwed it over the thread so that the latter was completely covered. I could then bend the conduit without injuring the thread.

William T. Estlick.

Device for Pull Chain Sockets.

On jobs where a number of fixtures having pull sockets are used the appearance of the place is often ruined by pieces of string which are tied to the chain in order to bring them within reach. Such strings can be obviated by providing the customer with the device illustrated in the accompanying figure. It is constructed by fastening a buttonhook to a piece of dowel stick and pressing the sides of the hook together so that it will catch between the balls of the chain. With this it is easy to operate a chain socket without the use of strings.



Device for Pull-Chain Sockets.

William Fisher.

Straightening Wire.

Line wire is often kinky when ready to use. Kinky wire does not look well on open work and will sag more easily with age. A good and convenient way to straighten it when in this condition, is to fasten one end of the wire to an article near the floor and taking the other end to some distance, throw the wire into the air bringing it down with force enough to drive out the kinks. If this is repeated a few times the wire becomes straight and in good condition. Roy Dean.

Among the Supply Men

The Northwestern Electric Equipment Company Moves Into Its New Home.

The Northwestern Electric Equipment Company has moved into its new home at 174 to 178 East Sixth Street, St. Paul, Minn. This company has had a remarkable growth in the past 12 years and is today more than ever representative of what the electrical industry stands for—enterprise, progress and development.

In its beginning the Northwestern Electric Equipment Company amounted to practically "Frank B. Thompson, salesman." Specializing in Fostoria lamps and Triumph motors, he built up a business to such proportions that in 1900 a warehouse and selling organization were necessary in St. Paul. The Thompson Electric Company was organized with Frank B. Thompson as general manager. In its first year as an electrical jobbing business the firm amassed a volume of a little over $55,000. Growth was rapid during the next three years, the idea being to constantly improve the service, and in 1903 the firm name was changed to the Northwestern Electric Equipment Company. In 1911 the present organization was effected and Mr. Thompson became president of the Northwestern Electric Equipment Company. In the 11 years intervening he had built up the company from a point where in its first year it barely passed the $55,000 mark in volume until during the year ending January, 1913, its volume closely approached one and a quarter million dollars.

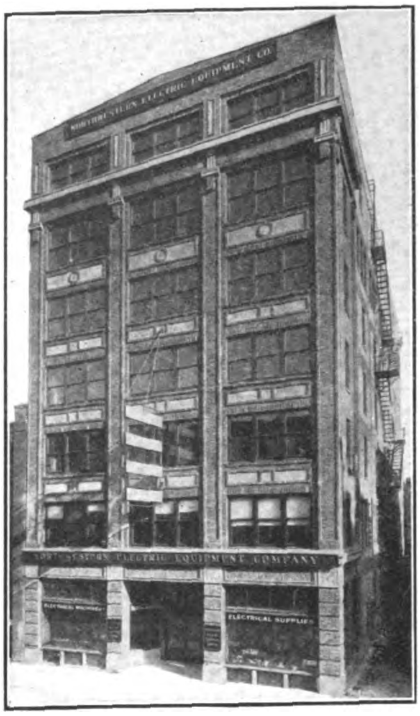


Fig. 1.—New Building of Northwestern Electric Equipment Company.

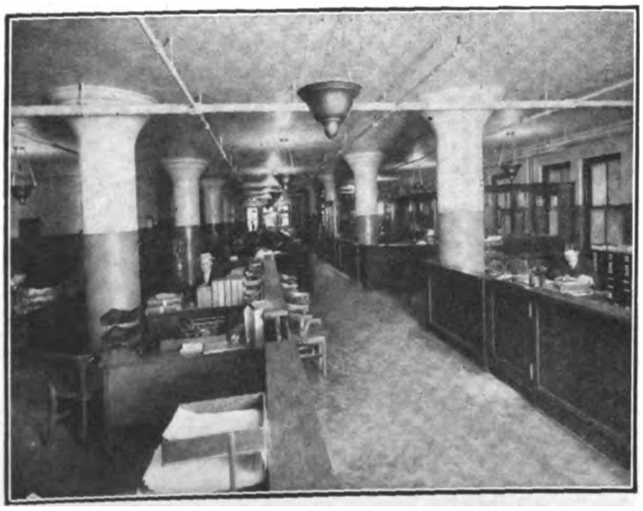


Fig. 2.—General Offices, Second Floor.

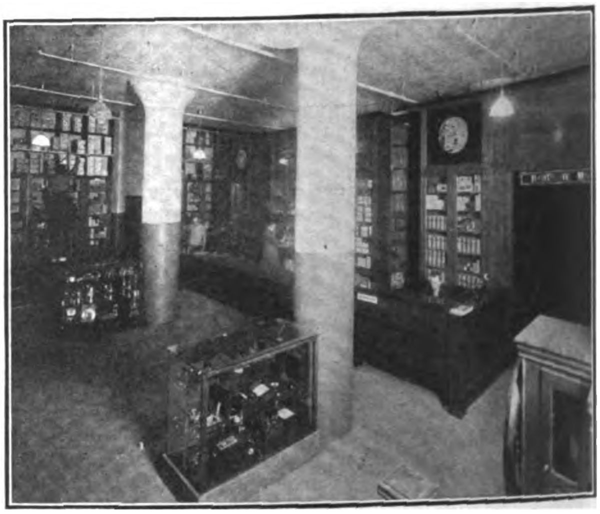


Fig. 3.—City Desk, City Department.

The new home is three blocks from the Union station and in the center of the wholesale district. It is the largest building in the middle west occupied exclusively by an electrical jobbing house. Built of reinforced concrete construction of the Turner type, 210,000 pounds of steel and 15,201 sacks of cement were used in the completed building. There is available 60,000 square feet of floor space and 700,000 cubic feet of space in the entire building, all of which, with the exception of 7,500 square feet of office space, is devoted to manufacturing and repair departments and stock rooms. Included in the electrical equipment are 13,600 feet of Greenfield-duct conduit, 72,000 feet of Americore wire for power, light, signal and bell systems, and 447 Fostoria Mazda lamps. The indirect system of lighting is used for the office illumination, 250-watt lamps being used throughout. The manufacturing department, shipping and stock rooms are equipped with 317 Holophone D'Olier shades. The city department is equipped with 27 Holophane prismatic glass shades. The entire interior of the building is given two extra coats of white paint to give a maximum light reflection. The Hackney electrically operated ventilating system is installed on the office floor.

The building is served with three elevators operated by motors aggregating 26 horsepower, and a Minnesota Manufacturers' Association gravity carrier and chute connects all floors in the building with the shipping room, facilitating the rapid assembling and filling of orders. Central-station service is used exclusively and the maximum electrical load is approximately 50 kilowatts. In addition to telephone connection with private switchboards with the Tri-City Telephone & Tele-

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graph Company and the Northwestern Telephone Company, a complete system of intercommunicating telephones is installed, connecting every department in the building, utilizing 38 telephone extensions.

The demonstrating rooms are located on the first floor, showing industrial and residence fixtures, household electric devices, and the rooms are for the use of the company's customers. If so desired, a sale can be made in them by any of the retail merchant trade the same as in their own stores. The building is of fireproof construction and in addition is equipped with a complete automatic sprinkler system. The rear stairway is in a fireproof enclosure opening on every floor and directly to the outside, and the windows on two sides and the rear are made of reinforced fireproof glass.

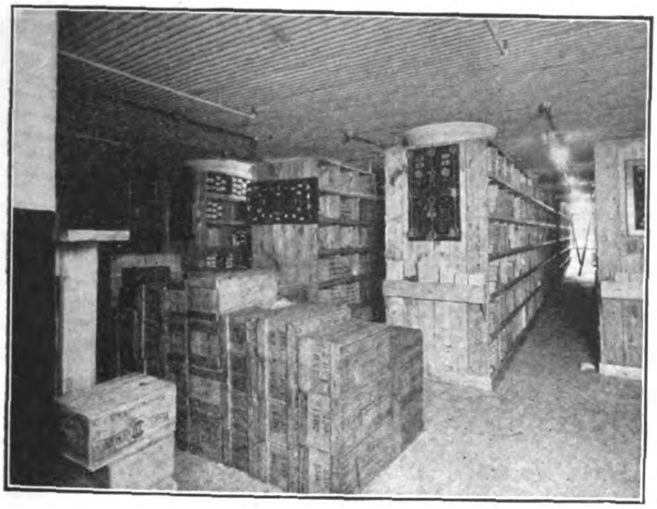
Fig. 4.—Section of Wiring-Device Stock Floor.

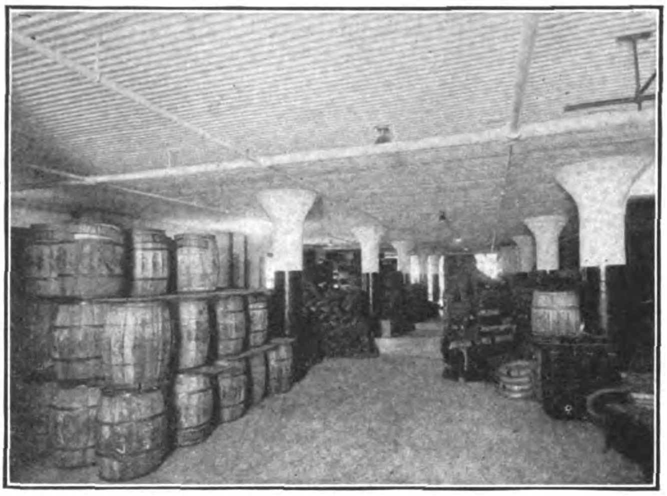
Fig. 5.—Battery and Wire Stock.

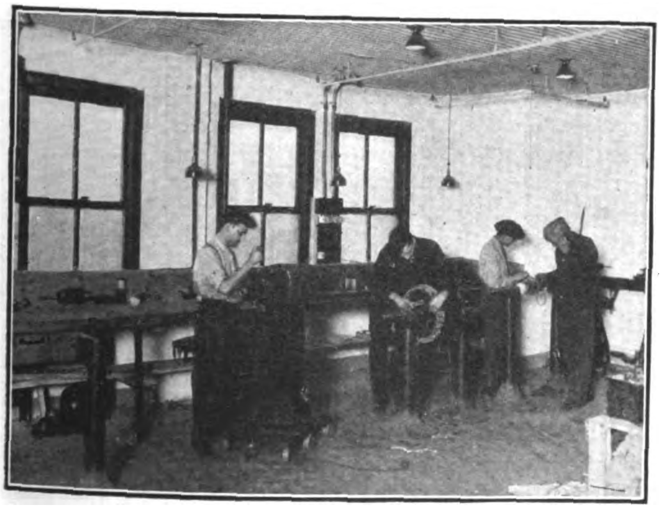
Fig. 6.—Armature-Winding Shop.

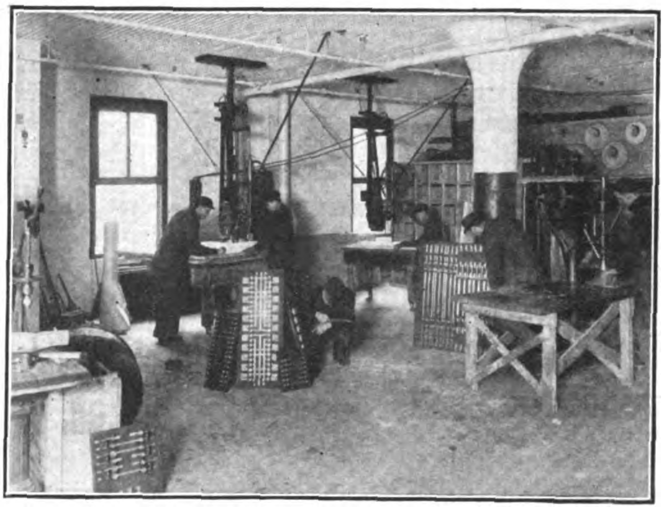
Fig. 7.—A Corner of the Panel Department.

The accompanying illustrations show the exterior of the building and illustrate various features connected with the several departments of the company's organization and equipment.

Mr. Thompson has associated with him a strong organization, prominent among which are the following personalities:

James M. Whalen, vice-president, started with the company nine years ago as manager of the machinery department. Before he was connected with the company he was with the foreign department of the General Electric Company, participating in the development of a number of important foreign installations. Mr. Whalen is still in active charge of the machinery department.

Albert J. Anderson is secretary and manager of the company. As sales manager of the Manhattan Electrical Supply Company, which position he held for four years before going with the Northwestern Electric Equipment Company, he acquired a pretty comprehensive knowledge of the electric equipment business. He started with the company as manager of the supply department and still has active charge of that branch of the work.

Others members of the selling organization include A. M. Baldwin, Jr., whose territory lies along the main lines in Minnesota, North Dakota and Montana; R. P. Payne, northern part of Minnesota; H. C. Wyatt, the southern half of Minnesota; L. J. Bridger, Iowa; J. L. Holmes, Wisconsin and the northern peninsula of Michigan; E. D. Yayo, South Dakota; J. L. Tucker, central Minnesota and North Dakota; R. W. Richardson, apparatus salesman; L. G. Mample, N. H. Snyder and F. G. Klein, Jr., city salesmen.

The credit department is under the direction of E. A. Oas, the purchasing department being managed by C. H. Ritter, and the shop and repair department is managed by H. M. Lyons.

The company publishes a monthly bulletin called the "Northwestern Buzzer." This is the pet of J. M. Hannaford, Jr., who is manager of the sales department, which has charge of both sales and publicity. The "Northwestern Buzzer" is one of the most interesting house organs published to the electrical trade and Mr. Hannaford's efforts in this direction have been of the greatest assistance to his organization and his fellow workers.

M. P. McClure, of the Pittsburgh Electric & Manufacturing Company, Pittsburgh, Pa., reports that all sections the company operates in are fairly active. The company makes a practice each month of instituting a special effort on those electrical supplies most commonly used such as wire, loom, sockets, lamp cord, porcelain, etc. The company is now in the midst of a vigorous campaign on these articles and is looking for a very successful issue. In handling a general line of supplies the company is experiencing an active demand.

The *Western Electric News* for May is dedicated to the office boy. There are forty pages of contributions either relating to or contributed by those who are either at present serving the company in that capacity or who have done so in the past. Both in its conception and subject matter the issue represents something unique in house organs.

The leading article, which deals with the office boy of 30 years ago, is contributed by F. H. Uhrig, western district manager of the company's Kansas City office. There are pictures of 39 Western Electric men now holding important positions with the company, all of whom started as office boys. This list includes a vice-president, an assistant general supply-sales manager, an assistant general superintendent of the factory, a traffic manager, an auditor, a credit man, three distributing-house managers, two assistant managers, two stores managers, two retail-stores managers, an engineer, a general foreman, two department foremen, four department heads, six salesmen and 10 others occupying miscellaneous executive positions.

The May issue is a good idea. It cannot help but be an inspiration to everyone it reaches, and outside of its importance in this direction it demonstrates a record that can be duplicated by few other business organizations in the country. As the Western Electric boys feel, the record must stand unchallenged until someone offers a better one. The illustration herewith is a reproduction of the front cover.

Western Electric
News
Vol. III. No. 3
May 1914
OFFICE BOYS' NUMBER

Office Boys' Number, Western Electric News.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Mount Whitney Power & Electric Company was authorized to issue $500,000 of its six-per-cent 30-year bonds to be sold so as to net the applicant 95 per cent of the par value. The proceeds are to be applied among other things to the completion of the Wolverton dam and to the construction of distribution lines and substations.

GEORGIA.

Changing Rates Fixed by Contract. In the decision mentioned in last week's issue, upholding the right of the Georgia Public Service Corporation acting under authority of the State Railroad Commission to abrogate contracts for electric power, and to charge an increased rate, the Superior Court has made the following important holding:

"Upon careful consideration of the contract in question, the order of the Railroad Commission, in re, Application of Georgia Public Service Corporation, for increase in commercial and residence and retail power rates, and of the adjudications of the (state) Supreme Court as to the jurisdiction and power of the Railroad Commission, after full and able argument by counsel, for the plaintiff and the defendant, I do not think that there is any doubt as to the power of the Commission to fix and regulate rates for the Georgia Public Service Corporation, and to require these rates to be uniform. The most serious question was whether a legal contract should be set aside even by the Commission with all its board powers. This question, however, is resolved by the principle repeatedly adjudicated, that such a contract was made, subject to the law, then in existence, giving the Commission plenary power to fix and to prevent discrimination, this having specially conferred upon the Commission long prior to the contract of July, 1912, and that both parties contracted subject to the public law conferring this absolute power upon the Commission.

"Recent decision of the Supreme Court of this state, as well as the uniform trend of judical opinions in construing statutes creating railroad and public service commissions, seems to leave no doubt as to the power of the Commission, at the instance of the consumer, or of the power company or of its own initiative to fix and regulate rates; and no doubt is left that not only is the power company bound by the rulings of the Commission as to maximum rates, but also as to discriminatory rates, and, of course, the consumer of light or power current must yield to the same authority when it condemns any contract, either in contemplation or in actual existence, as discriminatory, and so against public policy."

ILLINOIS.

The Western United Gas & Electric Company was authorized to put into effect a new schedule of rates and charges for electric service submitted by the company. The new rates will eliminate all concessions and discriminatory charges.

Rates to Stockholders. The Commission has issued a general conference ruling to the effect that it is unlawful to grant a lower rate to subscribers who are stockholders, directors and officers, that the subscriber who is a stockholder has no rights or privileges which are denied other subscribers, and that the stockholders must look to the profits of the business for return on his investment.

The Murphysboro Telephone Company was granted a certificate of convenience and necessity to construct and operate a telephone system in the village of Sessor in Franklin County. There is no other telephone company furnishing service in the village.

INDIANA.

The Indianapolis Light & Heat Company has been ordered to discontinue charging customers living outside the city limits of Indianapolis a higher rate than that charged residents in the city. The Commission found that there was no basis for the difference in rates and that the practice was therefore discriminatory. Other complaints against the company's rates are before the Commission alleging that discriminations exist in that several different rates have been offered individual consumers based on time limits of contract or other reasons, and the Commission has been asked to revise the entire schedule of electric rates.

The Union Light, Heat & Power Company has filed a suit in the Randolph Circuit Court asking that the order of the Commission, reducing the company's rate for natural gas from $1.00 a thousand feet to 56 cents, be set aside. The company claims that the rates ordered by the Commission are unreasonable and will not cover operating expenses.

NEW JERSEY.

"Seven Sister's Law." A case involving the constitutionality of the anti-trust law known as the "Seven Sister's Law" is being heard before the state Supreme Court. The American Malt Corporation and the American Malting Company attacked a recent decision of the Board of Public Utility Commissioners on the ground that the discretionary power exercised in withholding approval of a merger of the two companies was unconstitutional and the companies applied for a writ asking that the proceedings of the Commission be set aside.

NEW YORK.

Security Issues Authorized. The Astoria Light, Heat & Power Company was authorized by the Commission of the First District to issue $5,000,000 in 5.5-per cent bonds and $9,500,000 in additional stock to take up notes given to the Consolidated Gas Company.

The New York Edison Company was given permission to issue $15,-800,000 in additional capital stock.

The Pulaski Electric Light Company was granted the right by the Commission of the Second District to furnish electricity for light, heat and power in the town of Orwell, village of Altmar and town of Albion, Oswego County. The Commission also authorized the transfer of the franchises of the Salmon River Power Company to the Pulaski Company, permitting this latter company to construct and operate necessary equipment for transmitting electric power in and through the town of Richland, Oswego County.

Investigation of the Commission. The Department of Efficiency and Economy has begun an investigation upon complaints received relating to the failure of the Public Service Commission to reopen the case in which the Commission authorized the Canadian American Power Corporation to capitalize a contract with one of the Niagara power companies for the delivery of current.

OREGON.

The United States District Court for the District of Oregon has rendered a decision holding that the Commission has the power to require physical connection between two or more competing telephone lines. This decision upholds the order of the Commission providing for physical connection between the Pacific Telephone & Telegraph Company and the Home Telephone & Telegraph Company.

Standards of Utility Service. The Commission has under consideration the matter of adequate and serviceable standards of utility service involving the practices of all water, gas and electric utilities of the state.

PENNSYLVANIA.

Standards of Service. The Commission has issued a circular of rules and regulations for electric utilities prescribing the standard of accuracy of meters and rules for testing meters; standards of voltage regulation; and miscellaneous rules in regard to defective apparatus, maintenance and inspection, complaint records, and accident reports.

Issuing Rates on Less Than Statutory Notice. An order has been issued prescribing the manner and form to be used by public service companies in making application to the Commission for special permission to issue rates on less than statutory notice of thirty days.

WASHINGTON.

All Rates to be Published. The Commission has held that electric companies have not the legal right to furnish the state or any of its political subdivisions with electric current at rates other than those contained in the published tariff.

Annual Reports of Telephone Companies. The Commission has prepared forms for annual reports of telephone companies, and report blanks are being furnished to the companies doing business in the state.

WISCONSIN.

Security Issues of Electric Companies Authorized. The Commission authorized the Bark River Electric Light & Power Company to issue $12,-000 of capital, $8,100 of which was to replace a similar amount of void stock issued previously without the sanction of the Commission. The certificate of authorization recites that the void stock had been issued for money only and that the proceeds had been used in making extensions and additions to the property of the company and for this reason the company was allowed to replace this stock by a lawful issue, it being evident that there was no intent to evade the statutory requirements. The remaining $3,900 of stock is to be issued for money only and the proceeds are to be used to pay indebtedness and to complete the construction of the company's plant.

A certificate of authority to issue $6,000 of stock was issued to the Coleman-Pound Light & Power Company. The company is to use the proceeds derived therefrom in the construction of an electric light and power plant and the necessary transmission and distribution system to supply the villages of Coleman and Pound with electrical energy.

Security Issues of Telephone Companies Authorized. The Ripon Telephone Company was authorized to issue $10,000 of capital stock.

The Dancy Telephone Company was authorized to issue $1,800 of capital stock, the proceeds of which are to be used in paying for past and future extensions.

The Ryan Farmer's Telephone Company was authorized to issue $150 of capital stock.

Proposed Changes in Kansas Utilities Law.

Some radical changes in the public utilities act of Kansas will be made, if the recommendations of a committee appointed a year ago by Governor Hodges are carried out. The committee, consisting of three men from each branch of the Kansas Legislature, met at Topeka on May 5 for the purpose of considering changes in the act. Chief of the recommendations probably will be one which will give the Public Utilities Commission far more power than it has enjoyed in the past. The committee is composed of J. D. Joseph, J. H. Stavely and Noah Bowman, from the Senate, and S. N. Brewster, William Barrett and F. H. Chase from the House of Representatives. Others who participated in the conference at Topeka were John M. Kinkel and James Cable, members of the present commission and Ernest Hogueland, secretary of a former commission. Mr. Kinkel believes that 80 per cent of the public utilities of Kansas are inefficiently managed and that the Public Utilities Commission should be permitted to change the management wherever it finds incompetency. A uniform classification of accounting was among the other recommendations discussed.

Congress to Consider Hydroelectric Project for Washington.

A bill for the development of electric power for use in the District of Columbia, from the Potomac River, has recently been introduced in the Senate by Senator Norris, of Nebraska, as an amendment to the River and Harbor Bill. This bill authorizes an ependiture of $15,021,600 for the construction of a 115-foot dam and hydroelectric plant at Chain Bridge, a short distance above the city of Washington. It is said that such a dam would create a lake nine miles long, reaching back to Great Falls, the present source of the city's water supply, and that this lake could be used as a source of city water supply.

About 99,000 horsepower, which would be more than sufficient for the needs of the government, is expected to be capable of being developed in this way. At the present time the government owns a steam plant capable of developing 10,000 horsepower of electrical energy. In addition to this energy the government obtains over 1,000 horsepower from the Potomac Electric Power Company at an average cost of 2.011 cents per kilowatt-hour. The estimated cost per kilowatt-hour, including interest on the sinking fund, for the generation of power from the Potomac River under these conditions is about 0.87 cent. This low cost of generation would enable the government to offer the railway systems and commercial users very attractive rates for at present all power is furnished from steam power plants.

The Importance of Careful Investigation of Wood Preservatives.

A matter which has been giving electric light and power companies, steam and electric railway properties, and telephone and telegraph plants some considerable concern is the matter of securing authoritative analyses and tests of so-called wood preservatives. A great many public utility corporations are utilizing wood preservatives in considerable amounts, but as there is no official test to which these preservatives might be subjected, there is considerable concern over the actual value of some compounds, the practical value of which can only be determined after years of service.

It has been suggested, therefore, by some of the largest users of wood preservatives, and the matter has been highly endorsed by one of the largest producers of wood preservatives in the country, that the buyer of wood preservatives secure from the seller the protection of package brands which will constitute in effect a true statement of what a preservative contains.

The specification required by the American Telephone & Telegraph Company's method of analysis now in force, and that also of the Western Electric Company, which is also the specification of the New York Dock Department, the United States Signal Service and the United States Navy, calls for the producer to make affidavit that, first, he is familiar with its analysis and with its method of production. The analysis further consists of establishing the specific gravity at 38 degrees Centigrade, the flashing point, burning point, distillate below 235 degrees Centigrade, distillate coming over between 235 degrees Centigrade and 300 degrees Centigrade, the pure liquid coal tar oil residue at and above 300 degrees Centigrade, the tar acids in the distillate below 300 degrees Centigrade by volume of the entire sample, the sulphonation residue, the constituents insoluble in benzol, the form at 38 degrees Centigrade, the ash left on ignition, and the statement that it is a true product of coal tar free from adulteration, and that it is not a by-product of petroleum, water-gas tar or oil tar.

Utah Electric Club.

At the regular weekly luncheon of the Utah Electric Club held at the Commercial Club, Thursday, May 7, Lieutenant W. B. Wallace of the U. S. Army read a paper on the subject, "The Regular Army in Times of Peace, and Provisions for Its Expansion in War Times." He pointed out how the regular army as constituted in times of peace is intended to serve only as a nucleus of the war army, and that it is the purpose of the Federal Government to educate and train the National Guard of the various states as the first reserve to the regulars in case war is declared.

The club had as its guests at the luncheon the senior engineering class of the University of Utah with their professors. During the luncheon remarks were made by Professors Knowlton and Beckstrand emphasizing upon the boys the advantage of contact with the men who are actually engaged in commercial pursuits during their course in school.

The Entertainment Committee announced the spring outing of the club to be held at Lehi, 30 miles south of Salt Lake City on the line of the new Orem Interurban Line, Saturday, May 16. The club will leave Salt Lake City at 1:30. There will be a baseball game at Lehi in the afternoon between a picked team from the Electric Club and the Lehi team, which won the championship in the Utah County league last year.

At the regular meeting of the Utah Electric Club, held at Salt Lake City, Utah, on April 30, President Torrence explained that the Electric Club had been invited by the Commercial Club of Salt Lake City to participate in a "whirlwind campaign" on that day, which had for its object the raising of a $40,000 publicity fund for Salt Lake City to be expended during 1914.

Ten of the principal clubs of the city had been invited to co-operate in this campaign, each agreeing to put in the field at least six teams of two men each. The Electric Club had responded heartily to the call of President Torrence for assistance, and seven teams were out working that had consisted of the following: H. F. Holland and W. D. Bowerman; F. H. Barber and H. T. Plumb; C. B. Hawley and B. W. Mendenhall; Lloyd Garrison and F. C. Reinhart; C. D. Kipp and R. S. Folland; A. E. Smith and F. Rouston; W. W. Torrence and Leo Brandenburger.

The committees had been at work all of that morning and were meeting with excellent results. It was freely predicted that the Electric Club would head the list of all of the ten clubs in the number and amount of subscriptions secured. When the final results of the day's work were checked up, however, it proved that the Ad Club had been assigned the banks of the city and had received one large contribution from all of the banks through the Clearing House Association, which threw the Electric Club in second place in the amount of subscription. The latter led by a large majority, however, in the number of subscriptions secured.

The speaker of the day at the weekly meeting was Lieutenant Cake, of the United States Navy, who took as his subject the armament and electrical equipment of a battleship.

Pittsburgh Section Meeting.

The regular monthly meeting of the Pittsburgh Section of the Illuminating Engineering Society, which embraces Cleveland in its territory, will be held in the latter city, Friday, May 22. It had been originally intended to have this meeting on Friday, May 15, but at the suggestion of the Cleveland members it was decided to postpone the meeting until the later date so that the members could visit the Cleveland Electrical Show which will be in progress at that time.

The Pittsburgh delegation will go to Cleveland in a special car and the meeting will be held in the early part of the evening, after which the Society will be the guests of the National Electric Lamp Association at the Nela Park Laboratory. The following papers will be presented at the meeting: "The Illumination of Building Exteriors," by Ward Harrison; "The Latest Development in Mazda Lamps," by C. L. Dows.

Annual Meeting of the National Fire Protection Association.

The eighteenth annual meeting of the National Fire Protection Association was held in the assembly room of the Insurance Exchange Building, Chicago, Ill., on May 5, 6 and 7. Following the roll call on the morning of Tuesday, May 5, President Robert D. Kohn, of New York City, delivered a short address in which he summarized the work that had been done during the past year. The report of the Executive Committee was next presented and a resolution passed to the effect that the Executive Committee should give manufacturers the opportunity to express their views on matters under consideration. This was followed by the reports of the secretary-treasurer and the editor of the quarterly. F. H. Wentworth, secretary-treasurer and editor of the quarterly, in presenting the latter report, recommended that the quarterly retain its technical nature and that bulletins be issued to disseminate the more popular material that is desired. Both reports were accepted and the editor's suggestion adopted. The report of the Committee on Amendments to the Articles of the Association was then presented by R. L. Humphrey, of Philadelphia, and the Association voted to make several changes in its constitution. These changes included the creation of the position of second vice-president, the creation of a nominating committee, and the broadening of the articles on membership so as to make federal, state and municipal departments, bureaus, etc., eligible for membership.

The remainder of the morning was devoted to the reports of the Canadian Committee, Public-Information Committee, and the Committee on State Fire Prevention Associations. In presenting the report of the Canadian Committee, Chairman J. B. Laidlaw called attention to the active, energetic and successful work that is being carried on in Canada. The reports of the other committees both emphasized the necessity for educating the public, fire marshals, and firemen in fire-protective methods. During the morning session an engraved invitation inviting the association to hold its next meeting in San Francisco during the Panama-Pacific Exposition was delivered.

The afternoon session opened with an address by Frank D. Chase, who spoke on the subject, "Adoption of N. F. P. A. Standards by State and Municipal Action." About 26 states now have fire-prevention bureaus and numerous cities have inspection bureaus, but there is a great need for reducing the number of standards and for interesting municipalities in fire protection. R. H. Campbell then gave a short talk on accident prevention. The remainder of the session was devoted to the reports of various committees, among which was that on Safes and Vaults, which was presented by H. W. Forester, chairman. This report, which was adopted, recommends that the current for vault lights be secured by a detachable cord which can connect an inside and outside receptacle when the door is open, and that wiring entering a vault near the floor be accepted. The report of the Committee on Laws and Ordinances was also presented. This included the wiring of motion-picture booths.

The morning session on Wednesday opened with R. L. Humphrey, of Philadelphia, in the chair. Following the reports of the Committees on Automobile Fire Apparatus and High-Pressure Fire-Service Systems, was an address by Fire Commissioner Robert Adamson, of New York City, on the subject, "Municipal Fire Prevention." Commissioner Adamson called attention to the general campaign which is being carried on in New York City for fire protection. At the present time frequent periodic inspections are made of all buildings, excepting residences, by uniformed men of the fire department.

William H. Merrill, manager of the Underwriters' Laboratories, then delivered an address entitled, "New Features in the Work of Underwriters' Laboratories." A laboratory has been in successful operation for more than a year in New York City, its work being confined almost exclusively to electrical testing. It is hoped, however, to broaden its work to include the same variety of testing as is done at the Chicago laboratories. An office has also been opened in London, England, for the inspection of English-made goods. However, a laboratory test of sample ware is, of itself,. insufficient, and about 60 per cent of the laboratories' work is now done through inspectors stationed at branch offices and representatives in the field.

The morning session concluded with the report of the Committee on Fire Pumps, and the afternoon was spent at the Underwriters' Laboratories, where numerous tests were being made on rubber insulation, switches, electric signs and numerous tests on non-electrical apparatus such as wired-glass, sprinklers, fire-extinguishers, etc. Both the chemical and electrical laboratories in the new and old buildings were operated to their full capacity.

Thursday morning's session, during which F, J. T. Stewart and D. E. Waid, both of New York City, presided, opened with the report of the Committee on Controlling Equipments for Electric Fire Pumps. This report provides for the protection of the controlling equipment by grill or lattice partitions or sheet metal cabinets. Flame-proof wiring is specified as well as pilot lamps to show the presence of voltage on the line. Several other committee reports followed, among which was that of the Committee on Signaling Systems, which was presented by W. S. Boyd, of Chicago. Only a few changes were made in the rules adopted at the meeting in May, 1913. These changes provide for the insulation of starting levers from the mechanism and cases of starting boxes, and for the grounding of boxes. Mr. Boyd then presented the report of the Electrical Committee. This report recommends permission to be granted for the use of enclosed fuses in multiple when the capacity of a circuit is greater than that of the highest-capacity fuse made. Several other fuse problems were referred to a sub-committee which will report in March. A standard set of rules governing appeals between inspectors and contractors was adopted. The remainder of the morning session was devoted to the reports of the Committees on Fire-Protection Coverings for Window and Door Openings, Blower Systems, Fire Preventive Construction, and Standards.

The afternoon session, during which W. H. Merrill presided, opened with a report of the Committee on Field Practice. This report will be published at a later date as a guide for property owners, inspection offices, etc. Part of this report is devoted to electric-lighting and electric-power hazards. The National Electrical Code is recognized as the highest authority governing electrical installations, and rules are given regarding the care of apparatus and circuits and points which should be noticed during inspections. The reports of the Committees on Automatic Sprinklers, Fire Hose, Explosives and Combustibles, and Standard Hose Couplings and Hydrant Fittings were then presented.

The reports of delegates to conventions of other bodies were then presented, and were followed by the report of the Nominating Committee, which was appointed by the president, and the election of officers. The following officers were elected: President, R. D. Kohn, New York City; first vice-president, C. E. Meek, New York City; second vice-president, L. Wiederhold, Jr., Philadelphia; secretary-treasurer, F. H. Wentworth, Boston; executive committee, F. J. T. Stewart, New York City, chairman, and the following members for three years: S. W. Stratton, J. White, R. P. Miller, C. H. Patton and C. L. Scofield, and F. M. Drake for two years, and C. M. Goddard for one year; nominating committee, W. E. Mallalieu, D. E. Ward, C. H. Phinney and the two ex-presidents, W. H. Merrill and H. L. Phillips.

RELATION OF ELECTROMAGNETIC THEORY TO ELECTRICAL ENGINEERING.

Lectures by Professor Pupin Before the American Institute of Electrical Engineers.

Prof. Michael I. Pupin delivered two lectures to the American Institute of Electrical Engineers in New York City on the evenings of April 29 and May 6, the subject being "The Relation of the Electromagnetic Theory to the Science of Electrical Engineering of the Present Day." These lectures were arranged by the Committee on Technical Lectures, of which W. I. Slichter is chairman.

The lecturer was introduced by President C. O. Mailloux, who spoke of Professor Pupin's epoch-making work on loading coils for telephone lines and linked his name with that of Lord Kelvin as one who had distinguished himself by the solution of differential equations.

A synopsis of the first lecture follows.

I am going to present a discussion of the electromagnetic theory for the purpose of making it clear which part of this theory is of importance to the engineer and which part is of little importance to him but of great importance to the physicist.

Coulomb's experiment with the torsion balance in 1785 was the starting point of modern research along electrical lines. He discovered the existence of a force between two charged bodies which was proportional to the product of the charges and inversely proportional to the square of the distance between them. This law is one of the foundation pillars of the electromagnetic theory. It indicates the existence of a field of force surrounding every electrical charge which can be described by the statement that the force in any given direction is equal to the gradient in that direction of a function which is called the potential. It can easily be shown that the work done in moving any charge against the force produced by such an electrical field is equal to the product of the charge and the difference of potential existing between the two points. To move the charge against this force requires an expenditure of mechanical work and the question arises, what becomes of the energy so expended? We speak of it as energy stored and possessed by the charge due to its position, or potential energy. On the other hand, what becomes of the energy expended by the electrical forces when an electrical charge is set in motion by these forces and moves to a point of lower electrical potential? According to Newton's third law of motion you must always have two forces, usually spoken of as an action and a reaction, involved in every expenditure of energy or mechanical work.

In Coulomb's time this question as to what becomes of the energy when a charge moves to a point of lower potential could not be answered. In 1820, however, Oersted discovered that electricity in motion produces a magnetic field and that in consequence of the existence of that magnetic field electricity in motion has energy very similar to the kinetic energy of a moving mass. That gave the clue to the reaction above mentioned, which led to an answer to the question which was given by Maxwell.

Newton's third law of motion, involving action and reaction can be illustrated in the case of a closed network of electrical conductors and has been formulated as Kirchhoff's law that the sum of the electromotive forces in any closed circuit is equal to the sum of the reactions represented by the product of the current in each branch by the resistance of that branch. Kirchhoff's law is thus only a particular case of a more general relation which holds true in all cases, even in case of a circuit where you have mercury-vapor lamps, for example, where Ohm's law is not followed. The above applies to the motion of electrical charges with constant velocity, as inside of a conductor.

I will now discuss the case of the reaction experienced in the motion of an electric charge in a dielectric.

Faraday found a great aid in the study of electric phenomena to be a geometrical picture of an electric field occupied by lines of force. Coulomb's law would be represented in such a field by conical tubes, the variation of whose cross-section enables one to visualize the variation of force with distance. It is found convenient to draw $4 \pi Q$ tubes of force emanating from a charge Q and this number of tubes will cut any surface surrounding the charge, the cross-section of each tube varying with its distance from the charge. If a portion of this charge is permitted to move off to infinity under the action of the electric force, work is done upon the portion of the charge which has moved away and the potential energy of the remaining charge has been lowered. The question as to what has become of this energy and where it is located was first answered by Maxwell. Maxwell pointed out that the medium through which the charge moves must react and the work which has been done is stored up in the medium. What is the form of that reaction? As a general proposition we do not know.

When a condenser is charged, energy is stored in it by the application of force. How the dielectric of the condenser reacts we do not know, but the work is not entirely reversible when the condenser is charged and discharged. The curves of charge and discharge are not identical and the loop between them represents work done, which appears as heat in the condenser. Similarly when a piece of iron is magnetized work is again done, which appears as heat in the iron. If the iron had constant permeability and no hysteresis, the work done in a complete cycle would be zero. Actually it is not zero, and a finite quantity of heat is produced. In a perfect dielectric no heat would be produced and the energy would be entirely returned when the condenser was discharged. In the mean time this energy must reside in the dielectric. Maxwell's great work was to locate in the dielectric the seat of this energy. It is also the seat of the magnetic energy which disappears in a similar manner when work is done by the separation of two magnets.

When these operations take place not in empty space or a vacuum, but in a material medium, the quantitative values are affected by numerical quantities which are designated as the specific inductive capacity and the magnetic permeability of the material.

According to Maxwell, then, not only ordinary ponderable substances like iron and dielectrics can act against an impressed magnetic or electrical force, but the vacuum itself can react. This was the great innovation introduced by Maxwell—the possibility of an action and a reaction between a force arising from a ponderable body and a surrounding space which is a vacuum.

In beginning the second lecture Professor Pupin summarized the main points of the previous lecture and then proceeded to develop the subject further. A synopsis of the second lecture follows.

The work of Ampere followed the discovery by Oersted that an electric current acts upon a magnetic needle and must therefore create a magnetic field. Ampere formulated a law according to which the magnetic flux of a current is distributed in space. That law can be expressed in various ways. Maxwell expressed it in a distinctive way for the purpose of bringing out its relations as formulated in his mathematical theory. If a closed line be drawn surrounding any current of electricity, the magnetomotive force in such a closed circuit is equal to 4π multiplied by the current. Other ways of expressing this relation are by the Biot-Savart law and by the equivalent magnetic shell.

The second great innovation which Maxwell introduced was the conception of regarding electric tubes of force as the equivalent of the electric charges Through any surface surrounding a charge Q there pass $4\pi Q$ tubes of force. Whenever the number of tubes of force passing through a surface varies, the rate of variation divided by 4π gives the current through that surface. There is consequently a magnetomotive force produced in space whenever a distribution of electric flux is varied. It does not matter whether the space is occupied by an electrical conductor or not; it does not matter whether there is an actual electrical current or merely an electric flux of force. With this idea in mind we can regard an electrical current as existing in a vacuum. This extension of the relations discovered by Oersted and Ampere to the notion of an electric current in a dielectric and in a vacuum in the sense of motion of tubes of force was Maxwell's second great contribution to the electromagnetic theory.

The final step in this theory is a logical sequence of this law and the law of Coulomb, although it took the genius of Faraday and Henry to discover it. If an electrical current, whether a conduction current, a displacement current or current of electric flux, produce a magnetic field and consequently stores magnetic energy in the surrounding space, what is responsible for this energy? What is responsible for the action and the reaction? An electrical current is produced by an electromotive force and consequently an electromotive force is responsible for the magnetic energy. What reacts against this electromotive force and how does it react? Faraday discovered the reaction. Whenever the magnetic energy is varied there must be a variation in the magnetic flux and the rate of change of this magnetic flux through any circuit gives a reaction in the form of an electromotive force.

Maxwell introduced the extension of this idea that it does not make any difference whether the circuit considered is an actual conductor or not. The variation of the magnetic flux within any closed line produces an electromotive force in that circuit whether it be a conductor or dielectric. If there is a closed conducting circuit there will be a current, but in any case there is an electromotive force.

That is all there is to the electromagnetic theory, which may be summarized as made up of the following things: (1) Coulomb's law; (2) action and reaction in electrical circuits, particular cases of which are represented by Ohm's law and Kirchhoff's law; (3) electric and magnetic reactions in dielectric depending upon the electric flux and the magnetic flux; (4) Oersted and Ampere's law as extended by Maxwell—the rate of variation of the electrical flux linked with any curve is equal to the magnetomotive force around that curve; (5) the rate of variation of the magnetic flux linking any curve is equal to the electromotive force around that curve.

The general law in every case is that the sum of actions in a circuit is equal always to the sum of the reactions.

Only that part of the theory is useful in electrical engineering which relates to electrical conducting circuits. The part of the theory, however, which deals with the space surrounding electrical conductors has played a tremendous part in the electromagnetic theory of light. Reflection, refraction, polarization and other simple phenomena of light can be explained on the basis of this simple electromagnetic theory. Dispersion and magneto-optical phenomena present difficulties, however, and the equations representing the simple theory do not suffice to explain them. They must be modified for the case of high frequencies of variation, such as we have in the case of light, because the reaction of the dielectric in that case is not the same as for a slowly varying force, since molecular and atomic structure then come into play. It is consequently necessary to study the theory of electrons and the reactions of a charge freely moving at high velocity. He then referred to the work of Lorentz, Larmor, Roentgen, Perrin and J. J. Thomson.

The theory of Maxwell is extended by considering the moving electrical charge as equivalent to a current, since it has the same magnetic effects. He explained how the change of mass of an electron can be measured by deflecting it in magnetic and electric fields. It was found that the reacting mass of the moving electron not only depends upon its velocity, but that its mass is entirely electrical; that is, electrons have no gravitational mass at all.

The Michelson-Morley experiment was designed for the purpose of discovering whether the velocity of propagation of light is different for two sources whose positions with respect to the observer varied, in that the propagation in one case was parallel to the direction of motion through space and in the other case was perpendicular. No difference was discovered, which fact was explained by Lorentz and by Fitzgerald by the hypothesis that the length of the apparatus varied according to the direction of motion. On the other hand, Einstein advanced the theory of relativity to account for this phenomenon.

The study of electrons and the theory of their motions and actions does not at first seem very close to the electrical engineer, but modern developments make it incumbent upon him to become familiar with this material, since it is important in its relation to such subjects as corona, mercury-vapor rectifiers, action of the audion in wireless telegraphy, etc.

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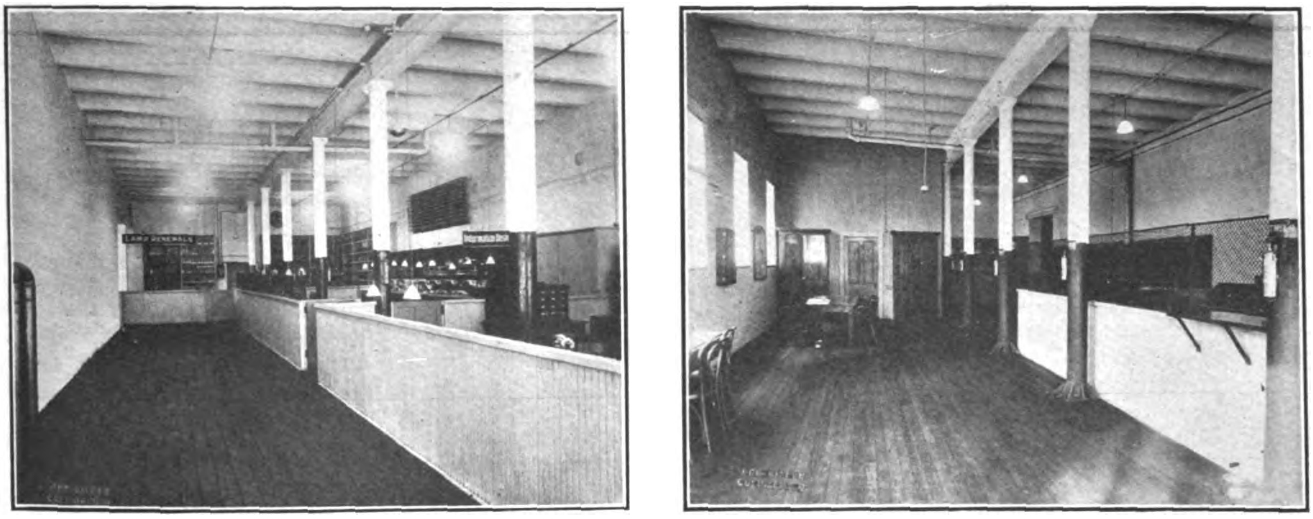
A New Wireless Record.

Officers of the Pacific Mail liner *Mongolia,* which reached San Francisco, Cal., recently from the Orient, announced that on the night of April 21 the ship's wireless operator picked up a message from Boston, 8,500 miles away. Several messages were exchanged. This is said to eclipse all previous distance records.

Conference of Ohio Metermen at Columbus.

A conference of the Meter Committee of the Ohio Electric Light Association was held in the rooms of the Meter and Distribution Department of the Columbus Railway, Power & Light Company, Columbus, O., on May 8. The meeting was attended by 41 men, representing 18 companies each possessing from 250 to 70,000 meters.

One of the encouraging features of the Ohio Electric Light Association work for 1914 is the large meetings that have been held by standing committees. It shows not only that the electric lighting men of the state are interested in advancing their work but they appreciate the fact that the Association is an agency which can be used for that purpose. This attitude was evidenced by the discussions that took place at this meeting and unquestionably much benefit was derived by those attending.



Two Views of New Meter Department of Columbus Railway Power & Light Company, where Conference Was Held.

The meeting was called to order shortly after one p. m., by Chairman A. H. Bryant, of the Cleveland Electric Illuminating Company, who spoke at some length relative to the general problems confronting the meterman. He stated that owing to the great diversity of work, some of the problems could not, at the present time at least, be solved. Some ideas which would be practical for one company could not be used by another on account of different existing conditions. Meter work has not yet reached the ideal stage as regards facilitation of work.

The early part of the meeting was taken up by all getting acquainted. Each representative was called upon to rise, give his name, the name of the company which he represented and the number of meters in his charge.

Following this, R. Wolford, representing the Ohio Light & Power Company, of Newark, presented an excellent paper outlining in detail the methods for testing meters at his plant. This was followed by an address by H. B. Bixler, of the Northern Ohio Traction & Light Company, of Akron, on "Meter Testing by Small Central Stations." It was pointed out by Mr. Bixler that an important factor in meter testing is the best meter standard with a convenient and quick way of checking its accuracy. A rotating standard with a range suitable for nearly all meters met with in practice can be obtained from the leading electric companies at very nominal cost. Its accuracy can be checked and maintained by taking the average accuracy of a lot of new meters, not including any one that might differ a few per cent from the others, or by maintaining what is known as a wall standard. Mr. Bixler stated in a very convincing manner that central-station companies lose considerable revenue by not making regular tests on their meters as in most cases tested if an error was found it was usually in favor of the customer. The policy of testing meters only on complaint should be discontinued.

After this paper there followed an open discussion on various questions pertinent to the work of metermen. The question of leaving meters on the line after an account was closed was taken up and discussed at some length, the general consensus of opinion being that meters should be left for a certain period. There were also brief discussions on the subjects of charging the consumer for setting a submeter, metering a welding installation, making calls on reading lockouts and policy of installing meters for charging plants.

Professor Caldwell, of the Electrical Engineering College of the Ohio State University, then gave a short talk in which he stated that his department was at all times at the disposal of the metermen and could render them aid in checking and calibrating at a very small expense and probably much quicker than the factories could do it. He stated that the engineering college was in close touch with the National Bureau of Standards in Washington, and during the summer months there were several men available who could be sent to the various stations if desired. In conclusion, he recommended that central-station companies get in closer touch with their customers and in this connection the relations of the meter department to consumers were decidedly important.

The meeting was then adjourned, after being pronounced one of the most successful of the meetings held this year. The two accompanying illustrations show the interior of the meter department of the Columbus Company, where the meeting was held. One of the illustrations shows the test racks.

Big Rejuvenation in Chicago.

The third rejuvenation of the Jovian Order held in Chicago during the administration of Statesman Homer E. Niesz was held at Hotel Sherman on Monday evening, May 11, and in many respects was the most successful function of its kind ever held in Chicago. The floor work was all of high order and elicited the hearty commendation of everyone present. Under the direction of George C. Richards, the Degree Team held several rehearsals and every member carried out his part in admirable manner. An innovation was the Pluto scene, representing a cave of fire from which Pluto appeared and disappeared as if by magic. The other electrical effects were also highly spectacular.

Although 96 applications were reported by Victor Tousley, chairman of the Membership Committee, preceding the ceremony, only 70 candidates were initiated, the missing ones being detained by the inclement weather and in many cases, for business reasons. Preceding the rejuvenation ceremonies, dinner was served and following the initiation a vaudeville bill of exceptional merit was provided.

At the regular noon-day meeting of the Chicago Jovian League, held May 26, C. D. Smith of the Willard Storage Battery Company, presented a very interesting paper entitled "Electric Light Plants in Mexico." Mr. Smith, who has spent considerable time in this district as a representative of electrical manufacturers, gave figures on the status of the electrical industry in Mexico, incidentally pointing out the deplorable conditions which exist in most localities in regard to the character of material used and the class of workmanship employed. There are great possibilities for hydroelectric development in Mexico, although at present the total capacity is but 130,000 kilowatts. The total mileage of transmission lines aggregates in the neighborhood of 900 and the greatest applications of electric power are in the mining districts. The rates for energy vary from one-half cent per kilowatt-hour in the mining districts to 40 cents per kilowatt-hour in some of the residential districts. Although there is a large amount of American apparatus in use there is practically an unlimited field for various apparatus and devices, particularly heating appliances.

Mr. Smith commented in a semi-humorous vein upon the wiring and construction work which existed in most localities. All interior wiring, he said, is done with twisted lamp cord and the cheapest of materials are used.

Following Mr. Smith, F. J. Blaschke, of the National Lamp Works, spoke briefly on the subject of "The Proper Lamp for the Circuit." His message to Jovians was to use every precaution to see that lamps and apparatus used on circuits were at least operated at the rated voltage of the circuit. He explained that exhaustive tests conducted by the engineering department of the National Lamp Works indicated that a great majority of the lamps and devices were operated at about four volts below rated voltage. This has been found to be largely due to faulty interior wiring and can only be remedied by the co-operation of all interested parties.

Louisville Jovians' Activities.

The Louisville (Ky.) Jovians, who organized several months ago, have dedicated the organization to serious purposes. Already there are 82 members, among whom is James Clark, Jr., of the electric manufacturing and supply company of the same name, who is Statesman. Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, is temporary chairman, and Fred V. Gantt, manager of the Louisville office of the General Electric Company, is temporary secretary. The plan heretofore followed consisted of holding fortnightly, noon-day meetings at local hotels, the last, Monday, May 11, having been held at the Henry Watterson Hotel. It is the plan, as soon as the club is thoroughly organized, to institute a membership campaign. It is estimated that there are nearly 400 eligibles in Louisville, and the founders of the local club announce that they are not going to stop until all are enrolled. One feature of the membership will be that it will not be limited strictly to electrical men. One of the first applications from men outside the business was that of Hugh D. Odom, manager of the Louisville Hotel and the Old Inn. In the future the Jovians plan to hold weekly noon-day meetings with luncheon to last an hour. These will be supplemented by other meetings, at which speakers will be heard and entertainment features provided. A committee has been named to look into the advisability of organizing a baseball team this summer. The Entertainment Committee has the various programs in charge and has been instructed to work largely along educational lines.

Philadelphia Jovian League.

At the weekly luncheon held by the Philadelphia Jovian League in the Bingham House, Philadelphia, Pa., on May 2, one of the speakers was William Draper Lewis, dean of the Law School of the University of Pennsylvania, who warned the members against politicians who seek office by promising to devote their time and efforts to dissolving monopolies. Dean Lewis showed that some monopolies were a help to the people and that not all were injurious.

BOOK REVIEWS.

"Les Surtensions Dans les Distributions d'Energie Electrique et les Moyens d'en Prevenir les Inconvénients." By I. van Dam. Amsterdam: Van Mantgem & De Does. Heavy paper, 273 pages (10x6½ inches), 109 illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $2.40.

Much has been written during the last few years on the subject of extra high voltages and abnormal pressure rises; but the practical engineer, looking for information in connection with a particular problem, cannot readily refer to the literature that might be helpful to him, because it is scattered through a vast number of separate publications. If Mr. van Dam's book had no other merit than that of providing an up-to-date résumé of the most important questions relating to the causes of abnormal pressures and the means of guarding against their ill effects, it would be of great value to the electrical engineer. But this book is far more than a mere compilation; it is written by an engineer thoroughly familiar with his subject, and therefore able to discriminate between essentials and non-essentials, thus presenting in a volume of moderate dimensions the material most likely to be of use to engineers. The author has always the practical end in mind, and although a few of the chapters must necessarily deal with theoretical consideration, the treatment of such chapters is clear and simple. With the patient study and thoroughness characteristic of the best Continental writers, the author has given in the form of foot notes, references to the most important sources of information wherein the reader may follow up any particular line of investigation. This method, by which a writer applies his judgment and experience in helping the reader to the deeper study of a particular subject, is far more helpful to the busy man with little time to waste on fruitless reading than the method sometimes adopted of providing under the heading "bibliography" a more or less complete list of the publications relating to the subject treated. Another commendable feature of this book is the inclusions—in small type—of brief descriptions and leading particulars of such power plants or systems as may be referred to in connection with the working of protective apparatus, or for other reasons. There are 13 chapters covering the whole subject, in the following order: Disruptive Potentials (in air); the Corona Phenomenon; High-tension Insulators; Inductance and Capacity of Overhead Lines and Underground Cables; Higher Harmonics in Alternator Electromotiveforce Waves; Resonance; Open-circuit Pressure Rises on Long Transmission Lines; Pressure Rises due to Switching Operations, etc.; Pressure Rises due to Atmospheric Electricity; Lightning Arresters; Methods of Grounding; Protection against Contact between High and Low-tension Lines; Factors of Safety for High-tension Work, as used in France, Germany, America, and England.

Space does not allow of a detailed discussion of the several features of this book; but in the reviewer's opinion it is exactly what it claims to be—a summary of our present knowledge and an introduction to more detailed or specific study; the author has the unusual faculty of saying what is necessary without saying too much. To the American reader, this book is particularly to be recommended; because, although American practice and experience receive their due share of attention, yet the Continental methods are given more prominence than they usually receive in the technical literature published in this country.

On page 148, the effects of an intermittent ground are considered and if further editions of his book are called for, the author will no doubt refer to the arcing-ground suppresser as proposed by Mr. E. E. F. Creighton[1] since, if automatic devices have to be used, this particular one appears to have many points in its favor. A. STILL.

"Electric Arc Phenomena." By Ewald Rasch. Translated from the German by K. Tornberg. New York: D. Van Nostrand Company. Cloth, xvi+194 pages (5½x8 inches), 52 illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $2.00.

Having as its chief purpose the discussion of the arc as a producer of light, this book does not deal to any considerable extent with the practical side of arc lighting. On the other hand, a fairly full account is given of the physical and theoretical aspects of the arc. The author's main thesis is that the light of the future is to be found in the arc between certain oxides—the "electrolytic arc," as he calls it.

Two of the chapters consist of a collection of extracts from the theory of electricity in gases and of spark discharges. The bearing of this discussion on the subject in hand is not always clear, so that these chapters leave a somewhat vague and unsatisfactory impression. At times a confusion is apparent as to the distinction between glow, spark, and arc discharges. On the other hand, the last three chapters contain much that is valuable on the voltage, current, and energy conditions in the arc, and on the efficiency of various types of arc. The diagrams are excellent. If the wild speculations of the closing pages, however, are ever realized, there will not be left much to electrical engineering but the study of the electric arc! In this adherence to what he considers the spirit of the electron theory, the author shows a curious tendency to disparage, in rather extravagant language, the work of Maxwell.

In the main, the work of translating is well done, although the English sometimes limps a little. Occasionally, it must be admitted, the translation quite fails to give the sense of the original. Pages 89, 97, and 177 contain conspicuous instances of this. Such incorrect forms as "discontinuance" for discontinuity, "disgregation," "limit value," and "anomal dispersion" may possibly be misprints. The equations on p. 41, dealing with what the translator calls "Neumann-Kopp's Law," contain several mistakes. The exponent —1 should be inserted after the word "Amps" in Fig. 30, and in Fig. 36, "supply" should be substituted for "external."

The book will doubtless prove of value to those who are interested in the physical problems connected with the electric arc. W. G. CADY.

"Electrician's Wiring Manual." By Frank F. Sengstock. Chicago: Popular Electricity Publishing Company. Flexible leatherette, 406 pages (4½x6½ inches), 414 illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $1.50.

This book is a handbook of practical information on electric light, power and wireless installations installed in accordance with the requirements of the National Electrical Code, and should prove of value to not only the apprenticed wireman, but to experienced contractors as well. In addition to describing the various tools, fittings and methods of wiring for different purposes, this book also gives detailed explanation of the requirements of the National Electrical Code. One section gives considerable information on estimating and specifications, which will be found valuable by contractors. Many tables and formulas are included and simple explanations of the various systems of distribution in common use are given. One chapter is devoted to a simple explanation of alternating-current generators and distribution systems, several elementary formulas being given, while another chapter is devoted to a practical discussion of the care and operation of storage batteries. 45 pages are devoted to practical wiring kinks, which should be of great value to wiremen, as they contain many useful suggestions.

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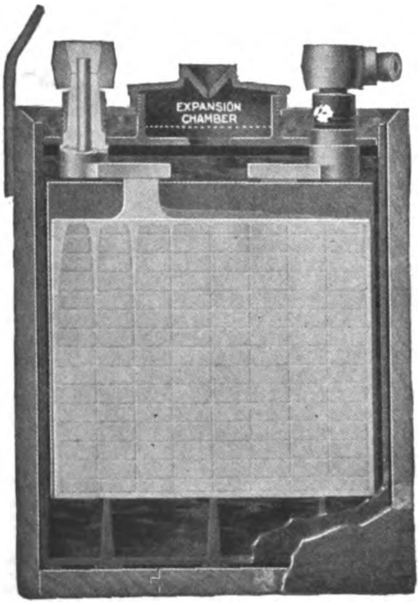
[1] Protection of Electric Transmission Lines; *Proceedings American Institute Electrical Engineers.* Vol. XXX, p. 377.

New Electrical and Mechanical Appliances

A New Series of Gould Starting, Lighting and Ignition Batteries.

An improved line of storage batteries for starting, lighting and ignition of gasoline automobiles is now being marketed by the Gould Storage Battery Company, 30 East Forty-second Street, New York City.

The grids of these batteries are of the well known Gould type assuring high conductivity and low internal resistance throughout the life of the plate. The active material in the positive plate is harder than ordinarily used, and in service wears evenly, the result being uniform capacity throughout exceptionally long plate life. The maintenance of this uniform or normal capacity throughout the battery life is very desirable, as it permits safe use of a battery having capacity much nearer to actual requirements and one consequently smaller and lighter than where the plates get weaker with age.



Section Through Gould Storage Cell.

A large settling chamber at the bottom of each jar permits long service without cleaning. Short-circuits between the plates are prevented by wide separation and rugged separators. Perhaps the most appreciated feature of these batteries is the neat cover arrangement, which is said to prevent leakage of electrolyte absolutely, permitting easy thorough internal inspection, and admitting of removal of plates, if necessary.

Each cell is closed by two hard-rubber covers and an intermediate layer of sealing compound in adhesive contact with the jar. Where the pillar posts come through the cover, sleeves of corrugated rubber and surrounded with the sealing compound make air and leak-tight joints of sufficient flexibility to allow for strains on the posts.

A very large expansion chamber with a threaded cap is provided for inspection and equalization of acid. Leakage up around the outside of this chamber is impossible as the chamber is made integral with the lower hard-rubber cover. Slopping over from the inside is prevented by making the cap an inverted cone. The spray condenses, drains to the point of the cone and drops back into the acid space.

Gould Six-Volt Starting Battery.

Removal of the vent cap, by twisting between fingers and thumb, exposes the entire chamber and admits enough light to make real inspection possible. With this construction and the acid level carried up in the chamber, gassing may be easily detected. A straight channel to the electrolyte allows the insertion of a hydrometer syringe to a sufficient depth for satisfactory test. The vent cap also provides a natural funnel for filling in water or acid without slopping or overflow.

These batteries may be had with an original end-to-end arrangement of the cells. This type promises to become popular, especially because of the short connectors and the small thickness (only 4.5 inches in the largest size). The latter permits the battery to be suspended from the frame and concealed back of the apron, instead of being put in front on the running board.

In addition to these features the general construction has been given great care. The pillar posts are copper-reinforced and copper connectors imbedded in lead are used between the cells to avoid connection resistance. The box, dimensioned to the standard recently adopted by the Society of Automobile Engineers, is made of thoroughly seasoned material, has interlocked corners and is coated inside and out with acidproof paint.

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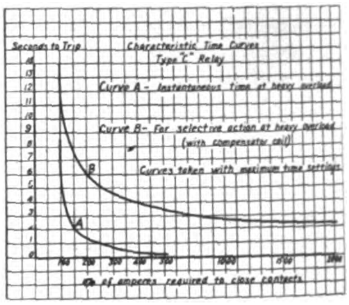
Torque Compensators.

The Westinghouse Electric & Manufacturing Company has introduced a new device, known as a torque compensator, intended primarily for modifying the time-element characteristics of an alternating-current overload relay. It reduces the torque of the relay at heavy overloads without reducing the torque at light loads. It thus increases the time element of the relay at overloads, its effect being in proportion to the overload.



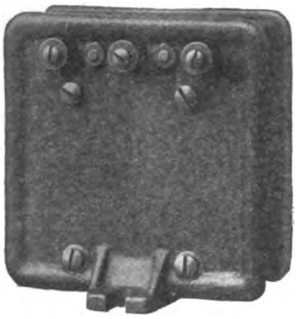
Time Curves of Relay.

An example of the effect of the torque compensator on the time-element characteristic of a relay is shown in the accompanying curves. Curve *A* shows the natural characteristic of the Westinghouse type C relay, which was described on page 948 of our last week's issue (May 9). When used with the torque compensator, a definite minimum time element at heavy loads is obtained, as shown in curve *B*.

The overload relay with definite minimum time element obtained by a torque compensator provides selective action of circuit-breakers where feeders are placed in series. The relays controlling breakers nearest the source of power can be set for slightly greater time element than those further along. The difference in time is retained at all overloads with sufficient accuracy to cause the breakers nearest the trouble to open, thus confining the inoperative section to the smallest area, without interruption of service on part of the system between the trouble section and the source of power.

Another use of the relay with definite minimum time element is in relieving circuit-breakers. It is well known that the ultimate breaking capacity of a circuit-breaker depends on the time of breaking. If a ground or short-circuit can persist for two seconds before the circuit is opened, the ultimate breaking capacity is greatly increased; that is, the strain on the breaker is reduced very materially, owing to the drop in voltage and current occuring during the interval.

The torque compensator consists essentially of a small autotransformer connected between the relay and the current transformer on the line. It is so designed that at a certain value of current the core of the compensator becomes saturated and any further rise in current results in an increasing impedance drop so that the current in the relay circuit does not increase in proportion to the current in the line.



Torque Compensator.

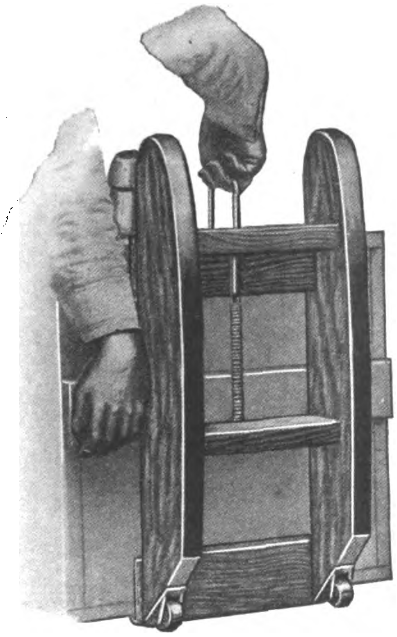
The ordinary time adjustment provided on standard relays will give the desired definite minimum time element within the range characteristic to each relay. In the Westinghouse relay this range is from zero to 2 seconds.

The winding and core are inclosed in a neat iron box with sides perforated for ventilation. The compensator can be mounted on any convenient place, such as the rear of a switchboard behind the relay it controls.

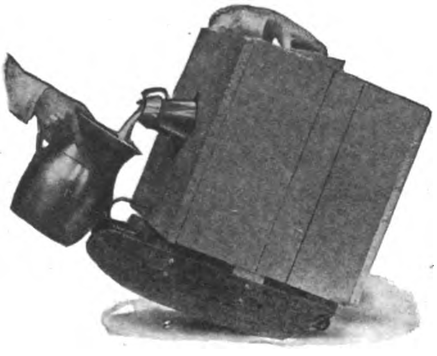
Combined Carboy Truck and Rocker.

The improved carboy rocker manufactured by the Munning-Loeb Company, of Matawan, N. J., combines the advantages of the hand truck and carboy rocker. This device is of great utility in the handling and pouring of acids and other chemicals or liquids from carboys.

The rocker is built of wood, and equipped with castor wheels. With this rocker one man can easily load and move a full carboy to any desired place and entirely empty it from the first to the last jugful without spattering a drop on his hands, face, clothes or floor. The castor wheels make it easy to move the heavy carboys around the plant without lifting them on or off hand trucks, with attendant danger of breaking. The rocker can be attached to a carboy or changed from one carboy to another in less than half a minute. The illustrations herewith make clear the construction of the device, its attachment to the carboy and its use. A vent tube used in connection with the rocker makes the flow of liquid from the carboy uniform and free from bubbles and spattering. The rocker weighs 11 pounds.



Applying Truck and Rocker to Carboy.



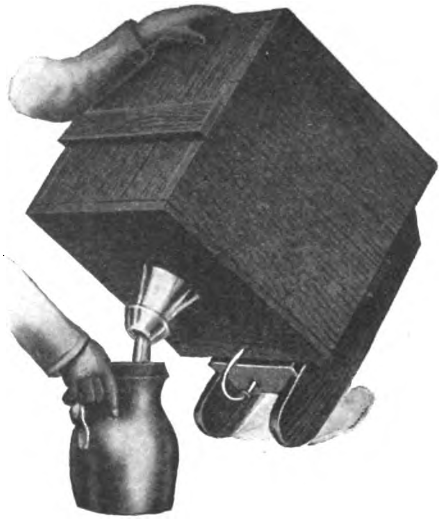
Tilting Carboy to Start Flow.

Electric Monorail Line for Cuba.

The Cameron Engineering Company, of Washington, N. J., has been awarded a contract for a monorail system to be erected in Cuba by a Cuban firm. The line will be electrically operated from trolleys.

Clipper Belt Lacer Company Has Good Profit-Sharing Scheme.

The Clipper Belt Lacer Company, of Grand Rapids, Mich., which inaugurated a profit-sharing scheme in 1913, has found that the plan has worked out to the advantage of both the company and the employees. It was decided to inaugurate the piece-work plan wherever practical, and to assure the employees that the piece rate would not be lowered as their earning capacity increased. The working day was reduced to nine hours with a Saturday half holiday, no reduction being made in wages, and a bonus varying from five to 10 per cent of the year's wages was promised each employee depending upon the number of years in the company's service, the lower rate being granted to employees in the company's employ for one year. At the end of the year it was found that the yearly output had nearly doubled with only a slight increase in the working force. The average gain to operatives was about 19 per cent and the average direct gain to the company nearly nine per cent. As a result the company has obtained the hearty co-operation and good will of the operatives.



Emptying Carboy Easily.

Pittsburgh Transformer Company Makes Recovery After Fire.

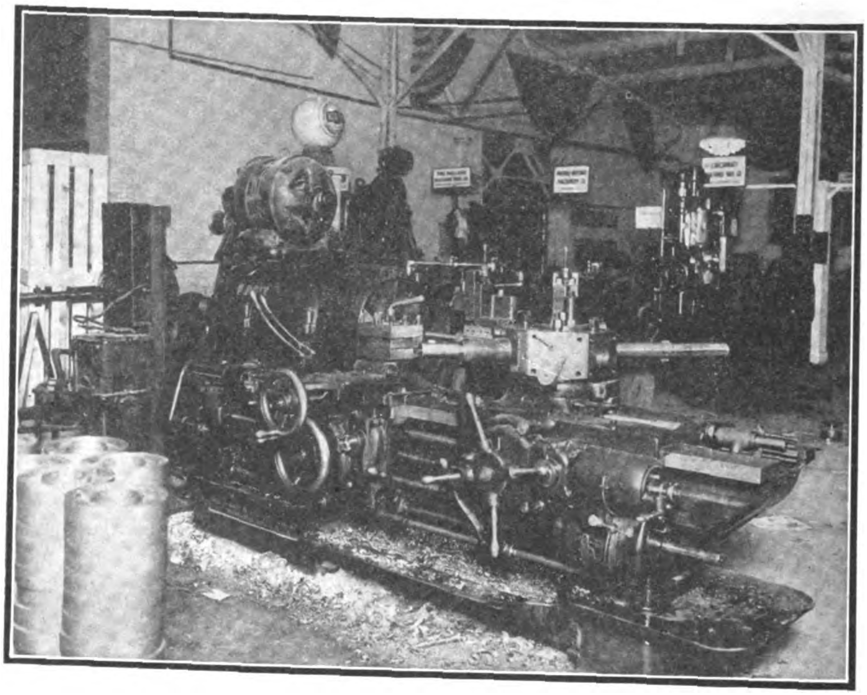
Fire broke out on May 2 at the plant of the Pittsburgh Transformer Company, Pittsburgh, Pa., doing some damage to the shipping department, store rooms, carpenter shop and tank factory. The loss is estimated at about $50,000. But few of the company's records and none of the drawings or designs were destroyed and there will, therefore, be no delay or inconvenience to any of the company's customers. A new shipping room was established on May 4, and shipments have been made every day since.

Motor-Driven High-Speed Lathe.

The motor-driven lathe shown in the illustration herewith was exhibited at the recent Foundry and Machine Exposition at Chicago, and was shown working on drop-forged gear blanks, 8.5 inches in diameter. The following results were obtained many times:

Rough and finish boring.....5.5 minutes
Rough and finish turning and facing on rim and hub.....2 minutes

The total time was 7.5 minutes for a job that is generally admitted to be a good hour's work for an engine lathe.



High-Speed Libby Turret Lathe.

This lathe is an 18-inch Libbey turret lathe manufactured by the International Machine Tool Company, Indianapolis, Ind. Its manufacturer claims that its rapid production is due to the great power developed, the strength and stiffness of all parts, and the convenience of operation. The entire operative control of the machine is concentrated for the operator and is so designed that the actual manual labor required of him is reduced to a minimum and he is offered every inducement to push the machine to its capacity.

It is driven by a Westinghouse alternating-current constant-speed motor. The speed changes are effected through a sliding pinion and two double frictions so arranged that the operator can stop his machine in the midst of a heavy cut and pick it up instantly under feed. Eight steps are provided, giving speeds ranging from 8 to 300 revolutions per minute.

◆

New Clutch for Starting Motors.

A unique type of dog clutch has been developed by the Ward Leonard Electric Company, Bronxville, N. Y., for use in the gear box between the electric starting motor and the crank shaft or flywheel of gasoline automobile engines.

This clutch consists of two parts, one of which is pinned to the shaft which drives the crank shaft through silent chain, or which is pinned to the shaft on which there is a silding pinion which meshes with the flywheel.

The second part consists of a gear ring driven by the electric motor. This latter is mounted on its own bearings. This bearing is mounted concentric with the shaft on which the first member is pinned, and is big enough in diameter so this shaft revolves inside without any friction.

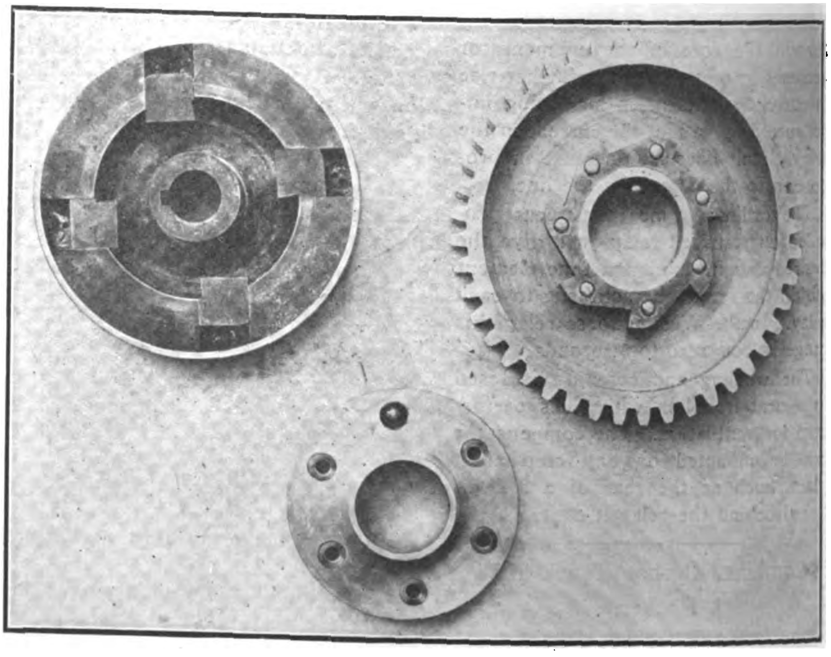
In the first member there are four blocks or dogs, spring-pressed inward, so that when the first member is mounted on the shaft, and the second member is on its bearings, these dogs are spring-pressed to engage with a series of notches cut on a cam in the second member. It will be noted that there are four dogs and seven notches. As a result only one dog will engage at a time, but one-twenty-eighth of a revolution will insure one engaging.

When these dogs are spring-pressed and engaged with the cam, the electric motor drives through the gear ring to the second member, thence through the cam and dogs to the first member, thence through the shaft to its sprocket, and then through the chain to the crank shaft

When the crank shaft starts up the first member will tend to revolve faster than the second member. The inclined surfaces of the cam of the second member push the dogs out into the pockets provided for them and centrifugal force will keep them in that position at speeds of over 100 revolutions per minute of the gasoline engine.

It will be noted that when the engine is running and the electric motor has stopped, the second member is stationary on its bearing, while the first member has its dogs in the extreme external position and is being revolved on its shaft. As a result there is no wear when the clutch is not holding or when it is holding.

The manufacturers of this clutch claim for it a number of advantages, among which are the following: There can be no wear in running. A lack of oil can have no effect other than the possible freezing of the gear member to its bearing, and while this will keep the electric motor from starting the engine, it will not in any way affect the dynamo. Before this outfit can be made inoperative all four of the dogs must be jammed or lost, as only one of these engages at a time and each has ample strength to do all



Clutch for Connecting Electric Starting Motor to Engine.

the work. As a result of the number of dogs and the number of cam jaws, the motor cannot drive the gear member more than one-twenty-eighth of a revolution before it engages. A lack of lubrication cannot put the outfit out of business. It is noiseless when running, because there are no rubbing parts. Centrifugal force is not relied on to pull out the dogs; these are mechanically pushed out by the cam of the gear member and centrifugal force holds them out. If for any reason they are not held out by centrifugal force, no harm will be done as they will then be acting as a ratchet and a slight clicking sound will be the only result.

◆

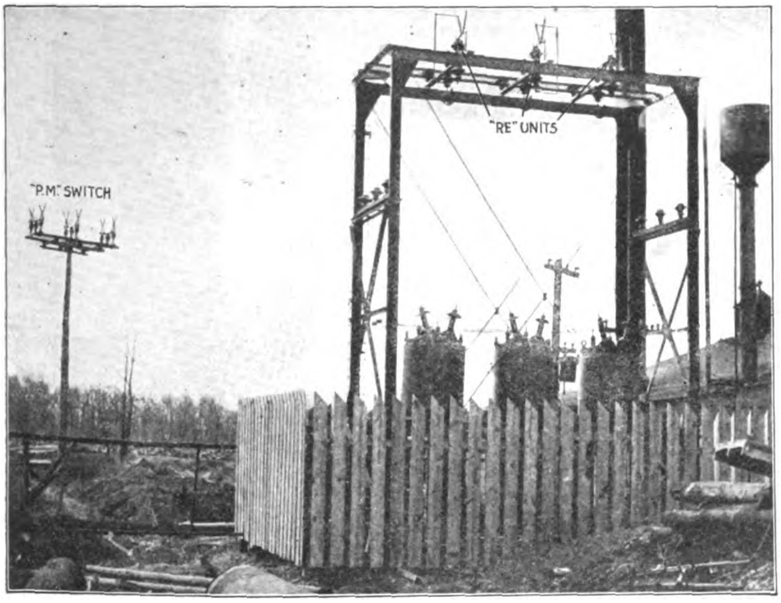
Outdoor Substations for Coal Mines.

The supplying of central-station power to coal mines is now making rapid progress especially in those districts traversed by high-tension feeders. The advantages of electric operation are well known, since mines have to be located where there is coal and the shafts put down at points required by mining conditions. This means that steam-driven plants are often at a disadvantage, owing to the poor water supply and the necessity of installing water-softening equipment, and the entire situation is materially bettered by electric operation. Central stations can, as a rule, supply power at more advantageous terms than it can be generated by the user and coal operators are rapidly realizing this fact.

The steel-tower high-tension outdoor substation is particularly well suited to this class of service, especially when safety and low operating costs are essential. The use of indoor or underground substations materially increases the fire hazard and also the factor of safety, as the insulation is rapidly weakened by moisture and corrosion. After a period of operation it may also be found necessary to relocate the substation and in such cases the steel-tower equipment has the advantage of high salvage values, the only loss being in the foundation and cost of erection.

A type of station designed by W. F. Corl, electrical engineer for the Allen & Garcia Company, Chicago, is illustrated herewith and has the advantage of low cost combined with reliability. The transformers and protective equipment are mounted on a substantial steel structure provided with ladders for ready access to the various units. The three-phase air-break switch is mounted on a separate pole.

The installation has an initial capacity of 300 kilowatts and can be increased to 1,000 kilowatts as the load develops. The transformers are of the Allis-Chalmers type, stepping down from 33,000 to 2,200 volts, and the switching and protective equipment was supplied by the Delta-Star Electric Company, Chicago, Ill.



Steel-Tower Substation for a Coal Mine.

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Illumination of Scribner's Book Store.

The remarkable illumination produced in Scribner's new store on Fifth Avenue, New York, N. Y., is an excellent example of what can be done through the proper application of laws governing scientific illumination. The arched ceiling, which forms the principal architectural feature of this store, is of a soft cream white color, and is embellished with a series of simple but rich panel designs. The surface of these arches forms one of the most perfect light-reflecting mediums possible to obtain in architectural construction.

At the base of each arch is installed a powerful reflector that throws a strong white light upward. This light spreads over walls and ceiling and is reflected downward, diffusing a mellow glow of almost pure white light over the innumerable tables, shelves and cabinets filled with many colored volumes. The light produced by this system is substantially a reproduction of daylight, with the result that the finest details are plainly visible, while the most delicate colors can be seen in practically their true values. This is particularly noticeable when inspecting some of the rare old volumes found in the store.

The illuminating scheme of this beautiful store is finished with a series of elaborate semi-indirect lamps that hang from the ceiling on chain drops at a distance of about 15 or 20 feet apart.

The lamps used at the base of the arches for the indirect or cove lighting are J-M Linolite lamps. They are about a foot long and an inch in diameter, and have a straight tungsten filament that runs from end to end. This filament produces a continuous "line of light" that diffuses the illumination evenly over the entire surface to be lighted, in marked contrast to the spotty effect produced by the bulb type of lamp. These lamps are highly efficient.

The manufacturer of these lamps, the H. W. Johns-Manville Company, New York City, claims that more than 90 per cent of all the art galleries in this country, together with 25,000 churches and over 30,000 stores, are equipped with Linolite lamps in conjunction with Frink reflectors, for which this company is sole selling agent.

Illumination of Scribner's Book Store.

◆

Electric Representation of Human Functions.

The use of electricity to perfect the representation of human functions is employed at Madame Tussaud's Wax works, the famous exhibition of celebrities in London, England. The wax figure of a sleeping woman is given a realistic effect by the lifelike raising and lowering of the chest, as if in deep slumber, which is accomplished by the use of a small electric motor working through reduction gears and operating an eccentric which slowly produces the required motion. Another figure, this one seated, is made to turn from side to side slowly by a mechanism operated by the same motor, which is installed under the couch of the sleeping figure.

The current for the lighting and use of the motors in the exhibition is generated by a private plant on the premises.

◆

Arc-Welding Equipment.

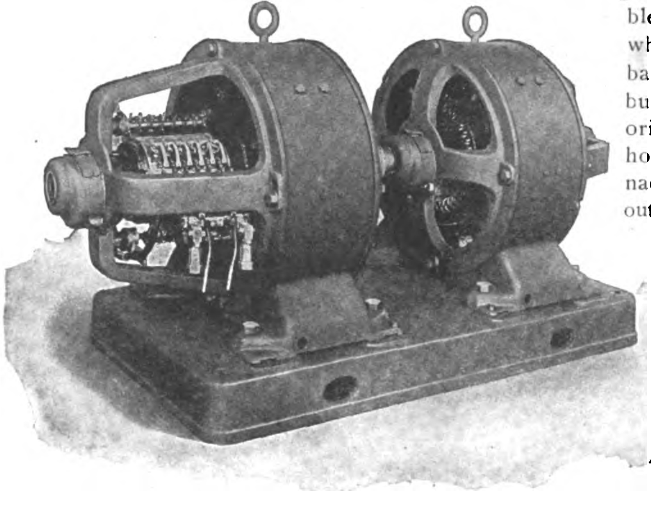
The subject of arc welding is receiving a great deal of consideration at the present time by railways and industrial concerns because of the many advantages it possesses for certain kinds of work.

Arc welding is particularly adapted for use in machine shops and foundries. Worn parts of machines can be built up prior to machining. Broken parts of steel castings can be welded together. Often defects develop in new castings, after considerable machining has been done. The machining and castings, in many cases, can be saved by repairing with the electric arc. Castings with blowholes and sandholes can often be very quickly repaired. Risers and sinkheads can be cut off.

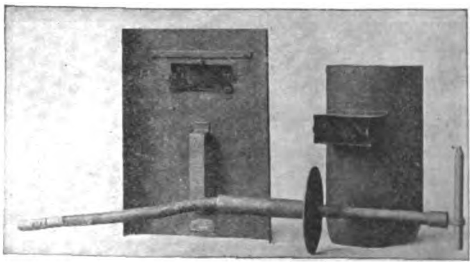
In steam-locomotive shops metal pencil welding is used extensively in fire box and boiler repairs, flue welding, repairing steel locomotive frames, building up mud rings and general work of this character. A large amount of equipment that would have to be scrapped can thus be repaired with the electric arc, and a large saving in money, time and labor effected.

In electric-railway shops arc welding can be used to special advantage in repairing broken armature shafts, axle brackets and motor frames. In track equipment, the repair of broken frogs, cross-overs and other work of this nature can be done with excellent results.

In steel mills, there are many places where the electric arc can be used to great advantage, often resulting in a considerable saving. The ends of wobblers and pinions, which have become badly worn, can be built up to their original size. Tap holes in blast furnaces can be burnt out quickly.



Motor-Generator Set for Arc Welding.



Welding Shield, Hood and Carbon Holder.

Realizing from past experience the practical value of the electric arc for general welding purposes, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a standard line of electric arc-welding equipments.

Making an Arc Weld on a Steel Ring.

The equipments comprise standard apparatus. They are simple in construction and easy to operate. Complicated relay schemes for automatically inserting resistances are eliminated. Ample protection is secured by circuit-breakers and special arrangement of the resistance. The outfits are furnished complete in the four following sizes: 200, 300, 500 and 800 amperes. Each equipment includes a welding generator, or a welding motor-generator set, switchboard, control and all necessary accessories.

The welding generator consists of a special 75-volt, commutating-pole, direct-current machine, either belt or motor-driven. The instrument and control panels are composed of two sections. The upper section contains the indicating instruments, protective apparatus and switches arranged for regulating the welding current, and the lower section contains the starting and protective equipment for the motor-generator set. It is often desired to have several welding circuits connected to one generator. For this arrangement a control panel is provided for each circuit. Each panel can be located at the most desirable place. Metal or carbon-pencil welding can be done from any of these panels, independent of all others, and one or more arcs can be operated simultaneously.

The accessories furnished consist of a carbon holder and a hood for protecting the operator, together with a shield and a metal-pencil holder for each welding circuit.

The equipment described above is the result of eight years' experience in its own shops by the Westinghouse Company, and has been employed on all classes of commercial work, thus ensuring a thoroughly practical shop outfit.

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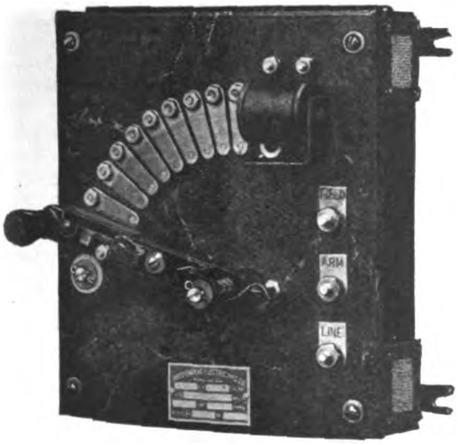
An Electric Furnace Heated Simultaneously by Arc and Current.

In a recent issue of *Zeitschrift fur Angewandte Chemie* is an account of an electric furnace heated simultaneously by arc and resistance. The current enters the furnace by a positive electrode suspended in a central position above the crucible containing the material to be melted; the arc is formed between the electrode and the crucible, the current escaping by a number of negative electrodes disposed in the side walls of the furnace. These electrodes form two series, one above the other; the upper series is at the level of the material in the crucible, and the lower is formed of elements united by means of a piece of iron fitting into grooves in the bottom. The latter start the fusion of the metal or other material, while the former serve to refine it. The positive electrode can be moved up and down in such a way as to co-operate with either the upper or the lower series of negative electrodes.

New Resistance Casing for Starting Rheostats.

The Independent Electric Manufacturing Company, of Milwaukee, Wis., has developed and is placing on the market a new type of resistance casing for starting rheostats and controllers.

The casing or the resistance box itself, in which the resistance units are mounted, is of cast iron, and in the sides of the box, at the top and the bottom, there are four large ventilating openings. These openings are covered with heavy noncorroding screens of fine mesh which allow free passage of air into the box, and positively prevent any sparks or flames emanating from the box in case of a burnout of the units, the principle being the same as on the safety lamps, which have been employed successfully for years in the mining industry.



New Casing for Rheostats.

There are no external openings whatever in the bottom plate of the box so that should a burnout occur, the molten parts dropping to the bottom of the box are absolutely prevented from falling to the floor. This box has been examined and approved by the Underwriter's Laboratories.

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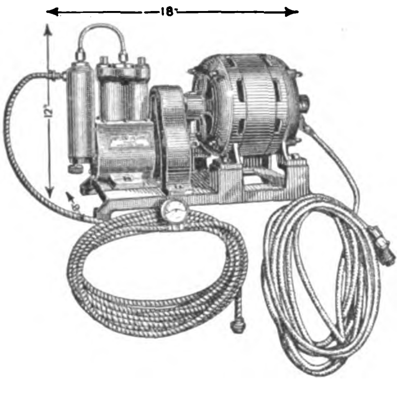
New Motor-Driven Tire Pump.

A new type of motor-driven automobile-tire pump for private garages has been perfected by the Hartford Machine Screw Company, Hartford, Conn. It is called the Master garage pump and is of simple design and construction. Its use dispenses with the tiresome hand pump and makes possible keeping the tires pumped full to the right pressure to insure the proper resiliency and service; this serves to keep down tire expenses. The pump has no rubber or leather packing rings and delivers pure air, free from oil. No large storage tank is required. All that it is necessary to do is to attach the end of the hose to the tire valve, turn on the switch, and then turn it off when the gauge shows that the tire is properly inflated. The pump will completely inflate a 37 by 5-inch tire to 90 pounds pressure in less than three minutes.



Master Garage Tire Pump.

The equipment consists of a two-cylinder pump driven by a small General Electric motor, all being compactly mounted on a frame; 20 feet of reinforced-rubber air hose with pressure gauge attached and 20 feet of lamp cord with plug are furnished.

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Disk-Stove Chafing-Dish Set.

A novel arrangement of a combination disk stove and chafing dish has recently made its appearance. The set is similar to the ordinary alcohol-type chafing dish except that it has an electric disk stove, in direct contact with the water pan, instead of an alcohol heater. The complete set consists of a stand, a disk stove, cord, three-heat switch, and attachment plug, a water pan, a food pan, and a cover, as illustrated in Fig. 1. The water pan, the food pan and the cover are the same as used in alcohol chafing dishes.

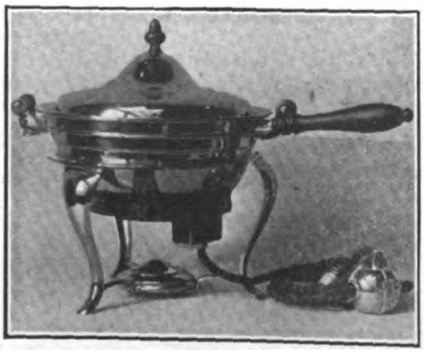


Fig. 2.—Chafing-Dish Set Complete.

All metal parts, except the top of the disk stove, are handsomely finished in polished nickel or polished copper. The handles are ebonized wood.

The heater of the disk stove consists of a steel disk inside of which the heating element is sealed and protected from oxidation. A dead-air space between the heater and the bottom of the stove casing acts as a heat insulator, preventing the loss of heat downwards, so that practically all of the heat is thrown upwards where it is wanted, making the stove very efficient.

An indicating switch controls the temperature. The high heat is ordinarily used to bring the chafing dish to the desired temperature. The low heat will keep water boiling after the boiling point is once reached and is useful for keeping food warm. The medium heat is the highest that is usually wanted for general cooking purposes.

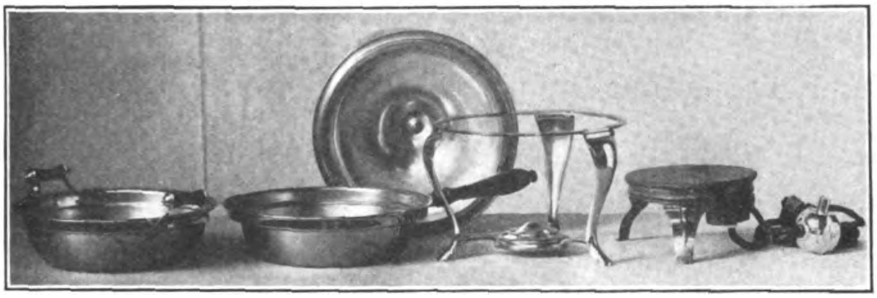


Fig. 1.—Separate Parts of the Disk-Stove Chafing-Dish Set.

With the feet of the disk stove reversed so that the stove can be suspended from the stand and with the parts assembled as in Fig. 2, the outfit is a chafing dish, capable of cooking anything in it that can be cooked in an alcohol chafing dish.

The food pan can be placed directly on the disk stove, omitting the water pan, and as such can be used for any cooking that requires high heat, such as frying, stewing, etc.

With the feet inserted in the stove as shown in Fig. 1, the disk stove can be used separately for any purpose that a single-burner gas stove can be used, such as frying, grilling, making coffee, and similar operations.

This disk-stove chafing-dish set is manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Current Electrical News

NORTH ATLANTIC STATES.

SPENCERPORT, N. Y. — F. Tracy, general manager of the Middleport Light & Power Company, and E. W. Barrett, electrician, of Spencerport, have been through all the streets arranging plans and specifications for electric lighting, to be submitted to the Public Service Commission and for letting bids.

HACKENSACK, N. J.—The Board of Public Utility Commissioners has granted the Hackensack Water Company permission to issue stock for $1,000,000 and bonds for $250,000 for improvements and extensions to its plants and system. The work will include an addition to the local pumping plant and doubling the capacity of the filter plant; additional boilers, extensions to the pumping plant, and also filtration plant at New Milford. A.

PENNINGTON, N. J.—The Public Service Electric Company will install a street-lighting system along Pennington Road. A.

NEW BRUNSWICK, N. J.—The Jersey Central Traction Company is planning to appropriate a portion of its recent $5,000,000-mortgage bond issue for extensions to its system in Middlesex and Monmouth Counties, including improvements and enlargements to the properties of the Middlesex & Monmouth Electric Light, Heat & Power Company, a subsidiary organization. A.

SOUTH ATLANTIC STATES.

CUMBERLAND, MD.—The Youghiogheny Power Company and its subsidiary corporation, the charters for which were recently secured, are preparing to construct an immense plant at the headwaters of the Youghiogheny River in Garrett County. The capacity will be 40,000 horsepower. Eastern and foreign capital is said to be interested.

ATLANTA, GA.—The Atlanta Telephone & Telegraph Company will expend $100,000 in improvements and extensions. A. B. Conkin is vice-president.

CARROLLTON, GA.—McCormick and Fahy, Cherokee Life Building, Rome, have been commissioned by the City Council to prepare plans and specifications for a municipal electric light plant.

MANSFIELD, GA.—$5,000 in bonds has been voted for electric lights. Address the mayor for particulars.

ST. MARYS, GA.—The St. Marys Ice & Light Company will establish a lighting plant here, with a capacity of 500 lamps.

NEW SMYRNA, FLA.—A movement is on foot for the building of a trolley line between the St. John's River, either at Enterprise or Blue Spring Landing, and New Smyrna, by the way of Lake Helen. Address W. P. Wilkinson for additional information.

ORANGE CITY, FLA. — The Orange City Telephone Company will construct a telephone system eight to ten miles in length. J. B. Seidel is president and general manager of the company.

NORTH CENTRAL STATES.

DAYTON, O.—In connection with the extension of its lines to Wilmington, O., which is now under way, the Dayton Power & Light Company is considering stringing a branch to Jamestown, O., as well, in connection with a proposition to acquire the power plant at that place. L.

FLOODWOOD, O.—A long-agitated project, that of building a big central electric power station in the Hocking Valley coal fields, is about to be carried out, and Floodwood is to be the site of the improvement. The proposed plant will have a capacity of 40,000 horsepower, which will be furnished mining operations and municipalities within a radius of 75 miles. It is announced that ground will be broken during May. Construction work will be in charge of F. C. Elliott, of Chicago, as representative of the syndicate which is financing the enterprise. Herman Gamper, former superintendent of the Columbus Municipal Light plant, and later of Erie, Pa., will be the engineer in charge. It is expected that several of the units of the generating system will have been completed by next November. Machinery, equipment and methods are to be of the most modern and approved type. J.

YOUNGSTOWN, O.—Investigations are being made by the municipal authorities to ascertain the probable cost and other particulars about the construction of an electric power plant. The Council has passed an ordinance authorizing a bond issue of $3,000 to defray the cost of this investigation. L.

RAVENNA, O.—A bond issue of $3,150 for the purpose of constructing an electric-light plant has been sold and contracts will be let shortly. L.

SANDUSKY, O.—This city is planning to construct an ornamental lighting system in the principal business streets.

SIDNEY, O.—The construction of ten dams in the 140-mile length of the Great Miami River, and the installation of equipment for the generation of an estimated 220,000 horsepower of current, was suggested in an elaborate plan recently laid before the Commercial Club by O. C. Barber, a well-known manufacturer of Akron, O.

CRAWFORDSVILLE, IND.—The Crawfordsville Electric Light & Power Company is in the market for a two-circuit, 100-lamp mercury rectifier and 10 magnetic arc lamps. F. H. Miller is superintendent. G.

EDINBURG, IND.—The Board of Electric Commissioners will purchase two 250-horsepower steel-incased return-tubular boilers. George R. Mutz is superintendent. G.

JEFFERSONVILLE. IND. — A move for a municipal lighting plant was made at a recent meeting of the City Council in Jeffersonville. Address City Attorney Jonas H. Howard for further information.

KIRKLIN, IND.—The Kirklin Telephone Company has been incorporated with a capital stock of $15,000 by William M. Turner, E. P. Turner and others.

RANKIN, ILL.—Business men here are forming a mutual company for the erection of an electric light plant. Scott Johnson is heading the movement. It is expected that the organization will be completed within a short time and that construction work on the plant will be pushed. Z.

EAST LANSING, MICH.—The East Lansing Council has advertised for bids for the installation of a lighting system for the "College City."

GRAND RAPIDS. MICH.—The United Light & Railway Company's budget for the coming year covering contemplated new construction extensions and improvements to various properties, will call for the expenditure of about $1,000,000. The largest expenditures will be on the properties in Iowa, especially at Mason City, Iowa City, Cedar Rapids and on the Tri-City system. Address Ben C. Robinson, 823 Michigan Trust Building, Grand Rapids, for desired information.

NEW ERA, MICH.—The Stearns Light & Power Company, of Ludington, has made a contract with the merchants of New Era to extend its lines to that village and work on the line will be started at once.

SHEBOYGAN, WIS.—The Sheboygan Railway & Electric Company will extend its lines. Address Ernest Gonzenbach, general manager.

HIBBING, MINN.—W. J. Ryder, of the Water and Light Board, has been empowered to consult with Engineer Jackson, who has prepared several sets of plans and specifications for the village on water and light problems relative to the possibility of constructing an up-to-date electric plant in the village.

DAVENPORT, IOWA.—The State Automatic Telephone Company will install a local system utilizing 173 miles of cable. E. H. Moulton, of Minneapolis, is president and B. H. Osborne, Franklin, Pa., secretary.

EARLHAM, IOWA.—Bids will be called for soon for equipment for the electric light plant. Address the village clerk for particulars.

GREELEY, IOWA.—Bonds have been voted for an electric light system. Address the city clerk.

HAMPTON, IOWA.—The Hampton Electric Light & Power Company has been given a franchise for 25 years. The company will now go ahead and equip its plant to furnish power and lights for the adjoining towns. Allison, Alexander, Latimer, Coulter, Bristow, Dumont and other towns are to have the electricity. It will mean the expenditure of a large sum of money and the employment of many men here. There is a material reduction in price to consumers in the new franchise.

WILLIAMSBURG, IOWA.—F. C. Harrington is manager of the company which has been granted a franchise to construct and operate an electric plant here.

CLARKSVILLE, MO.—The city has voted to construct an electric-light plant here. Address the mayor for further information.

KANSAS CITY, MO.—A separate power house will be erected by the Dorn-Cloney Laundry Company at a cost of $10,000. E. Dorn is in charge of plans. M.

KANSAS CITY, MO.—The Kansas Prison Committee, appointed recently by Governor George H. Hodges to make recommendations regarding changes in the State prison at Lansing, advocates in its report the razing of the present power plants and the establishment of a single power plant of sufficient size to generate electric power for all manufacturing work, as well as lights for all prison buildings, the exhaust steam to be used for heating. A high-pressure line also would be run to the prison mine from the central power plant. Removal of all stoves and detached heating apparatus also is recommended. The installation of electrical equipment in all manufacturing plants was also asked by the Commission. Charles Chandler, State Architect, has begun work on the plans for the alterations. M.

KNOBNOSTER, MO.—The Knobnoster Brick, Tile, Light & Power Company has been incorporated with a capital stock of $40,000 by C. A. Harrison, Charles D. Littleton and others.

PARNELL, MO.—The Grant City Electric Company has petitioned for a franchise to furnish electric lights to Parnell. Address Mayor Morgan for general information.

ST. LOUIS, MO.—The Missouri Public Service Commission granted the application of the North Missouri Light & Power Company for the construction of transmission lines to be built to Center, Perry and Frankfort, Mo., at a cost of $35,000, and substations at an additional cost of $15,000, at Keokuk. The company probably will extend its lines to New London, Mo.

SULLIVAN, MO.—The Electric Light & Power Company has been incorporated with a capital stock of $25,000 by W. E. Anderson, E. W. Illien and others.

WILLISTON, N. D.—Farmers of the district lying north of here are intensely interested in the projected construction of an electric line from Williston to Rudser. The line would be extended through Muddy Valley to a distance of about 60 miles northward. Address J. H. Cooper, of Williston.

SOUTH CENTRAL STATES.

ELK FORK, KY.—The Elk Fork Telephone Company has been incorporated with a capital stock of $340 by H. F. Fannin, Walter Skaggs and others.

LEXINGTON, KY.—Lexington proposes soon to have a great "White Way." The plan is for the establishment of no less than eighty-eight high-power electric lamps in the business district of the city, which is now lighted by only eighteen lamps of the familiar arc type. Address the city electrician for general information.

TAYLORSVILLE, KY.—M. F. Cheek contemplates enlarging the electric plant here.

BRISTOL, TENN.—Plans are on foot to electrify the Holston Valley Railway. Address B. L. Dulaney, general manager, Bristol, Tenn., for further information.

HALLS, TENN.—A considerable amount of electrical apparatus will be purchased immediately by the Halls Water, Light & Ice Company, which recently issued bonds for the purchase of the property. Material for transmission will be purchased as well as generators and other equipment for the plant. G.

MEMPHIS, TENN.—If a franchise is granted the Memphis Automatic Telephone Company, work will be begun June 1. Address J. B. Goodbar, who is interested.

MCKINNEY, TEX.—The McKinney, Bonham & Paris Interurban Railway Association has been formed to promote the construction of an interurban line connecting these towns. The road will run *via* Blue Ridge, Leonard and Bonham, and then paralleling the Texas & Pacific Railroad to Paris, 74 miles in all. A survey will be made at once. R. L. Waddill is interested. D.

TUSKEGEE, ALA.—An electric light and power plant will be constructed for the Tuskegee Institute, by the Lord Construction Company, of New York, which was awarded the general contract for that work, and for a heating plant, sanitary sewerage and a sewerage disposal system, by Consulting Engineer Walter G. Franz, of Cincinnati. The work will total about $180,000. L.

WESTERN STATES.

BAKER, MONT.—This town will hold a special election on June 23 upon the approval of granting a special franchise and privilege to E. C. Heinrich for a period of 25 years for the construction, maintenance and operation of an electric light and power plant here.

WEISER, IDAHO.—The Adams County Light & Power Company, of this city, has announced its intentions of erecting a power plant on Rush Creek, near here, in the Weiser National Forest. An application for a permit to construct the plant has been filed with the District Forestry Service in Ogden, Utah. The purpose of the project is to furnish light and power to the towns of Cambridge and Midvale. O.

MOAB, UTAH. — Messrs. C. A. Hammond, of this city, and Joseph W. Christensen, of Fairview, have under consideration the installation of an electric lighting plant in this city. A. V. Richards, of the engineering firm of Caldwell & Richards, of Salt Lake City, has been making an estimate of the cost to install a plant. Mr. Richards has also made preliminary surveys and estimates for the installation of a plant at Monticello.

RENO, NEV.—The Reno Interurban Telephone Company has been incorporated here with a capital stock of $50,000 by O. C. Bates, A. G. Burton, and others.

CHEHALIS, WASH.—Ben Walling, Jr., recently petitioned the City Commissioners for a franchise to enter into the light and power business in this city. He represents sufficient capital to give electrical service to the entire southwest portion of the state. The proposition will probably be placed before the registered voters of the city.

SEATTLE, WASH.—The County Commissioners of King County recently granted the Vashon Electric Company a franchise to conduct an electric light and power business on Vashon Island. The franchise granted covers 56 county roads, and 27 additions on the Island. The Company has 90 days in which to begin construction, and the franchise is void unless wholly in active operation within five years. Homer H. Edwards is president of the concern.

SEATTLE, WASH.—A resolution has been introduced into the City Council, providing for a cluster lighting system, on Madison, Marion and Columbia Streets. The bill is heartily favored by a majority of the Council. H. W. Carroll is city clerk. O.

ANDREWS, ORE.—J. B. Balcomb, executive engineer of the Wild Horse Power & Milling Company, is authority for the statement that his company has completed preliminary surveys for the construction of a hydroelectric power plant to be built near here. Active construction will begin shortly.

LOS ANGELES, CAL.—Lewis E. Degan, of Long Beach, will prepare plans for a city fire-alarm and police-signal system. Address R. H. Manahan, city electrician, for further particulars.

PROPOSAL.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., for furnishing interior lighting fixtures until June 5 for the post office at Muskogee, Okla.; until June 10 for the new post office at Minneapolis, Minn.; for the new subtreasury at San Francisco, Cal.; for the new customhouse at Boston, Mass.; until June 12 of a two-story building for the post office at Winchester, Tenn.; until June 13 of a two-story building for the post office at Covington, Tenn.; until June 15 of a two-story building for the post office at Macomb, Ill.; of a two-story building for the post office at McPherson, Kans.; until June 16 of a one-story building for the post office at Gastonia, N. C.; of a two-story building for the post office at Grenada, Miss.; until June 17 of a three-story building for the post office at Jackson, Ky.; of a two-story building for the post office at Burlington, N. J.; until June 18 of a two-story building for the post office at Mount Vernon, Ill., and a one-story building for the post office at Hanford, Cal., all in accordance with drawings and specifications, copies of which can be obtained from the custodians of the sites named or the office of the Supervising Architect.

FINANCIAL NOTES.

Bodell & Company, bankers of Providence, R. I., are offering $850,000 seven-per-cent cumulative preferred stock of the Elmira (N. Y.) Water, Light & Railroad Company. The issue has been approved by the New York up-State Public Service Commission.

The New York Telephone Company, at the annual meeting of the stockholders, elected Otis H. Cutler and Edwin P. Maynard directors, to succeed William H. Woolverton and Theodore F. Miller, deceased.

The Ozark Power & Water Company, of Taney County, Mo., has filed an application with the Missouri Public Service Commission to issue $2,000,000 of the first-mortgage bonds bearing five per cent interest and falling due in 40 years. The bond issue is sought to pay for the improvements already made.

Toronto Railway has announced a new issue of $1,000,000 stock which will bring the total stock outstanding up to the authorized issue of $12,000,000. The new stock will be offered at par to shareholders of record May 11, in the proportion of one share of new for eleven shares of old. At 136 for old stock, rights to the new issue would have a value of $3. The $1,000,000 stock now being offered is the balance of the extra $4,000,000 for which authority was secured three years ago.

At a meeting of the board of directors of the American Water Works & Electric Company, the following permanent officers were elected: H. H. Porter, president; Stuart H. Patterson, of New York, vice-president and treasurer; Harry E. Towle, of Boston, secretary. J. H. Purdy, of Pittsburgh, was elected assistant to the president. An executive committee was named consisting of President Porter, Samuel Insull, Guy E. Tripp, A. H. Wiggin, J. D. Mortimer and H. H. Pierce. It is understood that the executive, financial and operating offices of the company will be located in New York City.

A syndicate headed by A. B. Leach & Company, and the Continental and Commercial Trust & Savings Bank of Chicago is offering $6,000,000 West Penn Traction Company three year six-per-cent secured gold notes at 99 and interest, dated March 2, 1914, callable as a whole during the first year at 101, second year at 100.5 and third year at 100; interest payable March 1 and September 1. The company proposes to spend during 1914 and 1915, including part of the proceeds of this issue, approximately $4,000,000 for betterments, improvements and new construction, against which expenditures its first-mortgage bonds, to be pledged as security for these notes, will be issued. Through direct ownership, stock ownership and leases the compaany controls and operates numerous electric railways, electric lighting and power properties in Western Pennsylvania and adjoining territory in Ohio and West Virginia. Gross operating revenue for the year ended December 31, 1913, was $4,445,629, and net earnings after deducting expenses and taxes were $2,036,858.

The financial organization of the Elmira Water, Light & Railroad Company, a subsidiary of the United Gas & Electric Corporation, has been completed and the company is now on a firm financial foundation and in a position to provide for its requirements in the way of financing for a long time to come. The $1,250,000 one-year debenture notes issued as of May 1, 1913, have been paid off and the funded indebtedness of the company decreased. The funds for the payment of the note issue were secured by the sale of $850,000 seven-per-cent first preferred stock and $617,000 first and consolidated five-per-cent bonds. The former preferred stock has been made a second-preferred and an authorized issue of $3,000,000 first-preferred has been provided of which the above amount was sold. In addition $317,00 of the second-preferred five-per-cent stock has been sold and the proceeds will be used to retire $307,000 Chemug County Gas Company, first-mortgage six-per-cent bonds maturing July 1, 1923. The bonds will be called at 105 and interest on July 1 of the present year. The gas bonds are an underlying issue. The remainder of the authorized first preferred stock will be held to provide for future requirements of the company. The notes just refunded were issued to provide for construction of a new central power station and for the payment of an underlying bond issue.

Gross earnings of the American Light and Traction Company for the year ended March 31, 1914, were $4,442,766 as compared with $4,320,370 for the previous year and $4,104,550 for the year ended March 31, 1912. Expenses made the net earnings $4,291,884, as compared to $4,202,881 the year before and $3,986,193 the year before that. Dividends amounting to $3,603,167 were paid in the year just ended, compared to $3,346,302 in 1913 and $3,112,363 in 1912. The balance added to surplus in the year just ended was $688,717, as compared to $856,579 last year and $873,830 the year before. The total surplus as of March 31, 1914, was $9,577,507, as against $8,888,790 in 1913, $8,032,211 in 1912 and $7,158,380 in 1911.

Combined gross earnings for the Niagara Falls Power Company and the Canadian Niagara Power Company for the year ended December 31, 1913, was $2,742,192, an increase of $254,996 over 1912. Combined net earnings were $2,201,927, an increase of $169,828. Other income made the total net for the year $2,317,985, compared with $2,180,663 for 1912. Deductions were $500,000 for first-mortgage bond interest, $493,560 interest on general or refunding bonds and $1,200 interest on debentures, all unchanged from the year before, and taxes, insurance and Canadian Park rentals of $253,114, a slight decrease, leaving the surplus income for 1913 $1,070,109, compared with $927,857 for 1912, an increase of $142,251, making the total surplus $2,476,351.

Dividends.

	Term	Rate	Payable
Baton Rouge El. pf...	S-A	3. %	June 1
Columbus Ry. & Lt....	..	0.75%	May 25
Federal Lt. & Trac., pf.	Q	1.5 %	June 1
Cent. Ark. Ry. & Lt. pf.	Q	1.75%	June 1
Kings Co. E. L. & P...	Q	2 %	June 1
Nor. Texas Elec.......	Q	1.75%	June 1
Port'd Ry. Lt. & Pow..	Q	1 %	June 1
White Eng. Corp. pf...	Q	1.75%	June 1

Reports of Earnings.

DETROIT UNITED.

	1914	1913
March gross	$ 963,606	$1,029,289
Net	281,732	345,834
Total income	308,657	363,233
Charges and taxes.....	180,629	180,309
Surplus	128,028	182,924
Three months gross...	2,755,492	2,913,589
Net	777,773	928,829
Total income	856,912	987,450
Charges and taxes....	641,522	537,413
Surplus	315,390	450,037

AMERICAN DISTRICT TELEGRAPH COMPANY.

The report of the American District Telegraph of New Jersey for the year ended December 31, 1913, shows a balance available for dividends of $642,584, equal to 6.44 per cent earned on $9,965,351 capital stock, against 8.73 per cent on the same stock the previous year. The income account compares as follows:

	1913	1912
Gross income	$2,391,818	$2,351,346
Operating expenses ...	1,749,235	1,481,029
Balance	$ 642,584	$ 870,317
Dividend	398,556	398,554
Surplus	$ 244,028	$ 471,763

NEW ENGLAND TELEPHONE COMPANY.

The report of the New England Telephone & Telegraph Company for the year ended december 31, 1913 shows net earnings of $3,785,162, against $3,468,696 the previous year. The income account compares as follows:

	1913	1912
Gross earnings	$17,672,945	$16,324,305
Operating expenses .	7,293,751	6,320,173
Taxes	985,921	1,004,346
Current main	2,086,688	2,379,638
Depreciation	3,521,423	3,151,451
Total expenses ...	$13,887,783	$12,855,609
Net earnings	$ 3,785,162	$ 3,468,696
Interest	616,674	345,581
Balance net profit.	$ 3,168,488	$ 3,123,115
Dividends	3,015,987	2,810,859
Deduction from surplus	14,920	....
Surplus	$ 137,500	*$ 31,256

*The company's surplus was charged during the year 1912 with the $1,000,000 credited to employees' benefit fund and the unamortized portion of discount on bonds sold $296,453; while it was credited the balances in employees' retired pay and accidents $135,204, and the surplus earnings for the year as shown above $312,356; these charges and credits resulted in a net decrease of $848,992 in the surplus account.

At the annual meeting of the New England Telephone & Telegraph Company all the officers were re-elected. Henry W. Keyes, of North Haverhill, N. H., was elected to the board of directors in place of William H. Elliot, resigned. The date of the annual meeting was changed to the Wednesday after the third Tuesday in February.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 11	May 4
American Tel. & Tel. (New York)........	122	121¼
Commonwealth Edison (Chicago)........	134½	133½
Edison Electric Illuminating (Boston)........	247	247
Electric Storage Battery common (Philadelphia)........	52	49
Electric Storage Battery preferred (Philadelphia)........	52	49
General Electric (New York)........	145¼	147¾
Kings County Electric (New York)........	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric common (Boston)	10	9¼
Massachusetts Electric preferred (Boston)	58	57
National Carbon common (Chicago)	108	105
National Carbon preferred (Chicago)	118	119
New England Telephone (Boston)	135	136
Philadelphia Electric (Philadelphia)	25½	25¼
Postal Telegraph and Cables common (New York)........	78¼	76¼
Postal Telegraph and Cables preferred (New York)........	67¾	68
Western Union (New York)	61¼	61¼
Westinghouse common (New York)	73¾	74
Westinghouse preferred (New York)	120	119

PERSONAL MENTION.

MR. W. ROLLINSON WHITTINGHAM has been elected president of the Millburn Electric Company, Millburn, N. J.

MR. B. K. HOWARD, who has been associated with the General Electric Company for several years past, has resigned to join the Texas Power Company, at Dallas, Tex.

MR. H. F. HOLLAND, representative of the Simplex Electric Heating Company, Salt Lake City, Utah, is on a one-month trip to the Pacific Coast, and will include Los Angeles.

MR. W. J. JOHNSTON, of Chicago, Ill., has joined the sales force of the Connecticut Telephone & Electric Company, Meriden, Conn., manufacturers of the well known Connecticut ignition products.

MR. JAMES P. DUSENBERRY, retiring treasurer of the Public Service Corporation, Newark, N. J., was a guest of honor at a dinner given by the executive organization of the corporation at the Washington, Newark, Tuesday evening, May 5.

MR. EMIL GRUENFELDT, chief engineer for the Baker Motor Vehicle Company, of Cleveland, O., sailed from New York last week to spend about two months abroad. Mr. Gruenfeldt will take a brief vacation in Germany, and will also make an investigation of recent foreign motor-car developments.

MR. MELCHER EKSTROMER, electric vehicle specialist with the Electric Vehicle Company, Denver, Colo., is spending a short time in Salt Lake City in connection with some large deals on electric trucks under consideration by two of the large department stores of that city.

MR. D. W. SNYDER, of Clinton, Ill., has been appointed manager of the Jefferson City (Mo.) Light, Heat & Power Company, succeeding MR. A. H. R. JACKSON, who has been transferred to Oskaloosa, Iowa. Besides being prominent as a manager in electrical circles, Mr. Snyder has gained a reputation as a builder of power plants.

MR. A. C. SOELLNER, who has been in the billing department of the General Electric Company at Chicago, Ill., has been made chief clerk at the Kansas City, Mo., branch of the company. He has been with the company for five years. He succeeds MR. R. H. McCURDY, who has resigned because of ill health, after eight years' service.

MR. HARRY H. GERHARD, president of the C. A. Wood Preserver Company, St. Louis, Mo., was married to Miss Elizabeth D. Owsley, a Kentucky girl, at Hannibal, Mo., on April 18. Mr. and Mrs. Gerhard have many friends in the electrical industry. They are touring the States on their honeymoon trip and well reside in a suburb of St. Louis upon their return.

MR. S. R. INCH, general superintendent of the Utah Power & Light Company, and MR. W. R. PUTNAM, new business manager of the same company, together with MR. C. A. COHN, superintendent of power stations, also of the same company, will attend the convention of the National Electric Light Association, to be held early in June in Philadelphia, Pa.

MR. GUY E. TRIPP, who was recently elected president of the West Penn Traction Company, made an inspection trip over the lines of the company last week and is reported to have been well pleased with conditions. He was accompanied by Mr. W. Fish, the new controller of the West Penn properties, and Mr. H. S. Swift, the new treasurer. Mr. Fish succeeds Mr. J. B. Van Wagener and Mr. Swift takes the place of C. W. Scheck and Byron Trimble.

MR. WILLIAM C. TREGONING has established an office and laboratory at 813 Prospect Avenue, S. E., Cleveland, O., where he intends devoting his entire attention to the development of mechanical and electrical devices, but more particularly to fittings for electric lighting. Mr. Tregoning organized The Tregoning Electric Manufacturing Company in 1907, and was its president and general manager until March 1, 1914.

MR. DOUGLAS I. McKAY has been appointed assistant to the president by the directors of J. G. White & Company, Incorporated. Mr. McKay will give special attention to the problems connected with the development of the organization and its various associated and affiliated companies and will assist also with other general executive duties. Mr. McKay is a graduate of the United States Military Academy at West Point, N. Y., and has consequently had a general engineering education. He was former police commissioner of New York City, and his education, together with his experience in matters of organization gained through his association with the police department and elsewhere, will make him particularly useful to the organization he has just joined.

MR. GEORGE H. KELLY, secretary of the Baker Motor Vehicle Company, of Cleveland, O., was host at the Union Club, Cleveland, May 6, to a gathering of 12 men well known throughout the country for their connection in the electrical business. The guest of honor was MR. FRANK W. SMITH, president of the Electric Vehicle Association of America, who was visiting the Baker Factory. Other guests were Messrs. S. E. Doane, of the National Electric Light Association; L. P. Sawyer, manager of the Buckeye Lamp Company; C. L. F. Wieber, president of the Rauch & Lang Carriage Company; George S. Milner, general manager of the Erner Electric Company; Mathias Turner, commercial agent of the Illuminating Company; T. P. Cagwin, commercial manager of the Cleveland Telephone Company; H. B. Gay, manager of the Cleveland office of the Electric Storage Battery Company; George D. Smith, district sales agent of the General Vehicle Company, New York; Mr. Ayers, manager of the truck department, General Motors Company; and Hayden Eames, president of the Standard Electric Car Manufacturing Company.

OBITUARY.

MR. FRANCIS J. BEGG, a contractor, died recently in his home in Waverly, Md., of cancer of the brain. Mr. Begg was prominent in the electrical world, having had an important part in the construction of some of the electric railroads in this state.

MR. JOHN FOREST DILLON, general counsel for the Western Union Telegraph Company, died in New York on May 6, after serving that company since 1882. Mr. Dillon was 83 years of age. A son Mr. H. P. Dillon, of Topeka Kan., survives. Interment was at Davenport, Iowa.

NEW PUBLICATIONS.

ELECTRIC FURNACES.—The Bureau of Mines, Washington, D. C., has issued Bulletin 67 entitled "Electric Furnaces for Making Iron and Steel," by Dorsey A. Lyon and Robert M. Keeney. This deals with the use of the furnace for both pig-iron manufacture and steel-making. The various forms of furnace used for these purposes are described and illustrated, and some costs of operation are given.

NEW INCORPORATIONS.

DETROIT, MICH.—Union Electrical Construction Company has been incorporated with a capital stock of $50,000 by Louis H. and Elsie M. Sass, and Henry C. Pappert.

KANSAS CITY, MO.—The Ohio Electric Kansas City Company has been incorporated with a capitalization of $2,500. The incorporators are Charles R. Guibor, K. C. H. Loechler, and Brown Harris.

WILMINGTON, DEL.—The Empire Vehicle Company has been granted a charter by the state of Delaware. The purpose of the company is to manufacture and sell electric vehicles. N.

ELKHART, IND.—Sevison Electric Company has been incorporated with a capital stock of $10,000 to deal in electrical equipment. The incorporators are M. E. Crow, J. B. Fitch and L. J. Sevison.

CHICAGO, ILL.—The Lucas Signal & Control Company, of Chicago, capitalized at $10,000, has been incorporated by Paul Pierce, Everett N. Murphy and Joseph N. Pierce, to manufacture and deal in electrical appliances. Z.

CHICAGO, ILL.—The Chicago Electric Shoe Shining Machine Company; capitalized at $2,500, has been incorporated by E. A. Biggs, E. S. Carr and J. Rigney, to do a general advertising hardware and electrical business. Z.

NASHVILLE, TENN.—Detroit-Nashville Construction Company has been incorporated with a capital stock of $100,000 by Cameron Currie, W. E. Steger, A. W. Willis, W. O. Vertrees, William J. Pulling, Urey Howard and Strathearn Hendrie.

BLOOMFIELD, N. J.—R. K. Mickey Company has been incorporated to manufacture incandescent electric lamps. The capital stock is $50,000 and the incorporators are D. McNeill, of New York City; M. L. Mickey and R. K. Mickey, of Bloomfield.

WILMINGTON, DEL.—National Electric Distributer Corporation has been incorporated to manufacture and deal in machinery for generation of electricity. The capital stock is $500,000 and the incorporators are H. E. Latter, W. J. Maloney, O. J. Reichard, Wilmington.

MANHATTAN, N. Y.—Willis Mitchell Company, Incorporated, has been incorporated with a capitalization of $100,000. The incorporators are A. B. Britton, J. J. Jensen, Jr., W. P. Powell, all of New York City. The company will carry on business of light, heat and power system.

ROCK ISLAND, ILL.—M. & F. Electrical Company has been incorporated with a capital stock of $2,500 for the purpose of manufacturing and dealing in all kinds of electrical apparatus, machinery, etc. The incorporators are Martin McNealy, William McNealy and William Fox.

DATES AHEAD.

American Institute of Electrical Engineers. Annual meeting, New York, N. Y., May 19. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks' Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29. Secretary, George Skillman.

American Institute of Electrical Engineers. 296th meeting, Pittsfield, Mass., May 28-29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Minnesota Electrical Contractors' Association. Annual Convention, St. Paul, Minn., June 22.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 22-26.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-16. Secretary, W. H. Morton, 40 Martin Street, Utica, N. Y.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

American Electrical Works, Phillipsdale, R. I., has issued its May price list covering bare, weatherproof and rubber-covered wires and cables, lamp cords, annunciator wire, galvanized iron wire, etc.

Harvey Deschere & Company, manufacturer of the Argus miniature electric sign, announces its change of address from 50 Church Street, New York, N. Y., to 1507 Garden Street, Hoboken, N. J.

The Appleton Electric Company, Chicago, Ill., has just issued a very neat catalog, No. 7, entitled "Unilets—Conduit Fittings," which fully lists and illustrates its complete line of unilets, outlet boxes, etc.

The Hazard Manufacturing Company, New York, N. Y., manufacturer of all kinds of wire rope and insulated wires and cables, announces that its office and warehouse have been removed from 50 Dey Street to 533-541 Canal Street.

The United States Light & Heating Company, Niagara Falls, N. Y., announces that the New York sales office and service station, formerly located at 210 West Fiftieth Street, has been transferred to the Locomobile Building at 16 to 24 West Sixty-first Street.

F. W. Wakefield Brass Company, Vermilion, O., is sending out to fixture dealers some new folders calling attention to marked advantages of its standard universal or interchangeable lighting fixtures, also to its new line of Mellowlites, convertible direct and indirect fixtures.

Electrical Engineers Equipment Company, Chicago, Ill., has moved into its new building at 711-715 West Meridian Street. The entire structure is occupied by the firm, giving it an increase of floor space to nearly 29,000 square feet. This will enable the company to carry on a more extensive business.

The Universal Battery Company, Chicago, announces the completion of its new factory building which is designed especially for making its various lines of batteries. The new building will be more spacious, which has been made necessary by the increasing demand for Universal batteries and lighting systems. The new location is at 3410 to 3424 South La Salle Street.

The Standard Paint Company, 100 William Street, New York, N. Y., announces the removal of its Boston office from 70 Kilby Street to 6 Beacon Street. The old offices on Kilby Street have been occupied by the Standard Paint Company for about 18 years, and it is with a certain feeling of regret that the change is made, although the increased volume of business necessitates more commodious quarters.

Belden Manufacturing Company, Chicago, Ill., has just issued bulletin No. 1006, which gives full data on its complete line of standardized bare-copper cables and braids manufactured. A very complete range of sizes is shown, including an entirely new line of cables designated as "Hawser-lay." These cables are stranded and laid up by a method that gives the maximum flexibility. The entire line shown in this bulletin has a wide range of applications in the electrical field.

The Bissell Engineering Company, 426 Board of Trade Building, Indianapolis, Ind., has been awarded the appraisal work for the Browne-Mills Electric Company, North Manchester, Ind. This work comprises the complete appraisal of the entire plant, including the power house, transmission lines, etc. While there has been no agitation as to change of rates, the company desires to get a complete valuation of its property in accordance with the requirements of the Commission.

Diehl Manufacturing Company, Elizabeth, N. J., has recently issued bulletin No. 6, devoted to Diehl motor-driven exhaust fans. These are made with several different types of blades and in sizes ranging from 9 to 48 inches in diameter of the table wheels. The fans serve for several ventilating purposes and are of high efficiency. The bulletin describes their construction and gives complete data and dimension diagrams. Copies of the bulletin can be had by writing the company.

Bonestead Electric & Manufacturing Company has established itself at 215 First Avenue North, Minneapolis, Minn. The company will manufacture motors up to 50 horsepower, as well as switchboards and panelboards. It will handle a complete line of generators and electrical machinery. James T. Bonestead is at the head of the company. He has been in the electrical business since 1881, when he installed the first dynamo in Minneapolis. Twenty-three years ago Mr. Bonestead organized the Electric Machinery Company, from which concern he recently resigned to enter the field with his new company.

The Multi-Refillable Fuse Company, Chicago, Ill., is now comfortably located in its new plant at 723 West

Fulton Street. In connection with its expanding business the company announces that the Mid-City Sales Company, at 811 West Adams Street, Chicago, will act as selling agents for the states of Wisconsin, Illinois, Nebraska, Kansas and the northern part of Indiana. The Mid-City Sales Company is under the direct management of S. R. Kalisch, until recently connected with the Thomas G. Grier Company as special representative. Associated with Mr. Kalisch are several men of long experience in the electrical industry.

The Robbins and Myers Company, Springfield, O., announces that ground has recently been broken for the construction of a new factory building to take care of its rapidly growing output. This building will be immediately south of and adjoining the new shops which were completed a little less than a year ago. It will be of reinforced concrete and will contain four stories and basement, the ground area being 60 x 265 feet. The Philadelphia office has recently been removed from 206 Bailey building to 606-608 Bellevue Court building, 1418 Walnut street. The new office will provide greatly increased facilities for handling the business of this branch.

General Insulate Company, 1008-1014 Atlantic avenue, Brooklyn, N. Y., manufacturer of Insulate composition receiver cases, mouthpieces and electrical insulations, is rapidly recovering from the effects of the fire on April 25. This fire almost destroyed its power plant, finishing rooms and part of its press rooms and machine shops, and a continuous three-day rainfall made it almost impossible to do any work in its unroofed main factory building. Nevertheless, within four days after the fire the company had taken a physical inventory of its entire plant, covering 2,700 different classifications. On May 3 its die shops, finishing rooms, etc., were installed in temporary quarters, and within ten days the company began to ship many of its products to various trades throughout the country. Reconstruction work was started on the old plant almost immediately after the fire, and it is expected that before the end of May the plant will be in full operation.

The Westinghouse Electric and Manufacturing Company has recently issued a number of publications. Catalog section No. 3,082 deals with motor-driven pumps. This publication has an attractive art cover and is profusely illustrated with views of installations of pumps of various kinds and performing duties of a varied nature. Tables are given showing the frictional heat in wrought iron pipe, horsepower for pumping, standard dimensions of pipe, and atmospheric pressures, equivalent heads and suction lifts. Folder No. 4,281 entitled "Ironing a Pleasure," describes the household and traveler's iron. Westinghouse 56-inch direct-current ceiling and column fans are described in Folder No. 4,282. Leaflet No. 3,719 describes and illustrates Type-KD battery-charging panels for two-wire systems, 50 to 250 volts, for lighting and electric-vehicle charging. Typical diagrams of connections are shown. Type-I oil switches are described in leaflet No. 3,745. This type of oil switch is intended for use on direct or alternating-current series-lighting circuits and for controlling inductive loads of small capacity. Leaflet No. 3,512-A describes electric auto-starters for squirrel-cage motors. The construction of this device is fully described and illustrated as is also the overload relay with which it is equipped. Leaflet No. 2,364 describes direct-current Type-K crane motors. These motors are designed for intermittent varying-speed service where high starting torque is required such as cranes, hoists, coke-charging machines, etc. Folder No. 4,172 describes bell-ringing transformers. On the back page is shown a comparison of the oid method of using batteries and how they are subject to breakage; with the new way involving the use of transformers. Section No. 3,164, covering motor-driven laundry machinery, has also been issued. This forms one of the series of publications being issued on motor-drive in the industries.

Record of Electrical Patents.

Issued by the United States Patent Office, May 5, 1914.

1,095,182. Trolley Harp or Head. J. J. Barnick, Bloomsburg, Pa. A detachable quick-change head.

1,095,214. Electric Cooker. P. Johnson, Winnipeg, Manitoba, Canada. An open-topped cylindrical pot with cooking grate and coreless heating coils supported on the heat-insulated bottom.

1,095,235. Electric Signal for Hay Presses. C. Schade, Cropsey, Ill. Roller contacts close the circuit as they engage the metallic frame of the dividing blocks.

1,095,244. Combined Priming and Sparking Plug. C. G. Tate, Chicago, Ill., assignor to United Motor Equipment Co. Covers details.

1,095,273. Testing Device for Gas Engines. W. C. Force, North Plainfield, N. J. Was a number of handles each with a central member adopted to be placed in circuit with the spark plug and a common conducting member adopted to be grounded on the frame.

1,095,279. Electric Switch. R. C. Hull, Germantown, Pa. A push-rod operates the pivoted contact arm.

1,095,284. Instrument for Locating Breaks and Grounds in Electric Wires. M. J. Myers, deceased; L. O. Myers, Syracuse, N. Y., administratrix. Includes a fixed primary coil and a number of oppositely acting secondary coils movable axially.

1,095,296. Lighting Fixture. M. P. Stevens, East Orange, N. J. A combined socket cover and shade holder.

1,095,300. Arc Welding Apparatus. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Includes a resistance-varying motor having its armature in shunt with welding arc.

1,095,321. Illuminated License Number. W. T. Fisk, Detroit, Mich. Includes an electric lamp.

1,095,324. Method of Making Reinforcing Bars. N. L. Hall, Los Angeles, Cal. Consists in twisting the bar along its whole length and simultaneously electrically hardening separate portions to cause them to resist twisting action.

1,095,328. Plating Apparatus. J. H. Jordan, St. Louis, Mo. Special electroplating tank.

1,095,329. Cable Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co. His two sources of current connected in the line transmission, but in opposition to each other.

1,095,331. Field-Magnet Winding for Dynamo-Electric Machines. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Current is supplied to the two parts of the field in parallel to produce main magnetic poles, and in series to produce commutating poles.

1,095,342. Wireless Receiver. H. Merton, London, England. Audible signals from receiving circuit make record on phonograph.

1,095,354. Telephone Transmitter. J. Redding, assignor to F. H. Lord, trustee, South Weymouth, Mass. Has a number of cells containing the granular resistance material.

1,095,358. Call Box. H. O. Rugh, assignor to Hall Switch & Signal Co. Covers details of selective mechanism.

1,095,379. Röntgen-Ray Apparatus. S. Cabot, Brookline, Mass. Has a number of series contacts arranged to minimize sparking.

1,095,388. Automatic Engineer's Signal. L. Edwards, Aurora, Ill. Covers mechanical device operating bell and lamp in engine cab.

1,095,392. Electrically Heated Waving Tongs. L. Frey, Munich, Germany. Has electric heating coils in tongs.

1,095,405. Heating Apparatus. C. Kratt, Glasgow, Scotland. Switch controlling electric heating circuits is mechanically attached to the valve handles.

1,095,425. Process and Apparatus for the Production of Long Continuous Electric Arcs. O. Schönherr and J. Hessberger, assignors to Norsk Hydroelektrisk Kvaelstofaktieselskab, Christiania, Norway. Has two tubular electrodes and means for creating a continuous draft.

1,095,426. Process for Producing Long Continuous Electric Arcs. O. Schönherr and J. Hessberger, assignors to Norsk Hydroelektrisk Kvaelstofaktieselskab. A modification of 1,095,425, using one tube with two electrodes.

1,095,427. Means for the Production of Long Continuous Electric Arcs. O. Schönherr and L. Hessberger, assignors to Norsk Hydroelektrisk Kvaelstofaktieselskab. A modification of 1,095,425, having a conical electrode.

1,095,437. Spark Coil. C. R. Underhill, assignor to Detroit Coil Co., Detroit, Mich. A vibrating armature with tension adjusting support.

1,095,439. Ground Detector for Insulators. J. Wahn, Austria-Hungary, Vienna. Conductor placed between insulator and a secondary insulator permits testing for grounds.

1,095,453. Motor Mechanism. C. W. Coleman, assignor to The Hall Switch & Signal Co. Motor with electromagnetic clutch for operating signal.

1,095,473. Apparatus for Treating Articles with X-Rays. F. S. Smith, assignor to Electri-Sterilizing Co., Dover, Del. Electric motor rotates X-ray tube.

1,095,474. Snap Electric Switch. J. A. Smith, assignor to The United States Electrical Tool Co., Cincinnati, O. A snap switch having a reciprocating operating handle.

1,095,491. Remote Switch Control for Electrical Circuits. P. C. Butte and C. F. Butte, San Francisco, Cal. Has magnetic tripping device.

1,095,507. Motor-Controlling System. W. D. Lutz, assignor to Otis Elevator Co., Jersey City, N. J. Elevator motor with parallel armature circuits, one of which has a speed-controlled resistance.

1,095,525. Call Box. H. O. Rugh, assignor to Hall Switch & Signal Co. An impulse selective calling device.

1,095,533. Portable Light. L. J. Starr and W. H. White, assignors to The Badger Brass Mfg. Co., Kenosha, Wis. Incandescent lamps placed inside of reflecting shell.

1,095,539. Calling Device for Telephone Exchanges. C. A. Anderson, assignor to Anderson Electric and Mfg. Co., Wichita, Kans. Combined signal and calling device for automatic telephones.

1,095,541. Printing Telegraph System. C. G. Ashley, assignor to General Engineering and Construction Co., Limited, Toronto, Canada. Selective contacts operate printing elements.

1,095,557. Electric Vaporizer. C. L. Davis, Detroit, Mich., assignor of one-half to H. W. Frost. Has electric heating unit.

1,095,586. Alternating-Current Motor. B. McCullum, Lawrence, Kans., assignor of one-half to M. E. Rice. Controlling apparatus for single-phase motor.

1,095,593. Fluid-Pressure System for Operating Bulkhead Doors. F. J. Pike, and H. Neville, assignors to J. Stone & Company, Limited, Deptford, England. Has electromagnetic control of main valves.

1,095,609. Purifying Electrolytes. F. von Kügelgen, F. von Bidder and G. O. Seward, assignors to Virginia Laboratory Co., New York, N. Y. Molten salts are purified between electrodes at high temperatures by electrolysis.

1,095,632. Dynamo-Electric Machine. C. J. Heineman and A. H. Hensley, Chicago, Ill.; said Heineman assignor to said Hensley. An automobile engine-generator, the voltage of which is kept constant at varying speed by automatically varying length of armature under pole faces.

1,095,645. Vaporizer for Internal Combustion Engines. E. Koster, Yonkers, N. Y. Has electric heating coils.

1,095,648. Armored Conduit or Conductor. G. A. Lutz, assignor to American Circular Loom Co. Armored conduit with a spiral surface in the grooves of which is inserted a binding wire. (See cut.)

1,095,655. Elective Signaling Means. J. McFell, Chicago, Ill. A step-operated selective signal-receiving device.

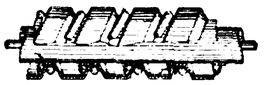
1,095,656. Ignition Timer for Reversible Gas Engines. W. R. McKeen, Jr., assignor to McKeen Car Co., Omaha, Neb. Includes automatic control of circuit breaker upon reversal of engine.

1,095,666. Telephone System. E. R. Parker and E. R. Corwin, Chicago, Ill.; said Corwin assignor to said Parker. Covers details.

1,095,696. Engine-Starting Apparatus. J. Bijur, assignor to Bijur Motor Lighting Co., New York, N. Y. Motor starter with automatically operated clutch for use with internal combination engines.

1,095,722. Secondary or Storage Battery. B. Ford, Philadelphia Pa. Support for rubber walls of battery designed to minimize breakage of jars due to brittle rubber.

1,095,733. Ground Connector. E. Klein, New York, N. Y. A ground clamp with special contact-making point. (See cut.)

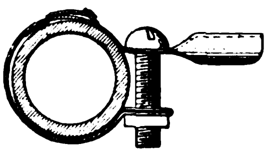


1,095,648.—Armored Conduit.

1,095,748. Electrolytic Apparatus. W. Thum, Hammond, Ind. Includes supporting means for electrodes independent of tanks.

1,095,744. Toilet Box. Frederick Knapp Smith, New York, N. Y. Electrodes inserted through slots in bath.

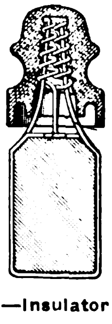
1,095,811. Electric Low-Level Signal for Tanks. O. C. Carr, Lansing, Mich. A float-operated switch inclosed in a tube.



1,095,733.—Ground Connector.

1,095,816. Crossing Arrangements for Block Signals Systems. M. Conrad, Adrian, Mich., and W. G. Kelly, Winslow, Ariz. Track-operated signal system for railroad crossings designed to show presence of train on crossing tracks.

1,095,844. Extensible Electric-Light Fixture. F. Garrecht, Idaho City, Idaho. Lamp supported by lazy tongs which also support lamp cord.



1,095,860.—Insulator Holder.

1,095,845. Electric Mail Box. P. O. Gaudreau, Burlington, Vt., assignor of one-half to E. L. Smith. Electric bell indicator for mail box operated by insertion of mail in box.

1,095,860. Insulator Holder. H. C. Heffner, Martinsburg, W. Va. A two-part spirally wound wire insulator pin. (See cut.)

1,095,863. Railway Safety and Recording Device. F. Hudson, assignor to Recording Safety Device Co., Phoenix, Ariz. A magnetically operated air-brake control device.

1,095,893. Process of and Apparatus for Treating Water. C. P. Landreth, Philadelphia, Pa. Electrolytic purifier for water involving use of aluminum electrodes.

1,095,902. Rear-End Signal for Vehicles. C. F. Marston, Cedarhurst, N. Y. Electromagnetically operated rear-end vehicle signal designed to make known vehicle intended motion.

1,095,915. Safety and Signaling Device for Railroads. D. C. Newton, assignor of one-half to M. Lindeman. Signal and bell operated by short-circuiting contacts between tracks.

1,095,935. Electrically Controlled Air-Releasing Valve for Train Pipes and the Like. T. H. Sheldon, assignor of one-half to F. Herz. Solenoid operated air-release valve.

1,095,949. Fire-Alarm Circuit Closer. B. Trent, Clifton, N. J. Suspended ring designed to be released by heat and complete circuit.

1,095,967. System of Propulsion. J. T. Lister, assignor to The Turbin Motor Electric Car Co. Includes automatic control of floating storage battery.

1,905,982. Railway Block Signal and Train Controlling System. G. R. Guild, United States Army. Include use of one sectionalized rail and one auxiliary sectionalized rail.

1,095,990. Trolley. C. A. Soule, Canandaigua, N. Y. Has insulating collars carried by the arms of the lamp and means for conducting the current around the insulated portions.

Patents Expired.

The following United States electrical patents expired May 11. 1914:

582,187. Telephone-Controlling Device. T. A. Dull, Chicago, Ill.

582,200. Telephone Transmitter. R. P. Green, Columbus, O.

582,218. Electric Motor. J. A. Mosher, Chicago, Ill.

582,237. Electrically Propelled Agricultural Implement. H. Schimpff, Halle-on-the-Saale, Germany.

582,259. Electric Trolley Device. W. M. Brown, Johnstown, Pa.

582,262. Electrically Actuated Switch. J. Bryan, Pittsburgh, Pa.

582,269. Armature for Dynamo-Electric Machines. E. P. Clark, New York, N. Y.

582,273. Electrical Striking and Alarm Attachment for Clocks. B. DeWitt, Terra Alta, W. Va.

582,303. Electric Switch. W. J. Newton, New York, N. Y.

582,378. Carbon for Arc Lamps. J. D. Smith, Washington, D. C.

582,396. Insulator. W. G. Schnee, Pueblo, Colo.

582,461. Electrical Indicating Device. W. W. Dean, St. Louis, Mo.

582,462. Electric Circuit Terminal. E. N. Dickerson, New York, N. Y.

582,464. Electric Contact. C. C. Dusenbury, Lake Mahopac, N. Y.

582,481. Fastening Means for Core Plates of Electrical Machines. E. E. Nolan, Wilkinsburg, Pa.

582,493. Electric Meter. G. A. J. Telge, Oldenburg, Germany.

582,494. Core for Electrical Machines. G. Westinghouse, Pittsburgh, Pa.

582,512. Mast-Arm for Electric Lamps. A. Wright, Providence, R. I.

582,513. Telephone Transmitter. H. C. Alexander, Bonham, Tex.

582,522. Telephone. C. F. Dunderdale, Chicago, Ill.

582,578. System of Electrical Intercommunication. E. A. Clark, Sioux City, Iowa, J. P. Ellacott and W. J. O. Johnson, Chicago, Ill.

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PROTECTION FROM LIGHTNING.

We referred in the issue of May 2 to certain phases of the question of securing protection to buildings from lightning. In a paper presented before the Junior Institution of Engineers in England, Mr. F. H. Taylor discusses in some detail the desirable properties of lightning conductors and the tests which should be carried out to determine their fitness not only at the time of installation, but after having been in service The inspection and testing of lightning conductors after having once been installed is usually neglected utterly. This has probably given rise to much trouble, such as is reported from time to time as having occurred in buildings that were believed to have been protected by lightning conductors. Such neglect is entirely unjustified, since the earth connection is of the utmost importance and cannot be relied upon to maintain itself in good condition indefinitely. In this regard it should be remembered that the area of contact is an important element affecting the resistance of any ground connection. The surface contact between conductor and soil will usually form the largest portion of the total resistance. Where copper plates are buried to provide a ground connection, they should be thin in order to give as large a surface as possible for a given mass of copper, and yet not so thin as to be liable to mechanical damage, which will limit the useful surface. Mr. Taylor advocates a vertical rather than a horizontal position for such a ground plate. Where a ground plate is surrounded with broken coke or cinders, with a view to retaining moisture, such material should be thoroughly washed beforehand in order to eliminate any sulphur which might be present and which would attack the copper.

Regarding the choice between iron and copper for a rod, it is usually recognized that either one may be effective. In the case of an oscillatory discharge, iron, by interposing a larger resistance, will cause a more rapid diminution in the oscillations. Iron, however, has the disadvantage that it may become corroded and thereby suffer mechanical damage, due to its loss of strength. Conductors should be kept away from interior gas pipes and electric conduit as much as possible, but external metal work, such as roofs, should be connected to the lightning conductor system.

In many cases lightning conductors are installed by persons unfamiliar with the proper requirements and are consequently inadequate for the desired result of protection. This is especially the case where no detailed specifications are drawn up covering this item of installation for a new building. To secure real protection, such a specification should be gone into with as much detail, if not more, than any other portion of the building. It would seem desirable for electrical contractors to familiarize themselves with the requirements of a satisfactory lightning-conductor installation and endeavor to have this portion of the work included in the electrical contract. There is an opportunity here for men familiar with the nature of lightning and with the latest work which has been done in designing lightning conductors to perform a real service to the builder and building owner.

INCREASING THE POWER-FACTOR.

The general tendency toward increase of individual drive and the use of smaller induction motors in all sorts of motor applications has tended toward a lowering of the power-factor upon both the supply lines of central stations and upon the isolated power plants. Such low power-factors are not only disadvantageous in that larger currents are necessary for the same power, thus requiring either larger capacity in feeder cables and generating equipment or else greater heating, but they also have considerable effect upon regulation. Not only is there a greater drop on feeder and transmission lines with load when the power-factor is low, but the regulation of the generators themselves is affected. The percentage regulation of generators is much larger at low power-factors than at unity power-factor. Moreover, excitation becomes more difficult, as a larger exciting current is necessary, and this item frequently limits the capacity of an alternator at low power-factor. The consequences of low power-factor might be carried into even further detail, such as the lack of utilization of the full capacity of prime movers under such circumstances, but the above effects suffice to show its undesirability.

There are several methods by which the power-factor of a system may be improved, although in this country the use of the synchronous condenser, that is, an unloaded synchronous motor, appears to find greatest favor. The application of this machine for this purpose is constantly increasing. The question of its advisability must be decided in each case, of course, by commercial considerations, the cost of the necessary equipment being balanced against the saving in losses, the saving in capacity of equipment and the improved satisfaction of operation with better regulation.

The power-factor of any synchronous machine can be altered by changing the degree of excitation of the fields. By connecting a synchronous motor to the line, the power-factor of the current taken from the line can be controlled to a certain extent through excitation of this motor. By increasing the excitation, the current may be made to lead the voltage. Since with the ordinary induction motor the current is a lagging one, every contribution to leading current must improve the power-factor, until it reaches unity. By varying the excitation the amount of leading current can be varied and the power-factor regulated within certain limits.

Whether it is preferable to operate such synchronous condensers in a substation at the end of a transmission line or to endeavor to have customers of a supply company make use of synchronous motors will depend upon local conditions. Since in most cases, however, it is difficult to control customer's installations, it is advisable for the sake of having control in its own hands for the supply company to have such apparatus in its own substations. Conditions are especially favorable where such a motor can be used to drive a fairly steady load. The most favorable condition perhaps is obtained by using a machine rated about 50 per cent higher than the actual load to be placed upon it. There will then be available a wattless current about equal to the energy current used.

The synchronous motor does not represent the only method of controling power-factor. In Europe the phase advancer, which is attached to the shaft of an induction motor, is being used for this purpose. This, perhaps, finds its most suitable application in private plants where it is desirable to correct the power-factor at the point where power is being utilized. A modification of this idea is found in the vibrator proposed by Dr. Gisbert Kapp.

Static condensers may also be used for this purpose, especially where it is desired to make local correction of power-factor, and the decreasing cost of such equipment may make it a commercially possible method in the near future. Since about 11 microfarads per kilowatt of load are necessary to entirely compensate a power-factor of 0.75, it will be seen that the expense of this method will be considerable.

The possibility of using a rotary converter to correct low power-factor through overexcitation has been suggested. This method, however, is not so feasible as might at first glance appear. Usually power-factor adjustment is not required upon circuits where rotary converters are installed. Supposing this to be the case, however, the change in excitation will affect the voltage on the direct-current side, especially on account of the drop in the reactance usually placed in the alternating-current leads. In case this voltage is automatically controlled, it is possible to vary the amount of leading current drawn from the supply mains without affecting the direct voltage. This will usually require special design, however, since the heating of the armature is increased when a leading current is created.

Another use of the synchronous condenser somewhat similar to the above and with equally good result in increasing the amount of power which may be transmitted over a given line, is to utilize it in maintaining a constant voltage at the receiving end of a transmission line. In this case, adjustment is made not to the point of highest power-factor, but to the point of definite voltage. Drawing a leading current from a transmission line tends to reduce the voltage drop along the line and consequently to raise the voltage at the receiving end. With a low load the drop of voltage on the line may even be made negative, so that the voltage at the receiving end exceeds the voltage at the supply end. Under ordinary circumstances, in order to maintain a constant voltage at the receiving end of the line the voltage at the generating end must be increased when the load increases. This produces a variable voltage at intermediate points which may be very objectionable. By using the synchronous condenser to maintain constant voltage at the receiving end it is possible to adjust at the generating end for constant voltage there and thus greatly improve voltage conditions along the entire line. This makes it possible to feed a higher load over the transmission line without a prohibitive variation in voltage and thus attains the same object as an improvement in the power-factor. In systems having long transmission lines where the cost of copper is one of the main items of investment, operation for constant voltage may be the best method of utilizing synchronous condensers.

It must be remembered that the advantages obtained with the synchronous motor are not without some cost, in addition to that represented by the initial investment. While the current taken by the motor is leading, it must have a sufficient energy component to provide for the iron and copper losses in its own armature, windage and friction, and in addition current must be supplied for its excitation. This energy consumption, while not large, is nevertheless very appreciable. Thus for a circuit delivering 1,000 kilowatts at a power-factor of 0.75 per cent, a machine would be required drawing 880 wattless kilovolt-amperes, in order to bring the power-factor up to 100 per cent. This would mean a motor with a capacity of 880 kilowatts, in which the losses would probably reach 60 watts when running loaded. At times of low load this loss would diminish, but it, in addition to interest on the cost of the machine, must be included in the estimate of expense for improving the power-factor.

SAFEGUARDING THE PUBLIC IN RAILROAD ELECTRIFICATION.

A praiseworthy campaign of education has recently been inaugurated by the New York, New Haven and Hartford Railroad for the protection of the public in the electric zone in southwestern Connecticut. It was planned by the company to energize the entire overhead system between Woodlawn and New Haven on or about May 15, and as the territory east of Stamford and Westport had not until that date received full electric service, it was felt by the management to be important to give the public some practical suggestions along the line of preventing accidents due to carelessness and the small boy's innate love for deviltry. To this end a great number of newspapers in the district were supplied with a well prepared article pointing out the results liable to follow tampering with the overhead systems by mischief makers, and in addition the company has been in communication with mayors, fire-department officials and other authorities in the municipalities between Stamford and New Haven, seeking their co-operation in trying to instill caution in the minds of the public and particularly to restrain the rising generation from imprudence in the vicinity of the tracks, catenary and feeder lines. The precautions suggested are capable of modification by central-station and transmission companies in many localities and in view of their technical accuracy and popular diction are reprinted in full on another page of this issue.

EQUIPMENT FOR INDUSTRIAL PLANTS.

The advantage of designing the electrical equipment for industrial plants at the time the building is laid out and before construction has started is pointed out in an article by Mr. H. C. Spillman in this issue. In this respect the factory building is no different from the residence, the store, the office, etc. In every case the best results from the utilization of electrical equipment can only be obtained when it is designed as an integral part of the building and when the wiring is so arranged that the outlets are found to be in the most convenient place when the time comes to attach current-consuming devices.

In the case of the factory, however, more is involved than proper provision of conduit capacity and outlets. The entire system should be decided upon in advance and not only the type of equipment and its location fully determined, but arrangements for distribution fully worked out. Where current is purchased it is frequently necessary to have a small substation upon the premises of the consumer, and unless space is provided for this in the original building plans, there is likely to be difficulty later through the compromise of efficiency and convenience to suit the conditions which are imposed by the completed building. Where a private power plant is to be installed, careful consideration is necessary in determining upon the most suitable voltage, etc.

In considering the power requirements, it is, of course, necessary to have the entire electrical drive designed and provision must then be made for losses and an estimate formulated as to the power which will actually be used. Mr. Spillman gives some data on this subject which are of special value on account of the scarcity of reliable information on this point.

The choice of control equipment, the method of mounting motors and various other details should all be decided upon in advance and then the electrical equipment can be installed as an integral part of the complete plant, and will not look like an afterthought, with the accompanying detriment not only to the appearance but probably to the efficiency and usefulness of the apparatus.

Electrical Supply Jobbers' Association.

The regular quarterly meeting of the Electrical Supply Jobbers' Association was held at the Hotel Chalfonte, Atlantic City, N. J., from May 12 to 14, 1914. About 65 members of the Association were present. Two executive sessions were held daily, beginning at 11 a. m. Tuesday, May 12. There were no open meetings. Much time of the meeting was devoted to a discussion of referendum instituted by the National Chamber of Commerce, relating to the pending Trade Commission Bill. The Association voted in favor of all propositions except No. 3. The question of the electrical trade's status in reference to rubber-covered wire was also discussed.

On Wednesday evening a dinner, entertainment and rejuvenation of the Jovian Order was held at the Hotel Rudolph. This was in charge of J. C. Vogel, statesman-at-large, together with R. L. Cunningham, stentor, and A. B. Young, comedian. These gentlemen were assisted by the Philadelphia Degree Team.

Among those in attendance were the following: H. C. Adams, Jr., W. J. Anderson, H. P. Andrae, A. I. Appleton, George N. Beatty and Mrs. Beatty, C. Baker, W. K. Beard, H. D. Betts, A. Hall Berry, Thomas H. Bibber, E. G. Bernard, W. S. Bissell, F. V. Burton, L. L. Brastow, H. G. Buckmeister and Mrs. Buckmeister, J. F. Bevins and Mrs. Bevins, James Brown, W. S. Brown, C. E. Browne, William K. Browne, J. A. Burke, S. A. Chase, J. H. Cook, Robert B. Corey, C. E. Corrigan, H. B. Crouse, S. B. Condit, Jr., H. H. Cudmore, W. G. Campbell, Judge T. M. Debevoise, W. M. Deming, V. R. Despard, L. O. Duclos, B. M. Downs, A. P. Eckert and Mrs. Eckert, G. W. Elliott, J. J. Eleson, W. R. Frazer, L. V. Garrison, L. V. Garron, William Gloeckner, R. D. Gloeckner, H. J. Gorke, E. C. Graham, H. S. Greene, E. F. Grier, Thomas G. Grier, G. B. Griffin, H. Griffin, A. L. Hallstrom, R. Howland and Mrs. Howland, Charles A. Harding, F. S. Hardy and Mrs. Hardy, N. G. Harvey, E. B. Hatch, W. R. Herstein, C. L. Hight, F. C. Hodgins, R. H. Harper, P. H. Hoover and Mrs. Hoover, J. H. Hughes, C. P. Hill, A. F. Hills, H. H. Hornsby and Mrs. Hornsby, H. O. Jones, E. A. Jenkins, J. Joseph, J. G. Johanneson, E. B. Kittle, C. H. Kelly, P. S. Klees, W. Kindner, W. W. Low and Mrs. Low, Ray D. Lillibridge, C. H. Litscher, W. J. Leveridge and Mrs. Leveridge, D. H. Murphy, H. P. Moore, F. D. Masterson, Shiras Morris, H. C. Moran, G. E. McGuire, J. R. McNaughton, S. F. McFedries, W. W. Merrill and Mrs. Merrill, M. McGraw, S. C. Nicholson, W. A. Oberlander, Percy Oblinger, W. H. Onken, Arthur Organ, Thomas O'Brien, Franklin Overbagh, H. T. Paiste, McKew Parr, A. E. Pollock, George L. Patterson, John Perry, A. D. Page and Mrs. Page, J. H. Parker, J. A. Pizzini, I. M. Post, F. S. Price and Mrs. Price, George W. Provost, W. T. Pringle and Mrs. Pringle, E. W. Rockafellow, James Richardson and Mrs. Richardson, J. H. Rogers, H. C. Rice, W. L. and W. T. Sinnot, L. A. Schwab and Mrs. Schwab, Charles P. Scott, B. E. Salisbury, W. S. Sisson, G. S. Smith, B. H. Scranton, Charles J. Stahl and Mrs. Stahl, Frank Stout, F. E. Stow, W. V. Stuart, A. S. Terry, W. R. Thomas, John M. Trumbull, J. D. Underhill, J. C. Vogel, F. D. Van Winkle, J. B. Ward, T. G. Whaling, James Wolff, M. B. Wheeler, E. W. Wilkins, E. Whittemore and Mrs. Whittemore, J. A. Worth, H. R. Worthington, H. E. Watson, and Elmer E. Wood.

Columbia School of Mines to Celebrate Founding of School.

The largest gathering of graduates of Columbia University in its history will be seen on May 29 when the alumni of the School of Mines meet on Morningside Heights to celebrate the fiftieth anniversary of the founding of the technical school. Invitations have been issued to all alumni of the university and the number of acceptances is larger already than for any previous celebration at the university. Elaborate plans for the entertainment of the guests have been made by the committee in charge, and the celebration will begin on the night of May 28 with a reception in the gymnasium followed by a dance. On the morning of May 29, there will be a convocation in the gymnasium at which President Nicholas Murray Butler will preside. J. H. Vam Amringe, ex-dean of the college, will present candidates for honorary degrees, and there will be addresses by T. A. Richard and Henning Jennings. In the afternoon the first lecture in the Chandler Foundation will be given by Dr. L. H. Baekeland; and in the evening there will be a banquet at the Waldorf-Astoria Hotel, at which well-known alumni will speak and at which there will be many novel and enjoyable features.

Utah Society of Engineers.

The regular monthly meeting of the Utah Society of Engineers was held on May 15, in Consolidated Music Hall, Salt Lake City, Utah. S. E. Park, engineer of the Utah Gas & Coke Company, of Salt Lake City, read the principal paper of the evening on the subject "Coal Gas Production."

Annual Meeting of American Institute of Electrical Engineers.

The annual meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on the evening of Wednesday, May 20. The tellers of election made their report, as the result of which the following officers were declared elected for the year beginning August 1.

President: Paul M. Lincoln, Pittsburgh, Pa.

Vice-Presidents: F. S. Hunting, Fort Wayne, Ind.; N. W. Storer, Pittsburgh, Pa.; Farley Osgood, Newark, N. J.

Managers: Frederick Bedell, Ithaca, N. Y.; Bancroft Gherardi, New York City; J. H. Finney, Washington, D. C.; A. S. McAllister, New York City.

Treasurer: George A. Hamilton.

The Board of Directors presented a report covering the activities of the Institute during the year ending April, 1914, and showing the finances to be in good condition.

A technical session was then held under the auspices of the Committee on the Use of Electricity in Marine Work. The first paper was by H. L. Hibbard, and was entitled, "Electricity, The Future Power for Steering Vessels." This was discussed by George A. Pierce, Jr., Mathias Pfatischer, Maxwell W. Day, and R. A. Beekman.

H. J. Mauger then presented a paper entitled "The Future of Electric Heating and Cooking in Marine Service." This was discussed by W. S. Hadaway and E. F. Dutton. A full report of the technical session will be given in our next issue.

New York Electrical Society Meeting.

At the meeting of the New York Electrical Society to be held on the evening of May 25, at Havemeyer Hall, Columbia University, there will be two addresses. L. A. Bauer, director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, will lecture on "The Magnetic Survey of the Whole Earth." John C. Porte, lieutenant in the Royal Navy, will give an address on "Aerial Navigation," with especial bearing upon the Rodman Wanamaker transatlantic flight.

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Massachusetts street-railway companies have petitioned for legislation to put them on par with steam roads in issuing bonds. Under the present law a street railway whose stock is selling below par is denied the right to issue additional stock and in consequence is unable to secure money for development.

OF THE UNIVERSITY

S. B. Way.

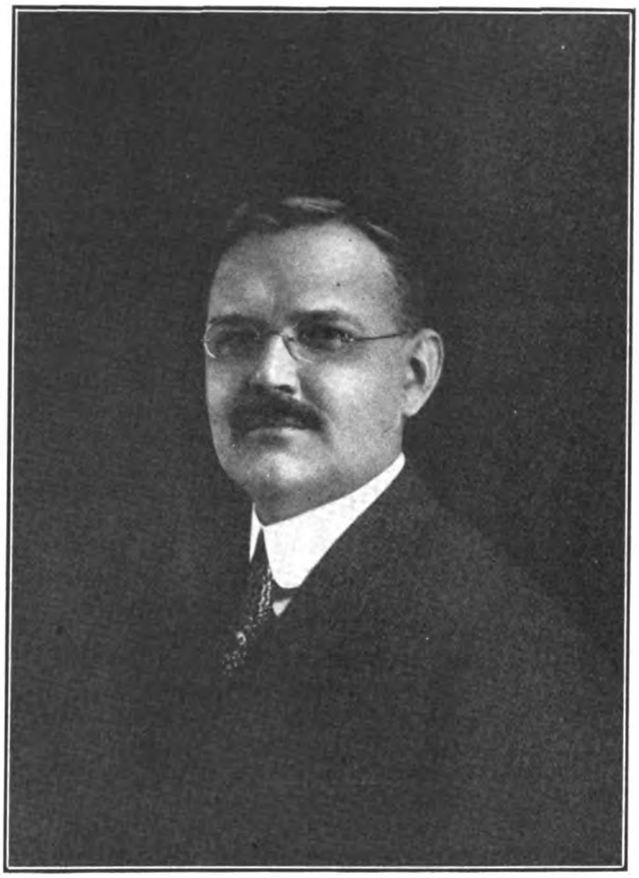
The opinions of the pessimists to the contrary, there appears to be today just as great an opportunity as ever there was for men of ability to advance rapidly in their chosen professions, providing they are endowed with the mental, physical and moral attitudes which make for success. In that department of electrical engineering that has to do particularly with central-station development, it has been demonstrated time and time again that the avenue of approach for the hard-working, intelligent and courageous man is not only wide open, but lined with helping hands extended to those who make the effort to travel its length, unknowing what the end may bring.

In the short span of 16 years it is something to have progressed from the position of draftsman to that of ranking officer in one of the largest public-utility corporations in the country today.

All of which is apropos of the election of S. B. Way to fill the position of general manager of the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company. The selection ot Mr. Way to fill this important position is a well merited recognition of sterling qualities and ability, and one that meets with the hearty approval of every employee of the company and carries with it the sincere and cordial wishes for continued success from a host of friends and acquaintances throughout the country.

Mr. Way is 39 years old. He received his technical education at Drexel Institute, Philadelphia. After graduation he began his business career in the employment of the Electric Storage Battery Company of Philadelphia, as a draftsman, shortly thereafter becoming an erecting engineer for the company. He left that organization in 1898 to accept a position as electrical superintendent with one of the relatively early electric lighting and power companies in St. Louis, which later on became the present Union Electric Light & Power Company, the principal electric utility of that city. Mr. Way remained in the service of the Union Company at the head of the largest department of the organization until he went to Milwaukee, in November, 1911, as assistant general manager. Early in 1912 he was elected vice-president of the company.

Mr. Way is also actively interested in the management of the Wisconsin Gas & Electric Company, of Racine and Kenosha, the Watertown Gas & Electric Company, of Watertown, Wis., the Burlington Light & Power Company, of Burlington, Wis., and the North Milwaukee Light & Power Company, of North Milwaukee, Wis. These properties, with the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company constitute the Wisconsin Edison Company, one of the big underlying properties of the North American Company. In the absence of James D. Mortimer, president of the company, Mr. Way will be ranking officer.



S. B. Way,
General Manager of the Milwaukee Electric Railway & Light Company.

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Philadelphia Section Notes.

The Philadelphia Electric Company Section, National Electric Light Association, set aside Monday evening, April 20, as "Philadelphia Night." The speaker of the evening was Edward J. Cattell, statistician of the City of Philadelphia, and the title of his discourse was "Philadelphia, Past and Present."

The April meeting of the Accounting Department Branch was held on April 14. It was strictly for jollification and was designated as "Ladies' Night." A vaudeville and motion-picture bill of 12 numbers was presented, the feature of the evening being a "Mock Trial" by members of the Branch. The music of the evening was furnished by the Peconela Orchestra under the leadership of Joseph G. Johnson.

A combination meeting of the Engineering and Commercial Departments was held on the evening of April 27. The paper of the evening was "The Industrial Future of Philadelphia" and was delivered by George S. Webster, chief engineer and surveyor, Department of Public Works of Philadelphia.

The April meeting of the Meter Department Branch was held on the evening of April 3. "Modern Astronomy" was the topic of the evening. The paper was delivered by Harry J. Malgrave, Jr. The usual luncheon was served and music furnished by the orchestra.

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Railway Convention to Be at Atlantic City.

The 1914 Convention Committee of the American Electric Railway Association, acting with the Committee of the American Electric Railway Manufacturers' Association, has decided upon Atlantic City as the location for the 1914 convention of the Association. The dates are October 12 to 16.

The decision of the Committee was arrived at only after a very careful investigation of several other suggested locations. Boston and Washington were the leaders among the other applicants, but neither of these cities could furnish the accommodations required at the time required

The Association's conventions are growing so large that both from the standpoint of hotel accommodations and a place to house exhibits, available locations are each year growing fewer. It is known that Atlantic City can take care of the conventions and the history of the Association shows that conventions held in Atlantic City have been uniformly successful. Last year's arrangement at Young's Million Dollar Pier was admirable and with the prospect of the use of even more floor space this year, it is necessary that ample room be provided for the exhibits of manufacturers.

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Telephone cables containing as many as 900 pairs of wires are now put into about the same size of lead sheath originally used for 50-pair cables.

Philadelphia Section, Electric Vehicle Association.

The May meeting of the Philadelphia Section, Electric Vehicle Association of America, was held on May 13 in the Philadelphia Electric assembly room. The paper of the evening was by F. E. Whitney, entitled "Some Investigations of Electric Vehicle Tires."

The presentation of this instructive paper was illustrated with lantern slides and practical demonstrations of the methods of test. Exhibitions of several kinds of tires were made. The point was brought out that the most efficient tire was the one that embraced in a moderate way all of the good points desired, namely: long life, resiliency, toughness, elasticity, etc. It did not always turn out that the most resilient tire was the one that lasted longest or gave in the end the most economical results. Mr. Whitney stated that now he, representing the vehicle manufacturers, had given to the tire manufacturers the requirements asked for; it was up to the tire manufacturers to produce the desired result. A short discussion followed the reading of the paper.

Chief Walker of the Department of Public Safety was present and entertained the meeting with his experiences in the introduction and use of the electric fire engines in the department over which he has supervision. He told how in a number of cases, the electric engine had broken all records formerly made towards getting to a fire after an alarm was sounded. One case in particular where the former time for a run had been 22 minutes, the electric apparatus had made the run in 11 minutes and 7 seconds. He stated that his experiences had demonstrated that the storage-battery electric engine had proven perfectly practicable in both good and bad weather for fire-department purposes. Last winter when the snow was up to the level of the top of the fire plugs, two-horse-drawn engines had been unable to get to the plug, while the electric engine pulled right up to it without trouble. There are at present three electric fire engines, two high-pressure hose carts and two gasoline-electric trucks in the Philadelphia Fire Department service.

On motion, a committee was appointed to visit the Philadelphia postmaster for the purpose of calling his attention to and endorsing the use of electric trucks in the parcel-post service.

Electric Vehicle Association Rapidly Growing.

At the time of the last convention in Chicago, the Electric Vehicle Association of America had 437 members. At this writing over 650 members are enrolled, an increase of over 200 members, or at the rate of about 600 a year. It appears that by the time of the next convention, to be held in Philadelphia during October (the exact date to be announced shortly) that the 1,000 mark will have been reached—the membership being better than doubled in one year!

It will be interesting to note also that last year only two sections (New England and Chicago) existed. Now sections are organized in New England, Chicago, Philadelphia, Washington, Cincinnati, and San Francisco, the last two sections being very recently added. It is expected that by the time of the Philadelphia convention the present six sections, representing a growth of 300 per cent in about six months, will have increased to about twice that number.

Meeting of Chicago Electric Club.

R. E. Goodell, in charge of the Chicago Bureau of Public Efficiency, was the speaker at the meeting of the Electric Club of Chicago on May 14. Mr. Goodell outlined the work of the Bureau, which is maintained under the auspices of the City Club and which is financed by private subscription. He said the Bureau was really established to carry on the work started by the Merriam Commission of the Chicago City Council, which automatically went out of existence in 1911. The Bureau has made extensive investigations of the affairs of the county administration and has published reports on this subject. General investigations have also been made and reports submitted on the Municipal Court Act; the proposed purchase of voting machines; report on the growing cost of elections; and several reports on the Park Commissions. Concerning the latter, Mr. Goodell stated that these Boards of Commissioners were in a measure duplicating each other's work, with the resultant financial burden on the tax payers. Investigations also disclosed the fact that there are 19 separate and distinct taxing bodies having the power to levy taxes on the citizens of Chicago. Mr. Goodell explained that the Bureau is governed by a Board of Trustees appointed by the City Club and all official reports must be passed upon by this body.

Utah Electric Club.

At the regular luncheon meeting of the Utah Electric Club held at Salt Lake City, Utah, on May 14, Stephen H. Love, president of the Commercial Club Traffic Bureau of Salt Lake City, delivered an address on the subject "The Regulation of Public Utilities." Mr. Love has led the fight for the reduction of freight rates to the intermountain territory before the Interstate Commerce Commission, and has an intimate knowledge of this important subject.

Meeting of New England Section.

The spring meeting of the New England Section of the National Electric Light Association was held at the New American House, Boston, Mass., Friday evening, May 8, with an attendance of over two hundred members and guests.

The first speaker of the evening was Frederick P. Fish, of Boston, who has been in the electrical business since its beginning. He spoke of the early days when what is regarded now as apparatus of so small capacity as to be entirely inefficient and unusable was thought to be the largest that could possibly be manufactured. From his description of these small beginnings Mr. Fish traced the development up to the great enterprises of the present day and spoke of their importance in our economic development. His next step was to emphasize the economic efficiency of the well regulated monopoly in the electrical business and referred in complimentary terms to a number of the public-service commissions, of which the Massachusetts State Gas & Electric Light Commission is the oldest.

Continuing on this subject, he said in part: "You cannot have two like companies in the same vicinity without waste, and where there is waste it is generally at the expense of the common people. Thus a corporation must have exclusive rights in a district, for the best interests of the people as well as for the best interests of the corporation."

Mr. Fish maintained that large public-service corporations should be encouraged by the people and the government, instead of being restricted and in many cases tampered with until they were ruined. He predicted that if the people did not soon begin to realize the value of the large public-service corporations and treat them fairly, many of them would be in the condition of the Boston & Maine and the New York, New Haven & Hartford railroads. Such failures must be paid for with the money of the common people, according to Mr. Fish, for he said that they are the persons who furnish the greater amount of the capital for these large corporations.

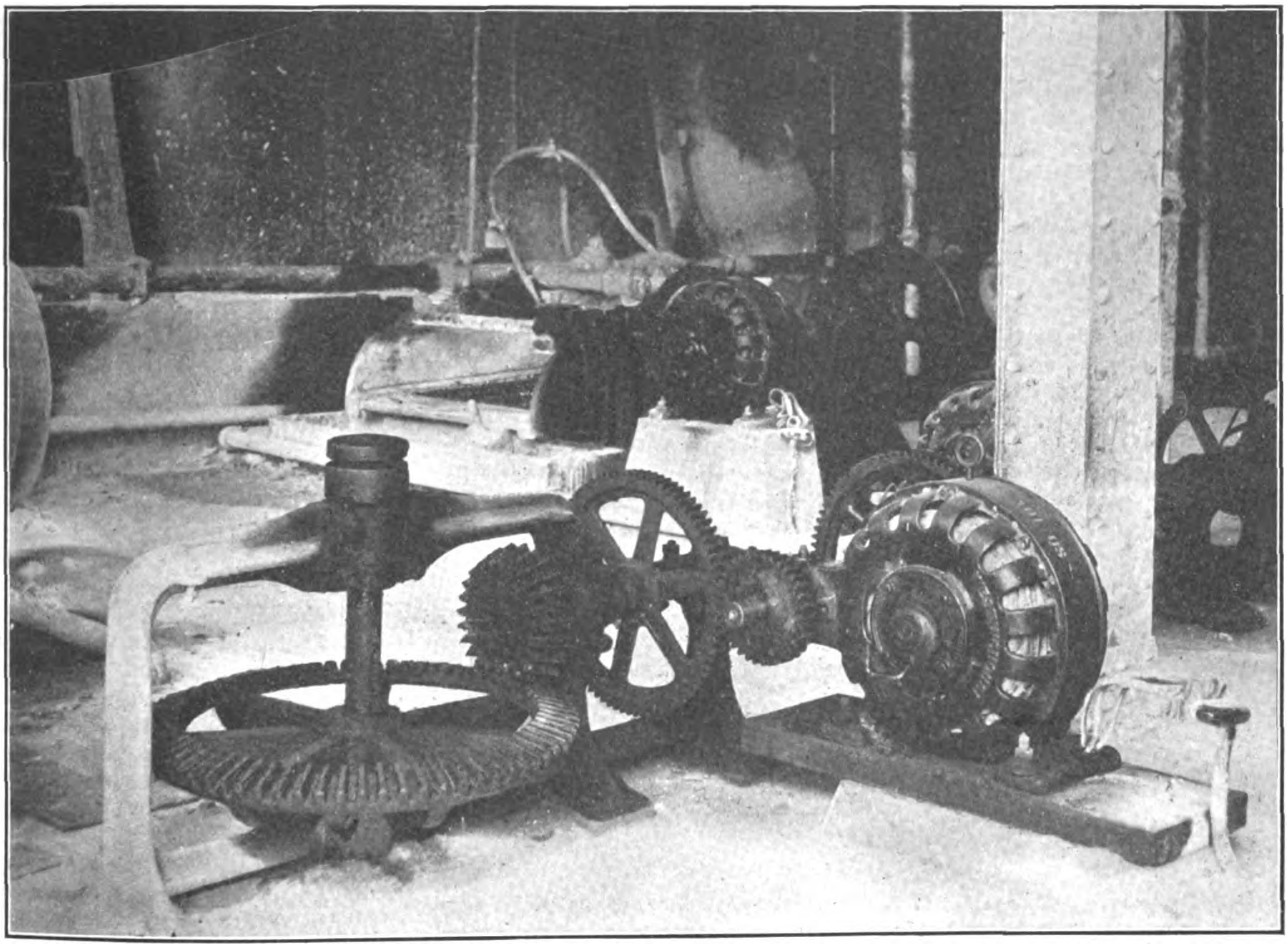
Kansas City Electric Club.

A frolic will conclude the year's work of the Kansas City Electric Club. While the last business meeting of the organization will be held on May 26, a picnic will take place on June 6. The Soldiers' Home and its spacious grounds at Leavenworth, Kans., have been selected as the scene of the outing by A. P. Denton, of the Denton Engineering Company, who is in charge of arrangements.

Electricity in Brick Making.

Although the extent of the economies which can be effected by the application of central-station service to brick-making plants depends to some degree on the method of drying employed, there are comparatively few plants that cannot profitably use electric drive with purchased power. Data on drying methods and motor requirements are given in this article.

While the application of electric power to industrial service is comparatively recent, it has already won recognition and is making rapid progress. Manufacturers of steel were the first to recognize and make use of the considerable advantages obtained by driving machinery electrically, and this industry now consumes more electrical power than any other. Since the first moves toward the industrial application of electricity were made in steel mills, other industries have followed the example and now practically every recognized industry, cement, textile, mining, metal-working, clay-working, etc., use electrical power for the manufacture and transportation of a very large proportion of its product.



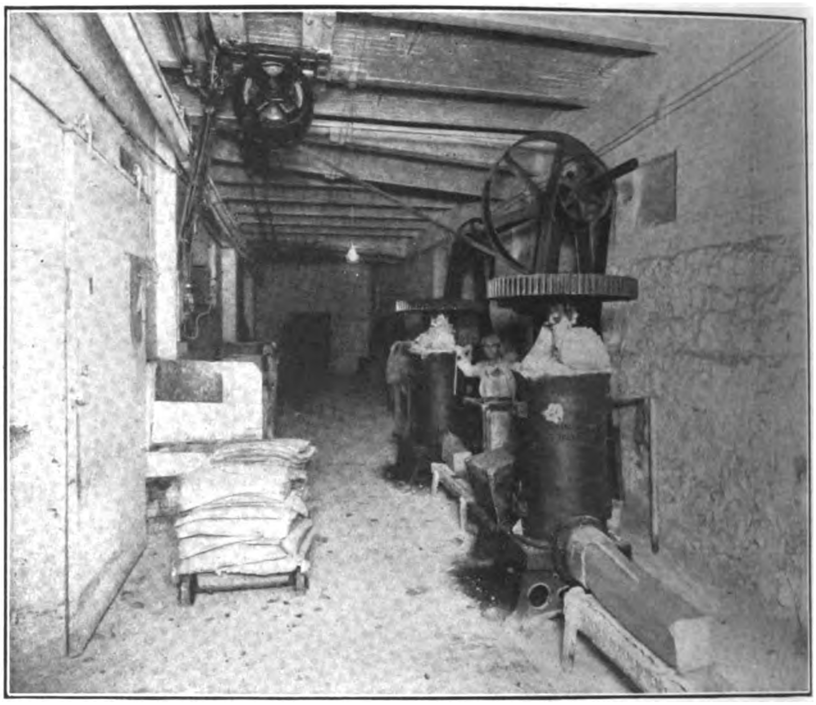
Back-Geared Motors Driving Agitators and Sifters in Brick Plant.

The manufacture of brick and tile is probably the oldest of all industries, dating back to early Biblical periods. It would seem, however, that the antiquity of the industry had not brought about a complete knowledge of the possibilities of scientific manufacture and management, for it was not until a few years ago that the clay-working industry departed from methods which had been in use for hundreds of years. The first steps toward electrically operated clay-working plants, and therefore the possibility of economically operated plants, were probably made because of the solicitations of central power plants desiring to sell power. It has been upon the service and publicity of central power plants that the extension of electric drive in clay-working plants has been dependent. This has been because of the fact that the power requirements of such plants are usually of such amounts that a power plant, generating a small amount of power for one consumer cannot make it as cheaply as a central power company, generating a large amount of power for a number of consumers, can sell it.

Within the past few years, the territory served by central power companies has increased to a large extent, and in most localities the clay-worker, with a plant making 25,000 to 100,000 brick per day, can buy electrical power at a rate which will allow the manufacture of product more cheaply than can be secured by any other means of production.

The selection of the means of securing power for a large brick plant, making several hundred thousand brick per day, or a smaller one, which is located so that it cannot obtain a favorable power rate from a central station, is problematical and one which needs complete investigation as to railroad facilities, water, coal, and cost of attendance, before making a decision as to power installation.

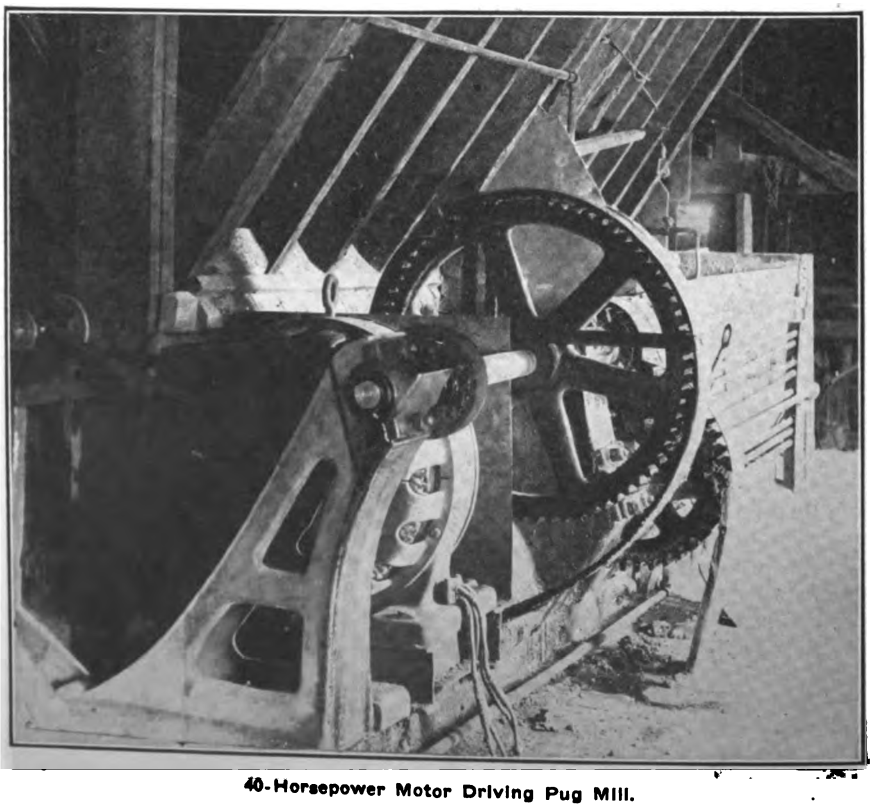
In the consideration of the equipment of an existing plant, which has already some other method of drive



Motor Driving Two Pug Mills In Brick Plant.

than electrical drive, there are a number of factors that require careful consideration in comparing power costs. In plants operating with permanent kilns, the waste heat from which can be utilized for drying, electric power offers advantages over the central engine drive in many cases. One saving in particular, is in regard to the operation of the blowers and exhaust fans which have to be in service continuously 24 hours a day when there is a charge in the kilns. As the main portion of the plant is operated only during the day time, or approximately 10 hours, it is quite an expense to provide steam power for the engines to drive the blowers and fans the remainder of the 24-hour period. With electric drive, however, this work can be accomplished at a minimum expenditure of energy and cost, as all departments of the plant, with the exception of the kiln department, can be shut down during the greater portion of the time. When temporary kilns are used, it is necessary to provide steam for the drying process and consequently it is necessary to operate a portion of the boiler plant during the period when the other portions of the plant are idle. This condition necessarily reduces the advantage offered by motor drive to some extent, but even in this case motor drive will compare favorably with steam engine drive from a power cost standpoint, and the other advantages as noted previously result in increased output at lower costs.

With the installation of a central power plant and temporary kilns, the plant is subject to the same disadvantages as noted above, that is, a portion of the boilers have to be in operation when the remainder of the plant is shut down for drying purposes. This disadvantage, however, is about on an equal basis no matter what method of drive is selected, and when the advantages for electric drive, as noted below, are taken into consideration, any other method of drive than electric drive is seen to be working at a disadvantage.



40-Horsepower Motor Driving Pug Mill.

The clay-working industry is similar to many others in that the future depends largely upon the economies and refinement of manufacture.

The many advantages and the great resourcefulness of electricity have been important factors in making progress along these lines and afford:

(1) More economical arrangement of plant. By the application of individual motors, the various departments of the plant can be located and arranged to the best advantage for operating without the limitation of arrangement as imposed by any other method of drive which requires belt connection.

(2) Increased ouput. When the various machines or departments are operated by individual motors there is a greater assurance of continued operation as compared with a central engine drive, in which case, engine trouble means a shut down of the entire plant. Motors also maintan practically a constant speed throughout their operating range, which results in an increased production as compared with a plant driven by a single engine where the speed varies not only with the boiler pressure, but also with the variation in load. Also the most practical method of drive for auxiliary apparatus such as brick-setting machines, haulage locomotives and other traveling machinery is by means of electric motors.

Electric motors are of simple construction and even for the most severe classes of service are very durable. Due to the fact that they can be applied at the closest position relative to the driven machine, the connecting apparatus such as belts, gears, etc.,

Motor Driving Pumps in Brick Plant.

are reduced to a minimum. Fuses or circuit-breakers are installed in the motor circuits as a protection against severe overloads, such as caused by clogging of the various machines which might cause damage to the motor and the driven apparatus. The possibility of shut downs, due to machine breakage, is thereby greatly reduced.

Clay possesses the characteristic property of plasticity by virtue of which, when subjected to a deforming pressure and the pressure removed, it preserves the shape of the mold. The degree of plasticity can be varied by tempering or adding in suitable quantities water and sand, sawdust, ashes or other inert material. The further manipulation then falls under one of four general methods: hand molding, stiff-plastic, semi-plastic or dry methods, each of which, with the possible exception of the first, permits of the advantageous application of electric power. The stiff-plastic process is generally regarded as the best and most economical where the nature of the raw clay makes its use possible.

In up-to-date plants equipped for electrical operation throughout, a great variety of motor applications is found. The clay or shale is excavated by means of electrically operated shovels and loaded into transfer cars hauled by an electric yard locomotive, to stock piles where, under action of rain and frost, it is weathered and partially disintegrated. From the stock piles the clays, especially the harder shales, are transferred to the motor-driven roll crushes or dry pans, and screens, and then by cup conveyors to the pug mill. From the pug mill the now thoroughly mixed and tempered mass is delivered to the auger brick machines where it is forced through dies carefully designed to produce a true cross section with maximum uniformity of density, in the form of a continuous rectanglar column. A frame carrying tightly strung piano wires or suitable knives rotating at the proper speed, cuts the issuing column of clay into standard sized blocks or bricks.

The green bricks are carried by a belt conveyor, which moves somewhat faster than the column issuing from the auger and consequently separates the bricks slightly, to the represses where they are forced into molds and subjected to heavy pressure. This operation smooths the surface and squares up the corners. The brick is now ready for the drying house and kiln.

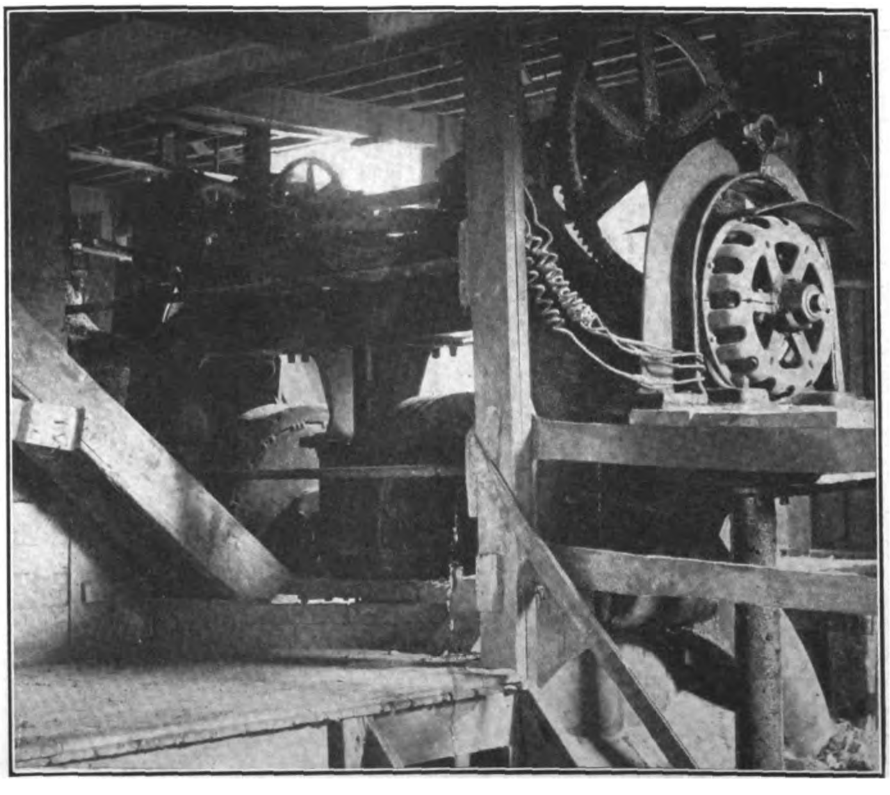
From the central-station standpoint, the opportunity to sell power to brick plants depends almost entirely on the method of drying employed.

In addition to sun drying there are three general methods used, depending to some extent upon the condition of the clay. These three methods are steam drying, waste heat and direct heat.

If the drying of the brick is to be done by steam, generation of energy at the plant often proves more economical than purchased energy, although several factors other than actual coal consumption must be considered. Numerous plants, however, have found it profitable to purchase power, although using steam for drying.

Without doubt the most economical and efficient methods of drying brick is the hot air system which uses waste heat from the kilns. Motor-driven fans draw the hot air and gases from the kilns to the dry rooms. Usually an auxiliary furnace is employed with this system.

When this method of drying is employed, central-station power will, in every instance, effect a considerable saving. The accompanying table shows the results of tests conducted on four



40-Horsepower Motor Driving Dry Pan.

drying plants, two using exhaust steam and two using waste heat. The increased efficiency of the latter is at once apparent.

Regardless of methods of drying, however, another factor which dictates the adoption of central-station power is the temporary nature of most brick plants. Usually, when the workable supply of clay is exhausted, plants shift their location to more desirable points. If this policy is adhered to it would, of course, be impossible to maintain an isolated plant with any degree of efficiency. Also, the actual cost of foundations, boiler setting, etc., would in many cases equal the cost of purchased power.

The machinery required and the methods adopted in the manufacture of bricks are governed largely by the nature of the raw material available and the desired character of the finished product. For the most part, a careful selection from the great variety of standard motors built for general industrial service will fully meet the requirements of clay-working machinery. The range of so-called standard motor design is so great, however, that when new installations are contemplated, it is often to the advantage of the customer to take up with the manufacturer the requirements of each proposed application.

In general alternating-current induction motors fully meet the requirements of clay-working machinery. They are of simple construction with large overload capacity and have no wearing parts except the bearing or slip rings, which in every case are of ample design. The particular form of induction motor to use will depend upon the capacity of the distributing system and service characteristics, including such considerations as frequency or starting, starting torque, continuous or intermittent operation, reversal, etc.

For dry pans, sanders, conveyors, fans, bucket elevators and other machines with similar requirements the standard induction motor with short-circuited bar-wound rotor is usually entirely satisfactory. Each of these applications involves continuous duty at constant speed together with relatively easy starting conditions and no occasion for reversal of direction of rotation. On the other hand, for pug mills, augers, tempering wheels, hoists, excavating shovels, etc., where frequent starting and reversal variable-speed requirements and excessive starting torque are encountered, the induction motor with phase-wound rotor and external secondary resistance, is in general recommended. This form of motor with variable secondary resistance is designed to secure maximum torque with the least possible shock to the supply system when starting under full load.

When for any reason direct-current apparatus must be used, motors with compound windings should always be specified, except for driving fans, for which service shunt-wound motors are suitable. Where the service requirements are similar to those outlined for the induction motor with short-circuited bar-wound rotor, the direct-current motor should have the standard amount of series winding; where the induction motor with phase-wound rotor would be suitable for alternating-current service, the direct-current motor should have approximately 40 per cent of series winding and commutator and bearings should be properly protected from grit and flying mud.

If motors are geared or belted direct to any of the large machines without the use of friction clutches they should be designed for a high starting torque since when starting any of these machines full of clay a very large torque is required. Either induction or direct-current motors may be designed to meet these requirements. If friction clutches are used the motors may be started light and the load thrown on later, but this introduces another piece of apparatus subject to wear and trouble and should be avoided where possible.

The direct-connected motor drive makes the most compact and efficient layout, but care must be taken to see that none of the laws of mechanics are violated; that is, that the foundations are solid, that gears are not run at too high speed, that they are well supported in bearings and rigid, and that the motor is not subjected to severe vibrations. The motors are not injured by the clay and dust, and if the mechanical application is well made a satisfactory drive is assured.

As to the horsepower required to drive the various machines used in the brick-making industry, the following motor sizes are the average taken from several similar installations all of 100,000 bricks capacity per day.

Machine.	Horsepower.
Electric locomotive	30
Hoist	20
Dry pan	30
Elevator	10
Pug mill	50
No. 65 auger	90
Repress	30
Transfer car	10
Brick-setting crane	25

Additional data are given in the following table:

Machine.	Horsepower.
No. 1 Horizontal clay steamer, 20 by 10-inch	10
Eagle D. M. brick press	5
No. 42 D. M. brick press	5
R. 2 brick repress	5
No. 33 roofing tile press	8 to 15
No. 39 roofing tile press	5
No. 46 roofing tile press	4
American Clay Machinery Company.	
Model.	
B-4 mold press-brick machine	10 to 12
C-4 mold press-brick machine	10 to 12
D-3 mold press-brick machine	10 to 12
D-4 mold press-brick machine	10 to 12
2 and 3 mold press-brick machine	8 to 10
American Clay Machinery Company, Auger Brick Machines.	
No. 1 giant	40 to 60
No. 2 giant	25 to 30
No. 6	15 to 20
No. 8	25 to 35
No. 10	30 to 50
No. 15	75 to 100
No. 41	30 to 50
No. 43	35 to 40
Acme	20 to 25
Centennial	20 to 30
Mascot	10 to 12
Special Giant	75 to 100

Accurate figures covering cost of electrical operation are difficult to obtain owing to the widely varying factors influencing production. Records from several plants with a daily capacity of from 50,000 to 100,000 soft-mud sand-molded bricks, indicate a fair average of 15 to 20 molds of six bricks each per minute or from 90 to 100 bricks per kilowatt-hour for all electrical power consumed. Plants using the stiff-plastic method show approximately the same output per kilowatt-hour energy expended in brick machines proper. One plant of 156,000 daily capacity shows a power consumption of 1,700 kilowatt-hours per day for its auger brick machines. Another plant, with a daily capacity of 200,000 common bricks, shows for two successive months an average monthly output of 4,700,500 bricks at an average expenditure of 45,600 kilowatt-hours in driving its auger machines. Where the change from steam engine or other form of mechanical power has been made, an estimated saving in operation expense of from 20 to 30 per cent has often been effected.

While the total power required, including auxiliary devices, varies from 12 to 18 kilowatt-hours, a conservative estimate of power required by pug mills and augers is about 1.5 horsepower per 1,000 bricks per 10-hour day, or 11 kilowatt-hours per 1,000 bricks.

Data on several typical brick-making plants purchasing energy from central-station companies are given in the accompanying sheets.

	Steam Dryer, Natural Draft.	Steam Dryer, Forced Draft.	Hot Air, Natural Draft.	Hot Air, Draft Forced
Capacity of dryer (bricks)	390,096	395,280	175,560	544,3
Brick dried in 36 hours	373,000	395,000	219,000	36
Outside temperature—Fahrenheit	33°	20.5°	35°	34
Temperature of emergent air—Fahrenheit	121°	154°	104°	12
Average mean temperature of dryer	106	119.5	88.80	11
Average relative humidity, per cent	29	26	70	67.1
Average grains of moisture per cubic foot	15.5	16.9	14.2	[illegible]
Volume in cubic feet	78,678	112,028	126,595	537,156
Average moisture taken from brick, ounces	11	12.5	13	......

Brick-Making Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Keystone Clay Products Company, Greensburg, Pa. This is a six-kiln brick plant with a capacity of 60,000 bricks per day. The average daily output is 28,000 brick. Running hours per week, 60. (The pan and pug mills are operated approximately 48 hours per week.) Group drive.

Total connected horsepower, 215. Number of motors installed, 6. Average kilowatt-hours per month, 12,664.

Kilowatt-hours consumption for 12 months: January, 1,897; February, 1,593; March, 1,745; April, 2,156; May, 13,970; June, 1,782; July, 17,653; August, 19,689; September 24,731; October, 27,917; November, 13,970; December, 24,870.

Load-factor, 11.8 per cent; operating-time load-factor, 22.6 per cent.

The average total electric energy consumption per 1,000 brick is 26.4 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed withphase, 60-cycles, 220-volts. The motors are of the squ their respective drives. The supply source is two-irrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	40	840	Geared to a nine-foot dry pan and belted from extension shaft of dry pan to a 40-foot bucket conveyor.
1	40	840	Geared to a nine-foot dry pan and belted from extension shaft of dry pan to a 40-foot bucket conveyor and a 50-foot by 24-inch belt conveyor.
1	40	840	Geared to a No. 51 pug mill.
1	15	1,120	Belted through countershaft to a 140-inch blower. Speed 216 revolutions per minute. (Supplying draft for ovens.)
1	5	1,700	Belted to a 72-inch disk fan.
1	75	685	Geared to a No. 1 Giant brick auger (capacity 6,000 per hour). From the countershaft of brick auger is belted a 30-foot shaft (four hangers) which drives an 18-brick automatic cutter (three belt conveyors, 6-foot, 25-foot and 50-foot respectively), and a 10-foot bucket conveyor and repress.

All brick-making machines were supplied by the American Clay Machinery Company. Energy is supplied by the West Penn Electric Company.

Brick manufacturing plant having an average yearly output of 9,000,000 bricks. Plant operates 54 hours per week except during the months of December, January and February, when no work is done.

Total connected horsepower, 100. Total number of motors installed, 1. Average kilowatt-hours per month, 17,810.

Kilowatt-hour consumption for 9 months: May, 17,010; June, 15,600; July, 19,600; August, 18,600; September, 19,280; October, 18,280; November, 14,320; March, 17,520; April, 21,340.

Load-factor, 32 per cent.

The approximate electrical energy consumption per 1,000 bricks made is 21.3 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	100	580	Belted to a line shaft driving one nine-foot dry pan; one clay elevator; one E. M. Freeze Company size L, brick machine, capacity 3,000 bricks per hour; and one cutting table.

Manufacture of brick and tile products. Group drive. Running hours per week, 60.

Total connected horsepower, 60. Number of motors installed, 1. Average kilowatt-hours per month, 8,399. Average kilowatt-hours per month, per connected horsepower, 139.

Kilowatt-hours per month for 12 months: January, 7,870; February, 9,530; March, 13,070; April, 11,850; May, 12,050; June, 10,150; July, 6,010; August, 5,350; September, 4,000; October, 9,500; November, 9,720; December, 1,680.

Load-factor, 25.7 per cent; operating-time load-factor, 53.8 per cent.

The average electrical energy consumed per 1,000 bricks made is 11.2 kilowatt-hours.

MOTOR INSTALLATION

The motor installed in this plant is a 60-cycle, three-phase, 2,080-volt machine.

No.	Horse-power.	Speed R. P. M.	Application.
1	60	720	Belted to a line shaft driving one nine-foot, Frost Manufacturing Company's dry pan; one Chisholm & Boyd mixer; one six-mold brick machine, capacity, 30,000 bricks per 10 hours; and one 2,000-pound hoist elevator and conveyors.

Brick-Making Data—Sheet No. 2.

Pressed-brick manufacturing plant having an average yearly production of about 8,000,000 bricks. Plant operates 60 hours per week.

Total connected horsepower, 60. Total number of motors installed, 3. Average kilowatt-hours per month, 4,949.

Kilowatt-hour consumption for 12 months: January, 4,000; February, 1,940; March, 2,600; April, 5,000; May, 2,708; June, 5,346; July, 5,592; August, 5,680; September, 6,100; October, 4,350; November, 6,920; December, 2,905.

Load-factor, 15 per cent; operating-time load-factor, 31.8 per cent.

The approximate electrical energy consumption per unit of output is 0.00707 kilowatt-hour.

MOTOR INSTALLATION

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,200	Belted to an American No. 4 blower.
1	5	1,200	Belted to a line shaft driving one small planer; one small drill press; and one emery wheel.
1	50	850	Belted to line shafting driving one four-mould Boyd brick press, capacity 2,300 bricks per hour; and one eight-foot dry pan with elevator.

This plant has been motor driven for three years without a day's loss due to motor power. Energy is supplied by the Enid Electric & Gas Company.

Brick-making plant having an average output of 6,000 bricks per hour. Plant operates 45 hours per week, 8 to 9 months per year.

Total connected horsepower, 185. Total number of motors installed, 3. Average kilowatt-hours per month, 12,200.

Kilowatt-hour consumption for 7 months: May, 20,360; June, 14,310; July, 99,420; August, 11,910; September, 9,000; October, 4,300; November, 110.

Load-factor, 12 per cent.

MOTOR INSTALLATION

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
1	100	850	Belted to a line shaft driving one E. M. Freeze Company Class 1 pug mill; one Freeze brick machine; one Freeze rotary cutter, size No. 20 one belt conveyor, 10-inch belt, 100 feet long, speed, 300 feet per minute; and one incline belt conveyor, 10-inch belt, 45 feet long, 8-foot lift, speed 300 feet per minute.
1	75	850	Belted to a line shaft driving two Thomas Carlin 9-foot dry pans, 150 revolutions per minute; two bucket elevators, buckets 6 by 9 by 6 inches on 28-inch centers; one bucket elevator, 25-foot lift, buckets 6 by 9 by 6 inches on 15-inch centers.
1	10	1,120	Back-geared motor, driving one 200-foot belt conveyor, 14 inches wide, 475 revolutions per minute.

Dry Pressed Brick Company, Sandpoint, Idaho. Manufactures pressed brick. Group drive. Running hours per week, 60.

Total connected horsepower, 117.5. Number of motors installed, 3. Average kilowatt-hours per month, 13,947. Average kilowatt-hours per month, per connected horsepower, 119.

Kilowatt-hours consumption for five months: April, 15,150; May, 18,280; June, 16,260; July, 15,780; August, 4,328.

Load-factor, 26 per cent; operating-time load-factor, 45.8 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60-cycles, 220-volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	75	720	Belted to a line shaft driving one Andrews brick press, No. AA-110, capacity, 1,800 bricks per hour; one Andrews brick press, No. AA-114, capacity, 1,840 bricks per hour; one clay mixer and feeder; one Scott pulverizer; one 6 by 10-inch bucket conveyor, speed 160 feet per minute, one 6 by 10-inch bucket elevator, speed 500 feet per minute; one nine-foot clay mixer; and one 12-inch double-drum hoist, speed 200 feet per minute.
1	35	900	Belted direct to one nine-foot exhaust fan. Speed of fan, 300 revolutions per minute.
1	7.5	1,800	Belted to countershaft driving one coal conveyor. Speed of conveyor, 200 feet per minute; capacity, 10 tons per hour.

Energy for this installation is supplied by the Northern Idaho & Montana Power Company.

Commercial Practice
Management, Rates, New Business

LOOK OUT FOR THE WIRES.

A Warning Against the New Haven High-Tension Lines.

The New York, New Haven & Hartford Railroad has sent out the accompanying publicity matter at the time of extending the electrification of its lines, as a warning to the public. The suitability of this for the purpose is apparent, and it may serve for a model in similar cases.

The New York, New Haven & Hartford Railroad has issued a warning notice addressed to all persons along the line covered by the recent work of electrification that its wires are about to be charged and that they therefore involve a deadly peril for mischief makers. This notice is addressed particularly to the small boy, whose venturesomeness and fondness for experimental research in connection with things that are dangerous is well known.

The wires are necessarily of high voltage in order that the power may be transmitted to the trains. One of the reasons why the overhead system has been used in place of the third rail is that the danger may be taken away from the immediate vicinity of the tracks. These wires are so placed that no possible harm can come to anyone unless he deliberately invites the hazard of a contact with the wire by some extraordinary act. It is possible for anyone deliberately to throw himself in front of a moving locomotive and so meet death; the result is the same when one goes out of his way to touch high-tension wires.

On April 1 that portion of the new electrified system from Glenbrook to Westport was energized, together with all feed and signal wires. This was for the purpose of testing out the system prior to the inauguration of electrical operation. From Westport to Bishop Avenue, at Bridgeport, the "juice" was turned on on May 10 or thereabouts, and from Bridgeport to Water Street, New Haven, about May 15. This marked the energizing of the entire electrification zone from New York to New Haven.

The New Haven's officials have already taken up the matter of the danger which it means for anyone who fools around these wires charged with 11,000 volts, and have been in communication with the mayors, fire-department officials and other authorities in all of the cities, towns and villages along the line from Stamford to New Haven. These authorities have promised their co-operation in trying to instil caution in the minds of the public, but it is the small boy with his love for deviltry that gives the railroad concern.

The latticed columns supporting the catenary bridges on which the wires are strung lend themselves to climbing. They could not be constructed in any other way. But the boy who climbs up one of these columns just for fun and tries to swing from a wire will never climb down again. It won't do for him, either, if his kite gets caught on any one of the wires that look so innocent, to try to poke it off with a pole. He would probably never fly that kite again, and a live boy is much better than a lost kite. Similarily, the boy who, just to see the explosion, sticks a wire down through the aperture of a bridge until it touches one of the trolley or feed wires, will probably pay for it dearly.

In the construction of the overhead system of electrification every possible measure has been taken to insure protection, but it is impossible to protect anything completely against the fool-hardy and against the boy who itches "to see just what would happen." There are many ways in which such persons can meet injury and even death if they venture too near the wires.

These high-tension wires necessarily have to run under the different highway bridges, and it might be possible, in some cases, for the boy or man bent on mischief to poke them with a stick or an umbrella. The boy who goes after a bird's nest in one of the latticed columns supporting the bridges is also flirting with death. Under no consideration should anyone except an employee climb up one of these columns.

At different points along the line there are what are called circuit-breakers, points where sections of the road can be de-energized. These are on the ground near the bridges and are surrounded by high board fences. They must not be entered except by authorized employees of the road.

It is hardly likely that the average citizen would have occasion to turn a hose in the direction of one of these high-tension wires. To do so would be most unwise. Water, while offering high resistance, will nevertheless conduct electricity. The officials of the road have recently been engaged in bringing this to the attention of the fire departments in the territory just electrified. No possible harm can come merely from the spray occasioned by squirting at a fire. It would be only a stream directed plump at one of the wires that would mean danger. In any case where the current might involve peril for the firemen the New Haven officials have urged that word be sent to the nearest telegraph office or that the despatcher's office be communicated directly with by telephone. In such an event the Cos Cob power house would be notified at once and inside of one minute from the time of notification the section involved would be "dead."

It is dangerous to cover outside high-voltage wires, and, as a matter of fact, there is no better known insulator than air. Under the plan followed in the construction of the New Haven system all contact and feed wires are placed so that in no conceivable way can anyone but a daredevil come in contact with them. As an additional protection, the road has just finished erecting six-foot board fences on the 30 or more highway bridges between Stamford and New Haven. Only by actually climbing over one of these fences could a person get within reach of any of the wires. At every conceivable place of danger the road has also erected signs reading "Live wire," "Danger," "Keep off." Over 2,000 of these signs have been installed. It is of course possible that cracks in bridges can be found, through which the small boy could poke something "just to see the fireworks." If he escaped with only a shock he would be exceedingly lucky.

One of the great benefits conferred on the community by electrification is the comparatively noiseless operation of trains. But this involves greater peril to trespassers, to boys and other persons who persist in crossing tracks and regarding a railroad right of way as a high road. The electric train gives little warning sound as compared with the steam train, and so it is best to keep entirely away from an electrified railroad. The increasing recognition given to the overhead system indicates that the day is coming when many railroads will be so operated and hence it would be well to cultivate the habit of caution now.

There is also anothre feature of the

electric trains presently to be operated which commuters would do well to heed. The electric train gathers speed four times as fast as the steam train. In 15 seconds it may be going at a rate of 30 miles an hour. Any one, therefore, who seeks to board an electric train after it has once started does so at the extreme peril of his life.

Prizes for Salesmen Stimulate Business in Louisville.

By means of a system of prizes for good work Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, is getting increased results in the way of house-wiring contracts from five solicitors compared with the results eight men had been getting previously. A striking point in this connection is that the total amount offered as prizes comes to less in a month than the salary of one of the three men who was dispensed with. First of all is an efficiency prize, of $10, which is awarded monthly to the solicitor who is working on the house-wiring campaign and whose record at the end of the month shows the largest amount of business computed in terms of kilowatt-hours, who has put in the most hours overtime, whose reports are neatest, who is least often tardy and who makes the fewest mistakes in the contracts he signs. The record is kept day by day on a blackboard where all can see it and where each man can see how he and the others stand. In addition, $10 is given in prizes each week, divided with $6 for the man who gets the most business and $4 for the man who is second in the contest. Mr. Montgomery has found that this system does more to stimulate the solicitors and increase their efficiency than anything else he has ever tried. The contracts for the wiring of old houses are coming in regularly, some 49 having been obtained by the five solicitors last week.

Safety Campaign in Kansas City.

The Kansas City (Mo.) Railway & Light Company, controlling the local street railway and light companies, has launched a safety first campaign which is unusual in some respects. The company has begun the use of safety first signs on the front of its street cars, its method differing from those in vogue elsewhere, however, by reason of a frame which allows the sign to be changed as often as wished. An educational campaign among employees already has been concluded, and the light and street railway companies will give their attention to the general public for furthering the reduction of accidents.

Pittsfield Vacuum Cleaner Campaign.

The Pittsfield Electric Company recently conducted a vacuum cleaner campaign which resulted in considerable new business. The machines handled were the Hurley "Four" vacuum cleaner, and in event of the customer not wishing to pay cash for the machine they were sold on the basis of $10.00 with the cleaner and $1.00 a week thereafter until the machine is paid for. A week's free trial was given to anyone expressing a desire for same.

Following up the new sales policy, the Pittsfield Electric Company gave to any of its employees bringing in a prospect which afterwards resulted in a sale, a bonus of $5.00 as soon as the first $10.00 on the account was paid up. This offer was also open to contractors and their employees. These prospects were to be turned in to the new-business department in order to receive the $5.00 bonus. This plan was carried out by the company in a recent washing-machine campaign with marked success.

The main object of the campaign was to advertise electric service in the home, and this policy will be carried out in other branches during the year.

Wakefield Municipal Light Plant to Shut Down.

The Wakefield, Mass., Municipal Light Commission, composed of Edwin C. Miller, L. Wallace Sweetser and Frank J. Henkel, has just signed for the town a contract with The Edison Electric Illuminating Company, of Boston, whereby the latter will furnish all the electric service the town will use. This will include street lighting and all of the service for commercial light and power business.

Wakefield has been operating under the supervision of its Commission, the town's electric generating plant to furnish the service from dark until daylight and has taken such additional service as needed for daytime use from the Reading municipal plant. The Commission some time ago began investigating the possibilities of securing service from the big generating and distribution system of The Boston Edison Company and after a careful study of all the conditions has decided to shut down the town's own old plant, discontinue using the Reading municipal service and take the Boston Edison service. The change will be made as soon as The Boston Edison Company can extend its service lines to the town, which will be done in a comparatively short time.

Technically speaking, the Boston Edison Company will furnish a service described as 2300-4000 volt, 4-wire, 60 cycle, alternating current, from which either single-phase service for lighting or three-phase service for power purposes can be delivered as desired. This service will be run in duplicate for the extra protection of the town.

This change from the use of a municipal generating station of limited capacity to the efficient, economical service of a public service corporation with practically unlimited capacity, may mean much in the development of Wakefield's manufacturing business, and does not represent any increase of the town's financial obligations or any further investment in property and machinery.

Central-Station Power for Car Cleaning.

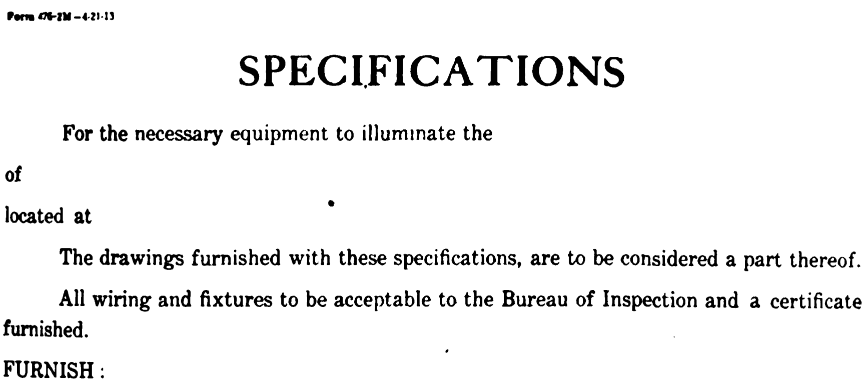
The Pullman Company has just made arrangements at Louisville, Ky., for the cleansing of its cars which call at that point with electrically operated vacuum cleaners. Heretofore the work has been done by hand in Louisville. The power will be supplied by the Louisville Gas & Electric Company, which is just completing the installation of service posts in all sections of the Louisville terminal yards. Each of these posts will have plug connections so that the power will be available wherever the car may happen to stand. The Pullman Company will use three of the vacuum cleaners and the current will be in use for eighteen hours a day. Each vacuum-cleaner motor will have a capacity of 1.5 horsepower. It is estimated that the new system, besides doing the work more thoroughly, will result in a big reduction of cleaning costs.

Popular Appeal Made for New Franchise.

R. P. Stevens, president of the Consolidated Electric Company, of Youngstown, O., as well as of other electric power and railway companies, delivered a vigorous address recently before the Northwest Improvement Club, of that city, relative to the present electric-light situation in Youngstown. The matter of a new contract with the company by the city is being discussed, and Mr. Stevens declared that the company is willing to make concessions in such a contract, in return for a five-year extension of the present agreement. Mr. Stevens took up complaints which have been heard, to the effect that other cities, particularly Akron, are receiving current for less than Youngstown, and showed that on the basis of population and light furnished, the latter town is receiving much the more advantageous rates. He declared that the company is now preparing to lay out a new system in Youngstown which will be adequate to give the best possible service obtainable.

Columbus Company Co-operates in Maintaining Good Lighting Installations.

The accompanying illustration shows the blank specification sheet used by the Columbus Railway, Power & Light Company in aiding commercial lighting customers in providing an efficient lighting installation. A careful record is kept by the new-business department of all commercial lighting prospects and of all changes from one location to another. A representative of the central station visits the customer moving to a new location, or a prospective customer, explaining that the company will be willing to co-operate in obtaining a satisfactory lighting installation without cost to the customer. With the consent of the customer the illuminating engineering department of the company draws up a suitable specification, conforming of course to the customer's general ideas, which are embodied on the specification blank, and this, together with a rough pencil sketch of the installation, is submitted by the customer to the various contractors and bids obtained.



Form 476-2M-4-21-13

SPECIFICATIONS

For the necessary equipment to illuminate the

of

located at

The drawings furnished with these specifications, are to be considered a part thereof.

All wiring and fixtures to be acceptable to the Bureau of Inspection and a certificate furnished.

FURNISH:

Specification Blank Used by Columbus Company.

This plan assures a well lighted store by giving the customer the benefits of the company's engineering knowledge and also permits of receiving bids from contractors on an engineering basis. The scheme which was inaugurated by W. A. Wolls, new-business manager, has proven very successful and has resulted in many notable installations in Columbus.

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New Business Activities in Sandusky.

The Sandusky Gas & Electric Company, Sandusky, O., is conducting a vigorous campaign in order to secure the wiring of a greater number of houses in the city, using a large amount of newspaper space for that purpose. An advertisement headed, "Why This House Remains Vacant and Unsold," with the explanation that the reason is its lack of electric wiring, has done good work in this connection. The company is also offering an allowance of a dollar on old sad-irons taken in exchange for electric irons.

Free Current for Searchlight.

A feature of dedication week, to be held at Topeka, Kans., in the near future, will be a 20,000-candlepower searchlight to be installed in the dome of the State House. Arrangements for the work were concluded recently, Albert Patten, assistant general manager of the McKinley interests, agreeing to make the necessary changes. The top of the dome is 385 feet from the ground. About 1,000 feet of 50-ampere wire will connect the searchlight with the wires of the Topeka Edison Company.

◆◆◆

Increasing Business Makes Extensions Necessary in Pittsburgh.

Contracts have just been let by the Duquesne Light Company, of Pittsburgh, Pa., for four turbo-generator sets, and the construction of new buildings and boilers for service at its Brunots Island power plant. These will give this one plant a total capacity of 100,000 horsepower.

The contracts for the turbines and generators call for an outlay of $400,000, while the new boiler plant will cost $200,000 additional. The Westinghouse Electric & Manufacturing Company was given the electrical order, and is working on it at present. This includes four 15,000-kilowatt turbo-generator sets, a total of 61,200 kilowatts. This, with 10,500 kilowatts in turbines now in the plant that are to be retained, makes a total of nearly 100,000 horsepower. The plant has also 30 boilers in its steam equipment and 20 additional boilers will be added at once.

In making these changes, the light company has abandoned three 5,000-kilowatt turbo-generator sets that have been doing duty for some time. The reason for abandoning the smaller machines is to increase the efficiency of the plant with larger units of power, at the same time reducing the space required.

From this great plant will radiate power lines that will operate the street lights in Pittsburgh and vicinity, as well as the thousands of motors for private users of power. Beside this, the street cars within the city will be operated from the same plant. On account of the vital part that the big plant is to play in the city life, special care is being exercised in placing it out of the reach of floods. The coal reserve that is to be carried will enable it to operate some weeks in case of interrupted coal delivery.

According to the contracts, the entire work will be completed during the current year. A large force of men is already at work on the foundations and steel work for the building and foundations for the machinery are also under way.

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Electric Pleasure-Vehicle Exhibition.

Not in many years has there been so complete an exhibit of electric pleasure vehicles as that now being held under the auspices of the New York Electric Vehicle Association in the new showrooms of the New York Edison Company at Irving Place and 15th Street, New York City. Six of the leading builders of electric pleasure vehicles have brought together in this combined display the finest product of their factories. All of the cars may be seen to advantage in this large showroom; in fact, the exhibition of electrics marks the opening of this artistic display room.

Among the cars displayed are an Ohio brougham, a Rauch & Lang town car, a Detroit runabout, a Baker brougham, a Waverley roadster, a Rauch & Lang five-passenger brougham, a Waverley brougham and a Ward coupe chassis.

President Arthur Williams of the New York Electric Vehicle Association, regarding the exhibition, said:

"It has been our endeavor to make an electric vehicle display free from turmoil, dust, heat and other disquieting effects and to conduct an exhibit of quiet elegance, in a properly ventilated and tastefully decorated hall where one may examine the cars at leisure and without annoyance from either surrounding conditions or too attentive salesmen.

"The exhibit includes all that is new in electric car designs and really indicates that gratifying progress has been made in this direction within the past year. The cars are truly suggestive of dignity, safety, comfort and cleanliness."

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Prosperity at Topeka.

The Topeka (Kans.) Edison Company has sent to the city of Topeka, a check for $1,190.33, representing 10 per cent of the company's net earnings during the past year, above the 10 per cent on the investment. The company's franchise provides for this payment. The check is the first turned over as the city's dividend, indicating that the company has had an exceptionally prosperous year.

Electric Sign Data

Wanted: Electric Signs.

Recognition of the electric sign's usefulness in other ways than for direct advertising is becoming general. This form of electrical publicity is, in fact, so widespread and productive that additional millions of dollars are spent for it each succeeding year.

What is not generally known, however, is the fact that owners of vacant lots and fine buildings are eager to have electric signs installed on them to increase their value. Operators in real estate appreciate the efficacy of an electric sign in endowing with life and light districts which would otherwise remain dormant or deserted.

Experience shows that a single sign on a building or a lot in an obscure corner of a city may start a healthy growth of business there. It becomes a landmark; it sheds light into the street; it makes travel safer at night; it enlivens the whole neighborhood and frequently induces other advertisers to seek the same location for their electric appeals.

That the owners of real estate have an understanding of the benefit that an electric sign will bestow on their property is demonstrated by their eagerness to have advertisers use space on buildings and lots without a cent of rental.

Frederick A. Kehl, president of the Brilliant Sign Company, St. Louis, recently told a representative of this magazine that his concern receives many offers of free space for the erection of electric signs in the different cities in which it operates.

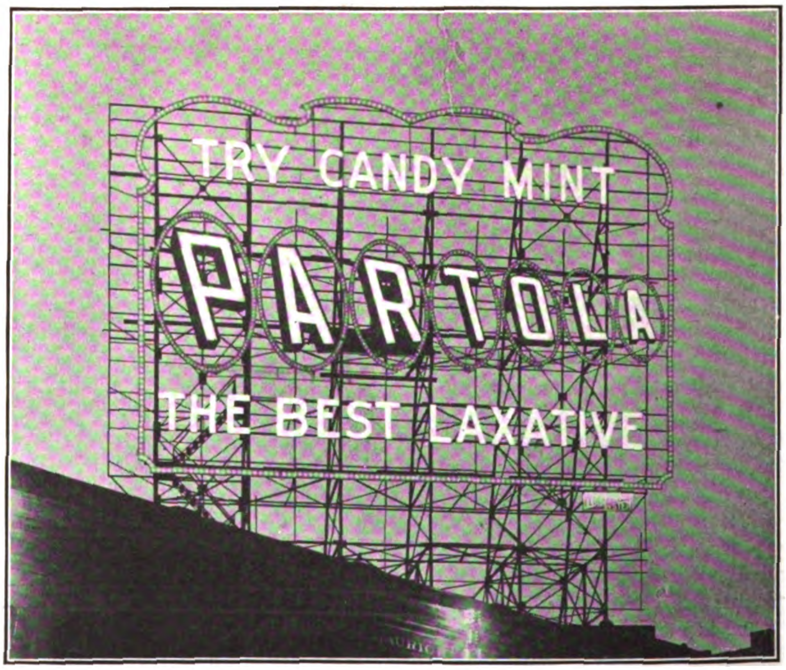
"There is no prejudice against the electric sign as there was some years ago against the billboard," said Mr. Kehl. "On the contrary, the electric sign can find a place almost anywhere—on a hotel, an office building, a bank, or even a church. It is regarded not only as an appeal but as a token of life and activity.

"We are constantly importuned by owners of buildings and vacant ground to erect electric signs on their premises, and quite often they volunteer permission, expecting no compensation. In many such cases, naturally, the location is unsuitable because of its remoteness or for some other reason. Not infrequently, though, we take advantage of such offers when the placing of the sign will give our customers adequate 'circulation.'

"This favorable disposition of the public toward the electric sign is attributable, no doubt, to the fact that it represents a good deal of skill and attractiveness. Electric signs are not built in haphazard fashion. Their electrical mechanism is such that only experts in design and construction can successfully produce them. This insures the public against the sort of blotches and daubs that discredited the billboard.

"The brilliancy of electric signs, even when they blazon no pictures against the sky, is an advantage which the public as well as the advertiser may enjoy equally. When their effect is spectacular, electric signs give their surroundings a continuous expression of liveliness, activity, prosperity.

"All this explains why many people not interested either in the manufacture or use of electric signs are eager to have them on their property."



Electric sign erected by the Federal Sign System (Electric) in New York, at Forty-ninth Street and Broadway.

Sign operates as follows: Starting with a circle around the "P" each circle goes on very rapidly, whirling as it lights, giving the appearance of a hoop rolling from the left to the right of the sign. Everything goes out, and it instantly starts with the circle around the "A" repeating the operation backwards. Then each circle goes on one after the other, turning steadily until all are on, all off, all on together, and all off. Then as each circle comes on whirling the letter in th ecircle flashes on with it, each circle revolving rapidly to the left. The border wording then follows, one word at a time, until all are on, after which the border lights up and holds for a short time. The sign then goes dark and repeats. A Betts & Betts flasher is used.

The color effect is produced with Betts Color Caps.

The Louisville (Ky.) Commercial Club has under consideration a suggestion that it provide for the erection of a mammoth slogan sign, to be electrically illuminated and operated. The project, if undertaken, would call for a country-wide contest for the best slogan.

A restaurant in Denver has installed a novel electric sign over the entrance, consisting of the figure of a dainty maid in the act of placing before a patron a dish that closely resembles strawberry shortcake, accompanied by the words: "Like Mother Used to Make." Six colors and three different sizes of lamps are used.

Electrical Construction

CIRCUITS FOR ELEVATOR SIGNALING.

Complete Installation for an Office Building.

An office building generally requires an extensive elevator signal system as it is not only necessary to have some means of notifying the elevator operative of an approaching car of the presence of passengers at the various floors and of notifying these passengers of the approach of a car, but it is also necessary to provide some means for signaling the elevator operatives during those periods when continuous elevator service is not necessary.

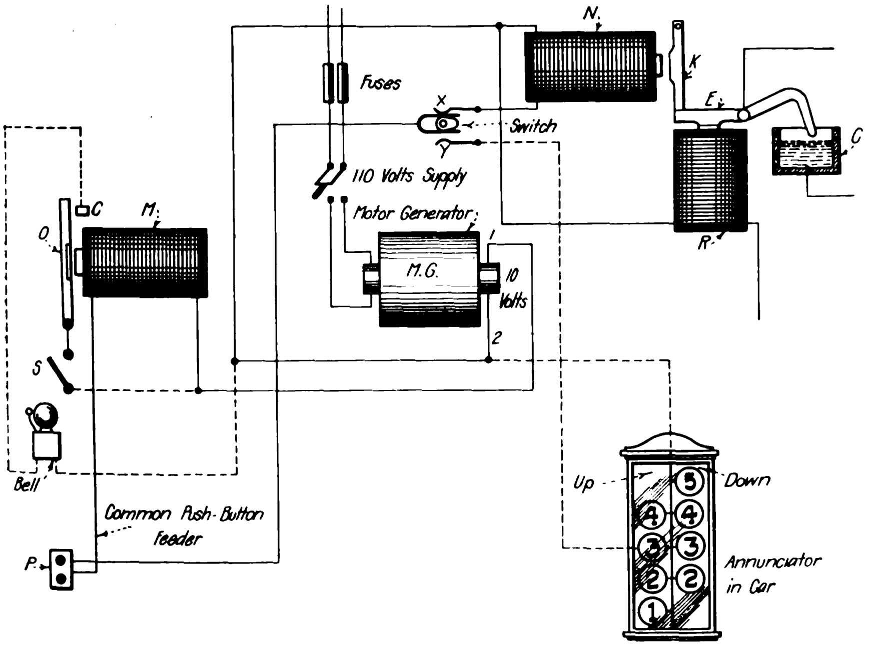


Fig. 1.—Third-Floor Push-Button, Bell and Annunciator Circuits.

This article describes the Armstrong system as installed by the Elevator Supply and Repair Company, of New York and Chicago, in the new Continental and Commercial National Bank building, Chicago, Ill. This system provides for both local and express service with floor and car-signal lights during the hours of continuous elevator service and for a car annunciator and bell for night and holiday service. For normal day service two signal lamps on each floor and one in each car are employed. These are so wired that the proper signal lamp on the floor where a signal has been given, lights when a car approaching that floor in the right direction is distant about the height of two floors. A little later the signal lamp in the approaching car is lighted. After a car passes the floor where the signal has been given both the floor and the car lamps are automatically turned off. If, however, the approaching car is crowded, the operative can switch the signal to the next car by means of the circuit breaker, thus leaving the next car to take on the passengers. For holiday and night service a bell and car annunciator are employed. When a signal button is pressed, the bell attracts the attention of the elevator operative on duty and by means of the car annunciator he learns the floor on which passengers are waiting.

The current for the push-button circuits, annunciator and bell circuits is obtained from a motor-generator *MG* situated in the pent house together with the other necessary signal apparatus. This motor-generator is supplied with 110 volts direct current and delivers 10 volts direct current. The current for the signal lamps on the various floors and cars is obtained from the 110-volt mains. For simplicity the wiring diagrams are confined to the circuits for a five-story building, express cars making no stop at the second floor. For the same reason the diagrams show only the circuits for one elevator and for only one of the push-button stations, namely the "up" push-button on the third floor.

Push-Button Circuits for Normal Day Service.

Figure 1 shows the push-button circuits for the upper push button of the third-floor push-button station, the full lines representing the circuits for normal day service and the broken lines, the additional wiring necessary to operate the annunciator and signal bell during those periods when continuous elevator service is not required. The switch *SW* is situated in the pent house and is used to effect the change from normal day signal service to night and holiday signal service.

When the switch *SW* is in the position shown, the circuits are arranged for normal day signal service. If the upper button of the third-floor push-button station *P* is pressed, an electric circuit is completed from terminal *1* of the motor-generator *MG* through solenoid *M,* push button *P,* switch *SW* and solenoid *N* to terminal *2* of the motor-generator. Magnets *M* and *N* are thus energized causing them to attract their armatures *O* and *K* respectively. During normal day service the switch *S* is kept open and hence the attraction of armature *O* does not close the circuit represented by broken lines under these conditions. However, when armature *K* is attracted by its magnet, it releases the lever *E,* thus permitting its terminal to drop into mercury cup *C.*

Signal-Lamp Circuits.

Referring now to Fig. 2 it is seen that when the lever *E* dips into the mercury cup *C* and when the three-pole switch *A* is closed, the circuits for the third-floor signal lamp and the car lamp will each be completed except at one point. Tracing the third-floor "up" signal-lamp circuit, it is seen that the positive side of the 110-volt mains is connected through the lever *E* and the mercury cup *C* to the segment *3* of feed *V* of the "up" signal-lamp "slate." This "slate" consists of a number of metallic segments fastened to a piece of slate as shown. Now segment *3* of feed *W* of the "slate" is connected through lamp *U* on the third floor, the junction *T* and the switch S^1 in the car to the negative side of the 110-volt mains. This signal-lamp circuit can hence be closed by connecting the segments *3* of feeds *V* and *W* of the "slate."

Over this "slate" a short-circuiting brush travels and makes electrical connection between the segments of rows *W* and *V* of the "slate," hence closing the circuit of lamp *U* on the third floor when it reaches the segments numbered *3*. These travelling brushes are mounted on a brush holder mounted on a threaded shaft installed near and parallel to the "slate." The threaded shaft as described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 28, 1914, is driven by means of sprockets and a chain belt driven by the shaft carrying the overhead elevator-cable sheaves. The travelling brush holder hence has a movement proportional to the movement of the car, and by making the segments on the "slate" of proper size and locating them at proper places, the brushes will short-circuit them at the proper point in the movement of the car, thus closing the signal-lamp circuits on those floors where the pushing of a button has caused the corresponding mercury contact to be made.

The car lamps are automatically operated in a similar manner, the current flowing from the negative side of the 110-volt mains through the car switch S^1 and the car signal lamp *L* to the upper segment *Q* of the "slate," and then through a travelling set of brushes to segment *3* of row *V* from where it passes through the mercury cup *C* and the contact point *E* to the positive main. The brushes effecting this change are mounted on the same brush holder previously mentioned, one of the brushes commutating the segments of row *V* for the floor lamps and the other, which is slightly in advance of the former, commutating the segments in row *Q*.

After the passengers on the third floor are taken on the car the signal-lamp circuits are opened by the brushes ceasing to make contact with the proper segments on the slate. The mercury contact for this floor is broken by means of a reset "slate," the segments of which are mounted on the same piece of slate as shown in Fig. 2. The travelling brushes are electrically connected and mounted on the brush holder previously mentioned so as to move over the segments of rows *D* and *L* of the reset "slate." As the segments of the reset "slate" are so positioned in relation to those of the signal-lamp "slate" that the brushes do not connect the segments of row *L* with the segment *D* until after the car has passed the corresponding floor levels, the reset circuits are not completed until such a time. When the brushes connect the segments on the reset "slate" for the third floor, current flows from terminal *1* of the motor-generator *MG* through the car circuit-breaker S^1 to the upper segment *D* of the "slate," and from there through the brushes to segment *3* of row *L* of the "slate" from where it passes through the solenoid *R* to terminal *2* of the motor-generator. The energizing of the electromagnet *R* causes it to attract its armature *E* thus breaking its contact with the mercury in cup *C*. The signal circuits for the "up" position on the third floor are hence all returned to the normal open position.

Express and Local Service.

Only the circuits for express service which omits the second floor as a stop have thus far been considered. When local service is desired, the switch *B* is closed. Considering first the circuits shown in Fig. *2* it is seen that the closing of switch *B* connects the segments of *Q*, the car-lamp feed on the signal-lamp "slate," through the left blade of the switch *B*; and the first and second-floor lamp-feeder *F* to the third, fourth and fifth-floor lamp-feeder *G* through the right blade of switch *B*. The switch by connecting these circuits in parallel thereby permits the circuits of the car-signal lamps and the signal lamps on all floors to be closed by the means of the travelling brushes.

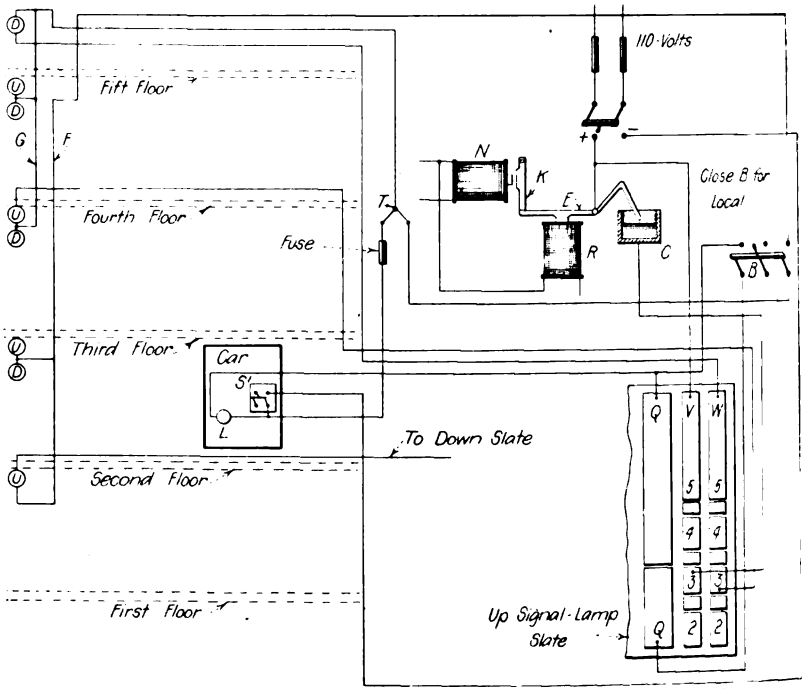


Fig. 2.—Signal-Lamp Circuits.

Fig. 3 shows that the closing of switch *B* connects the segments *D* of the reset "slate" together thus permitting the opening of the car and floor signal circuits below and above the third floor.

Complete Normal Day Signal Circuits.

Thus far only the circuits affected by the upper push button on the third floor have been considered, but the remainder of the equipment is laid out in a similar manner. With the exception of the first and last floors, a mercury-contact device with the necessary controlling mechanism is provided for each of the two signaling positions for each floor. Two "slates" each including both signal-lamp and reset segments are provided for each car, the one "slate" controlling the signal circuits during the upward movement of the corresponding car and the other "slate" controlling the signal circuits during the downward movement of the car. Only one set of travelling brushes, however, is used for each set of signal "slates." The "slates" are arranged so that the reversal of the screw driving the brush holder throws the brushes to the "slate" for the reversed direction of running. This shifting of the brushes is effected by the friction between the nut on the brush holder and the driving screw.

The pressing of a button on any floor causes the mercury contact to be made for that floor, thus energizing the signal-lamp segments on the corresponding "slate" for each car. When the first car moving in the right direction approaches the floor where the signal has been given, the travelling brushes for that car close the proper lamp circuits. If, however, the operative of this car does not desire to take on the passengers for any reason, he can open the floor signal-lamp circuit for his car and his car lamp by opening switch S^1, Fig. 1, which at the same time opens the left pole of the switch (Fig. 2), and causes the circuit of the reset solenoid for the floor where the signal has been given to remain open as the car passes the floor. The mercury contact for that floor is hence maintained and the proper signal-lamp circuits are closed as the next car approaches the floor. The switch S^1 is of the two-pole snap type, and the "on" button must be pressed before the circuits can again be completed.

As each car must necessarily stop at the first and last floors on each round trip during the day, no push-button signaling is required, as all that is needed is the closing of the floor signal-lamp circuits upon the approach of a car. Fig. 2 shows the lamp circuit for the fifth or last floor. One terminal of the lamp is connected to segment *5* of feed *W* of the "slate." When the travelling brushes connect the segment *5* of feeds *W* and *V*, current will flow from the negative side of the 110-mains through the "slate," lamp *D* on the fifth floor and switches S^1 and *A* to the positive side of the mains, thus completing the lamp circuit. A similar system is employed for the first floor.

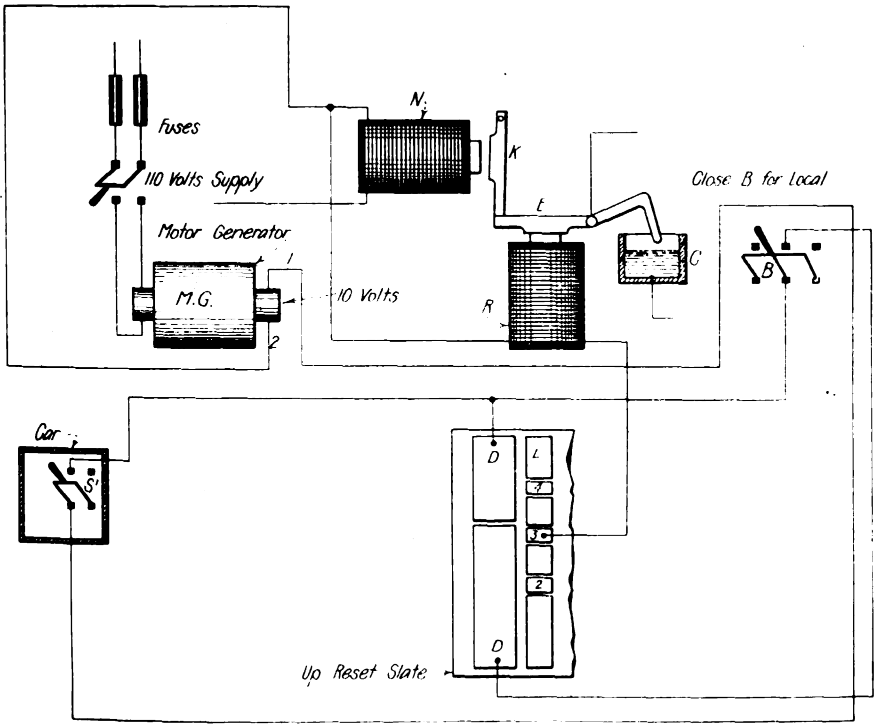


Fig. 3.—Reset Circuits for Third Floor.

Holiday and Night Signal Service.

Fig. 1 shows the additional wiring required for holiday and night signal service in broken lines. In order to put this system into service switch *S* is closed and switch *S W* thrown in the reversed direction, the latter thus breaking contact with *X* and making contact with *Y*. The pushing of the upper push-button on the third floor will hence cause current to flow from terminal *I* of the motor-generator *M G* through the solenoid *M*, the push-button switch *P*, the switch *S W* and the third-floor "up" indicator on the car annunciator to terminal *2* of the motor-generator. The proper indication is hence given on the car annunciator and the operative's attention is called to his annunciator by the ringing of the signal bell, the circuit of which is closed through the contact *C* upon the attraction of the armature *O* due to the flow of current through solenoid *M*. As the signal bell is located so that it can easily be heard on all floors only one bell is required. The push-button circuits for each floor are connected to the car annunciator in the manner shown by the broken lines in the diagram.

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New York Approval of New Devices.

The Advisory Board of Engineers, which supervises the electrical inspection service of the Department of Water Supply, Gas and Electricity, New York City, desires to have before it, at the time of consideration of any new device or installation, as full information as it is possible to obtain, otherwise the decision of the Board has to be postponed until further information or explanation is forthcoming.

The following announcement is intended to facilitate the transaction of business.

To Manufacturers of Electrical Devices.

(1) For what purpose is the device or appliance designed?

(2) Must be plainly marked with the name or trade mark of the maker and the current and voltage for which the device is designed.

(3) Is approval of the device desired for its use in New York City only?

(4) If a new device is submitted, a complete description in writing, and a sketch or print showing its use, if necessary, should accompany the application for approval.

(5) The manufacturer's name and address should appear clearly in the application and on the device.

(6) If approval on insulated or other wire is desired, samples must be submitted at the time of application.

(7) Give all information which will be helpful to the Board in judging as to the compliance of the device with the requirements of the Electrical Code of The City of New York.

To Electrical Contractors and Engineers.

(1) Is approval desired on the installation for use in New York City only?

(2) Submit a complete sketch or print showing wiring and other details of installation, and, if practicable, a print showing a plan and cross-section of the particular portion of the installation under consideration for approval.

(3) Explain in full detail why this installation is submitted for special approval.

(4) Contractor's or engineer's name and address should appear clearly on all papers submitted.

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Gary Passes Electrical Ordinance.

Gary, Ind., has recently passed an ordinance requiring the licensing of persons engaging in electric contracting business. Journeymen, working for a licensed contractor, are not required to take out licenses. Under the new ordinance any person applying for such a license must furnish satisfactory evidence that he is competent to engage in such business and must furnish a bond of [illegible] to the city of Gary as a security for the proper performance of the applicant's duties. Licenses are issued for one year, the fee for the first year being $25 and for succeeding years, $10.

This electrical ordinance also provides for the inspection of all electric wiring with the exception of minor repairs by the Indiana Inspection Bureau, acting as agent for the city of Gary. The inspection bureau will collect fees for the inspection of electrical work based on the number of circuits, fixtures, generators, motors, and switchboards installed. For small work the minimum fee will be twenty-five cents.

For outside work the National Electric Light Association's specifications for outside work are adopted. Semi-annual inspection of all outside electrical work on which the voltage is over 110 volts is also authorized, with the provision that all defects reported shall be remedied within 24 hours after notice has been given to the owner of the installation. A fine of from $10 to $100 will be imposed on any person or firm violating the provisions of the ordinance for the first or second time, and the license will be revoked and forfeited for a third offense.

LETTER TO THE EDITOR.

Percentage System in Electrical Contracting.

To the Editor:

Commenting on the very excellent discussion of "The Percentage System in Electrical Contracting," contained in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 9, I would like to say that R. G. Littler's comments seem to cover the vital points of the subject very thoroughly. The main point when doing work under the percentage system has always been to determine the cost price of material to which the buyer is entitled. If the contractor is buying sockets by the thousand in order to obtain a good price on them and is doing, for example, a $300 job for a customer, in which he uses 150 sockets, I hold that the customer is only entitled to the 150-lot price and that all other material should be charged for in the same manner. Otherwise the contractor is donating the difference in price to the customer and if he does the same thing with every percentage contract, he is giving away annually a very large percentage of his legitimate profit.

Nine-tenths of the buyers want a fixed sum agreed upon as the maximum cost of work done under the percentage system, thus making practically a straight contract with provisions favoring the buyer. Moreover, much time is required to explain to most buyers the meanings of the terms "actual cost of material," "overhead expense," etc., so that when all is considered, we prefer a well defined agreement with accurate specifications and a straight contract price. Life is too short to spend valuable time explaining the variations of bids under the percentage system. Most of these are due to variations in the overhead expense, a factor which is bound to vary with different concerns.

I shall take this opportunity to say a few words about small jobs. Most contractors aim to secure large work. In the case of the average contract of from one to two thousand dollars, one will find from three to 10 bidders; but there are many small contracts which these contractors overlook or do not care to take. The way large contracts are let usually allows the contractor only about 10 to 15 per cent profit. There are many small jobs where one can obtain a profit of from 20 to 30 per cent and obtain prompt payments. Even if one loses on several of these contracts, he is still ahead of the game, for he can carry on twice the amount of work within a definite period of time with the same investment, a smaller stock and equipment, less detail and supervision, and fewer costly mistakes, than if he had engaged in only large work. It might, therefore, pay to develop this end of the contracting business for if there is enough business, it is by far the most profitable. If any large concern will take the time to investigate the source of its profits, it will find that its profits are made on the medium and small sized jobs and not on the contracts obtained in competition with numerous other bidders.

This is true of every business. One does not see the public asking for bids on small articles of every-day use, because the amount is too small to spend time bargaining over. One goes to the most convenient place and buys the article. The same is true in our business. When a man desires one or two additional lights he does not ask for competitive bids but telephones a contractor. If one's price is reasonable he obtains the work. The transaction is closed and one is ready for another job.

I wonder if any of us ever try to figure the labor required to keep track of the many details of a large contract, which is prolonged for so long that we wish we could break the contract, pay or no pay, in order to eliminate the time and labor required to properly take care of these details. I think that no amount figured for overhead expense will cover the worries incident to the eternal watching of the condition of the work so that one can have his men on the job at the proper time. For large work one must have men and expensive equipment waiting in one's shop. These must be ready the moment the call comes. Anyone who has handled much new building and store work will know just what this means.

In closing I wish to remind my fellow contractors not to overlook or slight the small job. If one must figure on other work, he ought to demand his price or let the work alone. When price cutting starts, no good can come from it. It usually ends by the sheriff putting the padlock on the door of the price cutter.

E. M. Raetz.

Rochester, Minn., May 11, 1914.

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Indiana Contractors to Meet.

The annual convention of the Electrical Contractors' Association of Indiana will be held in Indianapolis on May 28 and 29.

The session on Thursday morning will be a closed one, at which the business of the association and the reports of committees will be taken up,

In the afternoon, an open session will be held. J. E. Latta, of the Underwriters' Laboratories, will give a talk on "The Underwriters' Attitude." C. C. Perry and H. H. Harrison, of Indianapolis, will speak on "Co-operation with the Central Station." There will also be talks on the position of the jobbers and the development of the electric lamp. In the evening there will be a Jovian rejuvenation.

At the closed session on Friday morning, there will be talks by Ernest Freeman, president of the National Association, and by George W. Hill, special representative of the National Association. The election of officers will also take place and reports of the Legislative Committee and the Underwriters' Committee will probably be presented.

The session on Friday afternoon will be an open one. T. A. Wynne, statesman for Indiana of the Jovian Order, will speak on "Jovianism." H. H. Magdsick, of the National Lamp Works, will speak on "The High-Efficiency Lamp." G. M. Sanborn, of Indianapolis, will present a paper, "Pitfalls in Estimating." It is expected to have an additional paper from the Society of Electrical Development on "Co-operation."

Other papers are expected during the convention from G. E. Varney and R. P. Oblinger, representing the jobbers, and by C. O. Brondel, of Warren, O., on "Application of Lighting Units."

On Friday evening the Indianapolis Electric Club will provide entertainment for members and guests at a boxing bout.

The president of the Indiana Association is M. K. Foxworthy, and the secretary is George Skillman, of Indianapolis. A souvenir program for the convention has been prepared which contains letters from T. B. Hatfield, H. Comer Wolf, A. L. Swanson, G. M. Sanborn, Brice H. Reid, and M. K. Foxworthy. It also contains the constitution of the association and gives reasons why all contractors in the state should become members.

◆

New Electrical Rules for Springfield.

A new electrical code is being prepared by the city commissioners of Springfield, Ill., which has in view greater safety. One requirement of the new ordinances will prohibit the attaching of wires to buildings except with a clearance of seven feet. F. H. Spears is city electrician.

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Atlanta Contractors Organize.

A number of the leading electrical contractors of Atlanta, Ga., met on May 6 and formed an organization to be known as the Atlanta Electrical Contractors' Association. The following were unanimously elected officers for one year: Fred H. Miles, of the Gate City Electric Company, president; Horace C. Russell, of Greene & Russell Electric Company, secretary; William F. McLendon, of the Cotton States Electric Company, treasurer.

Co-operation in Purchasing Stationery.

The Educational Committee of the Illinois Electrical Contractors' Association, of which F. L. Decker is chairman, has purchased a large quantity of sales, order, charge and credit tickets for the use of its members and the members of the Faraday Electrical Association, of Chicago. By purchasing this material through the Committee, members not only get a better price than is made on retail orders, but get the benefit of the experience and study of the committee in selecting the best form of tickets. Contractors desiring to avail themselves of this opportunity should address F. L. Decker, 2806 Sheffield Avenue, Chicago, Ill.

Gary Contractors' Association Formed.

An electrical contractors' association was recently formed in Gary, Ind., the following firms being represented: J. J. Scanlon Electric Company, Central Electric Company, Horton & Williams Electric Company, Star Electric Company and A. B. Harris Electric Company. The object of this association will be to promote good will and co-operation among electrical contractors. The officers of this association are: A. B. Harris, president; Mr. Jennings, vice-president; J. J. Scanlon, treasurer, and George Horton, secretary.

Storage-Battery Sludge.

Those who have in charge the care of storage batteries are aware of the use and purpose of a wooden stick to move the sediment from around the bottom of the plates so as to prevent it from accumulating in such quantities as to allow it to get up to the bottom of the plates. An improvement over the straight stick commonly used, is to make one which has an L-shaped piece left on the end. This should be made from one whole piece, as no metal should ever be inserted in the electrolyte. The advantage of the L-shaped piece is that it projects under the plates, allowing the sediment to be more completely and readily spread.

William A. Murray.

Among the Contractors.

Nollenberger & Dorner, electrical contractors of Denver, who have recently moved into new quarters at 1408 Stout Street, have added a line of fixtures displayed in an attractively arranged special fixture-display room.

The electric wiring contract on the new Swinney School in Kansas City, Mo., was let to the Burkholder Electrical Company, whose bid was the lowest of those submitted. The contract price was $3,950.

William A. J. Guscott has recently established a contracting business at 628 Eighteenth Street, Denver, Colo. Mr. Guscott has had a number of years' practical experience, during which time he has superintended some of the largest wiring installations in Denver, and he enjoys a wide acquaintance in that city.

The Wilson-Maltman Electric Company, Baltimore, Md., has recently been awarded the contract for the electric work in the tunnels connected with the power house of Johns Hopkins University, Baltimore. This company has been awarded all of the electric work which has so far been let in connection with the new buildings of the University. The work includes the wiring and fixtures for the administration building; wiring and fixtures for the electrical and mechanical buildings; wiring and fixtures for the power house and all of the electric work in connection with the tunnels. The same company has recently been awarded the electrical contract for the new hospital for the Women of Maryland and for the power house and tunnel work for the Eastern Shore State Hospital, Cambridge, Md., where the firm also is wiring the main building.

The employing electrical contractors of Dayton, O., have decided to reject the demands recently made upon them by the electrical-workers' union of the city, including recognition of the union. As a result the men are now on strike. It is understood, however, that a number of the men who quit work are not members of the union, and are not receiving strike benefits, in consequence of which, it is stated by several of the contractors, they are willing to come back to work. The union men are insisting on their point, however, and the strike bids fair to be prolonged. Several other trades in the city, notably the painters, are also on strike, practically tieing up building.

Members of the Youngstown (O.) Local No. 64 of the International Brotherhood of Electrical Workers were the hosts on May 11 of the contractors and employers in the electrical trade in that city. It was a get-togther meeting, having for its principal object the cultivation of closer and more friendly relations between the employers and their men. The affair was held at the Ohio Hotel, and a banquet was the principal feature, informal addresses and an entertainment program also being given.

Members of the Louisville Electrical Clearing House, having adopted stringent regulations in the way of the loop system for wiring, etc., are now considering means for increasing efficiency in the wiring business. The problem was gone over at length at the last two meetings, Frank A. Good, electrical engineer with F. A. Clegg & Company, delivering the principal address. The last meeting also was the occasion for a demonstration of insulation for fixtures. Membership and interest in the work of the organization are increasing, and the Kentucky Actuarial Bureau, in whose offices the meetings are held, has arranged to furnish larger quarters.

The Ogden Electric Supply Company, of Ogden, Utah, is just completing the complete electrical installation in the new Essles office building. This is the largest office building in Ogden.

The Independent Electric Company is the name of a new electrical-contracting and supply business, recently established at 119½ West Second South Street, Salt Lake City, Utah. H. M. Mylar, E. R. Haacke and J. E. Hennefer comprise the firm.

The Brigger-Hetherington Company, of Boise, Idaho, is just finishing the contract for the installation of wiring and fixtures in the new Elks Building in Boise.

The Idaho Electric Supply Company, of Boise, Idaho, has received the contract for the rewiring of the Y. M. C. A. building at Payette, Idaho.

The Westlake Construction Company, of St. Louis, Mo., has secured the general contract for the construction of the $1,000,000 Muehlebach Hotel at Twelfth Street and Baltimore Avenue, in Kansas City, Mo. Much electrical work of all kinds, including the construction of a power plant, is to be done.

Robert B. Kyle, electrical contractor of Pueblo, Colo., has recently moved his place of business from 124 South Union Street to 226 North Union Street, where he has a well located store which includes a large, attractively arranged and well stocked fixture room. This is the only fixture room in Pueblo.

Charles W. Perry has recently taken over the business of the electrical department of Higley & Dudley Company, at 109 East First South Street, Salt Lake City, Utah.

Palmer & Wall Electric Company has recently been organized and will conduct a general electrical repair business, specializing in armature winding, at 112 Michigan Street, Toledo, O.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President,
59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOP, Vice-President,
13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer,
Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association,
11 Wareham Street, Boston, Mass.

Executive Committee
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A. A. Moffitt
R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary is happy to announce that the New York Section has gained twelve members this month; the Western New England Section, three and the Eastern Massachusetts Section, two. The California Association of Electrical Inspectors has organized as the California Section with C. W. Mitchell, of San Francisco, as president.

The Secretary desires to call particularly to the attention of Executive Committee members the following resolution which was adopted unanimously at the last meeting of the Western New England Section:

"Resolved,—That the Secretary be and hereby is directed to request the National Secretary to direct his best efforts toward securing explanatory answers to the questions which are to appear in the question box of the National Association, these answers to consist of more than the words 'Yes' or 'No'".

One of the valuable things about these answers should be that they give an idea of the reasoning upon which a writer bases his answer. Even answers to questions that seem almost transparently clear can be improved by a little additional matter. There is almost always something that is obscure in the questioner's mind and a brief explanation of the answerer's idea of why the Code takes the position it does, is very valuable, as 15 or 16 of these will be fairly certain to put things in a clear light when collated.

Section Report.

The regular monthly meeting of the Eastern Massachusetts Section was held on Thursday, May 14, at the office of the commissioner of wires of the City of Boston. In the absence of President Davis, of Brookline, Mass., Commissioner of Wires Fuller, of Somerville, Mass., was elected chairman of the meeting. The Executive Committee, which had met earlier in the day, reported that they had settled upon a visit to New Bedford, Mass., for the next meeting, which is to be held during the week of June 22, the exact day to be settled later. The entertainment will include a clam bake, and visits to various places of electrical interest in the city, under the guidance of William R. Briggs, inspector of wires, of New Bedford, Mass.

After the reading of the records of the last meeting and the disposal of local and routine business, the Secretary presented a brief historical paper giving an account of the development of the carrying-capacity tables of rule 18 of the Code. In presenting the paper he disclaimed any attempt at originality and stated that what he had written was intended merely as a brief summary of the work upon which the table of rule 18 is based. At the conclusion of the paper there was considerable discussion by the members present, of the points brought out, after which the meeting adjourned subject to the call of the next meeting.

William Lincoln Smith,
Section Secretary.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

The Secretary regrets very much the delay in getting out his report, which he promised the members they should receive several weeks ago. He can only plead that the pressure of business has prevented its completion at an earlier date and he trusts that the members will forgive him, as he is really trying to keep the work of the office up to date as well as he can.

At the annual meeting of the National Fire Protection Association, which was held in Chicago, May 5, 6 and 7, our Association was represented by delegates, namely Executive Committee members Frank R. Daniel, J. E. Latta, and Thomas D. MacColl. At the time of writing this message the Secretary has not received any word in report of the meeting, and could hardly expect to receive a report at such an early date.

In conclusion he desires to call attention to a void in his system which can only be filled by the delicate attentions of the members in supplying him with an assortment of questions. Please attend to this, it will be of great assistance.

NOTES ON THE TABLE OF CARRYING CAPACITIES OF COPPER WIRE.[1]

By W. Lincoln Smith.

I have been led into preparing these brief notes upon the subject matter of Rule 18 of the National Electrical Code largely on account of the numerous questions put to me by wiremen and others as to the source and meaning of the current values given in Table A of that rule. Further, many of the men now engaged in or entering upon inspection work are not acquainted with either the research work nor the laborious conference work attendant upon the reduction of the results of the said research to a form suitable for the purposes of the Code.

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[1] A paper read before the Eastern Massachusetts Section on May 14.

The responsibility for all statements in articles and papers in these columns rests with the authors thereof, and not with the association, unless the said paper or article is certified by the secretary as having been presented to the executive committee and its publication as association matter duly authorized by them.

It is always well that an inspector should understand enough concerning the principles of an arbitrary set of specifications of this kind to answer questions which may be asked regarding its requirements, for while it may be in theory no part of his business to take his time for giving wiring instructions; at the same time if he can in a few words explain to a workman, interested enough and intelligent enough to ask the question, why Table A says 125 amperes for a rubber-covered wire of No. O B & S gauge rather than some other nearly similar value, he accomplishes two things. First, he makes the questioner understand that the rule is not the mere arbitrary say-so of some "highbrow" of whom he never heard, and secondly, he gives a distinct impression that he himself is not merely enforcing a printed rule handed him without knowing why, but that he has that underlying knowledge of principles and causes which will invariably lead to respect for his decisions when circumstances lead him to require some thing to be done which the Code does not clearly demand upon the face of things. Men are usually ready to do the right thing without controversy when they understand why it is the right thing, and better results in workmanship, harmony, etc., will certainly follow than when the direction is simply enforced by the apparently arbitrary invocation of the legal authority invested in the inspector.

Now without asking pardon for this somewhat lengthy introduction let us consider briefly the origin of the rule in question.

In the very earliest days when attempts were first made to transmit electrical energy over conductors in any quantity, it was found that two things must be considered, neither of which were of any importance when only feeble battery currents for moderately long telegraph lines were being considered: (1) the I^2R, or heating effect of the current; (2) the insulation for the relatively high voltages used; while from these two immediately arose the third question, what will be the effect of the former upon the material utilized for accomplishing the latter?

The very earliest investigation upon the carrying capacity of conductors was made by Prof. George Forbes, and published in the *Proceedings of the Society of Telegraph Engineers and Electricians* for March, 1884. The experimental portion of the work was unfortunately meager, while some of the thermal data used do not well apply to the conditions of the problem, and hence, although the mathematical discussion of the principles involved and their application to the concrete case was most thorough and excellent, the paper is not of material value to us.

Following Forbes, Sir William H. Preece, of the British Post Office, made an investigation which is also of great importance and which was presented to the Royal Society in March, 1888, it also being printed in the *Proceedings* of the same society as was that of Forbes. It, however, deals almost exclusively with the currents necessary to fuse wires of different metals and sizes and hence it too has but slight bearing upon our subject.

The next work which we find is the great classical paper on the subject presented to the Edison convention at Niagara Falls in August, 1889, by Prof. A. E. Kennelly, giving an account of the investigations made by him at the Edison Laboratory in Orange, N. J.

In the spring of 1891, Messrs. Sykes and Brainard took as their graduation thesis for a degree at the Massachusetts Institute of Technology, the problem of repeating some of Professor Kennelly's work and attempting to check his results with other types of insulation. They were, however, unable for lack of time to carry their work sufficiently far to do more than produce results showing a fair degree of concordance.

Finally, in 1895, H. N. Rust undertook as his graduation thesis an investigation of the currents at which wires of varying sizes and types of insulation would heat enough, (1) to reach the temperature of boiling water, and (2) the softening and ultimately the smoking point of the insulations.

Let us turn now to a brief examination of the work done by Professor Kennelly.

He studied (1) The action of insulated copper wire laid in wooden molding; (2) Of copper wire both insulated and bare hung on poles in the open air; (3) Of copper wires and strips suspended across a room to represent conductors in a station, and also to form a connecting link between the first and second sets of tests.

We shall be interested only, at present at least, in the first set of tests—those performed with wire laid in molding, or, as it was at that time called, panelling.

His molding was made in two sizes and in each case was laid on the laboratory floor as a support. Twenty-four wires were tested, varying in diameter from 18.5 to 445 mils.

The smaller sizes were tested one at a time, the larger sizes in two lengths at a time, each length occupying one of the two grooves in the molding.

His current was taken from a 110-volt direct-current Edison generator, its amount being controlled by a variable resistance consisting in part of a lamp bank and in part of a variable rheostat.

The value of the current was determined by means of a standard low resistance connected to a potentiometer, the settings of which were constantly checked against a Latimer-Clark standard cell. There was also included in the main circuit a standard ammeter as a secondary check. Each test was run for ten minutes and the current determined at minute intervals, the mean value being used in the calculation of the test.

The temperature of the wire was determined by the resistance method, using a differential galvanometer. Included in the main circuit was a standard invariable platinoid resistance; this gave a constant potential drop acting in one coil of the differential galvanometer; the other coil, being connected to the terminals of the wire under test, was subject to a variable potential drop increasing with the temperature of the wire, and with the proper adjusting resistances in the circuit these two potential drops were balanced against each other, by bringing the galvanometer to zero. Within the range of temperatures used, the temperature-coefficient of copper was taken as 0.00388 t, where t is the elevation of temperature in centigrade degrees. From the settings of the instruments in the circuit of the differential galvanometer it was, of course, easy to determine the amount by which the test wire increased in resistance, and therefrom by means of the above coefficient the corresponding temperature rise in centigrade degrees.

In each case the length of wire tested was 20 feet, approximately.

Theoretically the heating should increase as the square of the current; nevertheless a direct plot between currents squared and the temperature rise would give little information because the conductivity of the molding for heat varies, and the fit of the wire in the molding grooves has an important and varying effect. Under these conditions the heating would naturally increase faster than in proportion to the square of the current; however, as the temperature rises the convection and radiation from the surface of the molding also increase, the two effects tending to counteract each other, there being, however, too many variables for us to have reason to anticipate much, if any, agreement between the curve of squares and our measured relations. Professor Kennelly remarks that for diameters less than 100 mils the temperature seems to rise more slowly than as the square of the current, for diameters over 300 mils rather more rapidly, and between these two limits nearly according to the simple law.

He next determined by this method the curves of relationship between wire size and current for various temperature increments, of which I give three, namely the curves for 10, 40 and 80 degrees rise.

The accompanying table gives the data from which these are plotted, as well as several other curves which will be alluded to later on.

TABLE I.

Diameter in mils.	10 degrees rise.	40 degrees rise.	80 degrees rise.	10 degrees. Bare copper.	Boiling point.	Smoke point.
40	7	17	24	9	30	35
80	15	33	49	18	65	75
120	26	52	77	29	105	115
160	37	74	109	41	150	162
200	52	100	144	52	195	215
240	68	129	183	64	245	270
280	87	164	227	78	295	330
320	108	204	274	92	350	395
360	134	244	324	106	410	460
400	162	288	...	122	485	530

In this table, the first column gives the wire diameter in mils, the second, third and fourth, the currents in amperes required to give a temperature rise of 10, 40 and 80 centigrade degrees to wire run in moldings; the fifth column, the amperes necessary to give a temperature rise of 10 centigrade degrees to bare bright copper wire hung horizontally in still air at a temperature of 20 degrees centigrade, or 68 degrees Fahrenheit. The last two columns give the current necessary to raise the temperature of the insulated wire to such a point that when a small chip is cut out of the insulation and a drop of water placed on it, the water will just be brought to the boiling point, and the temperature at which the first traces of smoke can be detected emanating from the insulation. These last two columns are taken from the thesis of Mr. Rust already referred to. Briefly, the method used in determining these was as follows: The current was taken from the secondary of a large welding transformer, and carefully measured by means of alternating-current ammeters checked against each other and calibrated by direct currents, using reversals. The wires were cut into lengths about three feet long, the insulation stripped back about one inch from each end, and the wires clamped firmly in the jaws of the transformer. The wires were screened from heat and drafts and the surrounding temperature kept as constant as possible.

The wires tested ranged in size from No. 14 to 0000 B & S gauge and in all 75 samples were tested, of 12 different types of wire, as follows:

Americanite, next core thick black rubber, single braid glaze. Anchor, black rubber compound, single braid. New York Insulated, white rubber, then black rubber compound, then braid. Okonite, black rubber compound, single braid. Simplex, extra thick black rubber compound, double braid. ..... white rubber compound with single black braid. Underwriter's Wire, cotton braids with white fire-resistant compound. Weatherproof line wire, one black weatherproofed braid. Weatherproof line wire, two black weatherproof braids. Phillips wire, three black weatherproof braids. Clark line wire, one black weatherproof braid. Salamander wire, soft unvulcanized white rubber, then layer of black vulcanized rubber, then a greyish crumbly fire-resistive compound, then double weatherproof braid.

Professor Kennelly had stated in his papers that his tests showed conclusively that the effect of the insulating compound was to cool the wire. He found that a wire with a thick covering of insulation ran cooler than one of corresponding size with a thinner covering and observed that a bare copper wire laid in molding rose fully 30 per cent higher in temperature than a covered wire of equal diameter and load under the same conditions.

The same effect was observed in the wires tested by Mr. Rust, the effect being very obvious.

The table of boiling-temperature, current and smoking-temperature currents are the mean values obtained by consolidating all the different samples and makes of like sizes.

The striking thing in the original records is the surprising way in which the currents necessary to produce the smoke indication bunch about the mean value given in the table, wires of widely different types agreeing with pronounced closeness. The only one showing marked variation in this regard was the Salamander, which regularly ran pronouncedly higher, so much so that it required a plot of its own and could not justly be used in getting the mean values of the others.

It is obvious that from Professor Kennelly's data and plots we can determine the current necessary to bring a wire to any desired temperature, provided we know the temperature of the wire and its surroundings when not carrying a current.

We must, therefore, settle on an allowable limiting temperature and an assumed starting temperature. A committee of the English Institution of Electrical Engineers reported a rule in 1888 which was as follows: "The conductivity and sectional area of a wire should be so proportioned to the work it has to do that if double the proposed current be sent through it the temperature of the conductor shall not exceed 150 degrees Fahrenheit." As was stated, if this or any similar rule is to be applied we must assume a starting point and this Professor Kennelly took at 75 degrees Fahrenheit. Now 150 degrees Fahrenheit=65.6 degrees centigrade and 75 degrees Fahrenheit=23.9 degrees centigrade; the difference is 41.7 degrees centigrade, so that our conditions are:

(1) Double the allowable current shall not cause a final temperature higher than 65.6 degrees centigrade.

(2) Double the allowable current shall not cause a greater rise in temperature than 41.7 degrees centigrade.

Remembering that the temperature rise is approximately proportional to the square of the current, this criterion will work out that the allowable current must not produce a rise in temperature of more than 10.4 degrees centigrade or 19 degrees Fahrenheit and to allow for the fact previously referred to, that actually the temperature increases rather more rapidly, we use 10 degrees centigrade or 18 degrees Fahrenheit.

Professor Kennelly then proceeds to find a formula which shall best represent his 10-degree-rise curve by the usual methods and finds

$$d=14.7\sqrt[3]{I^2} \quad \text{or} \quad I=0.07775\sqrt{d^3}$$

where d is the diameter of the wire in mils and I the current in amperes.

This equation gives a curve which fairly represents the plot of the observations for 10 degrees centigrade rise, but which gives values slightly less below the 300-mil wire and then departs from it quite rapidly, as shown in Table II.

TABLE II.

Diameter in mils.	10-degree curve.	Equation to nearest integral number.	Current based on 1,000 amperes per square inch.
40	7	5	1.8
80	15	14	5
120	26	23	11
160	37	35	20
200	50	50	31
240	68	66	45
280	87	84	62
320	108	103	81
360	134	122	102
400	162	143	126

The last column of this table gives the allowable currents based on the standard of 1,000 amperes per square inch of cross-section.

We are now ready to consider the situation as it presented itself in the spring of 1896, when the first meeting of the National Conference on Standard Electrical Rules was held in New York, March 18 and 19. At that meeting the delegates had in their hands copies of the various codes in use and in these we find that the code as recommended by the National Electric Light Association contained a table as follows:

Gauge No.		16	14	12	10	8	6
Amperes.		5	10	15	20	25	35
Gauge No.	4	2	1	0	00	000	0000
Amperes.	50	70	95	100	120	145	175

This table was also contained in the code as established by the Associated Factory Mutuals Insurance Companies.

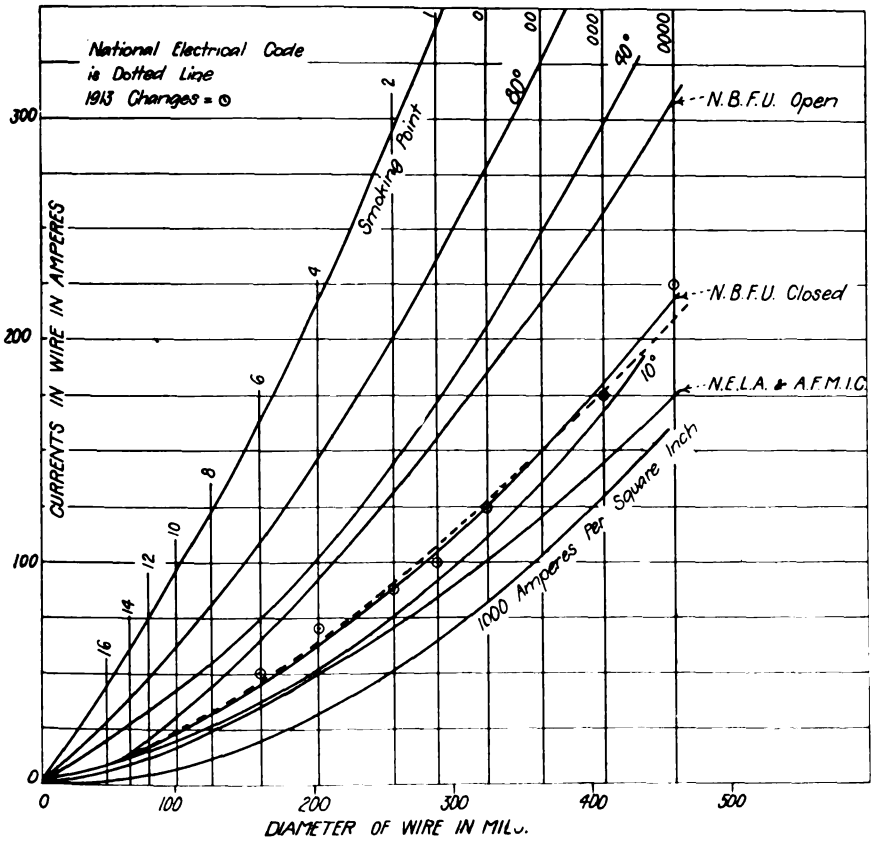
The table as contained in the code adopted by the National Board of Fire Under writers was as follows:

Gauge No.	16	14	12	10	8	6
Closed Work Amperes	6	12	17	25	35	45
Open Work Amperes	8	16	23	32	46	65

Gauge No.	4	2	1	0	00	000	0000
Closed Work. Amperes	63	88	105	125	150	181	218
Open Work. Amperes	92	131	156	185	220	262	312

The table as adopted by the first two associations mentioned was the practical embodiment of Professor Kennelly's 10-degree curve.

The table of the National Board of Fire Underwriters' was a modification of this, as was explained by its representative at the meeting as follows: "We found that if we increased the carrying capacity of No. 16 from 5 to 6 and of No. 14 from 10 to 12 we brought about an economical means of secure construction we were after. That allowed us to wire from the cabinet or center of distribution to the last lamp with only one cutout, and limit the current depending on the cutout to 6 amperes, using No. 14 wire and No. 16 cord. We did away with the fuse where the cord taps on the wire. Proceeding on that assumption, we plotted curves by Mr. Kennelly's table and straightened them out and then added certain percentages to those tables for our new tables of open and concealed work."



Curves Showing Various Ratings for Copper Wire.

Asked what was the objectoin to this table, the representative of the Factory Mutuals Companies replied: "I am not prepared to criticise it as a whole, but in making our rules we did not feel justified in adopting it for the present. As an example of the results of some tests we have made, a No. 00 wire with ordinary waterproof braid was made to carry 240 amperes. In about ten minutes the insulation had softened somewhat. You could press it between your fingers and it would show the impress of the skin lines. You could also rotate it around the wire. If you cut out a little piece the inside appeared gummy, showing the material had become more or less softened by heat. Now that current was only 20 amperes more than this table allows for open work."

In addition to these there was the rule of the Phoenix Insurance office which read: "The quantity of current sent down a conductor under normal conditions must not exceed the ratio of 1,000 amperes to the square inch of sectional area where the amount of current does not exceed 100 amperes. If in excess of that amount the ratio must of course be less.

At the same time we find that the original rule of the English Institution of Electrical Engineers' Committee (1888) had been modified to allow a temperature of 25 degrees Fahrenheit instead of 18 degrees Fahrenheit (10 degrees centigrade), as this had been found very safe but excessive in cost of installation.

Further there was the rule of the British Board of Trade, which allowed practically a 30 degree Fahrenheit rise. Also the rules of the Associated Edison Companies, the German rules, rules of the New York Fire Department, the Pittsburgh Wire Department, etc.

There was a very full discussion of the matter at the meeting of the Conference in the course of which Professor Kennelly stated:

"A wire may be considered to be safe, at a safe temperature so far as fire risks are concerned, when the hand can be steadily held closed upon it. The limiting temperature at which the hand can be borne upon a wire in this manner is about 50 degrees centigrade or 122 degrees Fahrenheit. Taking this as the safety limit and the summer temperature as 30 degrees centigrade or 86 degrees Fahrenheit, the safe temperature elevation that can be allowed for a wire is 20 degrees centigrade or 36 degrees Fahrenheit."

It was further stated that while no trace of rubber deterioration could be detected at this temperature, there were evident signs of such a result at 150 degrees Fahrenheit.

Thus we have the Factory Mutuals and National Electric Light Association rules allowing practically a ten-degree rise with a 50-per-cent safety factor; the 1,000-ampere-per-square-inch with a still greater factor; the National Board of Fire Underwriters with approximately a 25-degree rise; the English Board of Trade rule allowing a 30-degree rise; while it is recognized that a 36-degree rise will at usual summer temperature carry the wire up to about as hot as one can bear one's hand on for any length of time.

At this meeting of the Conference there was appointed a Code Committee consisting of

F. B. Crocker chairman, American Institution of Electrical Engineers; W. R. Ford, secretary, American Street Railway Association; William Brophy, National Electric Light Association and National Association Fire Engineers; W. H. Merrill, National Board of Fire Underwriters; E. V. French, Factory Mutuals Fire Insurance Companies; Alfred Stone, American Institute of Architects; E. A. FitzGerald, Underwriters National Electric Association; W. J. Hammer, (president of Conference) *ex officio*; and to them were assigned among other matters the consideration of changes and additions to the various rules. The committee met in the fall of 1896 and as one of the results of its labors there emerged a new table of carrying capacity, to wit:

Gauge No.	16	14	12	10	8	6
Amperes.	6	12	17	24	33	46

Gauge No.	4	2	1	0	00	000	0000
Amperes.	55	90	107	127	150	177	210

This set of values is, of course, well

known to us all as it is the current value of Table A of Rule 18 as it existed from the beginning of the year 1897 to March 26, 1913, when it was again modified to read as we have it now:

Gauge No.	16	14	12	10	8	6	
Amperes	6	15	20	25	35	50	
Gauge No.	4	2	1	0	00	000	0000
Amperes	70	90	100	125	150	175	225

The currents as established in the original Table A are just about 60 per cent of those necessary to carry the wire temperature 75 degrees Fahrenheit above its surroundings, or up to 150 degrees Fahrenheit from a starting temperature of 75 degrees Fahrenheit, which is assumed as the average indoor temperature. If the heating followed the I^2R-law strictly this would mean the currents of Table A would run the temperature up 27 degrees Fahrenheit, but as it does not do so the temperature will be carried up slightly more, say from 28 to 30 degrees Fahrenheit, depending somewhat on the size of the wire. At any rate this means under the assumed conditions that the wire will rise to about 102 degrees Fahrenheit or a little more, leaving a leaway of about 20 degrees Fahrenheit between the final temperature and the point where the average man finds the wire too hot to hold with comfort, which is ample to allow for fluctuations of room temperature and other inevitable variables.

As for the new ratings, it is seen that the largest change is an increase of 15 amperes (from 210 to 225) in the case of 0000 wire and as the heating is approximately as the square of the current, it would be increased in the proportion of 44100 to 50725; that is, a rise of from 31 to 34 degrees Fahrenheit according to the size of the wire, which it is seen still leaves a good factor of safety.

As for Table B of the rule, referring to insulations other than rubber, that was obtained by taking 90 per cent of the currents causing a rise of 75 degrees Fahrenheit, instead of 60 per cent thus giving a much smaller margin of safety, but all that was considered necessary, as these coverings are more a mechanical protection than a reliance for insulation.

It is interesting to note also that these values in Table A are just about one-third of those which will cause the wire to reach the smoking point.

Finally, although the changes made in 1913 look erratic, they accomplish two things: they bring the current values to multiples of 5, and they also bring them into accord with fuse ratings, which is quite important. In the diagram on page 1029 the original National Electrical Code ratings are shown by the dotted line, while to avoid obscuring the curves the 1913 changes are simply indicated on the diagram by points with small circles around them.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

Electric Line Construction. A hearing is to be held on June 10 for the purpose of adopting uniform standards for electric line equipment.

CALIFORNIA.

The State Supreme Court has denied the petition of the Commission for a rehearing of the Del Mar Water, Light & Power Company's case, mentioned in the Electrical Review and Western Electrician of April 25. The Commission contended that it has the power to compel a public utility to serve a person outside of any special limits it might lay down. This power is denied by the court. Referring to its former decision, the Supreme Court says: "It does not hold that the plaintiff company is not a public utility, or that it is not engaged in distributing water for public use; it merely declares that the land of the claimant, Glass, is not, and is not found by the Commission to be, within the district or area to the use of which the water owned or controlled by that company is dedicated, and therefore that he is not entitled to demand the distribution thereof to his land." Under this decision it appears that a public utility may specify the section to be furnished with its commodity and may not be compelled by the Commission to extend its service beyond the district which it has undertaken to serve.

The Downey Light, Power & Water Company was authorized to sell its electric system in Los Angeles County to the Southern California Edison Company for $50,938.30. The purchasing company offers rates for lighting purposes considerably lower than the rates charged by the former company.

Security Issues Authorized. The San Diego Consolidated Gas & Electric Company was authorized to renew eleven promissory notes aggregating $373,228.88.

The Pacific Light & Power Corporation was granted permission to issue promissory notes in the sum of $2,500,000.

The Roseville Home Telephone Company was authorized to transfer its system to the Roseville Telephone Company for $11,000 in stock of the latter company.

The Whitney Power & Electric Company was granted authority to issue $500,000 of six-per-cent 30-year bonds. The bonds are to be sold so as to net the applicant 95 per cent of the par value plus accrued interest.

GEORGIA.

The Georgia Railway & Power Company has an application before the Commission for authority to execute a substitute mortgage to secure the $30,000,000 bond issue authorized by the Commission in 1912 and to issue $650,000 more of these bonds. The $27,000,000 of capital stock authorized by the Commission has been issued, but the bond issue has not been sold because of certain provisions in the mortgage which the company is seeking authority to change. The stock and bond issue totalling $57,000,000 was authorized by the Commission in connection with the purchase of several utility properties by the applicant company.

There is a suit before the Superior Court to declare void the order of the Commission allowing the $57,000,000 merger of the Georgia Railway & Power Company on the ground that this authorization was acquired by fraud and misrepresentation. It is alleged that certain bond issues, previously authorized by the Commission, were not used for the purpose specified.

ILLINOIS.

The Elkhart Independent Telephone Company applied for authority to materially increase its rates for telephone service. In a decision rendered on May 7, the Commission found that the increased rates for business, residence and rural service were reasonable, but that, from the comparative data available, the proposed rates for switching service were excessive and a lower rate was named for this service.

The Lexington Home Telephone Company purchased the property of the Lexington Telephone Company, a competitor, and established a new rate for telephone service over the consolidated system, higher than that charged formerly by either company. The Commission issued an order on May 6 approving this rate effective as of December 15, 1913, the date of the consolidation.

NEW HAMPSHIRE.

Uniform Accounts. The Commission has under consideration the adoption of a uniform system of accounts for electric companies. A tentative classification has been formulated and a hearing is to be held before the Commission on May 26, at which time electric companies of the state will have an opportunity to offer criticisms and suggestions.

The Laconia Gas & Electric Company was authorized to make an additional issue of bonds to the par value of $25,000 to be used for the payment of indebtedness incurred for extensions, additions and permanent improvements to its plant and system made prior to September 30, 1913.

The Canaan People's Telephone Company was authorized to construct a telephone line to serve certain territory in the town of Canaan.

NEW YORK.

The Pioneer Telephone Company, operating in Clarence, Erie County, was authorized to issue $7,590 par value of capital stock to be sold at not less than par, the proceeds to be used to pay for new construction and to discharge certain obligations for capital purposes.

OHIO.

Bucyrus Light & Power Company. A decision was rendered on May 15 in the Bucyrus rate case. This is the first important valuation case to be decided by this Commission, and public utilities throughout the state have been interested in the investigation which has been in progress before the Commission for some months. The case arose upon application of the company alleging that rates fixed by city ordinance were confiscatory. The Commission fixed the value to be used as a basis for rate making at $95,000.

Valuation of Telephone Property. The Commission rendered a decision, May 18, fixing the value of the Central Union Telephone Company. This is the second complete appraisal of a public utility made by this Commission. It is expected that decisions in other valuation cases will be issued within a short time now that the fundamental case, the appraisal of the electric light plant at Bucyrus, has been completed. The valuation of the telephone company's property was made upon application of the city of Lancaster and is to be used as a basis for adjustment in the rates for telephone service in that city. The Commission fixed the cost of reproduction of the property at $150,983.45 and present value $126,148.52. The company submitted estimates showing higher figures. The company has 30 days in which to appeal and in case it fails to act the city of Lancaster will adjust its rate differences upon the basis fixed by the Commission.

The Wadsworth Light & Water Company. The Commission issued an order May 15 authorizing the company to issue $4,350 of preferred capital stock to be sold for the highest price obtainable, but for not less than par value, the proceeds of such issue to be used to reimburse the company for money actually expended in additions and improvements to its plant and system.

Proposed Purchase. The Ohio Service Company has arranged to purchase the electric light and power companies in New Philadelphia, Canal Dover, Cambridge and Circleville and the proper applications have been made to the Public Service Commission.

PENNSLYVANIA.

Rules and Regulations for electric utilities were noted in last week's issue. Circulars have been received containing rules and regulations for heating, gas and water service utilities which were adopted on the same date, April 9, 1914. These rules were prepared by Prof. R. H. Fernald, University of Pennsylvania, and Prof. L. H. Harris, University of Pittsburgh.

Transfer of Property. The Commission approved the purchase of the franchises of the American Electric Light & Power Company by the Lehigh Valley Light & Power Company.

WISCONSIN.

Telephone Rates. The compilation of telephone rates of all Wisconsin companies, in force October 1, 1912, has been published in pamphlet form. This is one of a series of pamphlets containing a complete compilation of the rates of all electric, heating, gas and water companies operating within the state.

Water-Power Act. The Commission has rendered a report relative to the obstructions to navigation in the Beaver Dam River in the city of Beaver Dam. The report is submitted to the governor in accordance with the provisions of the Water-Power Law. The Governor, if he approves of the Commission's findings, instructs the attorney-general to institute proceedings in the name of the state.

Earl Telephone Company versus Trego Telephone Company. The Commission decided that the Trego Telephone Company was not in violation of the statute prohibiting the paralleling of telephone lines when it built its lines along the same route as the Earl Telephone Company for over a mile. It appears that poles had actually been delivered to the place where they were to be erected prior to the passage of the act, although the actual setting of the poles and stringing of the wires was done subsequent thereto. Since the buying of the poles and delivering of the same was a considerable portion of the construction expense the Commission held that the line was in course of construction previous to the time the statute took effect. The Trego Telephone Company is cautioned, however, that it must receive permission from the Commission before any further extensions can be made in the territory of the Earl Telephone Company, especially at the terminus of its line in Spring Brook where the Earl Telephone Company now has subscribers.

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Municipal Appraisal of Cincinnati Central-Station Property.

For the purpose of making an accurate appraisal of the properties of the Union Gas & Electric Company, of Cincinnati, O., to use as a basis in fixing electric rates, the city has taken steps to employ A. C. King, deputy commissioner of gas and electricity of the city of Chicago, at $50 a day and expenses, to supervise the work. The Cincinnati Chamber of Commerce has taken a hand in the matter, and will probably suggest the employment of other experts for other purposes, on the ground that numerous other factors are involved in the fixing of rates.

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Valuation of Public Utilities in District of Columbia.

Preliminary arrangements for the establishing of valuation of the properties of the public utilities corporations in the District of Columbia were recently made, following the arrival from Chicago of Andrew Sanster and Robert McArthur, who will be employed in the work as chief accountants. They will be under the direct supervision of Edward W. Bemis, to whom the Public Utilities Commission recently awarded a contract for the valuation of the electric street railways, the electric-light plant and the gas plant.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—Panama Canal Locomotives.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 221.—Quartz Lamps on Alternating-Current Circuits—Why can the ordinary quartz-tube lamp not be used on alternating-current circuits? Are any such lamps available for these circuits?—B. W., Denver, Colo.

No. 222.—Induction Motors.—1. With a given set of coils and a three-phase induction-motor stator, is there any rule by which the proper coil pitch can be determined other than approximating by placing the coil in the slots? 2. What effect on the power-factor, efficiency and speed will changing the coil pitch give on induction motors? 3. With a given winding in an induction-motor stator, what effect on power-factor and efficiency will changing the connections from Y to delta have and vice-versa?—A. C. H., Security, Md.

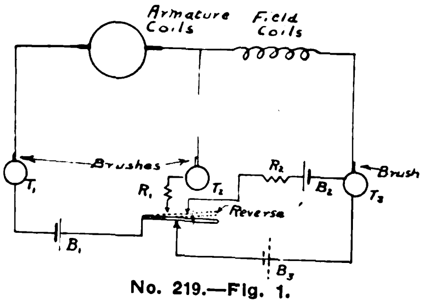
No. 223.—Street or Station Indicator.—Is there on the market an automatic device, usable inside of street cars, that will automatically, through electrically illuminated signs in each end or one end of the car, indicate intersecting streets by name as and when the car approaches such intersecting streets, irrespective of the number of such streets, and is the same practicable? Where is such a device used and by whom manufactured?—W. H. W., Kansas City, Mo.

Answers.

No. 219.—Reversing Electric Toy Train.—Some electric toy locomotives are made to reverse by means of a reversing switch on the locomotive, but this requires stopping the train and changing this switch. Is it possible to arrange the outfit so that reversing can be done from the control station without touching the locomotive? I have been told it would require four rails for each track. Can this be done with only the three rails usually provided?—D. H. S., Rockford, Ill.

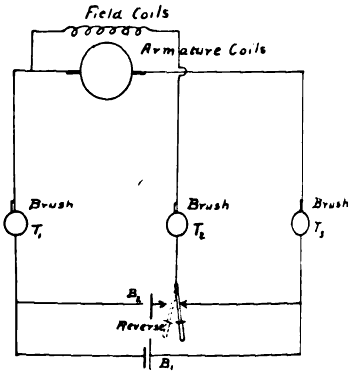
It must be remembered that in order to reverse the direction of rotation of an electric motor it is necessary to reverse the direction of current in *either* armature or field. This condition requires that one rail feeds the current into the field in one unchanged direction, and the current coming out of the field must go to the armature in either of two directions, as is required by the direction of rotation. It is obligatory that this outcoming field current must come on another rail to another externally controlled switch which will direct the current in and out of the armature by means of two additional rails. In other words, four rails are needed to permit reversal from the control station, if a motor with electromagnet field is used. However, if a motor with a permanent-magnet field is used, the field is not connected to the circuit at all and two rails insulated from each other will serve the armature and permit reversal of its current. Or the two main rails may serve as one side of the circuit and the third rail as the other.—W. M. P., Seattle, Wash.

It is assumed that the toy railway motor referred to is a direct-current motor operated on dry batteries or a few cells of storage battery; further, that the three rails of the track are insulated from each other, and are not brought into electrical contact with each other by the axles or other parts of the engine or cars, also that brushes are placed on the engine or cars for the express purpose of taking current from the rails; and further that current taken from the rails by the brushes may be from them conducted through the various coils comprising the motor windings, in any desired manner. All direct-current motors consist electrically of two main parts, the armature which usually is the rotating member and the field which is usually stationary. It will be necessary for you to first examine your motor to determine whether the field coils are connected in series with the armature or in parallel with the armature.



No. 219.—Fig. 1.

In case the coils are all connected in series the arrangement shown in Fig. 1 will enable you to reverse the motor without touching the engine. It requires making use of only the three rails and an extra battery, almost run down or of lower voltage than the battery ordinarily used; or an extra battery identical with that ordinarily used together with resistance as shown. The value of the resistance or lower battery voltage for the extra battery is to be determined as follows. Resistances at R_1 and R_2 must be adjusted so that when the motor is running reversed the armature or field coils will not heat more than ordinarily. In case you have no resistances of a suitable character available, old run-down dry batteries connected in opposition to battery B_1 at R_1 and in opposition to battery B_2 at R_2, so that the coils will not overheat as outlined above, will serve the purpose. If a sufficiently run-down battery, or new battery of proper voltage not to overheat the field coils is placed at B_2, no resistance or opposing battery need be placed at R_2. Also if battery of a sufficiently low or weak voltage can be placed at B_1 the resistance or opposing battery at R_1 may be omitted by placing a battery at B_3 such that the voltage of B_1 plus B_3 is equal to the voltage normally used. In reversing the motor, you should not throw the switch into the reverse position until the motor has stopped. It may be stopped quickly by arranging the battery switch for battery B_1 so as to cut off the battery and short-circuit rails T_1 and T_3. Neglect of this point regarding reversing the motor while battery is on and it is still running in the original direction might result in serious damage due to overheating of the coils.



No. 219.—Fig. 2.

If the armature is connected in parallel with the field, the motor may be connected as shown in Fig. 2. The batteries B_1 and B_2 are to be of the same voltage as normally used. The same precautions regarding reversing with the battery connected and the motor rotating in the original direction apply in this case as in the case of the serially connected motor above; and the same procedure will produce the same brake effect. The general theory of the arrangements shown in Figs. 1 and 2 hinges on the fact that it is necessary to reverse the field coils relatively to the armature coils in order to reverse the direction of rotation of a direct-current motor.—R. L. W., Hackensack, N. J.

No. 220.—PATENTABILITY OF COMBINATION INVENTION.—If a person invents an entirely new device by bringing about, after prolonged experimentation, a very difficult but successful combination of parts already in use, can a patent be secured on the new device? For example, I have been told that the new nitrogen-filled tungsten lamp cannot be patented because nitrogen and other inert gases had already been used during the early development of incandescent lamps and concentrated tungsten filaments have been employed in standard tungsten lamps for a year or more. Is this matter covered by the patent laws or has the practice been determined by the courts?—J. W. T., Toledo, O.

An invention composed of old or well known elements is patentable whenever their combination enables them to produce a new result, or a familiar result in a different way. However, the mere aggregating of old features into a more desirable combination in which each constituent performs its old function in the same way in which it performed it formerly, generally requires only the exercise of common sense and hence will not form the basis of a patent, even though the result is superior to what was formerly on the market. Thus, in the case cited by J. W. T., both nitrogen as a substitute for air in an incandescent-lamp globe and tungsten as a filament for such a lamp are old, hence the combination of the two would not be patentable. Generally speaking, any combining of old features which only requires ordinary mechanical skill to effect the same, is not patentable in this country. However, there may be exceptions to this general rule, as evidenced by a decision of the Court of Appeals of the District of Columbia (*In re.* Merrill, O. G. 199, p. 618), in which the court held that "Patentability will often be presumed from the fact that a device, although apparently disclosing but the mere exercise of mechanical skill, produces a result long sought after, but for the first time attained." Moreover, the inventor does not always grasp all of the principles involved in his new process or device, as viewed from the standpoint of the Patent Office, hence an experienced patent attorney can often point out a proper basis for patentability where none would appear to a layman, thereby helping the latter to the protection which ought to accrue to him for his contribution to general progress.—Albert Scheible, Chicago, Ill.

If a person creates an entirely new device by the combination of parts already in use for other purposes, the device can be patented if the combination is really a new one. The famous Selden automobile patents are a case in point. The inventor claimed as his invention "The combination with a road locomotive, provided with suitable running gear including a propelling wheel and steering mechanism, of a liquid-hydrocarbon gas engine of the compression type, comprising one or more power cylinders, a suitable liquid-fuel receptacle, a power shaft connected with and arranged to run faster than the propelling wheel, an intermediate clutch or disconnecting device and a suitable carriage body adapted to the conveyance of persons or goods." An analysis of this first and main claim shows that the machine consists of the following parts: (1) running gear; (2) gas engine; (3) fuel receptacle; (4) power shaft; (5) clutch; (6) carriage body. Each of these parts was well known and in common use at the time and the invention consisted in combining them to produce a previously unknown vehicle, and a patent was granted.

The question in regard to the patentability of the new nitrogen-filled lamps is one of priority. In this lamp we have the following elements: (1) an electrically heated incandescent filament, (2) the glass bulb, and (3) an inert gas filling the bulb and entirely surrounding the heated filament. The invention claimed is the combination of these three elements and if the combination had not previously been made it would be patentable now. The requirement that an invention must be *new* and *useful* is a statute requirement.—F. E. V., Madison, Wis.

Civil Service Examination for Expert Radio Aid.

The United States Civil Service Commission will hold an examination at the usual places on June 17 for eligibles to fill a position as radio aid in the Navy Yard in New York City and in similar service. The duties of this position are: to direct and assist in the laboratory standardization tests of all circuits, instruments, and apparatus pertaining to and used in radio signaling; the practical installation, repair, and adjustment of radio apparatus both in shore stations and on ships; the development of special apparatus and methods of radio signaling suited to special conditions, and of new forms of sending and receiving circuits; to inspect the various radio stations when called upon and to make the necessary measurements of their electrical constants; and in general to carry out such work as may be necessary for the development of radio apparatus. The aids will be required to prepare technical reports of inspections, tests, and experimental research work. The salary is $6 per day.

The examination will deal with theoretical and practical questions in the construction, use and adjustment of radio apparatus. Weight in the final selection will also be placed on technical training and experience of the applicant. Applicants should be graduates of technical schools of recognized standing and have taken a course in electrical engineering and a special course in wireless telegraphy; also should have had several years' experience in the manufacture or installation and adjustment of wireless apparatus and in theoretical or practical research work. It is further desirable that they should be operators, but this is not necessary.

Applicants must be men of 21 years or over, and should write to the Commission at Washington for application form 1312.

Civil Service Examination for Electrical Engineer and Draftsman.

The United States Civil Service Commission will hold an examination on June 3 and 4, for electrical engineer and draftsman, to fill vacancies in the office of the Supervising Architect, Treasury Department, Washington, D. C. The salary of this position is $1,200 per year. On the first day the examination will be devoted to questions on electrical science, covering particularly lighting and elevator service in public buildings. The second day will be devoted to drawing and design of electrical apparatus and machinery for public buildings. Training and experience will also be taken into account.

Applicants must have a good common-school or high-school education and not less than three years' special experience as draftsman, principally in connection with electrical work, or be technical graduates with not less than ten months' experience as electrical draftsman or practical experience in the installation of electrical wiring or apparatus. Applicants must be men 22 years of age or over. Application Form 1312 should be sent for and filled out.

Electrical Progress in Argentina.

The rapid progress that the electrical industry is making in Argentina can be seen from comparing the imports of electrical machinery and appliances during the past five years, these having been as follows: 1909, $4,069,322; 1910, $5,540,576; 1911, $6,449,744; 1912, $9,272,477; 1913, $9,576,235. The principal articles of import have been: cables, insulators, wire of all classes, carbons, dynamos and motors, switches, arc lamps, incandescent lamps, meters, and accumulators.

Valuation of Utah Power Companies.

The State Board of Equalization at Salt Lake City, Utah, has finished the compilation of the valuation of the properties of public utility companies in Utah, based upon the assessment made on January 1 of this year. The valuation of the principal lighting and power utilities are as follows:

Utah Light & Railway Company	$3,267,580
Utah Power & Light Company	2,405,925
L. L. Nunn Properties	55,415
Beaver River Power Company	100,275
Total	$5,929,195

ELECTRICAL EQUIPMENT FOR INDUSTRIAL PLANTS.

By Harry C. Spillman.

Few manufacturing plants realize the important fact that modern electrical equipment is one of the best kinds of insurance both in respect to fire and continuous production. The entire operation of a plant depends upon the power supply, and in case a single motor stops it directly affects the output.

A number of shutdowns and delays can be avoided by the proper selection of electrical equipment and by having the installation planned to possess the inherent qualities necessary to stand an enormous amount of abuse.

The layout and installation of the wiring for an industrial plant should receive the same careful attention as the layout of departments and the selection of machine tools. Unfortunately, the wiring is not considered until the buildings are nearly ready for occupancy and the rule of thumb methods are given preference over a careful study and systematic layout. When designing an installation it is far better to analyze every condition, including the shortest and best methods for running the feeders, the size of the wires both for present and future requirements, the choice between open wiring and steel conduit, and method of reinforcing the feeders for future demands. The voltage to be adopted and the question of using alternating or direct current must also receive careful attention.

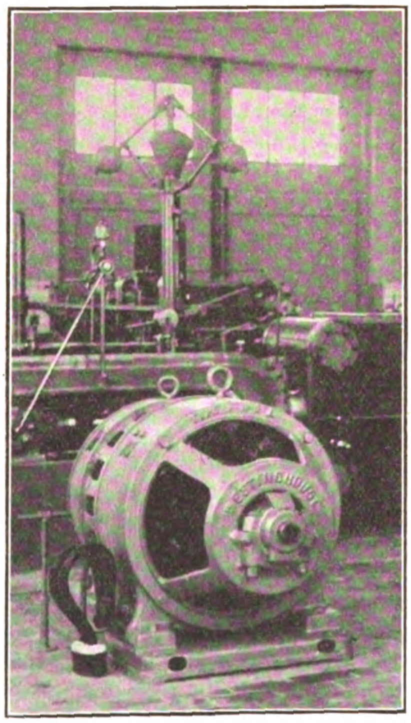


Fig. 1.—A Job Made Attractive by the Use of a Conduit Fitting.

The choice between alternating and direct current is a problem which can only be solved by knowing all the conditions to be met. When a plant does not demand variable-speed motors, alternating current will prove very satisfactory, as the voltage can be easily raised for long-distance transmission and it allows a higher voltage for motors than for lighting without a great loss. Alternating-current motors give less trouble than the direct-current type and they require less attention.

The voltage adopted depends upon the size of the plant and local conditions. Sixty-cycle, three-phase, alternating current works out the best for the average industrial plant, as one generator and one set of buses will supply both lamps and motors. For a small plant covering an acre or less the best voltage is 110 volts, which will take care of both the motors and lamps without balance coils or transformers. If the plant does not cover over 30 acres, 220 volts is correct. This voltage allows the use of 110-volt lamps by using balance coils, which are considerably cheaper than transformers. In case the plant covers over 30 acres of ground, but does not exceed a square mile, 440 volts is the best. This voltage will demand the use of transformers for the lighting circuits.

In case a power house is to be erected in connection with the plant, arrangements should be made with the local lighting company for a throw-over service which will take care of the load on Sundays and overtime. This service will also prove of great value in case of a breakdown in the power plant.

The power requirement is the greatest problem to be solved and unfortunately, data for power requirements for group drive are not available. Very little research work has been done in this line. An engineer has to work out his own load requirements. Most machinery builders can furnish power requirements for direct drive, which represents the maximum power demanded for their machines. When a number of machines are driven from a line shaft a portion of the machines are idle, others are taking a light cut and the remainder are demanding a range of power up to the maximum. If 40 per cent of the total maximum power for all the machines is taken it will give very close results for the power requirements. Recent tests of a modern machine shop show the amount of power necessary for group drive.

Per cent of machines in operation	71
Total average power per square foot of floor space	13.4 watts
Line shafting and counter shafting per linear foot of line shafting	25.3 watts
Power consumed by line and counter shafting per square foot of floor area	4.11 watts
Total friction losses, all machines running light, per square foot of floor area	9.98 watts

Floor area includes floor space occupied by machines and space allotted for the operators and storage of material around the machines.

The selection of the sizes of the motors should next be considered and it is an excellent idea to standardize the equipment as far as possible. A large automobile company recently built a new plant and they adopted one make of motors. All the motors in the plant run at 1,200 revolutions per minute; and 1, 5, 10 and 20-horsepower motors are used exclusively. This eliminates carrying a large number of spare motors in stock, and in case of a breakdown the new motor will drive the shafting at the right speed without changing the pulleys or belting.

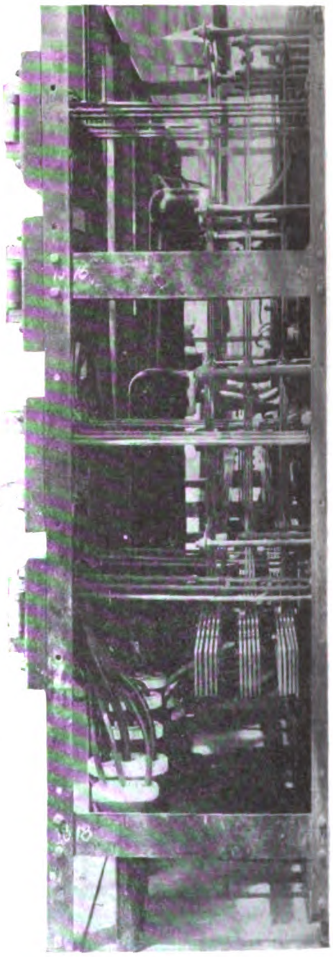


Fig. 2.—Conduit with Conduit Fittings Behind a Switchboard, Thus Avoiding Tangled Wires.

The lighting load can be very accurately obtained by deciding upon the kind of illumination and the number of foot-candles required at the working plane.

After the power requirements are obtained, drawings should be made showing the approximate location of each motor and lamp, and the location of each power and lighting cabinet. With this layout the length and size of the feeders can be determined very accurately. These drawings should show the size of each feeder and its entire run. The values of these cannot be overestimated as they will prove a quick and accurate method for obtaining the material and will be a great help when the installation is started. It will also serve as a permanent record of the work. It is good practice to allow a five-per-cent drop in the transmission circuits when they are fully loaded and a three-per-cent drop in the branches. The feeders should be of sufficient size to take care of the future load during the next four or five years. Each building should have separate feeders and the lighting circuits should be independent of the power circuits. This will give a more flexible arrangement and a far better layout. In case of trouble it can be more easily located and it allows each building to be independent of the others for power and light. When the layout of the feeders is planned it is far better to run the wires out of the way of belting, shafting and other obstructions, and conduit should be given preference over open work. If the wires are in conduit there is less danger of grounds, the wires are far better protected, less room is required and the installation is more attractive. The illustrations which accompany this article show the use of conduit fittings which further add to the appearance of the installation. It is advisable to place a tee or cross at intervals in all the feeder lines to allow future branches to be taken off without cutting into the conduit.

The mounting of motors has never been given the proper thought. A motor is usually suspended from the ceiling or else installed on the floor. There are a number of disadvantages of placing the motor on the ceiling. It is the hottest place in the room, and this lowers the efficiency of the motor; it is very difficult to install, and as it is located in an out-of-the-way place it is often neglected. It is almost impossible to repair a motor in this location, which is a great disadvantage. The great objection to placing a motor on the floor is the valuable floor space which it occupies and the danger of the belt. Fig. 3 shows an excellent method for taking care of a motor. The platform is made in one piece and bolted to the iron brackets, which are made of angle-iron, clamped to the column. In case it is necessary to change a motor it can be easily accomplished by means of a chain falls. Fifteen minutes is the usual time allotted to remove a motor and replace it with a new one. The predominating factor is speed,—when a department is idle due to motor trouble,—and the motor platform solves the difficulty. The motor is also out of the way and easily accessible. The small air hose shown is connected to the high-pressure air line which is used to blow out the windings and keep the motor dust free.

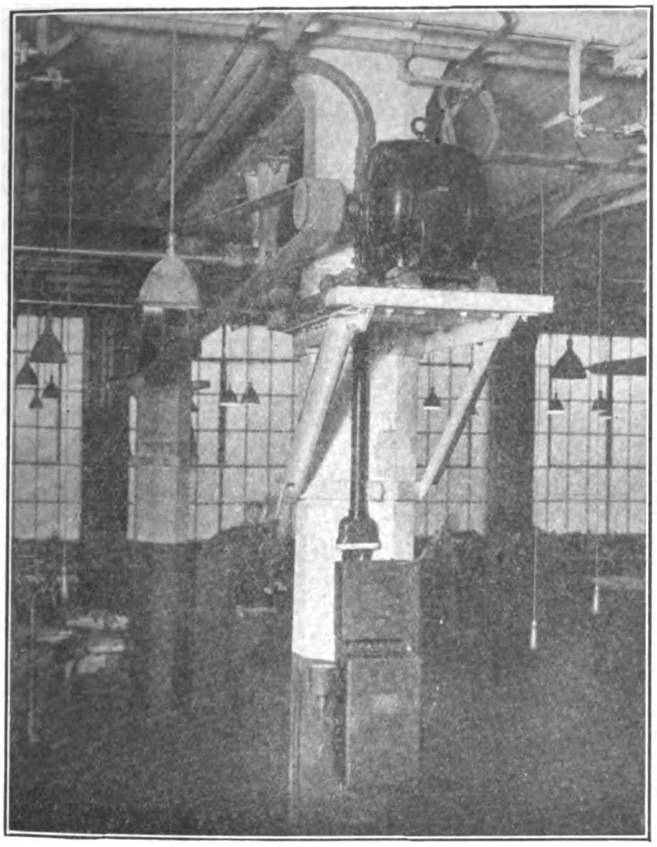


Fig. 3.—Showing Method of Mounting Motor for Group Drive on Column.

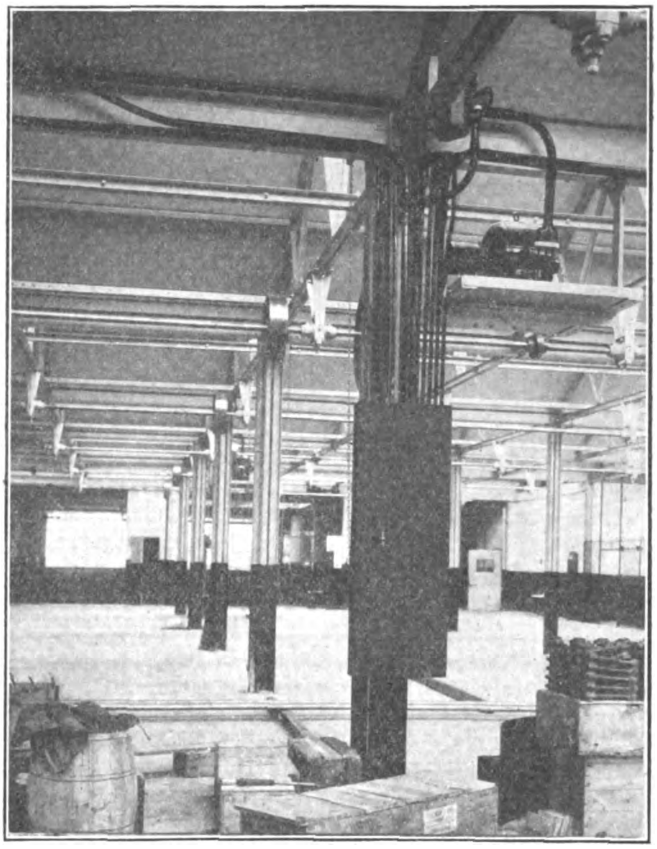


Fig. 4.—Ten Conduits Carrying 30 Lighting Circuits Away from a Cabinet.

The use of adjustable relays for protecting motors is far better than fuses, as it allows a motor to be started immediately in case it stops from an overload. It also saves the cost of renewing fuses, which is a large yearly item. Its adjustable feature is another great advantage. The starting boxes on a motor should have a no-voltage release and in case of an alternating-current motor it should be designed for one-minute starting duty and the working parts should be immersed in oil.

Metal should be given preference over wood for all cabinets and junction boxes. All fuses should be mounted on porcelain on slate bases and inclosed in a metal box. It is also best to standardize on one style of fuses for the entire installation.

These items are necessary to make a successful installation and they will repay many times their initial cost, as the installation will be free from the many annoyances which are continually causing trouble and shutdowns in many electrical equipments. The additional cost will not exceed 15 per cent, which is a small item considering the smooth running qualities of the installation.

Plans Formulated for Work of The Society for Electrical Development.

The Society for Electrical Development, Incorporated, has completed not only its organization and staff, but also the plans for its first year of work, which has now actively begun.

Everybody—the great public, the manufacturer of anything for which power is used in the making, everybody in the electrical industry, whether making, selling or installing electrical apparatus or making and distributing electrical current—is interested in knowing what, how and why things are done electrically, and what, how and why other things should be so done.

The dissemination of such information among the men in the industry and to the consumer of the industry's product, is one of the chief activities of The Society for Electrical Development and is undoubtedly the most effective work possible for developing further uses of and an increased demand for electricity for power, light and heat.

The public needs education as to the possible uses of electricity for light, heat and power, and the plans adopted by The Society for Electrical Development for its first year's activities indicate some of the methods by which the Society proposes to carry on this necessary work, and at the same time to furnish valuable information to its own members.

These plans have been formulated as follows:

Section I—Field Co-Operation.

Local Co-operation. Forming and Stimulating Local Organizations.—The plan is to organize the allied interests into local leagues, to secure the personal support and co-operation of the members of the Society in each district, so that they will all work together for the intensive cultivation of the electrical business in the territory in which the local organization is formed.

Part of this local work is to be done through co-operative advertising, through aiding in local legislation, local inspection of wiring, local wiring codes, etc.; also through being able to present to the local governing body ordinances regulating electric signs, street lighting, etc., in other cities.

This department is also prepared to co-operate with the local interests in the preparation of electrical pages and to furnish information regarding electric shows.

Covering Conventions.—It is intended that the Society shall take an active part in conventions not only of electrical interest, but in all conventions where users of electricity get together. Arrangements are to be made for papers to be presented by representatives of the Society on some application of electricity of interest to that particular convention.

General Co-operation.—The field representatives of the Society will devote a portion of their time to co-operation with architects, builders and engineers, so that these may be informed as to the proper method of writing specifications for installations for electric light, heat and power, so that the specifications will embody the use of *everything electrical* that is available on the American market.

As the text books used in public schools on electrical subjects are very apt to be behind the times, this department will co-operate with the publishers of text books with the view of bringing them up to date.

It is also the intention of the Society to co-operate with school boards by furnishing motion-picture films, lectures and stereopticon exhibitions showing the progress in the world of electric service. In this work the local central-station company is expected to actively co-operate. Visits to large manufacturing plants where electric drive and other uses of electricity could be pointed out, will also be arranged for high schools.

There are numerous business-men's associations in our cities, and by putting jobbers, contractors, manufacturers and central stations in closer touch with these boards of trade, chambers of commerce and other business-men's associations, great good can be accomplished.

This section will continue the campaign for membership and in a general way keep the allied interests fully posted on the work of the Society.

Section II—New Development.

The Society has engaged as a traveling investigating engineer a man whose experience in the electrical field has particularly fitted him for the work of compiling up-to-date information as to the various uses of electricity in the different industries, and suggesting every possible use of electricity for light, heat and power in factories, mills, etc., as well as in the home and on the farm.

It is very difficult at the present time to secure such information; some of it has been published in different periodicals, but it has not been brought together in a comprehensive way. Information as to the requirements of power in the various industries, together with the price per unit of output that the consumer could afford to pay for power, would be invaluable to central-station companies. Analyzing the application of electricity to the industries will undoubtedly show that none of them has been equipped to the limit of possibility, and the Society proposes to make practical suggestions as to the further uses of electricity in all industries.

There is a great work to be done for central stations throughout the country in developing an increased demand for electric service in the home. This can be done to a large extent by securing and disseminating information among the central-station members as to how such a demand has already been developed elsewhere, and outlining new-business campaigns.

There are innumerable examples of heating throughout the country, but the number of them in use in proportion to the prospective list is absurdly small. There is no place where one can obtain information covering what has been done in this connection, much less what might be done. The Society for Electrical Development can help central-station companies to get this kind of business, and can bring the manufacturer, central station and dealer together in the production and sale of such apparatus; the assistance so rendered will alone justify membership in the Society.

The work which this section outlines is one that cannot be accomplished through any other medium than The Society for Electrical Development, except at an expense which prohibits any one company attempting it: and this work will create a feeling among manufacturers of all classes that electricity is adaptable to most processes requiring heat, light and power in their establishments.

Section III—Commercial Exchange Bureau.

This section will work in very close co-operation with Section II, and the Society has engaged as manager of this bureau an electrical engineer who is thoroughly capable of collating, indexing and filing the information gathered by Section II and from all other available sources.

This bureau will prepare bulletins or pamphlets explaining the various uses of electricity, prepare data for articles of similar character for the trade journals and for convention papers, and carry on the necessary correspondence upon such subjects with the members of the Society and the public.

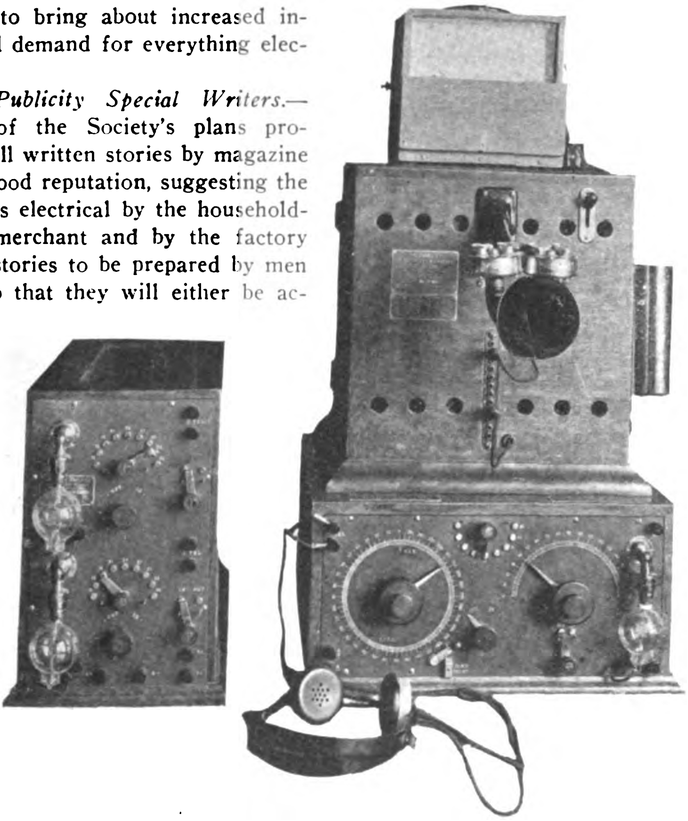
As an example: if the engineer in charge of Section II investigates an industry and finds that electricity has been used to some extent in that industry, but that it is capable of much further and more extended use, his report to the Commercial Exchange Bureau will contain all the information obtainable on the present uses of electricity, how and why it is used, together with suggestions as to what more could be done electrically, how and why it should be so done. This information will be properly filed and indexed by the Commercial Exchange Bureau and will be available for the use of our members. An article or articles will be prepared, dealing with the uses of electricity and its possible extension in that particular industry. The artcles will be supplied through the Editorial Department to one of the leading trade papers in that industry and will be reprinted and sent out in pamphlet form to the biggest manufacturers engaged in that industry, and to the central stations.

Section IV—Editorial and Advertising.

News Items and Electrical Stories for Local Papers.—Describing electrical inventions, improvements or applications compiled in news form so that electrical stories will be accepted by the press on their merit as news.

The Society plans to provide an advertising copy service for members of the Society to assist them in conducting their advertising in the best possible manner; also to carry on discussions in regard to newspaper advertising before meetings of the Electrical Contractors' Association, the Electrical Supply Jobbers' Association, the National Electric Light Association, etc., so that the greatest number of concerns engaged in the electrical business will be informed upon the value of newspaper advertising and how through this means to bring about increased interest in and demand for everything electrical.

General Publicity Special Writers.—This part of the Society's plans provides for well written stories by magazine writers of good reputation, suggesting the use of things electrical by the householder, by the merchant and by the factory owner, the stories to be prepared by men of ability so that they will either be accepted on their merits or be sufficiently interesting to be paid for by the publishers and in this way cut down the cost to the Society of having this work performed.



Wireless Telephone Set Used by Lackawanna.

Moving Pictures.—The Society has arranged for the preparation of moving pictures suggesting the use of things electrical, illustrating their uses in the home, factory, and on the farm. This is one of the most effective methods of interesting and educating the public to "Do It Electrically."

Window Trimming.—The Society has arranged to have a number of windows trimmed with electrical supplies, the displays to be made in a novel and effective manner, two photographs to be taken, one showing the fixture setting and the other showing the completed window. These photographs are to be reproduced in half-tone and sent to the members of the Society who have show windows, together with printed instructions as to how to dress the windows to obtain the effects shown in the photographs. Such photographs and instructions will be sent out at regular intervals during the year, and it is felt that this work will give the smallest and the largest member a concrete exhibit of the definite help that the Society is in a position to furnish its members.

Radiotelephony on Lackawanna Railroad.

Since the signal success which attended the wireless telegraph installations at division headquarters on the Delaware, Lackawanna and Western Railroad during the nine-day paralysis of their wires by a blizzard, the officials of that system have been investigating the possibilities of telegraphing and telephoning to their moving trains. With Marconi telegraph transmitters communication was maintained from a passenger train up to 60 miles, and from 100 to 207 miles from a track-side station to the train. In all this work the audion was the detector used.

Figuring that the wages of the special Morse operator necessary to operate the train telegraph amounted to 6 per cent per annum on $15,000, L. B. Foley, superintendent of telegraphs for the railroad, accepted the proposal that the Radio Telephone & Telegraph Company install the new de Forest wireless telephone at Scranton, Pa., and on one of the through fast trains.

The Scranton installation, though hurriedly made, was able on its second trial to maintain clear voice transmission to this train up to Stroudsburg, Pa., a distance of 53 miles, the train running 60 miles an hour.

The antenna at Scranton is 300 feet long and has an elevation of 150 feet. That on the train extends over the four forward cars only, the wireless station on board being in the second car from the locomotive.

Train noises render it imperative to use the audion amplifier with the audion detector. A two-step amplifier, giving from 50 to 60 times amplification, is used on the train.

The permanent train installation is now being prepared. The generator is direct-connected to a steam turbine in the baggage coach, supplied from the steam-heating pipes beneath the car.

At the Scranton station direct current is supplied, at 125 volts.

The present apparatus is of only one kilowatt capacity, but not the slightest difficulty is had in telephoning from Scranton to Binghamton, a distance of 67 miles, over rough wooded and mountainous country.

The officials of the railroad propose to make these installations a permanent part of their two best train equipments, for facilitating despatcher's service, and especially for the convenience of the travelling public. Messages will be handled at a fixed rate, as with the telegraph, but telephoned by a regular member of the train crew.

Hydroelectric Plant for Manila, Philippine Islands.

The development of water power for furnishing electric light and power for Manila and suburbs is to be undertaken by the Manila Electric Railway & Light Company, the concern now furnishing light and power and operating the street-railway system in Manila, if the new Public Utilities Board of the Philippine Government accedes to the proposal of that concern through Charles M. Swift, who has applied for a franchise. It is generally understood that the Government will grant the franchise, arranging for the reversion of the Govenment in due time. The poposal is for the development of power from the Caliraya River and its tributaries in the Province of Laguna, near Manila, the company also proposing to develop other power possibilities in various portions of the island of Luzon when the plant for power needed in Manila has been completed. The electric light and power system in Manila at present is by far the most modern and efficient in the Far East, but the power is developed from Japanese coal.

Brightness.

A meeting of the Chicago Section, Illuminating Engineering Society, was held on the evening of May 13, at which M. G. Lloyd, chairman, presided. William A. Durgin gave the final one of his short illustrated talks that had been continued during the season's meetings and which touched on the fundamentals of illumination. In the concluding talk, Mr. Durgin dwelt particularly on the characteristics of various types of arc lamps. Announcement was made that the next meeting, which will be held on the evening of June 10, will be a joint meeting with the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers. Two papers will be presented at this meeting; one by P. E. Haynes, dealing with developments in Chicago street lighting, and another by Prof. A. H. Ford, of Iowa State University, dealing with the illumination of electric signs.

The main paper of the evening was entitled "Brightness," and was presented by J. R. Cravath, of Chicago. The relative brightness of surfaces we observe and the amount of light they emit are of primary importance in comfortable illumination. As yet, however, the term brightness has not been used as commonly as illumination intensity or foot-candles. Any object in order to be visible, must have a certain brightness. The author used the term brightness as synonymous with intrinsic brilliancy and surface brightness, it being the amount of light emitted per unit of area, and expressed preferably in candlepower per square inch. Brightness is independent of distance. A reflecting surface that is a perfect diffuser has the same brightness in all directions. The brightness of a surface varies directly as the incident illumination and as the reflecting power of the surface. In the case of perfect diffusers it can be readily calculated. Mr. Cravath explained the very simple method of measuring brightness by means of a compact form of Sharp-Millar photometer. The instrument must be pointed directly at the surface to be measured. The results, while only approximate, are sufficiently accurate for most practical purposes.

Included in Mr. Cravath's paper was a long table giving the results of brightness measurements of light sources and of illuminated surfaces under various conditions. A striking result brought about by such measurements is the extraordinary differences in brightness within the range of ordinary vision to which the eye is frequently subjected. In a small room lighted by a bare tungsten lamp, the brightness of the filament is about 1,060 candlepower per square inch, while the walls may have a brightness of only 0.00015, which is a ratio of about 7,000,000 to 1. On a sunny day the brightness of the sun is about 500,000 candlepower per square inch and the surrounding blue sky may have a brightness of 2.15, which is a ratio of 230,000 to 1, thus presenting much less contrast than with bare artificial sources. The eye readily adapts itself to extraordinary changes in brightness in the central part of the field of vision and the changes in brightness of daylight on an ordinary day are almost unnoticed, even though they may be numerically quite high. Mr. Cravath gave results of brightness measurements in rooms lighted by daylight and also of rooms equipped with various types of artificial lighting. In indirect artificial lighting the brightness differences in the field of vision approximate those with daylight from north exposure. A type of room in which conditions are very trying is one in which all of the daylight comes through a single rather small window.

An investigation was made of the relative brightness of indelible pencil, black pencil and ink marks on different kinds of paper. It was found that the indelible pencil in some positions has almost the same brightness as the paper, and, therefore, is practically illegible. Ordinary writing ink makes a less glazed mark than either a black or indelible pencil and is, therefore, preferable for comfort. The common opinion that printing on white paper presents the maximum contrast which the eye can perceive is erroneous, since it is very doubtful whether a brightness ratio of 20 to 1 is exceeded in printed matter. The eye is better able to judge of differences of brightness between the surfaces if these are brought closely together, therefore, a sharp and clean-cut type is more easily read.

The discussion of the paper was rather brief. Prof. Morgan Brooks called attention to the greater contrast in the patterns of textile materials that have intermediate colors between white and black. He also dwelt on how the architectural effects in a room or building can be enhanced or diminished by attention to the relative brightness of illumination on adjoining surfaces. Ward Harrison spoke of brightness effects as related to photometric measurements. A. Scheible commended the paper on account of its originality and importance and suggested that a separate meeting be held for discussion.

The United States, according to the last census, has nine telephones per hundred inhabitants. Germany has two telephones per hundred inhabitants; Holland, two; Switzerland, two; Great Britain, 1.5; Belgium, 0.8; and France, 0.7.

Association of Supervising Electricians Formed in England.

An association of managers, supervising engineers, and permanent foremen attached to the electrical contracting trade, has been formed in England. The objects of the Association are: (a) to assist members in obtaining information of situations; (b) to form a technical library for the use of the members; (c) to form a benevolent fund for the assistance of members in distress; (d) to endeavor, by means of lectures and visits to large works, to maintain a high standard of efficiency of all members; (e) to foster the apprentice system for learners in the electrical trade; (f) to endeavor to extend the attendance of electrical workers to evening schools, both technical and practical; (g) to arrange the reading of papers on electrical subjects by members or visitors, invited from other societies; (h) to arrange periodical social gatherings to promote knowledge and good fellowship amongst members.

At the preliminary meeting at which the formation of the Association was decided upon, it was agreed that, in order to become members, foremen or supervising engineers would have to have been employed in the electrical contracting trade a certain time, during part of which they must have been actually acting as foremen or supervisors of work.—*Electrical Engineering* (London.)

Address by Long-Distance Telephone.

The Rev. Charles M. Sheldon, of Topeka, Kans., while in that city recently delivered an address by telephone to the Kansas State Editorial Association which was in annual convention at Manhattan, Kans. The 52 miles intervening was spanned by courtesy of the Bell Telephone Company, at Topeka, which arranged a special megaphone device at the end of the line where the audience was stationed. By this means every word of the speaker was heard distinctly. Electric light globes further assisted the audience by indicating the emphasis placed on each sentence by the speaker.

Co-operative Telephone News Service.

H. E. Lindas, president of the Arkansas Valley Telephone Company, of Dodge City, Kans., has arranged to give newspapers in towns covered by his company free news service. The plan is to form a co-operative news bureau, the editors in twelve towns being members. Each editor telephones to the central office the principle news of the day, and attachés of the main establishment distribute the news as it comes in. This service will be free.

Mississippi Electric Association.

The annual convention of the Mississippi Electric Association was held in Meridian, Miss., April 27 to 29. This was the most successful meeting ever held by the Association. Six regular sessions were held at which were presented a number of papers dealing with tungsten-lamp manufacture, boiler economy, lubrication and other pertinent topics. The election of officers took place at the final session and resulted as follows:

President, A. H. Jones, of McComb City, Miss.

Vice-President, Charles Hays, of Columbus.

Secretary and treasurer, H. F. Wheeler, of Hattiesburg.

Executive Committee: R. B. Claggett, W. F. Gorenflo, E. B. Booth, A. B. Paterson, A. H. Jones, R. H. Smith and Charles Hays.

It was decided to hold the next annual convention at Hattiesburg, Miss., on April 12 to 14, 1915.

Another Successful Rejuvenation at Dayton.

The third rejuvenation of the Dayton, O., Jovian League, which was held at the Dayton Club, in that city, May 9, was highly successful, 42 candidates being initiated in the presence of a large number of members and visitors. The Dayton degree team conducted the ritual, the following officiating: Jupiter, Alternate Statesman F. K. Bybee, of the Erner & Hopkins Company; Neptune, D. K. Funkhouser, of the Dayton Power & Light Company, Pluto, Arthur Gibbons, of M. J. Gibbons & Company; Vulcan, H. H. Wollaston, of Wollaston & Waxler; Mercury, C. A. Kuebler, of the Westinghouse Electric & Manufacturing Company; Hercules, F. S. Briedenbach, of the Chas. Q. Tyson Company; Mars, C. B. Frankel, of the Dayton Power & Light Company; Apollo, J. C. Matthieu, of the Dayton Power & Light Company; and Avrenim, G. B. Sayre, of the Apple Electric Company. "Imps" were A. B. Weinfeld, of Erner & Hopkins, H. E. Long, of the Wm. Hall Electric Company, R. R. Pleasant, of the Pleasant Electric Company, John Martin, of the Chas. Q. Tyson Company, and Chester Lesher, of the Lesher Electric Company.

Governor Cox, of Ohio, was present during the greater part of the evening, and apparently enjoyed the program very much, expressing himself to that effect. In the social session which followed the initiation, Statesman Thomas F. Kelly, of the Dayton Power & Light Company, acted as toastmaster, introducing as the first speaker Statesman Niesz, of Chicago, who was followed by H. H. Cudmore, of the National Lamp Works, of the G. E. Co., of New York, who was present as a special guest. He spoke on "The Society for Electrical Development," explaining the objects of that organization and benefits of membership in it. A number of the initiates also spoke informally.

Statesman J. W. Schrantz, of the Cincinnati Jovians, was present, and extended a hearty invitation to the Daytonians to attend the Cincinnati rejuvenation on May 18.

Jovian Activities at Columbus.

A gathering of fifty or more Columbus, O., Jovians listened to a fine address by H. C. Lord, professor of astronomy, Ohio State University, on May 15, at the Virginia Hotel. Professor Lord talked on "Astronomy as Applied to Every-Day Life," showing among other things the manner in which time was ascertained by aid of the stars and the results transmitted by wireless telegraphy.

Preliminary arrangements were made at the luncheon for the annual Jovian picnic, to be held at Buckeye Lake in June. This form of outing has prevailed for the past three years and is in growing favor. In addition to the 200 local Jovians, the invitation is extended to all Columbus electrical people and their families. This year for the first time business places will be closed throughout the day, if plans succeed, so that everyone will have a chance to attend. Buckeye Lake is a beautiful little summer resort, lying within an hour's ride of the city by trolley.

It is estimated that about thirty members will attend the Cleveland Electrical Exposition on Jovian Day, May 26, in response to an invitation from the Electrical League of Cleveland. A special car will probably be engaged for the trip.

Meeting of Dayton Jovian League.

About eighty members of the Dayton Jovian League attended the regular monthly dinner of that organization, at the Dayton Club, on Monday evening, May 19, at which A. A. Gray, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, was the principal speaker. Speaking on the subject of "Opportunity," Mr. Gray claimed that those connected with the electrical industry were receiving less remuneration for their product than was the case in any other field, although the comforts and conveniences that electricity brought into the home were greater than any other thing that goes to make up a real home.

Statesman Thomas F. Kelly, sales manager of the Dayton Power & Light Company, announced that the next rejuvenation would be held on Tuesday, September 15.

Louisville Jovians Activities.

The Louisville Jovians will be in the local amateur athletic field this summer with a redoubtable baseball team, if the promises of the leaders of the organization are borne out. Decision to organize was reached recently and the committee is now at work selecting the players and getting the equipment together. The recently announced plans for the weekly midday meetings of the local organization have found such meetings to be impractical, according to Robert Montgomery, temporary chairman. It was found that so few of the members were in position to assemble at a stated midday hour that it was decided, instead, to hold monthly evening meetings. These will probably be held on the second Tuesday of the month, with a dinner at 6:30 o'clock, followed by speeches.

Chicago Jovian League.

Max Zabel, patent attorney of Chicago, was the speaker at the regular meeting of the Chicago Jovian League on Monday, May 18. Mr. Zabel commented briefly on the present patent system and stated that while it was fundamentally correct, the remarkable increase in inventions during recent years has made certain revisions and additions necessary. He spoke of the old provisions which made it necessary to spend large sums of money and a great deal of time to ascertain the validity of a patent in case of litigation. Under the changes recently inaugurated, patent cases can be tried in open court, and much of the expensive testimony which was heretofore necessary can be eliminated. Mr. Zabel spoke particularly of the inadequate facilities of the present patent office building in Washington, and asked for the co-operation of everyone interested in inventions to lend his endeavors for the erection of a suitable building.

Extensive Use of Electric Power in Irrigation Construction.

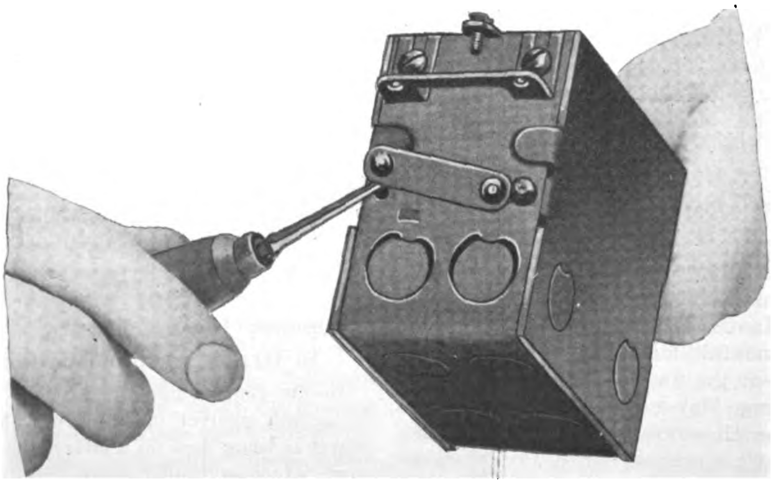
In the construction of the Sun River irrigation project in Montana, electric power is being used on a larger scale than ever before in similar work. In fact, it is stated that this project is the first one of its kind in which electric power is used extensively for operating excavating machinery for canals, drains, tunnels, etc. The Montana Power Company has constructed a special transmission line 75 miles long from the Great Falls of the Missouri River westerly along the entire length of the Sun River project. From this the power is distributed to the contractors over the distribution lines of the United States Reclamation Service. H. N. Savage is supervising engineer for the Service.

New Electrical and Mechanical Appliances

New Pressed-Steel Switch Boxes.

The Chelten Electric Company, 314 Armat Street, Philadelphia, Pa., has designed and is manufacturing a new ingenious pressed-steel wall case for use in connection with mounting push-button switches and receptacles and similar specialties. This box has the marked advantage of being so arranged that it may be ganged to meet the requirements of the contractor. Another decided advantage, which is something entirely new in this line, is the fact that no loose parts or screws are found, as the box can be readily ganged and held together by pins rigidly fastened to the side of the box by means of flat springs. These boxes are made in the deep and shallow types for loom and conduit, and are furnished in black enamel finish.

In using this box the contractor saves a great deal of time. It is not necessary to back the screw out of place, but simply necessary to lift the springs, place the spacer in place, replace the side, and the two-gang box is ready for use. Should larger gang boxes be required, these can be readily made up by means of extra spacers. These new boxes are meeting with general approval, and the Chelten company is distributing samples gratis for trial.


New Chelten Switch Box, Showing Method of Manipulation.

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New Battery-Charging Rheostat.

There are many storage-battery-equipped gasoline automobiles which have no protection for properly keeping the batteries automatically charged. This has aroused great interest among garage men and owners, and created a demand for a low-priced, durable battery-charging rheostat.

The Ward Leonard Electric Company, Bronxville, N. Y., which has specialized on dynamo controllers, battery controllers and motor controllers for many years, is placing on the market a rheostat that is 11 inches square by 3.5 inches deep, and will take care of from one to four cells of battery at a charging rate of eight amperes. This is a very inexpensive but serviceable rheostat. The company also builds larger rheostats to take care of higher charging rates. The illustration herewith shows the small rheostat mentioned.

CAT. NO R 28-220 VOLT
APPROX. OHMS 20 AMPS
Small Battery-Charging Rheostat.

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New Ozone Air-Purifier.

The illustration herewith shows a new type of ozone air-purifier made by the Neel-Armstrong Company, Akron, O. This machine is being used successfully in motion-picture theaters, toilet rooms of public buildings, etc. It is also widely used in the refrigerators of abattoirs and meat markets where it is claimed that a saving in ice is made as well as an improvement in the refrigeration. It is stated, for example, that fish can be kept three times as long with this system as when ice alone is used, and the odors are practically eliminated.

Tests by the city chemists of Akron in the Waldorf Moving Picture Theater show the following results obtained by the installation of one of these machines.

Examination of Air.

	Jan. 23, 7 p. m., No Ozone.	Jan. 24, 5 p. m., With Ozone.	Reduct'n in Colonies of Bacteria.
Carbon dioxide, in parts per 10,000	35	30	
Oxygen, per cent	19.4	20.1	
Colonies of bacteria on culture plates:			
10 minutes' exposure	300	17	95%
20 minutes' exposure	Innumerable	80	90% or more

The outfit illustrated is equipped with a Robbins & Myers rotary transformer for converting direct current into alternating current for the transformer which steps the voltage up to the high pressures required for this service. A "Standard" fan, also manufactured by the Robbins & Myers Company, Springfield, O., is mounted within the transformer case to blow the ozone out into the room.

To eliminate the formation of metallic oxides due to the ozone coming in contact with the metals of the outfit, all wiring is hermetically sealed in

Ozone Air-Purifier.

glass tubes. The design is also such as to prevent any heating so there will be no production of nitrous oxides.

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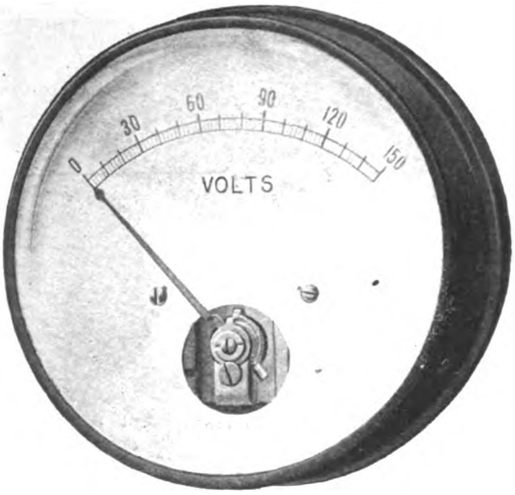
New Small Direct-Current Switchboard Ammeters and Voltmeters.

A new line of five-inch direct-current ammeters and voltmeters has just been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. These are indicating meters suitable for small isolated plants, yachts, battery-charging panels, etc., where a high-grade low-priced polarized instrument is required. The meters operate on the D'Arsonval principle, having a moving coil and a permanent magnet. Being of this type, they possess many points of superiority to the moving-iron type construction found in the usual low-priced meters.

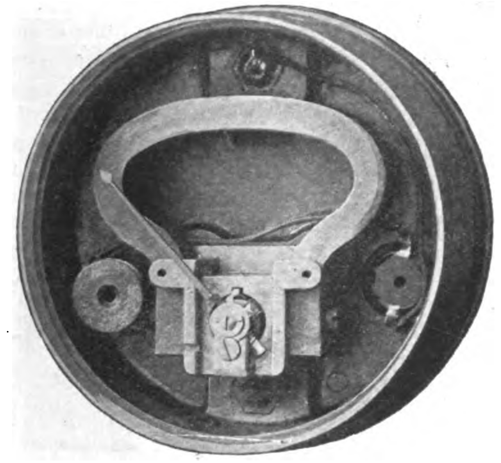
The complete movement is mounted in the case as a unit. A unique feature is the arrangement of the moving element, which can be taken from the movement by simply removing two screws on the side of the pole-piece support. The entire moving element and bearings can then be lifted out as a unit and can be replaced in exact position. This makes it possible to repair the meter without disturbing the alinement of the magnetic circuit.

Owing to the use of an aluminum pointer, a light counterweight is possible, resulting in a light weight of movement and small wear on the pivot jewels. The high torque, in proportion to the light weight, insures great accuracy considering the size of the instruments.

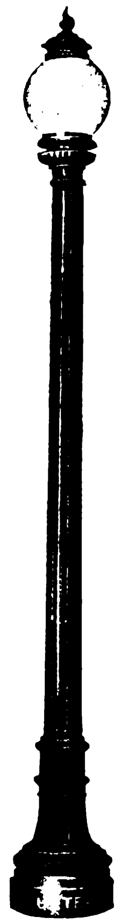
Their scales are four inches long, practically the same length as the scales of many of the seven-inch meters. The full length of the pointer shows on the dial, thus making the meter as easy to read as a clock. The movement is thoroughly damped to secure dead-beat readings. Although somewhat diminutive in size, these meters are not in any sense competitive with many "toy" meters on the market, but are designed along strictly scientific lines and possess a high grade of quality.



New Five-Inch Switchboard Voltmeter.



View of Interior Construction of Instrument.



Ornamental Post

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Electric Semaphores to Regulate Street Traffic.

Electric semaphores, the invention of Sergeant Jack Sherry and Wagon Officer Wallman of the Oakland, Cal., police department, have been installed at the four corners where Twelfth Street and Broadway intersect for the purpose of testing their efficiency in the regulation of street traffic. If the device proves its efficiency it is probable that the semaphores will be installed at all the principal crossings in the city.

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Ornamental Post for Gas-Filled Tungsten Lamps.

The development of the gas-filled tungsten-filament lamp has made it possible for many cities to have lighting systems which are not only ornamental, but efficient. Where single-light posts are preferred because of their simple elegance and dignity of design, such a unit as is illustrated herewith will be found very attractive in appearance and highly efficient for lighting the streets and boulevards.

The 16-inch globe is made of Alba glass which absorbs only a small percentage of light and yet eliminates glare due to the high intrinsic brilliancy of the filament of these lamps. On account of the high temperature of the lamp, it is necessary to provide ventilation. Air enters through ventilating holes in the globe-holder, passes around the lamp socket and lamp and out through the holes in the top ventilator. These holes are protected with perforated metal which keeps out the bugs which are usually attracted by the light. The ventilator is so designed that light rays in the vertically upward direction are reflected downward, and yet enough light is thrown into the region above the lamp to illuminate the facades of buildings. The greater part of the light is thrown downward, however, where it is required in lighting the sidewalks and streets.

The post is particularly adapted for lighting boulevards, parks and private grounds, entrances to public buildings, etc. The 750-watt or 1,000-watt multiple lamps may be used or any of the large number of street series lamps. Where lamps of 600-candlepower or larger are used, it is generally more economical to mount a compensator in the base of the post with an absolute cutout directly beneath it and operate the 20-ampere gas-filled lamps on a regular 6.6-ampere or 7.5-ampere series street-lighting circuit.

The base of this post is 20 inches in diameter and 2 feet 8 inches high. The column is 7.5 inches in diameter above the base and 6.125 inches in diameter near the top. The height to the center of the 16-inch globe is 13 feet 6 inches, and to top of the ventilator 14 feet 6 inches. The post is made of high-grade cast iron, sharp and true to design. The ornametal post and ventilator are manufactured by the George Cutter Company, South Bend, Ind.

The Connecticut Automatic Igniter System.

As the result of extended experience in the design and manufacture of ignition apparatus for internal-combustion engines, the Connecticut Telephone & Electric Company, Meriden, Conn., has perfected a very simple system of ignition which combines the advantages of both magneto and battery systems and eliminates the shortcomings of each. The new Connecticut automatic igniter system operates from a storage battery with or without reserve dry cells, but uses a breaker box of the magneto type and steps up the current by means of a transformer coil just as with a magneto. It can therefore produce a hot, powerful spark at all speeds. The system gives the best results when used with a generator supplying the storage battery for lighting and electric starting.

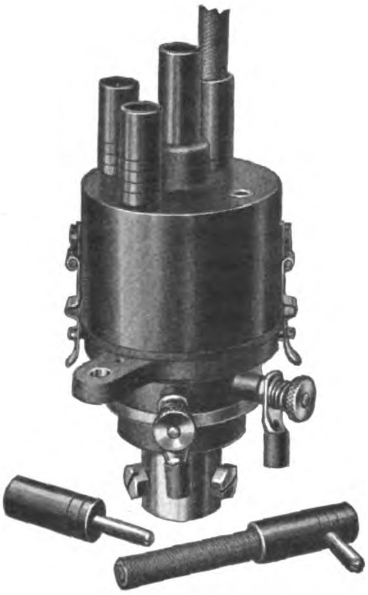


Fig. 1.—Connecticut Igniter Complete.

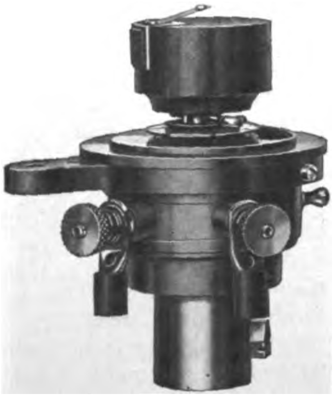


Fig. 2.—Igniter After Removal of Distributor Cap.

A single spark is produced upon a break occurring in the primary circuit which, when closed, has energized the coil. This break is produced in the igniter by means of a cam revolving against a breaker arm, the high-tension spark resulting being distributed to the spark-plug circuits in the same instrument. The igniter is mounted on a vertical shaft running at all times at half of the engine speed, regardless of the number of cylinders the engine may have.

A view of the igniter completely assembled is shown in Fig. 1, which gives a good idea of the compactness of the instrument. Its extreme length is only 4.75 inches and its weight only about 1.5 pounds. All of the equipment can be readily taken apart and reassembled without special tools. On removing the distributor cap the breaker box is better disclosed, as shown in Fig. 2. In Fig. 3 are shown all parts of the instrument disassembled. The contact points are extra heavy and when running on test after the equivalent of 40,000 miles gave good results without cleaning or adjustment. Since the breaker arm is heavily insulated from the base, no ground is needed in the battery circuit and the possibility of the ignition being disturbed by grounds or short-circuits in other circuits of the car, is obviated. The interrupter arm is not affected by centrifugal force, because it is provided with a single insulating roller acting against the cam.

No relay, trigger, cam or other time-lagging device is used to effect the primary break, which is produced directly; this avoids time lag on medium or high speeds and makes the device suitable for all speeds. Both the cam and shaft are of polished steel and the igniter is supported on the shaft by means of either ball bearings or special self-lubricating bearings. The distributing arm and the distributor case are made of special insulating composition which is unaffected by heat or moisture. A dustproof and oilproof partition separates the high-tension and low-tension parts of the equipment.

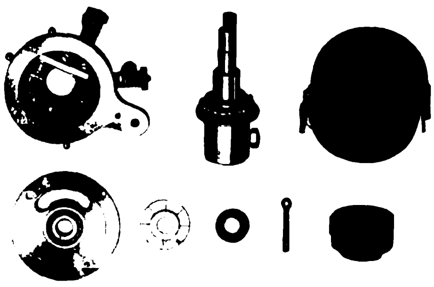


Fig. 3.—Ball-Bearing Igniter Entirely Disassembled.

In Fig. 4 is shown the new combined coil and switch with cover removed to show the terminal connections. This coil is built to the same high standard that has long characterized the company's coil equipment. The casing of the coil is made of a heatproof insulating material of high dielectric strength. The windings are thoroughly insulated to withstand a voltage greatly exceeding that to which they are likely to be subjected. The entire interior construction is such that the coil remains rigid and the internal connections tight. The cover keeps the outside connections well protected. In the cover is a window for observing the spark gap that is provided in all coils to protect the high-tension winding from rupture if the spark-plug terminals should become disconnected. This spark gap is arranged in a glass tube so as to be visible and to guard it from explosive vapor. The coil shown in Fig. 4 has combined with it an automatic switch. In another construction this switch is separate.

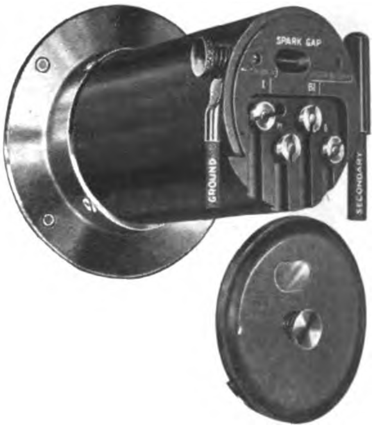


Fig. 4.—Combined Coil and Switch, Cover Removed.

Fig. 5 shows the front view of this switch. Three generous-sized push-buttons are provided. The buttons *B* and *M* are for the reserve battery and magneto, if one is used, or for the reserve dry battery and the main (storage) battery. In connection with the *off* button is an arrangement thermostatically controlled to open the primary circuit automatically if the car

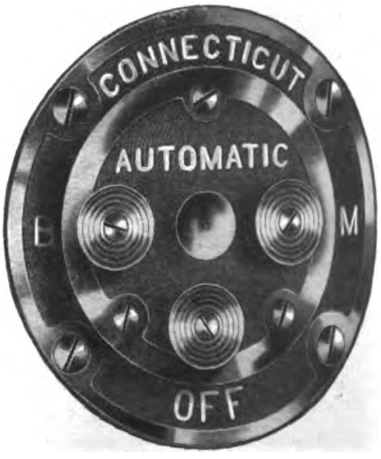


Fig. 5.—Front View of Automatic Switch.

is left standing with the engine not running but the switch still *on*; this also opens the circuit like an overload circuit-breaker, if an excess current should be thrown onto the ignition circuit. Thus in each case it protects the battery from wasteful drain. The circuit is closed in the automatic switch through heavy and positive contacts of the plunger type. These plungers are held in contact by a slotted locking plate, which is released by the *off* button on the switch, or in cases of prolonged or excessive flow of current, as mentioned above, by a vibrating magnetic release thermostatically effected. The construction is such that no amount of outside vibration or jar can affect the locking plate.

◆

Demagnetizing Cutting Tools.

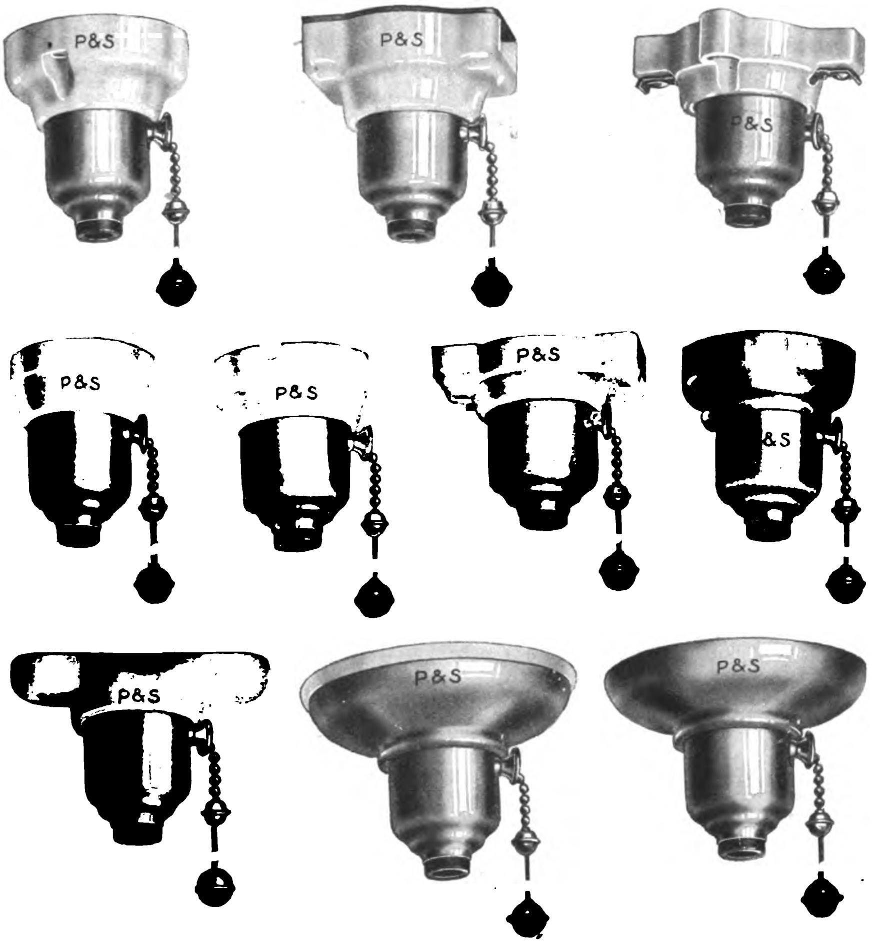
One of our British contemporaries states that magnetic grippers and chucks were first adopted for grinding machinery, and found adoption afterwards on lathes. Their use, however, involves the difficulty that the cutting tool itself becomes magnetic, and that the turning and chips stick to the tool, especially when the speed of working is not high. The neatness of the work suffers under this drawback.

The Magnetwerk, of Eisenach, in Thuringia, Germany is therefore introducing a demagnetizing coil which is pushed over the upper part of the cutting tool and fed with alternating current.

◆

New Pull-Switch Rosettes.

The firm of Pass & Seymour, Incorporated, Solvay, N. Y., has added to its already extensive assortment of electrical fittings a new line of pull-switch rosettes embodying the Fluto interchangeable feature. The general design and construction of these rosettes as well as their valuable interchange feature are well made clear in the accompanying illustrations. It will be observed that these rosettes can be adapted to a great variety of bases, so that they may be used on cleat work, on standard outlet-box work, on ordinary concealed wiring, as well as for special fittings such as Taplets, Adapti boxes, Condulets and other fittings.



Group of New Pull-Switch Rosettes With Various Bases.

These rosettes are all supplied with a short chain, to which is added 10 feet of black linen cord and black acorn. This permits of the use of a pulley or eyelet, through which the cord may be passed for distant control.

◆

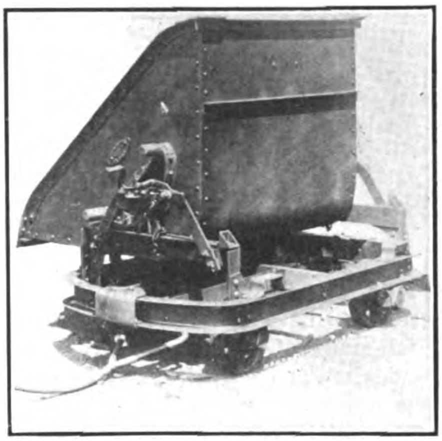
The electric light and power building at Washington Park, N. J., an amusement park near Philadelphia, was destroyed by fire early on the evening of May 11, causing a loss of $30,000.

A New Part-Way Dump Car for Handling Coal to Boilers.

The Bertha Mining Company recently purchased an interesting special type of dump car for handling coal to its boilers, the car only dumping part way and remaining in position so that the material could be shoveled out easily and rapidly. When loading, the car remains in normal upright position, but when unloading it is tipped over to the position shown in the illustration and held by an adjustable calk which fits under the rockers.

The car was designed for running over the floor and is provided with flangeless wheels and swivel front axle with handle so that it can be pulled in any direction. The car was designed and manufactured by the Orenstein-Arthur Koppel Company, of Koppel, Pa., and the underframe is made with that company's special wide flange channel and roller bearing.

Use of this type of car is peculiarly valuable in hand-fired boiler plants where accurate record is kept of weight of coal burned or where it is desired to keep the floor clear of coal piles. It also reduces the amount of extra handling of coal with its waste labor and dust and dirt. When a test is being made of a plant, this type of car will be found practically indispensable.



Part-Way Dump Coal Car.

◆

Baltimore's Large Railway-Motor Order.

The United Railways & Electric Company, Baltimore, Md., has awarded the General Electric Company the contract for the 85 four-motor equipments which will be installed on the new cars being built by the J. G. Brill Company. The cars are the double-end type, and improved K35-U2 platform cylinder-type controllers are included in the installation. The motors selected are GE200 split-frame commutating-pole positive-ventilated type, having a nominal rating of 33 horsepower on 500 volts and 40 horsepower on 600 volts, and a gear ratio of 69/14. It is interesting to note that this additional traction equipment has been purchased primarily to provide adequate service during the centennial celebration of the writing of "The Star Spangled Banner," which occurs in Baltimore during the week of September 7.

The contract also includes additional substation apparatus, comprising a 2,000-kilowatt 25-cycle six-phase compound-wound rotary converter; three 750-kilowatt transformers, and switchboard panels.

Oil Fuse Cutouts for High-Tension Circuits.

A new type of oil fuse for circuits up to 2,500 volts has been developed and placed on the market by the D & W Fuse Company, Providence, R. I. These fuses have been designed after careful study of the requirements of such devices and have been perfected to the point where it is believed they overcome all defects in devices of this type heretofore employed. It is known that the oil-break fuse possesses marked advantages over other types of primary cutouts. The crude design of such devices heretofore used, however, has rendered their operation unsatisfactory.

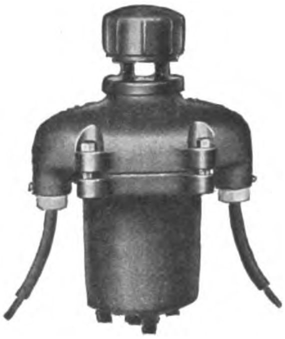


Fig. 1.—D & W Oil Fuse Cutout.

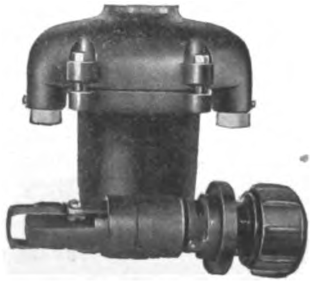


Fig. 2.—View Showing Construction of Fuse Carrier.

In the new D & W oil cutouts the fuse element is placed under a heavy mass of special oil. When the fuse is blown the terminals are forcibly thrown apart and the oil between them completely prevents the formation of an arc. The device has a venting system to prevent the accumulation of pressure within the casing and also to prevent blowing out any oil. At the bottom of the oil container is a plug outlet, by means of which the oil can be drawn off. This is seldom necessary, however, since under ordinary service conditions the oil does not require renewal more than once in one or two years. A filter can be furnished for readily removing carbon or other impurities from the oil when it is withdrawn. Flexible cable terminals are provided, as shown in Fig. 1, which illustrates the cutout complete.

Three sizes of these have now been developed suitable for currents of 50, 100 and 200 amperes. In each case the fuse link is made from a special alloy having low melting point and high conductivity; this prevents excessive rise in temperature of the oil and thereby makes carbonization of the oil practically negligible. The design of these fuses is liberal, so that a safe operating value of 10 times full load can be handled on short-circuit. Even above this is an ample factor of safety, so that in actual commercial service these cutouts have been found to meet all conditions.

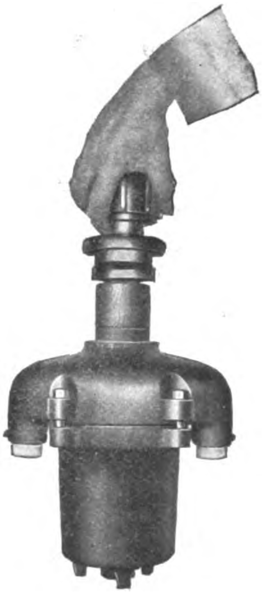


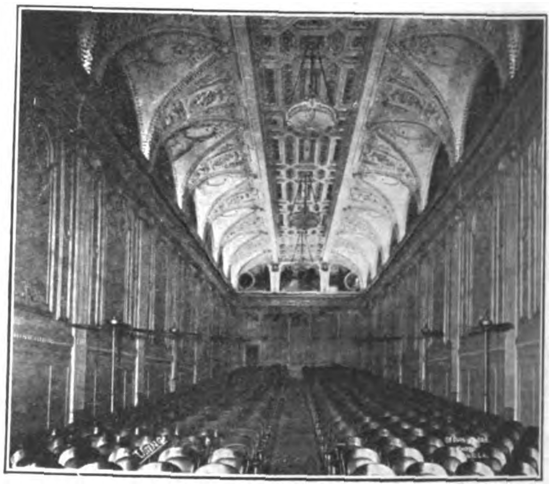
Fig. 3.—Replacing Fuse Carrier.

In Fig. 3 is shown the method of replacing the fuse carrier in the casing. The design has been made such that this is rendered perfectly safe for the operator. A new fuse can be inserted even while the line is short-circuited without risk to the lineman. This safeguard is obtained through an arrangement by which automatic locking of the cover takes place before contact is made with the fuse terminals. Thus the entire device is effectively locked against the blowing out of the fuse carrier and oil, if an unexpected blowing of the fuse should take place upon renewal of the element. The locking arrangement is made clear from the illustration herewith. In Fig. 2 the construction of the entire fuse carrier is shown.

Cove Lighting for a New Orleans Theater.

Not very long ago an elaborate system of direct lighting was installed at the Trianon Theater, New Orleans, La., but it was soon apparent that in order to show up the interior architecture and decorations to advantage it would be necessary to abolish this system, with its brilliant glare and deep shadows, and install in its place a system which would diffuse a powerful yet soft light over the entire area to be illuminated.

After a careful examination of the various systems now in use, the owners of the Trianon decided that their requirements were most satisfactorily met by the Frink and J-M cove system of indirect lighting. This system consists of lamps set in specially designed Frink reflectors, placed in the coves behind the cornice. In this way large auditoriums are perfectly lighted without a lamp being visible. A powerful light is thrown on the ceiling, and from the ceiling is reflected into the theater.



Cove Lighting in Trianon Theater.

The best results are obtained by the use of J-M Linolite lamps in connection with Frink reflectors. These lamps are tubular in form, measuring about one foot in length by one inch in diameter. On account of this small diameter they can be concealed in a much shallower cove than would be required by ordinary bulb lamps. When joined end to end, J-M Linolite lamps produce a continuous "line of light" which eliminates the "spotty" effect caused by standard bulbs.

The relighting of the Trianon Theater has brought forth many favorable comments from those who have had an opportunity to see both the direct and indirect systems.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—Metropolitan Engineering Company, 1238-1252 Atlantic Avenue, Brooklyn, N. Y.

Steel cabinets, Cat. No. 952, with sheet-metal meter adapters for inclosing the connections to meters.

Wire conduit connectors for use with the above cabinet, Cat. Nos. 9250-9259 inclusive, four inches to 10 inches long.

Approved April 14, 1914.

CINEMATOGRAPH PROJECTOR.—Compagnie Generale d'Establishments Pathe Freres, Vincennes, France, for Pathescope Company of America, 141 West Thirtieth Street, New York, N. Y.

"Pathescope" portable self-contained motion-picture machine, deriving power for the incandescent-lamp illuminating element from a small permanent-magnet generator belt-driven from the film-operating mechanism. A special slow-burning film is supplied for use with this equipment.

Approved April 30, 1914.

CONDUIT BOXES, Floor Outlet.—Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York, N. Y.

Catalog No. 6860, non-adjustable.

"P. R.," "Adjustable" and "Adjustable-Self-Leveling" watertight floor oulet boxes. Catalog Nos. 76470, 76459-60, 75939-40. Catalog No. 6860, non-adjustable.

Approved April 18, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Everhard Manufacturing Company, Canton, O.

"Diamond E" service ell, .5-inch size. The cast-iron fitting consists of a conduit ell having a pipe-like projection with an oblong opening facing downward near the end, the opening being closed by a porcelain insulating bushing with two outlet holes. The device is designed for installing on the outside of a building, to which it may be secured by two screws.

Approved April 14, 1914.

FLEXIBLE CORD.—Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green, white and black threads parallel with wire between rubber insulation and braid.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved April 6, 1914.

FLEXIBLE CORD, Portable, For Electric Heaters.—Northern Electric Company, Limited, Montreal, Canada.

Multiple-conductor cords composed of loosely twisted wires with cotton wind, rubber and asbestos insulation covered with an open retaining braid and assembled as a twisted pair with an outside protecting braid over the whole.

Marking: Yellow thread woven in braid, or, one blue, green or black thread in a red braid.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved April 18, 1914.

INCUBATORS AND BROODERS, Electrically Heated.—Electric Manufacturing Company, 926 LaFayette Street, New Orleans, La.

"Reed's" electric incubator and brooder.

Electrically heated incubators and brooders shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved March 26, 1914.

PAPER LIFT.—H. B. Rouse & Company, 2214 Ward Street, Chicago, Ill.

"Rouse" paper lift, consisting of a three-quarter horsepower, 220-volt, direct-current series motor geared to hoisting cables for attachment to trucks for lifting paper to feed boards of printing presses. Motor protected by fuses inclosed in cast-iron cabinet and controlled by an enclosed triple-pole, double-throw knife switch. Safety stops are provided which mechanically open the switch to prevent over-travel.

Approved April 30, 1914.

RECTIFIER. — Wagner Electric Manufacturing Company, 6400 Plymouth Avenue, St. Louis, Mo.

Vibrating rectifiers for use on 110-volt, alternating-current circuits for charging 6, 8 and 10-volt lead storage batteries.

Types 5-B, 7½-B, 10-B and 15-B.

Approved April 20, 1914.

ROSETTES, Fuseless. — Harvey Hubbell, incorporated, Bridgeport, Conn.

Ceiling pull-switch rosettes, Catalog Nos. 5900, 590, 5905, 5906, 5942, 5943, 5950, 6029, 6031; with "Economy" extender, Catalog Nos. 5920, 5921, 5925, 5926, 5944, 5945, 5951, 5952, 6032, 6033 and 6034.

Approved April 18, 1914.

SIGNS, Electric.—Halpern Brothers. 218 West Twentieth Street, New York, N. Y.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached to each sign.

Approved April 23, 1914.

SOCKETS, Standard.—Bryant Electric Company, Bridgeport, Conn.

"Bryant" porcelain-shell sockets.

Keyless, 1,500-watt, 600-volt, mogul base; catalog Nos. 4062, 4069-71.

Approved April 24, 1914.

SOCKETS, Standard.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

C-H, 660-watt, 250-volt.

Brass shell.

Push button, catalog Nos. 7500, 7506.

Keyless. catalog Nos. 7501, 7507, 7511.

Porcelain shell.

Push button, catalog No. 7401.

Approved April 18, 1914.

SWITCHES, Automatic. — General Electric Company, Schenectady, N. Y.

G. E. control switches.

Type CR-2391 (direct current) single-pole contactor, 50-1,800 amperes, 115,-320 and 550-volt.

Type CR-2392 (alternating current) single-pole and multiple contactors, 50-1,800 amperes, 115, 230 and 550-volt.

Approved April 18, 1914.

SWITCHES, Automatic. — General Electric Company, Schenectady, N. Y.

Types CR-2930, 2931 float switches for use with automatic motor starters of electrically driven hydraulic pumps, 5-25 amperes, 110, 220 and 550-volt.

Type CR-2920 pressure governors for self-starting motor-driven pumps, 3-50 amperes, 110, 220, 440 and 550-volt.

This approval is not to be construed as an approval of the devices for use in connection with automatic sprinkler or similar fire-protective equipments for which services their merits have not been investigated.

Approved April 20, 1914.

SWITCHES, Knife.—A. G. Electric & Manufacturing Company, P. O. Box 406, Seattle, Wash.

Motor-starting switch, 30-ampere, 250-volt, direct and alternating current.

Approved March 18, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

WATERBURY, VT.—Pursuant to a vote taken at the March meeting the committee selected for the purpose of investigating electrical powers has appointed F. O. Sinclair, of Burlington, who was formerly advising civil engineer for the Public Service Commission, to investigate the proposition of a municipal electric light and power plant. It is the purpose of the town to furnish lighting for its streets, residences and power for such industries as want it in the town. The committee, in charge of the matter, are William Clark, V. L. Perkins and Fred Luce.

EAST NORWALK, CONN.—An appropriation of $25,000 has been made for the construction of a new lighting plant here. Address Arthur Waldron.

NIAGARA FALLS, N. Y.—The Board of Public Works has approved the plan of extending the ornamental lighting system on Main Street to Falls Street, at a cost of $20,000. Address M. J. Donohue, city electrician.

HAMBURG, N. J.—The Township Committee is considering the establishment of a lighting system for the streets of Hamburg. A.

JOHNSONBURG, N. J.—Residents of Frelinghuysen Township are arranging for the construction of a telephone system between Johnsonburg and Marksboro. A.

PRINCETON, N. J.—The Public Service Electric Company will install underground lines in Nassau Street, Prospect Avenue and Washington Street. A.

BUTLER, PA.—The Butler Light, Heat & Motor Company was awarded the contract for lighting the streets of Butler at a meeting of the City Council last week. An effort was made for a time to have gas lights used and to eliminate a number of the electric lamps, but this was voted down at the meeting. Cluster lights will be used in the business section of the town.

HOLTWOOD, PA.—The Pennsylvania Water & Power Company is planning a new transmission line to be erected between the Holtwood plant and Baltimore, Md., which will take care of the increasing business in the latter city. At the present time the demand for power in Baltimore is greater than the capacity of the line, and much power is wasted by overloading the line. The work will cost about $400,000.

SOUTH ATLANTIC STATES.

WARSAW, N. C.—The Atlantic & Carolina Railway Company has been incorporated to construct and operate an interurban electric railway from Warsaw to Kenansville, about 10 miles. The incorporators are T. A. Hefty, Bowden, L. A. Beasley and H. D. Williams, Kenansville.

NORTH CENTRAL STATES.

BARBERTON, O.—The $20,000 bond issue for electric-light purposes has been disposed of at a premium, and the town will proceed to make arrangements for the construction of a municipal plant. Contracts have not yet been let. L.

BRADFORD, O.—This town has sold an issue of $2,000 electric-light bonds, with the proceeds of which a small plant will be constructed. L.

LEBANON, O.—The plant and other property of the Loveland Electric, Ice & Water Company will be sold by the receiver, under orders of the Court, at Lebanon, on June 6. The assets of the company are appraised at $75,000. L.

ELKHART, IND.—The Elkhart Manufacturers' Association is planning to construct a $50,000 electric-power plant here.

RICHMOND, IND.—The city will shortly buy 350 street lamps, type not decided upon. C. A. Kleinknecht is the superintendent of the lighting plant. G.

EAST CHICAGO, IND.—The Northern Indiana Gas & Electric Company has been given authority by the Public Service Commission to issue $1,020,000 bonds and $282,000 gold notes for the construction of its new plant at East Chicago.

ROCK FALLS, ILL.—The Illinois Northern Utilities Company has purchased of Mr. Paul Dillon his electric power franchise in Rock Falls,, and it is expected that the transmission lines into Rock Falls will be rebuilt immediately.

SPRINGFIELD, ILL.—Residents of West Grand Place, an outlying residence section of Springfield, have organized the West Grand Improvement Association and appointed a committee to investigate the feasibility of erecting an independent lighting system. Dr. W. G. Bain is president of the Association, William Price, secretary. Inability to get a satisfactory arrangement with the Springfield Utilities Company is the reason for this decision.

SPRINGFIELD, ILL.—The City Commissioners have ordered the installation of a lighting system in Adams Street for a distance of twelve blocks. The new nitrogen lamp will be tried first. If they do not prove satisfactory they will be replaced with others. Z.

ALBION, MICH.—The Commonwealth Power company will install a complete new tungsten lighting system here.

ISHPEMING, MICH.—The Council will place additional boulevard lights. Address the village engineer for general information.

MANITOWOC, WIS.—It is estimated that improvements and a new building for the municipal lighting and power plant will cost the city $60,000.

NEW RICHMOND, WIS.—The Wells Electric Construction Company has been organized here, and will construct an electric lighting plant at New Richmond. P. F. Neverman is president.

ALLISON, IOWA.—The election on the proposed franchise asked by the Hampton Electric Company resulted in a unanimous vote in favor of the proposal of the company to furnish electricity to this town. The franchise runs for 25 years and the Hampton company will build a transmission line to this place.

HIBBINGER, MINN.—The Water and Light Board is considering ways and means of building a lighting plant. Address W. J. Ryder for desired information.

LAMBERTON, MINN.—A franchise has been granted for the construction of an electric light plant. Address Fred Griffin.

NEW YORK MILLS, MINN.—Instead of purchasing gas lights the Council will have an electric light plant installed. The contract will be awarded to the lowest bidder for installing the plant. C.

ST. PAUL, MINN.—The Consumers Power Company will soon build a high-tension transmission line 33 miles long from St. Paul to near Northfield, Minn., to connect the hydroelectric transmission systems of the Faribault and Mankato divisions. This line will open a number of new rural markets of electric service and with its building five hydroelectric plants with 36,500 horsepower and six steam stations with 29,500 horsepower, or a total of 66,000 horsepower, will be connected.

EARLVILLE, IOWA.—An electric light plant will be established here. Address H. J. Vanfleet, mayor, for further information.

MUSCATINE, IOWA.—More than $30,000 will be expended by the Muscatine Lighting Company, in electric-wire extensions in this city. Address Local Manager Carson for particulars.

WAUCOMA, IOWA.—The second election on the question of erecting and maintaining an electric-light plant and issuing $12,000 bonds for the erection and maintenance of such a plant, carried by a large majority.

CHURCHS FERRY, N. D.—The Commercial Club has taken up the matter of securing electric lighting for the town. C.

BROOKINGS, S. D.—Brookings will make extensive improvements to its municipal power and heating plant to the extent of about $10,000. Address the city clerk.

VALLEY FALLS, KANS.—Improvements are to be made to the electric light plant here, the City Council having adopted resolutions to that effect at a recent meeting. New engines and generators are among the equipment to be purchased. M.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—Business men with establishments in the central part of the business district have concluded arrangements for the institution of a "White Way." Eighty-eight high-power lamps will be used in a section now depending for street illumination on 18 arc lamps of the familiar type. The merchants will pay for the installation of the system and the city will be asked to keep it in operation. G.

WICKLIFFE, KY.—Stock has been subscribed, it is given out here, for the installation of a Home telephone exchange here. G.

ASHFORD, ALA.—An election will be held June 8 to decide the question of issuing $10,000 in bonds for establishing an electric-light plant. Address J. S. Radney, mayor, for further information.

ARDMORE, OKLA.—Chicago interests have taken over the Ardmore electric street railway lines under the name of the Ardmore Electric Railway Company and will make numerous improvements and extensions to the system. George S. Cravens is president of the company. D.

BUFFALO, TEX.—A 25-year franchise for an electric-light plant has been granted to Andrew J. Holmes, of Carthage, Tex. The plant is to be installed by July 1.

GAINESVILLE, TEX.—The Texas Light & Power Company will begin work at once on a large power plant in this city, costing $50,000, which will furnish current for local consumption and for interurban lines of North Texas.

SAN ANTONIO, TEX.—A 15-mile road will be constructed by the San Antonio, San Jose & Medina Interurban Railway Company, incorporated for $100,000. The road will run between San Jose and Kirk. The company headquarters, however, will be maintained at San Antonio, Tex. M.

WESTERN STATES.

COLORADO SPRINGS, COLO.—The City Council has under consideration the proposition of installing a municipal electric lighting plant. Bonds in the sum of $150,000.00 were voted for this purpose in 1907, but no action has been taken up to the present time.

PITKIN, COLO.—T. R. L. Dougherty and C. R. Calhoun, of Florida, have made a preliminary survey for the hyroelectric power plant for the Brant Independent Mining Company, and active work will begin on same at as early date as possible.

GREEN RIVER, UTAH.—A special election will be called in the near future to vote on the issuance of bonds for the purpose of erecting an electric lighting plant and distribution system. Information in regard to the same may be had by addressing the town clerk. V.

RENO, NEV.—The Beaver River Power & Plant Company has filed articles of incorporation with a capital stock of $100,000. The directors are H. R. Waldo, George F. Halliday, O. P. McBiersach, E. P. Bacon and H. V. Hoyt.

FLORENCE, ARIZ.—The City Council has instructed the City Engineer to investigate what legal steps are necessary for the city to proceed to raise the money and to install a municipal electric lighting plant. V.

LEAVENWORTH, WASH.—The Cashmere Electric & Water Company recently petitioned the City Council for a franchise for distributing electric current in this city. The Company has already made application for franchises in Cashmere and Wenatchee, and has filed an application with the County Commissioners for the right to set poles on country roads between this city and Wenatchee. The Cashmere company, which was organized several months ago, is planning to build a hydroelectric plant near Cashmere, which will develop enough power to supply the whole Wenatchee Valley. Sufficient capital has been raised to secure its completion. O.

NORTH YAKIMA, WASH.—The Central Heating Company recently petitioned the City Council for a franchise for an electric light and power business, in addition to heating, and has announced the intention of entering into competition with the Pacific Power & Light Company. If the franchise is granted, the company proposes to erect a $100,000 plant. O.

ANDREWS, ORE.—Plans have been completed and surveys made for the construction of a hydroelectric power plant on Wild Horse Creek. Address Jean Bart Balcomb, Andrews, engineer, for further information.

SALEM, ORE.—U. G. Hayne, of Portland, recently filed an application with State Engineer Lewis for a permit to build a 10,000-acre foot storage reservoir on Parmelia Lake, to be used for the development of 26,136 horsepower. Mr. Hayne also proposes to use the water of Marion River, Minto Creek, Parmelia Creek and White Water Creek. O.

LOS ANGELES, CAL.—At the bond election held here May 8, the $6,500,000 bond issue, the proceeds of which are to be used for the purpose of completing aqueduct power plant No. 1, and constructing or acquiring a distribution system in this city, carried by a large margin.

PORTOLA, CAL.—The supervisors of Plumas County have granted a franchise to R. B. Young, of Loyalton, to construct and operate an electric lighting system for the town of Portola. Light, heat and power will be furnished to the residents of Portola and vicinity.

RICHMOND, CAL.—Articles of incorporation have been filed of the San Francisco Northern Railway Company, with a capital stock of $2,500,000, by Allen L. Kittle, Archibald Borland, Frank A. Brush, William L. P. Jackson and John C. Kittle. The purpose of the corporation is to construct a road 42 miles long.

TULARE, CAL.—The Railroad Commission has granted authority to the Mt. Whitney Power & Electric Company to issue $500,000 of its five-per-cent 50-year-bonds. The funds to be received from the sale of the bonds will be applied to the completion of the Wolverton dam, the constructions of distribution lines in substations and other physical improvements. Several new substations will be constructed at various places.

PROPOSALS.

ELECTRICAL EQUIPMENT.—Bids will be received until May 26 for furnishing f. o. b. cars, one 100-kilowatt, 2,300-volt engine-type, two-phase alternator, direct connected to suitable engine. Address F. J. Weisser, city Clerk, Melrose, Minn.

CABLE AND ARC LAMPS.—Sealed proposals will be received until May 28 by John D. Kelly, city secretary, Galveston, Tex., for furnishing ornamental posts and ornamental arc lamps, and 12,000 feet of cable, all in accordance with specifications on file in the office of the city secretary.

ELECTRIC WIRING SYSTEM.—Sealed proposals will be received until May 25 by Mayor Joseph G. Armstrong, Pittsburgh, Pa., for an electric wiring system and other work in the new Market House, Diamond Square. Bids should be addressed to Bureau of City Property, Department of Public Works.

ELECTRIC WIRING AND FIXTURES.—Sealed proposals will be received at the office of the Depot Quartermaster, El Paso, Tex., until June 3 for the electric wiring and lighting fixtures for the officers' quarters, Fort Bliss, Tex. Application for plans, etc., should be accompanied by a certified check in the amount of $10.

ELECTRIC WIRE AND ELECTROLIERS.—Sealed bids will be received until June 1 by John F. Murphy, city clerk, Great Falls, Mont., for approximately 41 one-lamp electroliers, approximately eight three-lamp electroliers, approximately 7,175 feet of conduit and approximately 22,000 feet of wire for the lighting system.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the office of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 2 for furnishing 15,500 feet of galvanized two-inch steel conduit, as per Schedule 6794, for delivery at the Navy Yard, Brooklyn, N. Y.; and until June 6 for furnishing 2,840 batteries, 7 by 1.75 inches, and 1,440 flash-lights without batteries, for delivery at various navy yards, both as per Schedule 6793.

NEW INCORPORATIONS.

BROOKLYN, N. Y.—Universal Sign & Letter Company, Incorporated, has filed articles of incorporation, capitalized at $50,000. The incorporators of the company are Henry A. Jourdan, Ernest Breuer, and Lewis Cohen, Brooklyn, N. Y.

VERNON, N. Y.—Tyler Light & Power Company, Incorporated, has been granted articles of incorporation with a capital stock of $500. The incorporators are Mary E. Tyler, George C. Capes and Edwin E. Morris, all of Vernon, N. Y.

NEW YORK, N. Y.—The Pisch Electric Sign Company, Incorporated, has been granted articles of incorporation with a capital stock of $15,000. The incorporators are Edwin C. Colwell, R. J. Nutting and Frank Pisch, all of New York City.

ROCK ISLAND, ILL.—The Victor Lead Storage Battery Company, capitalized at $100,000, has been incorporated by E. E. Winters, Gus E. Brown and Walter E. Snider, to manufacture and deal in storage batteries. Z.

FINANCIAL NOTES.

A special meeting of the American Gas & Electric Company, to be held on June 3, is to authorize an increase of $500,000 in common stock, to be offered to stockholders at par, or $50 a share.

At the first annual meeting of the Directors of the Western Power Company F. Lothrop Ames was elected president. Irving W. Bonbright was made a member of the executive committee and all other officers were re-elected.

Directors of the American Water Works & Electric Company have elected the following officers: H. Hobart Porter, president; Stuart H. Patterson, vice-president and treasurer; J. H. Purdy, assistant to president; Harry E. Towle, secretary.

The Delta Electric Light, Power & Manufacturing Company and the Greenville Street Railway Company have been consolidated as the Delta Light & Traction Company. F. N. Robertshaw is president and Ralph B. Claggett secretary, treasurer and general manager.

The $6,860,000 Georgia Railway & Power first-refunding-mortgage five-per-cent forty-year sinking-fund gold bonds, recently purchased by Drexel & Company, of Philadelphia, are being offered at 92.5 and interest in Chicago by Kennett, Cowan & Company, as Western members of the syndicate. The bonds are also being offered in New York by Kissel, Kinnicut & Company and in Boston by E. H. Rollins & Sons.

The Ohio Service Company has arranged to purchase the electric light and power companies in New Philadelphia, Canal Dover, Cambridge and Circleville, and applications have been filed by the prospective purchaser and the sellers with the State Public Utilities Commission asking authority to close the deals. At Canal Dover and New Philadelphia, the price is $694,000, at Cambridge $750,000, and at Circleville $45,000.

The Bangor Railway & El ctric Company will expend this year for extensions and improvements in lighting, power and car lines $191,000, of which $43,000 will be devoted to reconstruction work in Bangor, $28,500 for new water wheels and generators at the Veazie power station, and $37,000 in extending the lines of the Bar Harbor & Union River Power Company, a subsidiary concern in Hancock County. The light and power wires are being extended from Ellsworth to Bluehill, a distance of twenty miles.

The California Railroad Commission has authorized the Mount Whitney Power & Electric Company to issue $500,000 six-per-cent 30-year bonds at 95, the funds derived from their sale to be invested in the completion of the Wolverton dam, the construction of transmission and distributing lines and improvements on the hydroelectric properties. The largest items of expenditure will be $112,135 on the Wolverton dam and $75,000 for completion of the Kaweak generating station.

Control of the Southern Indiana Power Company, which was organized in 1911 as successor to the Bedford Power Company, has passed to a syndicate headed by Chester P. Wilson, of Indianapolis. The company supplies electric power and light to towns and industries in Southern Indiana. It has $800,000 capital stock and $770,000 six-per-cent bonds and operates a combined steam and hydroelectric station on the White River at Williams, with 5,000 horsepower hydroelectric and 5,000 horsepower steam generating capacity.

The $2,000,000 first and refunding five-per-cent bonds sold by the Scranton & Wilkes-Barre Traction Company to Harris, Forbes & Company and Perry, Coffin & Burr are secured by the deposit of $5,000,000 first-mortgage bonds of the Lackawanna & Wyoming Valley Railroad Company and of $1,848,750 of the $1,850,000 capital stock of this company and through these are a first lien on the entire operating property, subject only to prior liens of $880,000 underlying bonds.

At the annual meeting of Western Canada Power Company former directors were re-elected and C. H. Cahan was elected president. President Cahan reported that earnings of the company had increased from $74,420 gross for the year ended December 31, 1912, to $286,210 for the year ended December 31, 1913, while the surplus of the company had increased from $14,804 for 1912 to $200,320 for 1913. It was stated that revenue from power is showing a steady increase, as with improving industrial conditions in British Columbia larger amounts of current are being used.

Arthur D. Lord, president of the Atlantic Gas & Electric Company, has issued a letter to shareholders covering operations of the company for the first quarter of the present year. In it he says: "The larger amount of investment made by subsidiary and affiliated companies of the Atlantic Company is being made for improvements to properties in the Easton, Pa., district, which work is now nearing completion. A new 6,333-horsepower turbo-generator was put into service early in January, and the work of installing a second 6,333-horsepower turbo-generator is being rapidly pushed. The generating capacity of the plant at present, without taking into consideration the new generator being installed, is 10,000 horsepower. The new station building at Boonton, N. J., has been completed and two 1,000-horsepower turbo-generators are now being installed. Announcement has been made by the Bethlehem Steel Company that in the next three years $25,000,000 will be spent in the Bethlehem-Easton section of the Lehigh Valley to meet the rapidly expanding manufacturing conditions."

Dividends.

	Term.	Rate.	Payable.
Am. Pow. & Lt.	Q	1 %	June 1
Am. Rys. com.	Q	1.5%	June 15
Atl. Gas & Elec. pf.	Q	1.5%	May 15
Blackstone Val. Gas & Elec. pf.	S-A	$3.00	June 1
Blackstone Val. Gas & Elec. com.	Q	$2.00	June 1
Cent. Miss. Val. Elec. pf.	Q	$1.50	June 1
Colo. Pow. pf.	Q	1.75%	June 15
Conn. Riv. Pow. pf.	S-A	3 %	June 1
Norf. Ry. & Lt.	S-A	3 %	June 10
Ontario Pow.	Q	1.25%	June 1
Pensacola Elec. pf.	S-A	$3.00	June 1
Phila. Elec.	Q	1.75%	June 1
So'west Pow. & Lt. pf.	Q	1.15%	June 1

Reports of Earnings.

CONSUMERS POWER OF MICHIGAN.

Consumers Power Company of Michigan reports as follows on April, 1914, and the twelve months ended April 30:

	April	12 Months
Gross earnings	$279,085	$3,241,643
Net earnings	199,013	1,862,786
Surplus after charges	105,429	793,299
Balance after preferred dividends	77,929	463,299

STANDARD GAS & ELECTRIC.

Combined earnings of operating subsidiaries of Standard Gas & Electric Co for year ended February 28, 1914, were:

	1914	1913
Gross earnings	$14,077,589	$13,365,914
Net after taxes	6,372,505	6,078,062

MONTANA POWER COMPANY.

The Montana Power Company reports for three months ended March 31:

	1914	1913
Gross earnings	$977,666	$875,095
Net after taxes	697,378	608,062
Surplus after charges	449,253	383,549

NEW ENGLAND POWER COMPANY

	1914	1913
April gross	$85,428	$54,507
Net after taxes	54,486	35,836
Surplus after charges	25,217	13,754
Balance after accrued dividends	4,667	3,505

NIAGARA FALLS POWER COMPANY

The Niagara Falls Power Company has issued its report for the year ended December 31, 1913. The combined income account of the Niagara Falls Power Company and Canadian Niagara Power Company compares as follows:

	1913	1912
Gross earnings	$2,742,192	$2,497,196
Operating expenses	440,265	365,097
Reserve*	100,000	100,000
Net earnings	2,201,927	2,032,099
Total income	2,317,986	2,180,663
Charges, taxes, etc.	1,247,876	1,252,805
Surplus	*1,070,110	927,858
Dividends	460,616	460,616
Surplus	609,494	467,242

*Equal to 18.58 per cent on $5,757,000 capital stock, against 16.10 per cent earned on same stock previous year.

CUMBERLAND COUNTY POWER & LIGHT

	1914	1913
March gross	$ 182,628	$ 171,116
Net after taxes	62,874	67,966
Surplus after charges	*669	11,158
12 months' gross	2,388,970	2,178,538
Net after taxes	1,021,309	963,973
Surplus after charges	286,707	302,365
Balance after preferred dividends	†148,707	204,365

*Deficit. †Equivalent to 5.5 per cent on common stock.

COLUMBUS RAILWAY, POWER & LIGHT.

	Mar. 1914	3 Months
Gross earnings	$250,185	$768,751
Net after taxes	89,934	282,494
Balance after interest	47,025	141,925
Surplus after preferred dividends	26.680	90.890

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WTH THE PREVIOUS WEEK.

	May 18	May 11
American Tel. & Tel. (New York)	128¼	122
Commonwealth Edison (Chicago)	134½	134½
Edison Electric lluminating (Boston)	251	247
Electric Storage Battery, common (Philadelphia)	52¾	52
Electric Storage Battery, preferred (Philadelphia)	52¾	52
General Electric (New York)	138	145½
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric, common (Boston)	11	10
Massachusetts Electric, preferred stamped (Boston)	61	58
National Carbon, common (Chicago)	108	108
National Carbon, preferred (Chicago)	118	118
New England Telephone (Boston)	135	135
Philadelphia Electric (Philadelphia)	26	25½
Postal Telegraph and Cables, common (New York)	82	78¼
Postal Telegraph and Cables, preferred (New York)	68	67¾
Western Union (New York)	61½	61¼
Westinghouse, common (New York)	75	73¾
Westinghouse, preferred (New York)	*120	120

*Last price quoted.

PERSONAL MENTION.

MR. JOHN K. PUNDERFORD, general manager of the Connecticut Company, has been promoted to vice-president of that company.

DR. EDWARD B. ROSA, of the Bureau of Standards, delivered an illustrated lecture on "Electrolysis and Its Mitigation" at the meeting of the Schenectady Section, American Institute of Electrical Engineers, on the evening of May 20.

MR. C. R. FAIRCHILD, district manager of the Delaware & Atlantic Telegraph & Telephone Company, Trenton, N. J., tendered an address on the growth and operation of the telephone industry, at the Bordentown (N. J.) Military Institute, May 15.

MR. J. W. GILLETTE, for six years manager of the Fort Smith (Ark.) Light & Traction Company, has been appointed sales engineer for the Electrical Engineers' Equipment Company, Chicago. Mr. Smith's many friends among the electrical profession will wish him success in his new position, for which he is so well qualified.

GEN. IRVING HALE, formerly in charge of the Denver office of the General Electric Company, was a recent visitor in Salt Lake City, Utah. General Hale has been in poor health for the past three years, and this trip was principally for the purpose of exchanging greetings with the men in the various offices formerly under his direction.

MR. H. S. SINES, assistant secretary of the Minerallac Electric Company, Chicago, aided in the capture of a team of runaway horses which were endangering scores of lives on one of Chicago's busiest thoroughfares on May 13. The horses were brought to a halt by a local police officer standing on the running board of Mr. Sines's motor car after an exciting chase of over a mile.

DR. EDGAR F. SMITH, provost of the University of Pennsylvania, and formerly vice-president of the American Electrochemical Society, was the recipient of an Elliott Cresson medal awarded by the Franklin Institute at its regular meeting in Philadelphia on the evening of May 20. Upon this occasion Dr. Smith made an address entitled "Scientists From the Keystone State."

MR. JACOB STRUB, has been appointed inside wiring inspector of Toledo, O., taking the position until recently held by MR. THOMAS D. McCOLL, resigned. Mr. Strub has disposed of his interests in the Whipple-Strub Electrical Company, and will devote all his time to his new duties. The firm name of the company he has left has been changed to Whipple Electric Company.

MR. CHARLES L. ESHLEMAN, general sales manager of the Adams-Bagnall Electric Company, of Cleveland, O., has resigned to become vice-president and general sales manager of the Union Metal Manufacturing Company, at Canton, O., which is making arrangements to build a new factory, doubling its capacity. The company now employs 50 men, and has found it necessary to have a large part of its work done in other foundries.

MR. F. W. HARVEY, JR., business manager of *Popular Electricity and the World's Advance,* has accepted the position of assistant manager for the Chicago Electrical Trades' Exposition Company. In this capacity Mr. Harvey will assist Mr. Homer E. Niesz, who has been in charge of the Chicago shows since their origin. Mr. Harvey is vice-president of the Chicago Jovian League, treasurer of the Electric Club of Chicago, and has a wide acquaintance among the electrical fraternit, in Chicago.

MR. WARNER P. SAYRES, of the F. D. Lawrence Electric Company, MR. PARKER H. KEMBLE, manager of the electrical commercial department of the Union Gas & Electric Company, and several other men prominent in the electrical field in Cincinnati, were members of the trade excursion which the Chamber of Commerce of Cincinnati sent out through Southern Ohio and Indiana last week, covering a number of the principal towns in that section.

MR. WAYNE D. JONES, of Phoenixville, Pa., has tendered his resignation as electrical manager of the Spring City Institution for Epileptics and Feeble-Minded, effective May 20, when Mr. Jones will become the superintendent of the Phoenix Water Power Company, whose plant is situated at the Black Rock dam, at Phoenixville. Mr. Jones states that the new power company has entered into a 15-years contract to furnish power to the Schuylkill Traction Company, and that company is now erecting a pole line to Collegeville, in order to convey the power. It is expected that power will be furnished by June 1.

PROFESSOR V. KARAPETOFF, of the Department of Electrical Engineering, Cornell University, has recently completed an extended lecturing tour. His itinerary and topics were as follows:

May 9, Springfield, Mass., an address before the Eastern Association of Physics Teachers on the subject "Some Calculations in the Magnetic Circuit." May 11, Cleveland, O., an address before the engineering students of the Case School of Applied Science on "The Production of Revolving Magnetic Field." On the same day, a lecture before the Case School Chapter of the Society of Sigma Xi on "The Dielectric Circuit." On May 12, an address before the engineering students of Carnegie Institute of Technology, Pittsburgh, Pa., on the subject "Some Transient Electrical Phenomena." On the evening of the same day, a paper before the Pittsburgh Section, American Institute of Electrical Engineers, on the subject "The Preparation and Qualifications of a Teacher in Engineering." On May 13, he addressed the students of the University of Pittsburgh on the subject "Electrification of Steam Railroads."

OBITUARY.

MR. CHARLES A. BRAMHALL, one of the oldest employees of the Diehl Manufacturing Company, of Elizabeth, N. J., died at his home in Allendale, N. J., on May 7. Mr. Bramhall was well known to the electrical industry, especially in New York City, and his death is regretted by a host of friends and acquaintances.

DR. PAUL LOUIS TOUSSAINT HÉROULT, well known as the inventor of the type of electric furnace which bears his name, died in Paris on May 9. Dr. Héroult was born at Thury-Harcourt, France, on April 10, 1863, and studied in England as well as in his native land. In 1886 he attracted attention by his process for producing aluminum and devoted his time to the application of his inventions. He spent much time in this country in connection with this subject. His electric furnaces have been installed in a number of plants for the refining of steel. He was a member of the American Electrochemical Society, the Chemists' Club of New York, the Faraday Society, the Société des Ingénieurs and the American Institute of Mining Engineers.

NEW PUBLICATIONS.

MISSOURI COMMISSION. —The Public Service Commission of Missouri has issued its first annual report covering the year 1913. The report itself is rather short and covers the organization and activities of the Commission for the period named. The cases coming before the Commission are separately published and circular No. 25 has been issued giving a report on investigations of railroad accidents.

DATES AHEAD.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Indiana State Electrical Contractors' Association. Convention, Indianapolis, Ind., May 28-29. Secretary, George Skillman, Indianapolis, Ind.

American Institute of Electrical Engineers. 296th meeting, Pittsfield, Mass., May 28-29.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, J. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Minnesota Electrical Contractors' Association. Annual Convention, St. Paul, Minn., June 22.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 23-26.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-16. Secretary, G. H. Duffield, 40 Martin Street, Utica, N. Y.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Railway & Industrial Engineering Company announces that it has removed its works and offices from the Peoples Bank Building, Pittsburgh, to Greensburg, Pa.

M. B. Wheeler has opened offices in the Union National Bank Building, Houston, Texas, as electrical manufacturer's agent. The principal features of Mr. Wheeler's business will be: sales of everything electrical in merchandise and apparatus; advisory service pertaining to installations, wiring and illuminating problems; purchase and sale of electrical securities.

Stow Manufacturing Company, Binghamton, N. Y., has ready for distribution a folder illustrating seven of its compact electrically driven tools. These are the portable buffer, emery grinder, breast drill, two-spindle drill, tool-post grinder, bench grinder and the combination "Gee Whiz" machine for drilling, boring, grinding, buffing, etc. The Stow two-spindle drill is separately illustrated and described in bulletin No. 88.

Copeman Electric Stove Company, Flint, Mich., is sending out to central stations and dealers in electrical heating devices a folder called "The Price of Success." This calls attention to the Copeman line of electric family ranges and hot plates, the new automatic electric toaster, electric water heaters, etc. Special features of these appliances are pointed out as well as the advantages of electric cooking, which is called the twentieth-century cooking system.

H. W. Johns-Manville Company's May number of its monthly organ, *The J-M Power Expert*, published at its Cleveland, O., branch office, contains an interesting article by B. C. McClure on "Maintenance Cost—Efficiency and Economy—Safety First—Standardization." This article discusses these four live topics of the day from a new angle. The May issue also has a fine interior view and description of the Quarry Street station of the Commonwealth Edison Company, Chicago, in which all steam pipes are insulated with J-M Fire Felt.

Central Electric Company, 320-326 South Fifth Avenue, Chicago, Ill., has recently issued catalog No. 35, listing and describing automobile, motorboat and motorcycle supplies and accessories. This catalog contains 160 pages, a large number of which are devoted to electrical supplies such as lamps, spark plugs, foot warmers, speedometers, voltmeters, ammeters, horns, charging panels, garage lamps, storage batteries, switches, ignition coils, wires, etc. The catalog is well illustrated and prices and directions for ordering are included.

Hazard Manufacturing Company, Wilkes-Barre, Pa., has issued price list No. 54 of Hazard rubber-covered wires and cables. This list is very comprehensive, covering 28 pages of data and useful information. Among the wires and cables listed are solid, solid duplex, and stranded conductors (ranging in the latter case from No. 14 to 2,000,000 circular mils), light and heavy fixture wires, telephone wires, and a variety of special cords and cables. Additions for special insulations or coverings are given, also full data on freight additions. All of the wire lists are given for base prices ranging from 13 to 20 cents. Copies of this price list may be had on request to the company.

Rochester Lighting Company, Rochester, Pa., has been organized and has opened studios in the Marquart Building. The company carries a full line of residence, store and office lighting equipment, and is also prepared to manufacture and install electric signs for both plain and decorative effects with the most modern flasher equipments. Leon S. Malone, has active management of the business, and Charles Z. Fogel, connected with the Phoenix Glass Company, is acting in an advisory capacity. The new company has already listed a large number of new homes and business blocks, among them the Majestic Theater in Rochester, and with the prospects of a good building season will no doubt push rapidly to the front.

The Yost Electric Manufacturing Company, Toledo, O., announces that the infringement suits brought against it and one of its customers by the General Electric Company in Ohio and in New York have been dismissed. The controversy arose over the alleged infringement of the Sargent patent covering the retaining means of the insulating lining in the cap of a brass-shell socket. In both cases the courts held that the Yost construction did not infringe. Both cases, however, were appealed. The appeal of the New York case resulted in the affirmation of the finding of the lower court. Subsequently the appeal of the Ohio case was dismissed by agreement of the appellant. The Yost Company has made use of this construction since 1902.

Sprague Electric Works of General Electric Company, New York City, has recently issued a number of pamphlets, among which is No. 905, entitled, "Sprague Electric Hoists." This pamphlet illustrates and describes electric cranes of various sizes ranging from one-half to six tons in capacity. Numerous views of installations are included, together with a table of ratings, capacities and weights. Pamphlet No. 952 is devoted to theatrical devices such as strip, proscenium, foot and border lights. Numerous line drawings add to the value of this pamphlet. Other pamphlets on theatrical appliances which have recently been issued, are Nos. 950, 951 and 953, illustrating and describing plug connectors, stage floor and wall pockets, and iris-shutter color disks respectively. All of these pamphlets are illustrated by half-tones and line drawings. Pamphlet No. 331 is devoted to a brief description of electric fans for private and commercial purposes. Pamphlet No. 441 describes and illustrates watertight floor outlet boxes.

Santo Manufacturing Company, Philadelphia, Pa.; announces that it has purchased the patents and manufacturing facilities of the Kellar Manufacturing Company. A. H. Boyd, manager of the Philadelphia office of the Fort Wayne Electric Works of General Electric Company, has accepted the position of general manager and treasurer of the new company. Mr. Boyd began work in the construction department of the Fort Wayne Electric Works in 1899, and superintended the installation of many large and important light and power plants all over the country. In 1907 he was transferred to the sales organization and shortly after that was promoted to manager of the power-sales department. In 1910 he was sent to Philadelphia to take charge of the district sales office. During the past nine months he has acted as receiver for the creditors of the Kellar Manufacturing Company, and when the Santo company was organized to take over the factories, equipment and business of the Kellar Manufacturing Company, he was offered the position as general manager and treasurer. The same engineering and manufacturing organization has been retained, and the company will continue to manufacture and market Santo vacuum cleaners.

General Electric Company, Schenectady, N. Y., has recently received the following among a multitude of orders for electric power equipment: Great Falls Power Company, Butte, Mont., four 10,000-kilowatt waterwheel-driven generators, two 500-kilowatt generators, nine 6,000-kilowatt water-cooled transformers, nine 360-kilovolt-ampere reactances, switchboard and accessories. Thompson Falls Power Company, Butte, Mont., two 6,250-kilowatt waterwheel-driven generators, two 500-kilowatt generators, four 3,750-kilowatt water-cooled transformers, switchboard and accessories. Great Western Power Company, San Francisco, Cal., two 150-kilowatt three-unit motor-generator booster sets, switchboard and accessories. American Iron & Steel Manufacturing Company, Lebanon, Pa., a 1,500-horsepower induction mill-type motor with sectional control equipment. Bethlehem Steel Company, South Bethlehem, Pa., nine motors ranging from 10 to 50 horsepower; also two additional 125-horsepower and two 150-horsepower induction motors. Riter-Conley

Manufacturing Company, Pittsburgh, Pa., 32 motors of 10 and 25-horsepower capacities. Hubbard Steel Foundry Company, East Chicago, Ind., two 100-kilovolt-ampere synchronous motors with five-kilowatt exciters and accessories. John P. Squire & Company, Cambridge, Mass., a 300-kilowatt alternating-current generator, three 40-kilowatt transformers, a Tirril regulator and a six-panel switchboard. Michigan Limestone & Chemical Company, Rogers City, Mich., a 1,250-kilowatt Curtis turbogenerator with motor-generator exciter set, a 200-horsepower induction motor, ten motors ranging from 20 to 75 horsepower, transformers and switchboard. Edward Ford Plate Glass Company, Toledo, O., a 13-ton electric industrial locomotive and transfer car equipment. Braender Rubber & Tire Company, Rutherford, N. J., five 100-horsepower induction motors. Hebron Fire & Pressed Brick Company, Hebron, N. D., a 300-kilowatt Curtis turbogenerator, a 120-kilowatt generator with exciter, 10-kilowatt transformer, 19 motors ranging from 7.5 to 50 horsepower, and a switchboard. The J. C. Hubinger Brothers Company, Keokuk, Iowa, a 1,270-horsepower synchronous motor with 18-kilowatt exciter and switchboard. Quaker Oats Company, Chicago, Ill., three 75-horsepower and two 100-horsepower motors. Webster Manufacturing Company, Tiffin, O., six motors ranging from 7.5 to 100 horsepower. Oneida Community, Limited, Sherrill, N. Y., 104 motors ranging from 3 to 20 horsepower. Mutual Chemical Company of America, Baltimore, Md., eight motors ranging from 5 to 75 horsepower. Robert Gair Company, Brooklyn, N. Y., 57 additional motors ranging from ½ to 3.5 horsepower, with controllers and accessories. Huetteman Creamery Company, Detroit, Mich., two 300-horsepower induction motors and three 200-kilowatt transformers.

Record of Electrical Patents.

Issued by the United States Patent Office, May 12, 1914.

1,096,020. Safety Trolley Wheel. J. A. Burton, Covington, Ky. A trolley wheel with side plates hinged to wheel shaft and bent so as to overhang the trolley wire and to automatically open when passing a trolley-wire support.

1,096,048. Magneto-Generator. J. L. Milton, Tiffin, O. An ignition generator having an oscilating armature designed to be driven in one direction by engine shaft and to return to its initial position automatically.

1,096,061. Electropneumatic Control Apparatus. W. M. Scott. Philadelphia, Pa. A pneumatically operated circuit-breaker.

1,096,065. Electric Tuning Device. E. G. Stalnaker, Chicago, Ill., C. W. Stalnaker, guardian, assignor to C. W. Hoff, Chicago, Ill. A rotable tuning coil for wireless-telegraph apparatus so wound that a stationary brush makes contact with successive turns as coil is turned.

1,096,085. Electrolytic Process and Apparatus. C. White, London, England. Process for the electrolysis in non-diaphragm cells of sodium chloride and other solutions evolving gas at the anode comprising the application of local heat and special exhausting means.

1,096,106. Telephone System. B. G. Jamieson, Chicago, Ill. Includes means for branch exchanges to indicate at central exchange the conditions of subscribers' lines.

1,096,109. Circuit Controller. A. A. Kent, Philadelphia, Pa. Ignition means for a four-cylinder internal-combustion engine involving the use of two induction coils each of which is connected to two cylinders.

1,096,127. Telephone Receiver. A. Rosenberg, London, England. A watch-case telephone receiver in which the air gap is capable of being varied by means of an indicating-adjusting screw fastened to pole of magnet.

1,096,136. Electric Signal and Recording System. A. L. Sohm, assignor to Sohm Electric Signal & Recording Co., Spokane, Wash. A printing-telegraph apparatus.

1,096,138. Electric Connector. J. C. Stearns, Worcester, Mass. A plug-socket device in which the plunger is held by a compressed spring.

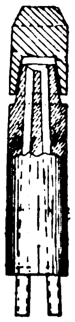
1,096,142. Ethereal-Wave Responsive Device. E. Weintraub, assignor to General Electric Co. A crystal detector for receiving wireless messages one member of which is composed essentially of boron.

1,096,151. Spark Indicator. C. D. Bremer and J. L. Mooney, Milwaukee, Wis. Includes spark gaps with short-circuiting switches.

1,096,153. Telephone Transmitter. E. B. Craft, Hackensack, N. J., assignor to Western Electric Co., New York, N. Y. Covers details of contact construction.

1,096,155. Firing Mechanism of Breech-Loading Guns. A. T. Dawson and G. T. Buckham, assignors to Vickers Limited, Westminster, England. Covers details of arrangement of electrical firing mechanism.

1,096,158 and 1,096,159. Apparatus for Testing Castings. E. I. Dodds, Central Valley, N. Y. An electromagnetic means for testing castings.



1,096,205.—Spot-Welding Electrode.

1,096,175. Electric Transmission of Intelligence. I. Kitsee, assignor to American Telephone & Telegraph Co. Special cable construction having shield conductors for each conductor, the shield conductors forming a closed circuit transposed at intervals.

1,096,182. Transmission System. D. D. Miller, assignor to Western Electric Co. Includes automatic control of resistances connected to polarized relays in telegraph systems.

1,096,205. Electrode-Point for Spot-Welding Machines. A. C. Taylor, assignor to The National Electric Welder Co., Warren, O. A removable welding point for spot welding, internally tapered to receive a pointed welding electrode. (See cut.)

1,096,215. Signal Device. G. L. Barrett, Springfield, O. An electric bell with an automatic indicating circuit-breaker device.

1,096,229. Method of and Apparatus for Testing Castings. E. I. Dodds, Central Valley, N. Y. A modification of 1,096,158 and 1,096,159.

1,096,243. Secondary Winding for Induction Motors. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Rotor bars have laterally-bent touching ends and short-circuiting rings are shrunk upon the two ends of the structure.

1,096,276. Gas-Igniter. H. B. Steele, Boston, Mass. Covers details of arrangement of contacts in a divided jet burner.

1,096,285. Illuminated Head-Covering. F. S. Collier, Fremont, O. Includes the use of a miniature incandescent lamp.

1,096,287. Adjustable Mounting of Armatures of Electromagnets. E. B. Craft, assignor to Western Electric Co. A fork device for varying the distance between the magnetic poles and an armature.

1,096,289. Electric Resistance Unit. O. Dale, New York and H. A. Frederick, Tuckahoe, N. Y. A reflexed resistance unit so folded as to provide an open but compact construction.

1,096,321. Electric Furnace. A Scott-Hansen, assignor to Norsk Hydro - Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Covers arrangement of air passages.

1,096,390. Osmo-Anticathodic Vacuum-Regulator for X-Ray Tubes. C. Regaud, Lyon, France. Includes means for conducting gas to osmotic anode.

1,096,411. Arc-Lamp. A. Blondel and G. Dobkevitch, assignors to General Electric Co. Covers details.

1,096,414. Electric Furnace. W. D. Coolidge, assignor to General Electric Co. An aluminum-tube furnace for treating metallic lamp filaments.

1,096,422. Cap and Shell Fastening for Lamp Socket Casings. E. H. Freeman, Trenton, N. J. Covers details for fastening cap and shell.

1,096,434. Telephone-Transmitter Cut-Out. A. R. Langdon, Hartford, Conn. Has a switch mechanism in the supporting arm.

1,096,440. Lamp. G. C. Lynch, New York, N. Y. A table electric lamp with a swivel arm.

1,096,448. Electric Window Sign. W. J. Murphey and O. R. Burgess, Newcastle, Ind. A transparent window sign supported on a bracket.

1,096,457. Connector Stand. F. J. Ravlin and J. Lofgren, Chicago, Ill. Comprises a hollow stationary standard and a table containing pull sockets.

1,096,470. Automatic Controller for Electric Circuits. L. Stern, Philadelphia, Pa. A float-operated signal device.

1,096,475. Electrically Heated Implement. C. Van Glahn, assignor to National Electric Utilities Corporation, New York, N. Y. An electric soldering iron containing electric heating coil.

1,096,484. Holding Device for Telephone Receivers. K. H. Atherton, Carson City, Nev., and M. N. Rodgers, Chicago, Ill. A vertical telephone-receiver support fastened to receiver hook.

1,096,485. Electric Switch. T. E. Barnum, assignor to The Cutler-Hammer Mfg. Co. A flywheel-operated switch.

1,096,506. Electric Welding Apparatus. E. E. Haskin, New York, N. Y., assignor of one-half to W. E. Haskin. A mandrel for electric welding, having an anvil and an electric contact.

1,096,534. Electric Lantern for Vehicles. L. E. Hoover, Wooster, O. An adjustable electric lamp.

1,096,536 Automatic Synchronizer Indicator for Clocks. E. A. Hummel, assignor to A. L. Haman, St. Paul, Minn. Includes magnetic synchronizing means and indicator.

1,096,562. Traction Harvester. C. F. Radatz, Kenosha Heights, Wis. Has electric-motor drive.

1,096,587. Electric Accumulator. M. L. Ashbaugh, Anderson, Ind. Has horizontal electrodes with spacing elements.

1,096,601. Muffler for Electrostatic Machines. L. C. Charbonneau, Brooklyn, N. Y. A combination of two conical members through which the electrodes pass.

1,096,618. Conduit Wire Fishing Reel. G. Russell, assignor to W. C. Schmitt, Portland, Ore. A drum device with restraining rollers. (See cut.)

1,096,625. Ignition System for Internal Combustion Engines. A. C. Gundy, Upland, Cal., assignor of one-half to M. H. Hay. An electromagnetic switch controlling circuits from timing device.

1,096,627. Take-Down Apparatus for Handling Glass Cylinders. H. F. Hitner, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. A motor-operated tilting frame with an automatic circuit-opening device to prevent overtravel.

1,096,656. Tower Wagon. E. R. Whitney, assignor to Commercial Truck Co. of America, Philadelphia, Pa. Telescoping part of tower is motor operated.

1,096,673. Elevation-Controlled Firing Apparatus for Guns. E. Bourdelles, Paris, France, assignor of one-half to Compagnie des Forges et Aciéries de la Marine et d'Homécourt. Has gravity-controlled electromagnetic means operated automatically when gun has correct elevation.

1,096,676. Telephone Receiver. S. G. Brown, London, England. Diaphragm is supported at the center of a reed.

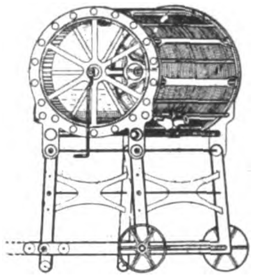
1,096,677. Telephone Transmitter. S. G. Brown. Diaphragm thickness decreases towards its periphery.

1,096,680. Electric Clock. E. E. Clement, Washington, D. C. Electric striking means for clocks controlled by a commutator in synchronism with clock movement.

1,096,681. Time-Control Element for Electric Clocks. E. E. Clement. Comprises a pendulum, oppositely disposed contacts and interlocking relays connected to opposite contacts.

1,096,682. Electrically Illuminated Clock. E. E. Clement.. Has radial segments in which lamps are placed to denote position of hands.

1,096,691. Apparatus for Taking Photographs with Röntgen Rays. F. Dessauer, Aschaffenburg, Germany. X-ray tube is in secondary of a transformer supplied with direct-current, the primary being suddenly broken upon blowing a main fuse.



1,096,618.—Wire Fishing Reel.

1,096,692. Apparatus for Making Instantaneous X-Ray Photographs. F. Dessauer. A modification of 1,092,691, employing an electrolytic interrupter.

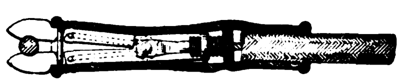
1,096,699. Connecting Clip for Electrical Conductors. J. G. Elkin, New York, N. Y Has spring-pressed jaws for engaging binding post. (See cut.)

1,096,716. Starting Device for Explosive-Engines. T. Herbig, Hornbrook, Cal. Includes means for giving electric ignition on starting engine by injecting gas in cylinder by pump.

1,096,717. Oscillator for Wireless Transmission. C. D. Herrold, San Jose, Cal. Sparking electrodes are of tubular shape and immersed in insulating fluid.

1,096,726. Pocket Lantern. W. Knopf, Berlin, Germany. A pocket lantern of revolver shape, the lamp being operated by the trigger.

1,096,729. Automatic Block System. H. G. Kurtzhals, Somerset, Pa. A track-operated electric-semaphore signal device.



1,096,699.—Connector Clip.

1,096,741. Trolley Switch. J. G. Munson, Cedar Rapids, Iowa, assignor of one-third to J. D. Wardle and one-third to E. F. Winslow. Auxiliary trolley wire is grooved to shape of main wire.

1,096,743. Pneumatic Renovating Machine. A. T. Noé, assignor to Electric Renovator Mfg. Co., Pittsburgh, Pa. Has electric-motor drive.

1,096,747. Telegraph Receiver. A. Parodi, New York, N. Y. Electromagnets carry pen engaging with tape.

1,096,751. Negative Electrode for Alkaline Secondary Batteries. H. P. R. L. Pörscke and J. A. E. Achenbach, Hamburg, Germany. Process of forming electrodes consisting of depositing a metal-ammonium compound, the escaping gas giving the metal a porous nature.

1,096,754. Electric Regulator. F. E. Ricketts, Baltimore, Md. A vibrating field-regulating system.

1,096,755. Automatic Electric Regulator. F. E. Ricketts, Baltimore, Md. A modification of 1,096,755.

1,096,765. Method of Collecting Particles Present in an Ionized Medium. W. W. Strong, Mechanicsburg, Pa. Includes a magnetic depositing device.

1,096,766. Railway Safety Appliance. M. Thomas, Rifle, Colo., A. Thomas, guardian, assignor of one-third to M. S. Thomas and one-third to F. M. Gillum. A stationary track-operated lamp for illuminating railway curves.

1,096,778. Electric Clock. E. E. Clement, Washington, D. C. Covers the wiring and arrangement of an electric sign representing a clock.

1,096,779. Electric Clock. E. E. Clement. A clock-operated controlling system for 1,096,778.

1,096,794. Automatic Stop Mechanism for Phonographs. A. Nielsen, New York, N. Y. An automatically operated electromagnetic brake.

1,096,800. Rheostat for Toy Electric Railways. F. Dangel, assignor to Nürnberger Metall & Lackierwarenfabrik vorm, Gebrüder Bing A. G., Nuremberg, Germany. Rheostat forms part of railway tie.

Patents Expired.

The following United States electrical patents expired May 18, 1914.

582,615. Electric Lock. H. Bezer, New Rochelle, N. Y.

682,640. Machine for Forming Armature Coils. G. A. Grisell, Madison, Wis.

682,649. Electric Advertising and Display Apparatus. J. L. Killmer, New York, N. Y.

582,663. Electric Controller. W. H. Morgan, Alliance, O.

582,664 and 582,665. Electric-Arc Lamp. J. A. Mosher, Chicago, Ill.

582,694. Electric Searchlight. S. W. Rushmore, Brooklyn, N. Y.

582,698. Electric Rail Bond. G. H. Scott, Worcester, Mass.

582,713. Toll Apparatus for Meters. F. M. Archer, New York, N. Y.

582,714. Telephone Toll Apparatus. F. M. Archer.

582,721. Electrode. J. A. Deuther, Boston, Mass.

582,722. Method of and Apparatus for Preventing Formation of Arcs when Opening Circuits. T. Von Zweigbergk, Cleveland, O.

582,773. Telephony. J. Absterdam, New York, N. Y.

582,840. Electric Switch. E. H. Wright, Chicago, Ill.

582,862. Circuit-Breaker for Trolley Wires. C. Hoff, Cincinnati, O.

582,882. Trolley for Electric Railways. S. H. Short, Cleveland, O.

582,883. Brush-Holder. S. H. Short.

582,884. Brush-Holder for Dynamos or Motors. S. H. Short.

582,889. Automatic Electric Gate. J. M. Williams and T. P. Kinney, Danville, and H. W. Kinney, Lynchburg, Va.

582,910. Electrical Conduit. J. J. Groshans, Buffalo, N. Y.

582,913. Telephoning from Cars. M. Garl, Akron, O.

582,918. Electropneumatic Organ Action. H. E. Hobbs, Weston, Mass.

582,936. Electrode. W. Majert, Falkenberg, Germany.

ELECTRICAL REVIEW

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THE PHILADELPHIA CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The thirty-seventh convention of the National Electric Light Association will be held at Philadelphia, Pa., June 1 to 5. Rich in history, the seat of the most important of early electrical developments and the home of the most advanced ideas at the present time relating to central-station design, the generating of electrical energy and the supplying of electrical service, Philadelphia is indeed the chosen city for the convention of the National Electric Light Association.

The General Convention Committee, under the direction of Mr. W. C. L. Eglin, has prepared an outline of the work to be done at Philadelphia that indicates a most important and profitable occasion. The Committee on Meetings and Papers, under the direction of Mr. W. F. Wells, has provided a series of formal sessions which appear to be of the most singular interest and value.

In response to the demand for more time for discussion there has been imposed a radical limitation in the number of papers that will be presented, supplementary to the committee reports. While the fixed papers, therefore, may be substantially decreased in volume, there is no falling off in the classical character of the offering to be expected. If the hope of the committees is realized, the discussion this year will mark a new development in interest.

Indicating the continuing tendency to devote more attention to the commercial side of central-station work, we note important contributions by Mr. R. C. Lanphier dealing with a new demand indicator for small consumers, and an address by Dr. C. P. Steinmetz relating to the electric vehicle. The Commercial Section comes in for several important sessions and the growing importance of the Accounting Department is indicated by the character of the papers and the time allotted to their discussion.

THE LARGEST TURBOGENERATOR IN THE WORLD.

It is a notable coincidence that the convention of the National Electric Light Association is being held this year in the city which will soon see in operation the largest turbogenerator unit in the world. The Philadelphia Electric Company has a unit with a capacity of 35,000 kilowatts now under construction and will house it in the new generating station at Twenty-eighth and Christian Streets, described in this issue. The size of generating units has been steadily creeping up and this unit marks the maximum which has yet been attempted. Whether we shall witness in the near future still further increases in the size of such turbo units may be regarded as doubtful, as there is a limit to the increase in efficiency obtained by increasing size and to the investment which it is wise to tie up in a single unit. The initial cost per kilowatt, of course, may be steadily diminished by increasing size, but when consideration is given to the provision of a spare unit and other important elements connected with the choice of capacity of the generating unit, it is likely that an economic maximum will be reached, at least for present needs, at a capacity not differing much from this giant.

The Philadelphia Electric Company has found it advisable to install a second unit whose size very nearly approaches that of the record-breaker, and the new station will therefore offer a combination of large units not to be found elsewhere. It would add an interesting feature to this year's convention if the new units were already installed and could be seen in operation, but it will probably be some months before this is possible. Nevertheless, the convention city must be recognized as a leader in electrical development and the arrangements which have been made for the annual convention indicate that it will go down into history as one of the most successful which has yet been held by the National Electric Light Association.

GARAGE FACILITIES IN PHILADELPHIA.

The article on page 1072 of this issue, prepared by the chairman of the Philadelphia Section of the Electric Vehicle Association of America, describes conditions in Philadelphia with respect to garage service for electric vehicles. This subject has received considerable attention in the Quaker City and the Philadelphia Electric Company, like all other progressive central stations, is doing its part in encouraging the use of electric vehicles for both commercial and passenger purposes. It should be noted that a favorable rate is supplied by the central station for customers who agree to keep off the line during the hours of peak load. In making a contract with the garage, the central station stipulates that the consumer shall not charge his customers more than the six-cent rate, but a commission is allowed the garage for its part in supplying the ultimate consumer with current.

There are now in Philadelphia 20 public electric garages, and prominent among these is one illustrated in the present article, and operated by Mr. J. C. Bartlett, who has done much to develop the use of the electric vehicle in that city. While this garage at present caters also to gasoline vehicles, it is intended that it shall be all-electric as soon as the available business will warrant it.

It is to be noted that in Philadelphia the method of payment for garage facilities involves billing the electric energy and the storage account separately. The reason why this method is likely to work out to greater satisfaction on all sides than where a lump monthly sum is involved is explained in the article.

The policy of the Philadelphia Electric Company in keeping complete records of its own electric vehicles, of which it has a large fleet, sets a good example to other central-station companies. Such records enable accurate data to be compiled regarding the cost of operation of electric wagons and the service which they are adapted to render. Such records form convenient material for convincing the prospective user of vehicles that his investment along this line is a wise one. Backed by such figures the central-station representative can effectively co-operate with the vehicle salesman in promoting the wider introduction of electric vehicles.

THE ELECTRIC VEHICLE IN PARCEL-POST SERVICE.

For some time there has been very evident a growing appreciation of the utility of the electric vehicle for commercial service. In many ways determined effort has been made to bring about a cordial system of co-operation between central-station managers and the manufacturers of electric vehicles so that each might appreciate the problems encountered in the other's business developments.

While there has been a recognition of the general relation of one element to the other, and the interdependence of each with the other, there has been too much delay in an actual coalescing of these two interests.

It is, therefore, a matter for congratulation that the meeting held under the auspices of the Electric Vehicle Association of America in New York last week, brought out such a spontaneous expression of good will from both electrical manufacturers and central-station interests. Under the aggressive leadership of Mr. James H. McGraw, chairman of the Parcel Post Committee of the Electric Vehicle Association, in joint effort with the Electric Vehicle Committee of the National Electric Light Association, under the chairmanship of Mr. Frank W. Frueauff, a large attendance was gathered at this meeting and a spirited discussion followed the presentation of the paper of the evening, which dealt with the advantages of the electric vehicle as an adjunct to the parcel-post service of the United States Post Office.

No one taking intelligent cognizance of the startling array of facts presented, an epitomization of which appears on other pages of this issue, can remain in doubt as to the value of hearty support and co-operation upon the part of central-station interests in building up the electric-vehicle load. While the manufacturers of electric vehicles will gain greatly, the steady demand upon the power mains of the central station will more than compensate for an extraordinary effort to secure this business.

It is, therefore, to be desired that central-station managers all over the country, wherever the operation of electric vehicles is feasible, pay strict attention to the work of these two important committees and lend their earnest support to the work of these organizations to the end that one of the most useful and logical developments of the electrical industry may be utilized to the fullest degree.

ELECTRICITY IN MARINE WORK.

While the application of electricity in marine work has been steadily progressing, it does not seem to have met with as rapid advances as would be warranted by the conditions. In some respects this field presents features which are admirably adapted to the application of electricity. In recent years electric propulsion has been tried successfully and large developments may be expected along this line. When they come we may expect the complete electrification of ships and even when electric propulsion is not attempted there are many advantages to be derived through other electric applications.

Since the introduction of steam for driving sea-going vessels, applications of the same power have been made to all sorts of purposes, such as operating windlasses, hoists, steering gear and the many other appliances requiring power on board such vessels. For many of these, steam is not nearly so well suited as electric power. The piping from the boiler room to distant parts of the vessel involves greater space, weight and danger of accidents than does the running of electrical conductors. The application of the power is usually inefficient and the control not so refined as may be obtained by electric means. Every modern ship has an electrical installation for supplying current forlighting and the extension of this portion of the equipment sufficiently to supply current for all power and heating purposes, though involving greater space and weight for the generators, would probably result in an economy in these items when considered as a total.

The meeting of the American Institute of Electrical Engineers last week was concerned with two particular applications of electric current aboard ship, with special regard to naval vessels. These constitute an admirable field for testing out the possibilities of electric application, since in every regard service is placed before initial expense. Electric cooking as tried out upon the *Texas* has proved very satisfactory, although the consumption of 1.25 kilowatt-hours per person per meal does not indicate high economy in the use of current. The present habits of the nation of requiring food cooked at high temperatures is partly responsible for this, and when the realization has become more general that food cooked at comparatively low temperatures is more palatable and more nutritious, one difficulty met with in electric cooking will largely disappear. To meet present requirements, however, it seems necessary to supply high temperatures and large blocks of energy even in the electric stove, and this condition it must be admitted is not one that can be economically supplied by this means.

The use of electric motors for steering gear has been experimented with for some years and successful installations of this kind have been in operation for over a decade. The system which has been installed upon the *Texas* and the *New York* is of a different type and the only question now seems to be as to which system will operate with the greatest certainty and least cost. That two or more systems are operative seems to have been demonstrated, and the future growth of the application of electric drive for steering gear seems to be assured.

THE CONVENTION OF THE SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION.

The wisdom of the policy adopted by the Southwestern Electrical and Gas Association in maintaining a permanent secretary was shown in the results which have been achieved during the past year as well as by the success of the annual convention held last week. The indefatigable secretary, Mr. H. S. Cooper, has not only been of material assistance to the members of the Association from his office in Dallas, but he has been able to give attention to those details which count for so much in the work of a utility association.

A departure from previous policy was inaugurated in planning for this year's convention. Mr. Cooper proposed to devote convention time as far as possible to discussions between the members of points which come up in the every-day operation of utilities and are of vital importance to utility men. This idea was kept in view in arranging the program and topics were selected as far as possible which were of general interest and papers scheduled which would form an opening wedge for profitable discussion. While, no doubt, experience along this line will lead to more perfect attainment of the results desired, the convention was pronounced evidence of the success of this idea. Discussion was freely indulged in and interest was not lacking at the several sessions. The attendance figures show the general interest which was engendered by the program and the discussions themselves proved that this interest did not flag.

We have before urged in these columns the desirability of carrying out the ideas which Secretary Cooper has put into practice and we would recommend to other convention committees the consideration of this element when arranging convention programs, in order that the gereatest benefit to the visiting members and the greatest interest at the convention sessions shall be achieved. An annual convention is not the place for papers which are either too complete or too devoid of interest to provoke discussion. Regular channels of publication provide a suitable outlet for papers of this type and those of a statistical or highly technical value. A convention should be a medium for the discussion of the common problems of the Association members and for that personal contact which broadens the viewpoint and gives wider scope to the ideas and the initiative of its members. The Southwestern Association has set a good example in this year's convention.

Tablet Erected to Memory of W. A. Anthony.

Members of the 1910 class in general science, of Cooper Union, New York City, have erected a bronze tablet in the corridor of the main building to the memory of the late William A. Anthony, former professor of physics at that institution and one time president of the American Institute of Electrical Engineers. The formal presentation ceremonies took place on the evening of May 29. The tablet is a bas-relief of Professor Anthony, worked out by George T. Brewster, in charge of one of the departments of the art school at Cooper Union.

Professor Anthony was prominent throughout the country, both as an electrical engineer and an educator. Besides his work at Cooper Union, he was at one time identified with the scientific school of Cornell University. It was through his efforts that the engineering course at Cooper Union was established on its present basis. He was also in a measure responsible for the erection of the Hewitt Memorial Building, which was recently constructed to house the scientific departments of Cooper Union.

Additional Train to Electric Light Convention.

The Transportation Committee of the National Electric Light Association has announced that another special train has been arranged for from Pittsburgh, leaving Pittsburgh in the morning of Sunday, May 31, and making a daylight run to Philadelphia. This train will be an accommodation for passengers from St. Louis, Cincinnati, Columbus and other points who will arrive in Pittsburgh in the early morning of Sunday, May 31; and these together with the large Pittsburgh contingent, will make up the special train. This train will be known as the Pink Special and will be under the personal direction of J. C. McQuiston, of East Pittsburgh, Pa.

Telephone Society Elects Officers.

At the meeting of the Telephone Society of New York, on the evening of May 26, officers were elected for the ensuing year as follows:

President, F. B. Jewett, of the Western Electric Company.

Vice-president, H. C. Carpenter, of the New York Telephone Company.

Secretary-treasurer, R. S. Scarburgh, of the New York Telephone Company.

Executive Committee; P. O. Coffin, R. Gordon, L. R. Jenney, L. F. Morehouse, I. J. Thorp and G. L. Yates.

The subject for discussion at the meeting was "The Operation of the Greatest Long-Distance Telephone Central Office in the World."

Program of Convention of Michigan Section.

As has been already announced, the Michigan Section of the National Electric Light Association will hold its 1914 convention on board the steamer *City of Cleveland III*, which will leave the foot of Third Street, Detroit, at 5 p. m., on June 17. The cruise will include Buffalo, Niagara Falls, Thousand Islands and Toronto, and return will be made by rail, arriving at Detroit at 2:30 p. m., on June 20.

Sessions for the reading of papers will be held on board of the above steamer and also on the steamer *Rochester*, which will be used for the eastern portion of the trip.

At the first session, to be held on the evening of June 17, the presidential address will be resented by H. C. Sterling. There will also be addresses by James V. Oxtoby and William J. Norton. A paper entitled "Reserve-Fund Accounting" will be presented by H. A. Fee, and one on "Regulation of Public Utilities and Returns Allowed Thereunder" by Halford Erickson, of the Wisconsin Railroad Commission.

At the session on the evening of June 18, the following papers will be presented: "Deep-Well Pumping," by A. A. Hall, of the Eastern Michigan Edison Company; "Water Power in Michigan," by G. W. Bissell, of the Michigan Agricultural College; "Description of Automatic Substation," by James Bishop, of the Detroit Edison Company; "Overhead Substations," by A. Meyer, Detroit Edison Company.

The final session will be held on the evening of June 19 and the following papers will be presented: "Safety Devices in the Electrical Industry," by Charles B. Scott, of the Middle West Utilities Company; "The Gas-Filled Lamp," by J. R. Colville, of the National Lamp Works; "Interior Illumination," by M. Luckiesh, of the National Lamp Works.

Following the last session there will be a rejuvenation of Jovians. The portion of the trip from Buffalo to Youngstown will be by way of electric cars through the Niagara Gorge. The returning train will leave Toronto at 8:30 a. m., on June 20. Tickets for the complete trip, including all traveling expenses except a portion of the meals, may be had from Herbert Silvester, 18 Washington Boulevard, Detroit, Mich., who is secretary, for $30.

Canadian Electrical Association Convention.

The annual convention of the Canadian Electrical Association will be held on June 24, 25 and 26 at Montreal. Headquarters will be in the club rooms of the Canadian Society of Civil Engineers, on Mansfield Street.

Program of Institute Convention.

The thirty-first annual convention of the American Institute of Electrical Engineers, at Detroit, Mich., will be held on June 22-26. The following program has been announced:

Tuesday, June 23, 10:00 a. m.—President's addess, by C. O. Mailloux; paper, "Electric Heating as Applied to Marine Work," by C. S. McDowell and D. M. Mahood; and paper, "The Electrically Driven Gyroscope in Marine Work," by H. C. Ford. Evening session, 8:15 p. m.—Paper, "Direct-Current Motors for Coal and Ore Bridges," by R. H. McLain; paper, "Method of Keeping Down Peaks on Power Purchased on the Peak Basis," by T. E. Tynes; paper, "Concatenated Induction Motors for Rolling-Mill Drive," by William Oschmann; motion pictures of tube-mill operations.

Wednesday, June 24, 10:00 a. m.—Paper, "The Sphere Gap as a Means of Measuring High Voltage," by F. W. Peek, Jr.; paper, "The Electric Strength of Air," by J. B. Whitehead and W. S. Gorton; paper "Sphere-Gap Discharge Voltages at High Frequencies," by J. C. Clark and H. J. Ryan.

Thursday, June 25, 10:00 a. m.—Paper, "Data on High-Tension Transmission Systems," by P. H. Thomas; committee report, "Specification for High-Tension Insulators." Afternoon session, 2:30 p. m.—Paper, "Prime Movers," by H. G. Stott, W. S. Gorsuch, and R. J. S. Pigott; paper, "Voltage Testing of Cables," by W. I. Middleton and Chester L. Dawes. Evening session, 8:15 p. m.—Presentation of Edison Medal and Past-Presidents' Badges; introduction of President-Elect P. M. Lincoln.

Friday, June 26, 10:00 a. m.—Paper, "Sterilization of Water by Ultra-Violet Rays," by M. von Recklinghausen; paper, "Toll Telephone Traffic," by Frank F. Fowle; paper "A High-Speed Printing Telegraph System," by Carl Kinsley.

Section delegates' luncheons will be held on all days except Monday, June 22, from 12:30 to 2:30 p. m. A meeting of the board of directors will be held at 9 a. m., on Friday, June 26, and a conference of section delegates and officers at 2:30 p. m., on the same day.

Among the entertainment features will be a reception and dance on Monday, June 22, at 9 p. m. An automobile trip is scheduled for Tuesday at 2:30 p. m., and a ladies' card party at 8:30 p. m. At 2:30 p. m., on Wednesday, June 24, the convention will leave by boat for Bois Blanc Island where sports will be engaged in and supper served, the members and guests returning in the evening. A ladies' putting contest will be held on Thursday afternoon and at 9:30 p. m., the entertainment features include dancing and a private cabaret.

Walter Howard Johnson.

Walter H. Johnson has been, throughout his business career, identified with important phases of the commercial and industrial life of his native city of Philadelphia. For the past quarter century he has been connected, and during a great part of that time in an official capacity, with the corporations engaged in developing the city's public utilities. He is now first vice-president of the Philadelphia Electric Company which, affording an unusually efficient light and power service to Philadelphia and its widely extended suburban communities, is recognized as one of the foremost organization of the day in an industry that has become essential to the country's material advancement.

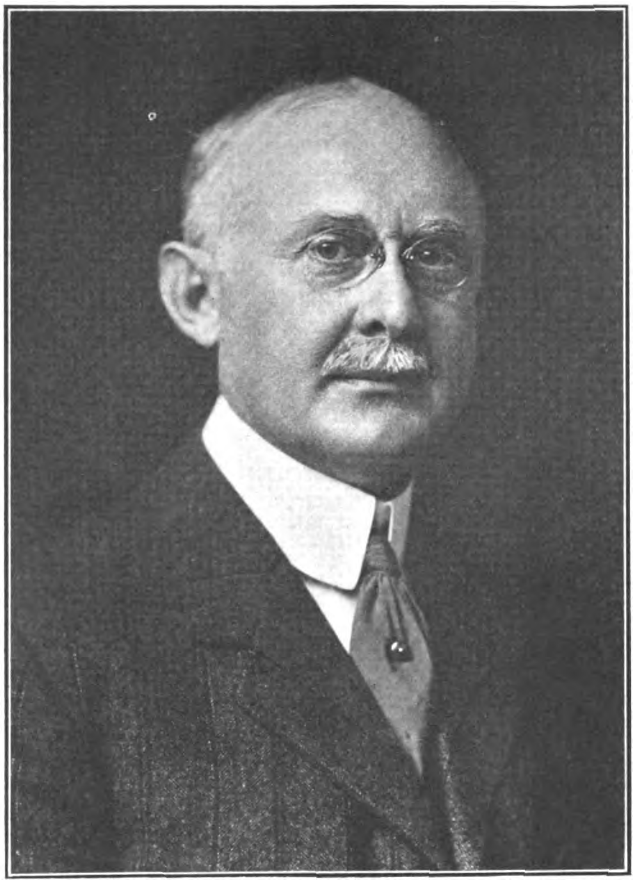
Walter Howard Johnson was born August 27, 1863, at Philadelphia. His father was Jesse and his mother Charlotte Grace C. (Duncan) Johnson. His paternal ancestors were early colonial settlers in Connecticut. In later generations the family removed to New Jersey, in which state it has long been established. Mr. Johnson's great-grandfather was a soldier in the Revolutionary War and served in the patriot forces through the entire struggle for National independence. On the maternal side his ancestors were of Scotch origin; the family having settled in the state of Virginia two generations back.

The subject of the present sketch obtained his education in the public schools of Philadelphia, from which he was graduated in 1878.

His early business experience was gained in the employ of the department store of King, Seyfert & Clothier and the succeeding firm, Strawbridge & Clothier. He next entered the service of the Philadelphia, Wilmington & Baltimore Railroad, and later went with the Pennsylvania Railroad Company.

On November 7, 1887, he accepted a position with the Edison Electric Light Company, of Philadelphia, and has since been continuously active in the affairs of the public utilities enterprises serving Philadelphia and surrounding territory. He was chosen secretary of the last-mentioned corporation which was subsequently acquired by the Pennsylvania Heat, Light & Power Company. This company in 1898 came under control of the Pennsylvania Manufacturing, Light & Power Company, which was taken over by The Philadelphia Electric Company when the latter was incorporated, October 6, 1889. Of this organization Mr. Johnson is a director and first vice-president.

Mr. Johnson is a member of the Pennsylvania Society of the Sons of the Revolution, a life member of the Navy League of the United States, and a member of the Franklin Institute of Pennsylvania. He is prominent in Masonic circles, being a member of University Lodge No. 610, F. & A. M., University Royal Arch Chapter No. 256, and of the Philadelphia Consistory. His clubs include the Union League, Racquet, Merion Cricket, Philadelphia Country Club and the Pen and Pencil Clubs.



Walter H. Johnson,
First Vice-President of the Philadelphia Electric Company.

Course in Power-Plant Operation.

A practical course in power-plant operations designed especially for power-plant operators desiring more theoretical knowledge, will be established at the Agricultural and Mechanical College of Texas beginning with the fall term of 1910-15. It will be a two-year course, with low entrance requirements, students being required to have a grammar-school education for admittance to the course. Upon completion of the course, the graduate will be fitted to assume the superindency of a power plant. Class and laboratory work in power-plant operation will form the principal part of the course, but instruction will also be given in mathematics, English and other academic studies. Instruction in the care and operation of engines and boilers, the handling of equipment for power plants, work in refrigeration, pumping machinery, and shop practice will also be given. E. J. Fermier, head of the mechanical engineering department, will be in charge.

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Rejuvenation in Cincinnati.

Cincinnati Jovians had one of the most successful and enjoyable rejuvenations in the history of local Jovianism on Monday evening, May 18, when 53 candidates were initiated in the presence of about an equal number of old members. The affair was held at the Sinton Hotel, Stateman J. W. Schrantz, of the Westinghouse Electric & Manufacturing Company, presiding as toastmaster at the banquet which preceded the initiation, and directing the subsequent ceremonies in his official capacity. There was no formal program of addresses, but a number of short talks were made, the speakers including W. W. Freeman, vice-president of the Union Gas & Electric Company; J. A. Brett, Cincinnati sales manager of the Westinghouse Electric & Manufacturing Company; T. J. Ryan, of the General Electric Company, and others. A. H. Heyl, medical officer of the Cincinnati & Suburban Bell Telephone Company, spoke on behalf of the candidates. The degree team of the local branch, which has not been long organized, acquitted itself very creditably in the initiation ceremonies which followed the banquet, its members being as follows: Jupiter, George Baily; Neptune, John Winkle; Mars, M. E. Trimble; Hercules, H. G. Hopkins; Pluto, J. W. Schrantz; Apollo, Lane Schofield; Mercury, G. W. Archiable; Vulcan, C. A. Bissonette; Avrenim, H. C. DeCamp; Imps, C. J. Smith, C. E. Dimmitt, C. S. McGill and R. J. Oliver.

While the membership of the Cincinnati organization is now well over 200, it is intended to keep up vigorous work in the wide field which the city offers, and it is expected before the summer is over to increase the membership largely. The weekly luncheons, held every Monday at the Gibson Hotel, have been a strong feature in keeping up the interest, regular addresses by prominent men helping to make them attractive. Plans are under way for a picnic to be held some time in the latter part of June.

National Electric Light Association.

Thirty-seventh Convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. The Program, Entertainment and Exhibits and Exhibitors.

The 37th convention of the National Electric Light Association will be held at Philadelphia, Pa., June 1, 2, 3, 4 and 5, 1914. In 1887, attended by about 500 persons, the convention was held at Philadelphia, 24 years ago. It is estimated that at least 5,000 persons will attend the coming convention in that city.

Place of Meeting.

The headquarters of the Association will be at the Bellevue-Stratford Hotel. All the regular sessions will be held in three commodious meeting rooms on the ballroom floor, one flight up, where more than 2,000 members can participate conveniently in the exercises at one time, and can, within a minute, go from one session to another. The Exhibition Committee, on behalf of the Class D members, has made arrangements for the occupancy of the entire Roof Garden of the hotel. The Garden has a wide view over the whole city, and has also a separate restaurant of its own. Thus the entire convention will be housed in one building, while the facilities are such as to minimize any crowding or difficulty in circulation. The offices of the Secretary, the Hotel, Transportation and Local Registration and Information Committees, the Main Registration Bureau, and the Bureau for distribution and deposit of convention reports and papers will all be on the ballroom floor, within immediate access of every meeting hall. Telephone bulletins will keep each room and the offices advised as to the progress of business in the various sessions.

Work of the Convention.

The work of the convention will begin on Tuesday morning, June 2, and will close on Friday morning, June 5. A very full program has already been arranged for the General, Executive, Technical, Commercial, Accounting and Hydroelectric Sections and sessions, but it is proposed to limit mere reading of papers and reports as much as possible, and to develop discussion. There will be several parallel sessions during Tuesday, Wednesday and Thursday, culminating in a most important General and Executive meeting on Friday morning. The program has been tentatively announced as follows:

Tuesday, 10:00 a. m.
First General Session.

1. Welcome to the City.
2. Address of President McCall.
3. Announcements.
4. Report of Committee on Organization of the Industry, H. H. Scott.
5. Report of Secretary, T. C. Martin.
6. Report of Insurance Expert, W. H. Blood, Jr.
7. Report of Committee on Progress, T. C. Martin.
8. Report on Question Box, S. A. Sewall.
9. Paper, "Safety First," Paul Lupke.

Tuesday, 2:30 p. m.
First Technical Session.

1. Report of Committee on Meters, P. H. Bartlett.
2. Report of Committee on Grounding Secondaries, W. H. Blood, Jr.
3. Report of Committee on Electric Measurement, A. E. Kennelly.
4. Address, "The Electric Vehicle," C. P. Steinmetz.

Tuesday, 2:30 p. m.
First Accounting Session.

1. Address of the Chairman of the Section, H. M. Edwards.
2. Report of Library Committee, C. L. Campbell.
3. Report of Question Box Committee, E. C. Scobell.
4. Paper, "Cost and Statistics," Thos. J. Walsh.

Tuesday, 2:30 p. m.
First Commercial Section Session.

1. Address of the Chairman of Section, T. I. Jones.
2. Report of Finance Committee, E. L. Callahan.
3. Report of Membership Committee, J. F. Becker.
4. Report of Publications Committee, Douglas Burnett.
5. Report of Committee on Education, F. C. Henderschott.

Wednesday, 10 a. m.
Second Technical Session.

1. Report of Committee on Electrical Apparatus, L. L. Elden.
2. Paper, "Temperature and Its Relation to the Limiting Capacity of Electrical Apparatus," F. D. Newbury.
3. Report of Committee on Underground Construction, P. Torchio.
4. Report of Committee on Overhead Line Construction, Thomas Sproule.

Wednesday, 10 a. m.
Second Accounting Session.

1. Report of Committee on Uniform System of Accounts, J. L. Bailey.
2. Address, "Appraisals," D. C. Jackson.
3. Paper, "Variation in Public Service Systems of Accounting," by E. C. Scobell.

Wednesday, 10 a. m.
Second Commercial Section Session.

1. Report of Committee on Rate Research, E. W. Lloyd.
2. Address.
3. Report of Lamp Committee, F. W. Smith.

Wednesday, 8 p. m.
Second General Session and Executive Session.

1. Action on Report of Public Policy Committee, Arthur Williams.
2. Presentation of Proposed Constitutional Amendments, F. W. Frueauff.
3. Report of Treasurer, W. F. Wells.
4. Election of Nominating Committee.
5. Appointment of Committee on Resolutions.
6. Music.

Wednesday, 8:45 p. m.
Public Policy Session.

1. Reading of Report of Public Policy Committee.
2. Address.
3. Music.

Thursday, 10:00 a. m.
First Hydroelectric Session.

1. Chairman's Address, W. W. Freeman.
2. Report of Committee on Hydro-Progress, T. C. Martin.
3. "The Nature of Electrical Disturbances in Transmission Work," D. B. Rushmore.
4. Report of Committee on Distributing Lines, P. M. Downing.
5. "Permanent Methods of Measuring Water in Water-Power Plants," D. W. Mead.
6. Paper, "Water-Power-Plant Economics," O. B. Coldwell.

Thursday, 10:00 a. m.
Third Accounting Session.

1. Paper, "Accounting for Merchandise Sold," H. B. Lohmeyer.
2. Paper, "Suspense Accounts," Fred Schmitt.
3. Paper, "Mechanical Auditing and Tabulating Systems," (a), "In Connection with Disbursement Accounts," F. A. Birch; (b), "As Applied to Inventory of Transmission and Distribution Systems," G. L. Knight and C. V. Woolsey.
4. "Accounting for Coal Consumed," A. L. Holme.

Thursday, 10:00 a. m.
Third Commercial Section Session.

1. Report of Committee on Non-Peak and High-Load-Factor Business, G. H. Jones.
2. Report of Committee on Interurban Highways Lighting, G. B. Tripp.

Thursday, 2:30 p. m.

Third Technical and Hydroelectric Sessions.

1. Report of Committee on Prime Movers: (a), "Steam," I. E. Moultrop; (b), "Hydraulic," J. E. Vaughan.
2. "Selection of Hydraulic Turbines," Charles V. Seastone.
3. Report of Committee on Street Lighting, J. W. Lieb, Jr.
4. Report of Committee on Accident Prevention, M. J. Insull.

Thursday, 2:30 p. m.

Fourth Commercial Section Session.

1. Report of Committee on Wiring of Existing Buildings, R. S. Hale.
2. Report of Committee on Electric Merchandising and Advertising, Parker H. Kemble.
3. Report of Nominating Committee.
4. Election of Officers.

Friday, 10 a. m.

Third General Session.

1. Report of Committee on Award of Doherty Medal.
2. Symposium, "Relations with Geographical Branches of the N. E. L. A."
3. Address, "Plans for Electrical Development," J. M. Wakeman.
4. Report of Committee on Memorials, T. C. Martin.
5. Report of Committee on Constitutional Amendments, F. W. Frueauff.
6. Vote on Constitutional Amendments.
7. Report of Committee on Resolutions.
8. Report of Nominating Committee.

Entertainment.

The convention will open on Monday night, June 1, with the annual reception to the President in the grand ballroom. With this and the Public Policy meeting of Wednesday night, special features of interest will be associated. On Wednesday afternoon the annual baseball game will be played for the trophy cup, and there is already keen interest among the competing company section teams. At the time of the convention a great Rejuvenation will be held by the Jovian Order, whose membership is very large in the ranks of the National Electric Light Association. Other general entertainment for ladies is being arranged for the week by the Special Entertainment Committee. Opportunities will also be provided for visiting the numerous historic spots in Philadelphia.

Joseph B. McCall,
President of the National Electric Light Association.

The Exhibit.

Occupying the entire Roof Gardens, in a setting unique and of rarely beautiful character, the Exhibit Committee on behalf of Class D members, has prepared an unusually comprehensive and attractive display of electrical apparatus. This committee is composed as follows: James I. Ayer, chairman, Simplex Electric Heating Company, Cambridge, Mass.; H. G. McConnaughy, secretary-treasurer, Dearborn Chemical Company, New York; Charles Blizard, Electric Storage Battery Company, Philadelphia; W. C. L. Eglin, Philadelphia Electric Company; J. F. Gilchrist, Commonwealth Edison Company, Chicago; John Mustard, Wagner Electric Manufacturing Company, Philadelphia; S. E. Doane, National Lamp Works of General Electric Company, Cleveland; F. H. Gale, General Electric Company, Schenectady; J. C. McQuiston, Westinghouse Companies, East Pittsburgh; J. W. Perry, H. W. Johns-Manville Company, New York.

The following companies have announced their arrangements for exhibits and representation:

American District Steam Company.

Space 39.

Reception headquarters, displaying small models of various devices, together with catalogues, bulletins, photographs and a large amount of data appertaining to the operation of combined electric light and power and exhaust-steam heating systems. Represented by W. H. Wells, President; Charles R. Bishop, Secretary and General Manager; Hal C. Kimbrough, Manager Chicago office; Walter J. Kline, J. A. Bendure.

Barnes & Kobert Manufacturing Company. Space 20.

Bracket hardware and high-tension pins; pole line hardware; guy clamps, wood strain insulators, guy anchors, cable racks, cable hooks. Represented by R. H. Harper, sales manager, and R. J. Brenton.

James G. Biddle.

Space 29.

As United Etates distributor for the electrical instrument department of Siemens & Halske, Mr. Biddle will make a prominent feature of the precision voltmeters, ammeters, wattmeters and transformers of this make. Also, there will be Frahm resonance frequency meters, Frahm vibration tachometers, Jagabi hand tachometers and tachoscopes, Megger testing sets and Bridge-Meggers, graphic recording instruments, laboratory rheostats, etc. The exhibit ought to be of much interest to the Meter Department engineers of public utility companies who must equip for checking watthour meters and other commercial instruments; and also to operating, as well as consulting engineers, who have occasion to make electrical tests. Mr. Biddle will be assisted during the convention by B. S. DeCou, H. H. Sticht and W. C. Longstreth.

Century Electric Company.

Space 35.

This exhibit includes several "Century" single-phase motors, among which will be a back-geared and a back-belted motor, especially arranged for the operation of type-setting machines. Samples of two new sizes of "Century" single-phase motors, viz., one-sixth and one-quarter horsepower. These are repulsion-induction motors of the same characteristics as the larger sizes of "Century" motors, which have been brought out to meet the central-station operators' demands for motors of those sizes which will develop a heavy starting torque without an abnormal starting current. In addition to the above there will be samples of alternating-current swivel and trunnion oscillating, desk and ceiling fans. Represented by I. S. Adelberg and R. J. Russell, of St. Louis; E. B. Day and George Pechin, of Philadelphia; H. B. Steele and James Larkin, of New York, and C. A. Cotton, of Boston.

American Ironing Machine Company.
Space 38.

Domestic and commercial laundering apparatus.

Bell Electric Motor Company.
Space 32.

Examples of special motor-driven applications and display of motor specialties.

Central Station.
Space 41.

Reception headquarters for distribution of copies of the *Central Station* and electrical books. Represented by H. C. Cushing.

George Cutter Company.
Space 51.

Display of modern electric lighting fixtures, showing the new types of fluted street hoods and the Cutter posts for ornamental street lighting.

Delta-Star Electric Company.
Space 43.

A line of high-tension equipment, which will be of especial interest to those central-station men engaged in the sale of power from high-tension lines. Possibly the most interesting part of the exhibit is the model steel-tower, outdoor, 33,000-volt substation. This station is exactly one-sixth size and is complete in every detail. The unique method of handling the transformers by means of jib cranes and transfer table, will appeal to those called upon to install outdoor substations. The ice-proof pole-top, 33,000-volt switches; type "MRC" 22,000-volt substation units; 110,000-volt S. & C. carbon-tetrachloride fuses; choke coil, horn gaps, etc., all representing the latest engineering practice in outdoor high-tension equipment. Among the devices for indoor service, the unit type bus bar supports, of which there are over 7,000 combinations; the combination disconnecting switches, choke coils and fuses deserve special attention, in view of the new features recently incorporated. One feature of the Delta-Star exhibit is the large number of framed pictures showing actual outdoor installations in commercial service. Oscillogram records of recent fuse tests on 66,000-volt S. & C. fuses, showing the possibility of outdoor high-tension distribution. Represented by H. W. Young, president.

Edison Lamp Works of General Electric Company.
Space 17.

A very complete line of standard and new high-efficiency Mazda lamps with demonstration of modern illumination practice.

Edison Storage Battery Company.
Space 34.

The exhibit of the Edison Storage Battery Company of Orange, N. J., will consist of a complete set of the Edison alkaline nickel-iron storage battery as used in all classes of service. One cell of each type will be shown with the steel container cut away exhibiting the method of assembling the plates and general mechanical construction. The cells run from the small M-8 type used in the Edison safety electric lamp with a capacity of 4.5 ampere-hours to the A-12 type, giving a normal ampere-hour output at 450. The exhibit will also contain a "Shadow Box" consisting of a frame with concealed electric lamps containing the various parts of the Edison cell and showing how each was manufactured and assembled. Albums of photographs showing the various installations of Edison batteries in trucks over four and five years old.

Among the many delegates from the Edison Storage Battery Company who will attend the convention will be R. A. Bachman, vice-president and general manager; William H. Bee, vice-president and general sales manager; E. J. Ross, Jr., manager of sales engineering department; John Kelly, manager New York office; C. B. Frayer, manager Chicago office, and W. C. Andrews, advertising manager.

Electrical Review and Western Electrician.
Space 45.

Reception headquarters for distribution of copies of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. Full line of electrical books. Represented by Charles W. Price, A. A. Gray, H. S. Tuthill, E. E. Wood, J. B. McCarthy and Howard Ehrlich.

Electrical World.
Spaces 1 and 3.

Reception headquarters and publication offices of the *Convention Daily*.

Electric Service Supplies Company.
Space 7.

There is a complete exhibit of Garton-Daniels ligtning arresters for both direct and alternating-current service; low-voltage and high-voltage choke coils and disconnecting switches; ground fittings. Among these exhibits are the new wood box hangers for low-voltage, pole-type lightning arresters. In connection with this, the new design of box in which pole-type arresters are housed is attracting much attention. On these boxes, the cover is hinged at the top and weighted at the bottom; the front of the box is so sloped that the box remains closed at all times. Whenever a violent discharge passes through the arrester the explosive action of the suddenly heated air causes the cover to swing outwardly, relieving the internal pressure and so resulting in preventing what might have been a blown up box. Another novel feature of this company's exhibit of Garton-Daniels lightning arresters is the operation of the devices in connection with a "flash" picture. The flash picture is a large painting of a typical electric railway scene—track, car, transmission and feeder systems, etc. Dark storm clouds are seen piling up in the heavens. Attached to the sides of this picture are the lightning arresters which are connected up to condensers giving high-frequency discharges through them, and to a source of dynamic current so to stimulate actual operating conditions. A line of Keystone truss pins, together with Locke insulators, Keystone triangle cross-arms, and a new type of angle-iron ground wire support and clamp, are also shown. Represented by J. V. E. Titus, H. G. Lewis, G. W. Cox, F. C. Peck, J. R. McFarlin, T. F. McKenna.

Electric Storage Battery Company.
Space 18.

Reception headquarters. Represented by Herbert Lloyd, president; John R. Williams, second vice-president; Charles Blizard, third vice-president; Bruce Ford, fourth vice-president; J. Lester Woodbridge, chief engineer; Carroll Hodge, manager of construction; Edward L. Reynolds, manager of Pennsylvania sales office; and Hugh Lesley, manager of operating department.

Federal Sign System (Electric).
Space 63.

Display of electric signs and household electric devices. Represented by J. H. Goehst, president; J. M. Gilchrist, secretary; H. I. Markham, general manager; S. I. Levy, manager Philadelphia office; W. W. Tower, manager New York office; C. B. Graves, sales manager, New York office.

G. & W. Electric Specialty Company.
Space 57.

Potheads, switching boxes, subway boxes, series switches, primary cutouts, extra high-potential fuses and kindred specialties. As a special feature, in addition to a very complete line of potheads, a full line of series switches, showing several new types and a line of subway cutout boxes, included in which is a subway cutout using the S. & C. extra high-potential fuse. Represented by George P. Edwards and J. M. Hundley.

General Electric Company.
Space 19.

Samples of latest types of ornamental luminous arc lamps, long-flame arc lamps for series and multiple service, ozonators, lightning arresters, heating devices, measuring instruments, motor-driven applications, transformers and other electrical specialties.

General Vehicle Company.
Space 36.

Reception headquarters, with distribution of literature descriptive of electric trucks and electric-truck service. Represented by F. Nelson Carle, assisted by Louis Ruprecht, Philadelphia district manager; C. W. Squires, sales manager, and others from the company's engineering department will be in attendance.

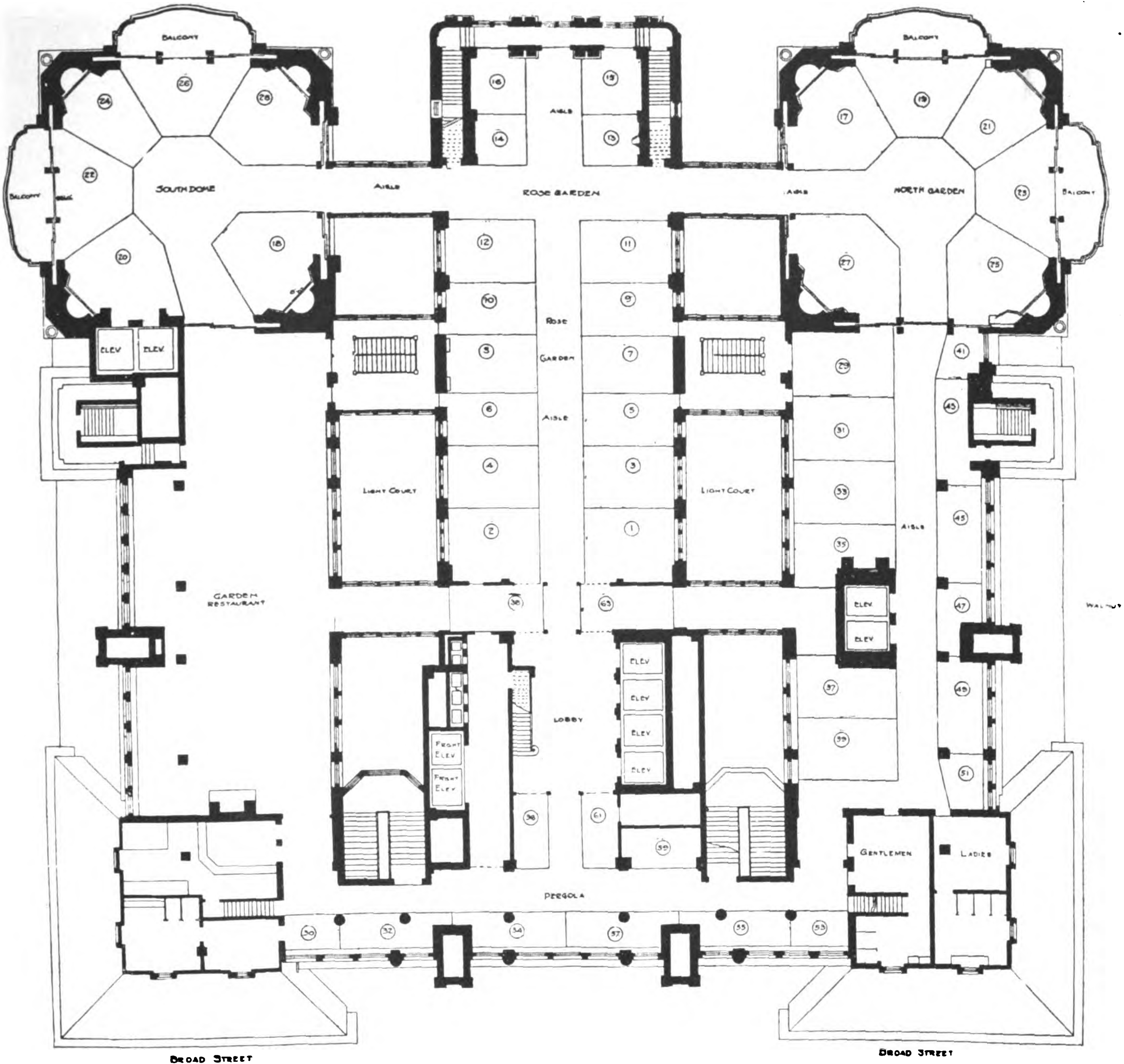
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Diagram of Exhibit Spaces, National Electric Light Association Convention.

Hubbard & Company.

Space 27.

A complete line of high-tension construction material, including "Bo-Arrow" arms, Peirce "Hi-Ten" fixtures, forged steel pins, etc., and also a complete line of Peirce brackets, secondary racks and other distributing fixtures. Also part of a complete line of standard pole-line hardware. Represented by C. P. Seyler and C. L. Peirce, Jr.

Hughes Electric Heating Company.

Space 5.

The company's new type ranges, some of which will be equipped with the new white-enamel finish, and also with the new type round heating unit. This new type heating unit removes the last objection made against electric ranges, viz., that the operation is slower than with gas stoves. The new type unit will boil water in approximately the same time as the ordinary gas burner. These units have been on test for some time, and J. F. Roche, manager of the Montana Power Company, Billings, Mont., which now has a connected stove load of approximately 3,000 kilowatts (800 ranges), in a letter says: "Your new round-type heating unit is a wonder and sounds the death knell of gas." There is also exhibited a new No. 9 oven for use on lamp socket, with thermostatic control. Represented by George A. Hughes, president, and C. E. Preble.

Hurley Machine Company.

Space 8.

Full line of motor-driven washing machines and electrical household apparatus.

H. W. Johns-Manville Company.

Space 28.

"Noark" inclosed fuses, "Noark" service boxes, "Noark" fuse boxes, "Noark" subway boxes, "Noark" primary boxes. "Noark" service meter-protective devices to make possible the testing of meters in quick time, without interruption of service. J.-M. fiber conduit, J.-M. Transite asbestos wood. Represented by J. W. Perry, general manager, electrical department; S. G. Meek, assistant general manager, electrical department; J. H. McManus, H. M. Voorich, K. C. Sadler, Jr., Robert Chas. Cole, electrical engineer, the Johns-Pratt Company, Hartford, Conn.

Lombard Governor Company.

Space 53.

Exhibit of framed photographs showing governors which have been installed under actual working conditions;

oscillograph and chronograph records of water-wheel performance. Represented by Allan V. Garratt, general manager; H. H. White, Atlanta, Ga., office.

Metropolitan Engineering Company.

Space 2.

Complete system of protective service and meter installations; high-tension fuses and network protectors, and a model of the company's porcelain clad reactance coil. Represented by J. E. McClernon, T. E. Murray, Jr., F. E. Brown, G. R. Smith, J. S. Rickard, R. B. Sammis.

National Lamp Works of General Electric Company.

Spaces 24 and 26.

Three phases of the proper voltage for the lamp circuit are shown by means of instruments on a three-panel switchboard. These instruments will be arranged so that the spectators may operate them themselves and the results will be shown on dials. Another phase of the proper voltage question will be shown by means of a large grandfather's clock, which will drop coins, thus indicating in a graphical way the loss to a central-station of a given size due to under-voltage burning. The ruggedness of the Mazda lamp will be shown by means of a mechanical bumper. The new high-efficiency Mazda multiple and street series lamps and units to be used with them, will be shown burning on racks. A full line of regular Mazda lamps will be shown and also pieces of Holophane decorative glassware. Represented by S. E. Doane, W. M. Skiff, R. W. Shenton, R. W. Davis and L. C. Kent.

Naugle Pole & Tie Company.

Space 47.

Reception headquarters, displaying sections of white cedar poles and photographs and illustrations of various lumbering operations. Represented by J. W. Benham, secretary and treasurer, and L. E. Morier.

Ohio Brass Company.

Space 33.

Display of high-tension porcelain insulators and line material.

Otis Elevator Company.

Space 6.

Three building models illustrating central-station opportunities in electric elevator service, and a chart indicating the yearly increase of Otis electric elevators from 1900 to 1914, and the horsepower represented by these installations. This illustration will indicate also the comparative development of direct and alternating-current types of machines, and demonstrate the gradual expansion of the alternating-current type of apparatus. Represented by G. R. Rebman, R. W. Charles and W. B. MacLean.

Philadelphia Electric Company Supply Department.

Space 37.

Reverse phase relay, in active operation. It is anticipated that this will attract considerable attention, since the policy of using a device of this kind on all polyphase motor-driven elevators is now an agitated one throughout the country; "Franklin" pot heads, formerly known as the "Fairmount"; a complete line of these, which are extremely unique in construction; high-tension "Franklin" insulators; air-pressure relay, a positive warning of the failure of the air supply to air-blast station transformers; will be seen in active operation. Instrument cut-out switch, something which is not only unique, but also fool proof in construction, eliminating danger of open circuiting the secondaries of the current transformers to which instruments are connected; high-tension compression fuses, "Maxum" ground boxes, Marshall Linemen's Protector Shields, and other specialties. Represented by L. V. Garron and William Taylor Poulterer.

Philadelphia Electrical & Manufacturing Company.

Space 4.

Ornamental lighting standards, tungsten arcs and Pemco products.

Philadelphia Storage Battery Company.

Space 31.

Photographs of storage battery installations and sample board showing the assembly of the Philadelphia storage battery.

Pittsburgh Transformer Company.

Space 49.

The latest development of the company in standard distributing transformers, the new pressed steel case; large photographs of water-cooled transformers, small outdoor, high-tension transformers, and mill-type transformers in sizes up to 2,000 kilowatt-amperes. The company will furnish, as is its usual custom, its famous brand of Pittsburgh stogies to all convention attendants, and there will be a goodly supply of the coveted Pittsburgh "Pretty Girl" calendars for distribution. R. V. Bingay, president; H. G. Steele, secretary and treasurer; P. H. Butler, salesmanager, and T. E. Burke, assistant salesmanager, will be in attendance.

John A. Roebling's Sons Company.

Spaces 10 and 12.

A complete line of samples of wire products, including bars, iron, steel and copper wire, wire rope and fittings, wire cloth and netting, alligator wrenches, and insulated wires and cables of every kind. Represented by W. L. Doyle, W. P. Bowman, A. B. Conover, R. R. Newell, A. W. Treaden, A. V. Errickson, and others.

Rumsey Electric Company.

Space 55.

A complete line of electrical machinery and supplies, including the products of the following manufacturers: Pittsburgh Transformer Company, Sangamo Electric Company, Lincoln Electric Company, Bell Electric Motor Company, Electric Machinery Company, Pelouze Manufacturing Company, Delta-Star Electric Company, Electrical Engineers Equipment Company, Pittsburgh High-Voltage Insulator Company, The Carlisle & Finch Company, Harter Manufacturing Company. Represented by George A. Rumsey, Jr., Eugene A. Rumsey, C. H. Kelley, B. T. Hare, D. C. Anderson, H. J. Schiefer, Jr., A. M. Goodloe, M. D. Summer, B. E. Achenbach, J. M. Pratt, J. R. Donley.

Sangamo Electric Company.

Space 23.

Reception headquarters, featuring a novel pedestal arrangement on which is displayed various types of meters. Represented by Jacob Bunn, president; M. B. Southwick, assistant sales manager; M. B. Chase, New York manager; Scott Lynn, Rochester manager; J. W. Bard, electrical engineer; R. C. Lanphier, general manager; Ray D. Lillibridge, advertising manager.

Simplex Electric Heating Company.

Space 11.

Complete display of domestic irons, portable stoves, disc heaters, curling iron heaters, urns, circulation water heaters, sterilizers, factory devices, electric ranges, toasters, water cups, heating pads, milk warmers, travelers' stoves, percolators, dining room sets. Represented by E. B. Stebbins.

Southern Exchange Company.

Space 9.

Sections of long leaf yellow pine octagonal poles, long leaf yellow pine square poles, southern white cedar poles, long leaf yellow pine cross arms, standard sizes, and heavy transmission arms. Represented by E. G. Chamberlin.

Standard Underground Cable Company.

Space 59.

Samples of various kinds and sizes of bare and insulated wires, Colonial copper clad wire, lead-covered cables, D. O. A. (Davis Open Air) and D. S. (Davis Station), cable terminals, cable junction boxes. Represented by R. C. Hopkins, New York office; F. C. Cosby, Boston office; S. S. Warner, Atlanta office; T. E. Hughes, Edward Kerschner and R. M. Hirst, Philadelphia office; R. B. Wilcox and J. W. Lyon, Pittsburgh office.

Wagner Electric Manufacturing Company.

Space 22.

Alternating-current apparatus including the new single-phase motor converter and rectifier.

Western Electric Company.

Space 25.

The company will exhibit this year

for the first time, in addition to its already complete line of household electrical devices, the new Western Electric washer and wringer. An alliance has been formed between the Conlon Electric Washer Company, of Chicago, and the Western Electric Company, whereby, under the arrangement, the entire line of the well-known Conlon electric washing machines will be marketed under the trade name of Western Electric washer and wringer. There will also be shown a complete line of Western Electric-Sturtevant cleaners. These cleaners are marketed exclusively by the Western Electric Company under the trade name of Western Electric-Sturtevant. Other Western Electric devices on exhibit will be the "American Beauty" irons, toasters, warming pads, etc., "Triangle Lektrik" irons and the new "Triangle Lektrik" toaster stove, fans, poles, fir cross-arms, "Buffalo grips," D & W fuses, Benjamin wiring devices and Electrose insulators. In addition to the well-known D & W fuses on exhibit, there will be exhibited for the first time the new D & W oil-fuse cut-out designed for high-tension work. The company's representatives in attendance at the convention will be as follows: E. W. Rockafellow, assistant general sales manager; M. A. Oberlander, assistant general supply sales manager; H. R. King, power apparatus sales manager; R. A. Griffin, manager pole department; P. L. Thomson, advertising manager; A. G. Kingman, advertising department; A. G. Hartigan, sales department, all from the company's general headquarters at New York; and J. D. Kennedy, manager; A. L. Hallstrom, sales manager; F. C. Jaeger, J. L. Tower, S. Greenfield, G. F. Livezey, J. R. Stuard, L. C. Coller, E. F. Baird, sales department, Philadelphia; C. B. Whitehurst, Richmond; J. L. Ray, sales manager, Pittsburgh; D. J. Butts, sales department, Boston; W. B. Pierce, sales department, Chicago.

Westinghouse Electric & Manufacturing Company.

Spaces 13 and 14.

A full line of household utility and commercial motors, both in direct-current and alternating-current types. Domestic and industrial heating and cooking apparatus. Battery charging, mercury rectifier outputs, circuit breakers, lightning arresters and other electrical equipment.

Westinghouse Lamp Company.

Space 15.

New type Westinghouse Mazda lamp for multiple and street series service, with fixtures developed by the company for use with these lamps. Represented by T. G. Whaling, sales manager; H. F. Cameron, assistant to sales manager; W. H. Robinson, commercial engineer; F. N. Kollock, treasurer; C. A. Dostal, district manager, Philadelphia territory.

Weston Electrical Instrument Company.

Space 21.

In addition to the regular line of switchboard and portable instruments, the company exhibits for the first time a new line of portable alternating-current testing instruments. This line will include single and polyphase wattmeters, current and potential transformers, etc. These instruments are designed for laboratory use and all work requiring alternating-current indicating instruments of exceptional precision.

Electricity and Its Abundant Supply in Venezuela.

An estimate has recently been completed of the amount of electric energy from water falls immediately available in the neighborhood of Caracas, Venezuela, and a statement regarding it has recently been sent to the Pan American Union, the Director General of which furnishes the following résumé.

Caracas consumes at the present moment on the average of 1,600 horsepower of electricity during the day, and 2,000 horsepower during the night. There is in reserve about double this quantity, so that Caracas can count upon 4,000 horsepower as already available. But, according to the estimate above mentioned, this is by no means the limit of electric power within easy reach of the city. Only a few miles outside of the city are waterfalls, El Encantado with 1,250 horsepower; Los Naranjos with 1,900 horsepower; Lira with 750 horsepower; and Mamo with 4,800 horsepower; already equipped with apparatus, but not to the fullest capacity. Then other falls or swift streams, not quite so near Caracas but within easy transmission distance, have been demonstrated to have a capacity of at least 21,500 horsepower, which added to the above supply makes at least 30,000 horsepower available. Caracas, the population of which is 75,000, has now a first class modern trolley-car system with a branch line running across to its suburbs. The entire city is well illuminated with electric light, telephone lines extend into the country, and many of the factories are using electric drive.

In addition to this water-power already enumerated, there is more power available still further away from Caracas, but within economical transmission distance. The natural streams and waterfalls are very numerous, and there are unlimited opportunities for artificial retention of water by dams and storage reservoirs. This holds true of the capital, and of the principal cities like La Victoria, Puerto Cabello, Valencia, and very many others in the interior of the Republic. In fact, most of them are to-day using electricity to run their factories and smaller machine shops.

As an instance of the advantage taken of this abundance of electric power in Venezuela, it can be stated that in the last month a large crystal and glassware manufacturing plant employing 200 men has been started in Caracas. The combination of cheap power by electricity, and of raw material that has been shown to be suitable for the manufacture of articles of this kind, has encouraged local capitalists to establish these works to meet the increasing demand for such products. As industries of this character become demanded in Venezuela, there will be found a wealth of natural resources with which to lay the foundation for profitable business and the employment of the inherent talent of the native Venezuelan, and one of the essentials for commercial success in any such enterprise, a good and economic motive power, is at hand in the cheap hydroelectric power of the country.

Wireless in Australasia.

There is now a chain of wireless stations round the Australian coast so close to each other that as soon as the vessel gets out of the range of one she enters into another. Communication can, in fact, be obtained in a zone of 400 miles by day and 1,500 miles by night from any position on the seaboard, and the advantage in emergency, in trade, and in social life will be enormous. The stations in the north and south of New Zealand with the short-range installation at Fiji complete the system, and it is now proposed to link up the outlying British possessions in the South Sea.

Stations are in course of erection at Singapore, Penang, and several points in North Borneo.

Canvass of Customers Discloses Few Complaints.

With the April bills of the Pittsfield (Mass.) Electric Company, a return post card with a request for any complaints which their customers might have, was sent by the Company to each of its 3,500 customers. Of this total number three cards were returned with complaints together with a large number of cards complimenting the Electric Company on its service. These complaints in each case were welcomed by the Company and steps were immediately taken to rectify the trouble, as the Company tries at all times to give the best service possible to its customers and feels justly proud of the results of this canvass.

Testimonial to Mr. Herman Aaron, General Counsel of the American Institute of Electrical Engineers.

At a recent meeting of the Board of Directors of the American Institute of Electrical Engineers, a special committee which had been appointed by the Board to consider the question of suitably expressing to Herman Aaron, the Institute's appreciation of the services rendered by him gratuitously during the 10 years he has acted as its legal counsel, submitted for the Board's consideration the following resolution embodying its recommendations:

WHEREAS, March 25, 1914, is the tenth anniversary of the appointment of Messrs. Parker and Aaron as general counsel of the Institute, and

WHEREAS, the Institute is greatly indebted to Mr. Herman Aaron, as counsel, for his frequent, vital and wholly successful professional services throughout this period, for which he has refused all emolument.

RESOLVED, that the appreciation of the Institute be expressed to Mr. Aaron by the gift of a silver service to be presented, with appropriate formalities, on or about March 25, 1914.

This resolution was unanimously adopted, and a committee consisting of John J. Carty, chairman, C. E. Scribner, and S. D. Sprong, was appointed to carry out the intent of the resolution.

This committee arranged for the presentation of the silver service, consisting of eight pieces of a simple but exceedingly attractive colonial design by Tiffany & Company, at an informal dinner at the Engineers' Club, New York, Tuesday evening, May 19, which was attended by members of the Board of Directors, the committee, and a few personal friends of Mr. Aaron. President Mailloux presided, and the presentation address was made by Mr. Carty, who is entitled to the credit of obtaining the services of Mr. Aaron 10 years ago, at which time Mr. Carty was chairman of the Finance Committee and a member of the Board of Directors. Mr. Carty spoke feelingly of the valuable services rendered by Mr. Aaron at the time negotiations were being carried on relative to the proposed gift of Mr. Carnegie, to the engineering profession, of a suitable building as a home for the principal national engineering societies, and paid a high tribute to the public service rendered by Mr. Aaron at that time, and also as general counsel of the Institute during the entire last decade. After an appropriate response by Mr. Aaron, all present expressed in brief addresses their high opinion of the able, loyal, and efficient services rendered by Mr. Aaron to the Institute.

Mr. Aaron is a member of the firm of Parker & Aaron, attorneys of New York. His boyhood and manhood were spent in New York City. He was born in 1862, and was graduated by the College of the City of New York and Columbia Law School. He was admitted to the Bar in 1883, when he entered the office of Taylor & Parker, of which firm he subsequently became a member. On Mr. Taylor's death in 1894, Frederick S. Parker and Mr. Aaron formed the firm of Parker & Aaron which has continued uninterruptedly since. This firm is counsel for important banks and prominent industrial and commercial concerns, and has figured extensively in the trial of important cases in which he takes a keen delight. He is an ardent believer in the practical justice of trial by jury, and is never more serious than when deprecating an assault upon that system. Like many hard working men, he devotes himself to farming as a wholesome outlet for his leisure and surplus energies.

Herman Aaron,
General Counsel of the American Institute of Electric Engineers.

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May Meeting of Board of Directors.

The Board of Directors of the American Institute of Electrical Engineers held its regular monthly meeting in New York City on the afternoon of May 19. Upon the recommendation of the Board of Examiners, 54 applicants were elected Associates, and two were elected to the grade of Member. Four Associates were transferred to the grade of Member, and one Member to the grade of Fellow. Ninety-eight students were enrolled.

Upon the petition of the Portland Section, its territory was extended to include Corvallis, Eugene, The Dalles, Astoria, Tillamook and Winlock.

The annual report of the Board of Directors was approved. This report showed the present membership to be 7,876, a net increase during the year of 222. The financial statement showed total receipts for the year of $114,000, nearly $15,000 of which was a surplus over expenses. The disbursements per member for the year amounted to $12.86, which is a decrease as compared with 1913.

President Mailloux appointed Past-President John W. Lieb to represent the Institute at the commencement exercises of Cooper Union, to take place on May 29, at which a tablet to the memory of William A. Anthony, a past-president of the Institute, would be dedicated.

A communication was presented from the Board of Trustees of the United Engineering Society informing the Board of the receipt of a gift from John W. Lieb of a series of volumes covering the work of Leonardo da Vinci, and expressing the hope that Mr. Lieb's gift might lead to other donations of a like nature. The Board directed the secretary to express to Mr. Lieb its appreciation of his gift.

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Electricity at Anglo-American Exposition.

Electricity is to play an important part in the Anglo-American Exposition, which opens in London, England, this month. There will be over 100,000 decorative lamps, used in outlining buildings, festooning grounds, etc., and about 2,000 arc lamps will illuminate the exterior of buildings and walks. The use of half-watt tungsten lamps will be extensive. Current is received at 2,000 and 5,000 volts and stepped down through transformers to 220 and 440 volts, to single-phase and three-phase circuits.

Seventy electric launches will operate on a lagoon and through a winding canal nearly two miles in length. These boats are propelled by 15 to 20-horsepower motors. The storage batteries are charged through motor converters installed on the premises.

About 250 100-candlepower metallic-filament lamps will illuminate the cascade, which falls a distance of twenty feet over a series of corrugated glass steps. Eight different colors are employed, and the switches operating the lamps will be controlled by hand, to give a varying and flexible combination of colors, which it is found a mechanical device would not do so satisfactorily. Pumps operated by two 50-horsepower motors will raise the water from the basin to the top of the cascade, their capacity being 20,000 gallons per hour.

Philadelphia Electric Company's New Generating Plant

A brief outline of the engineering features of the Philadelphia Electric Company's new power plant, and a description of the largest turbogenerator in the world.

The modern high-voltage polyphase generating and substation equipment of the Philadelphia Electric Company, which is used in connection with its distribution system supplying light and power to the metropolitan and suburban districts of the city of Philadelphia, to nearby towns and outlying rural districts, to the city of Chester, Pa., and adjoining territory; to Philadelphia's street-railway systems, and now about to supply energy to the railroad electrifications in and around Philadelphia, offers very many features of engineering interest, especially since the company is numbered among the very large American central-station companies. This system covers a territory which is bounded on the south by the state line between Pennsylvania and Delaware, and on the east by the Delaware River, a territory which is roughly 40 miles in length by 15 miles in breadth.

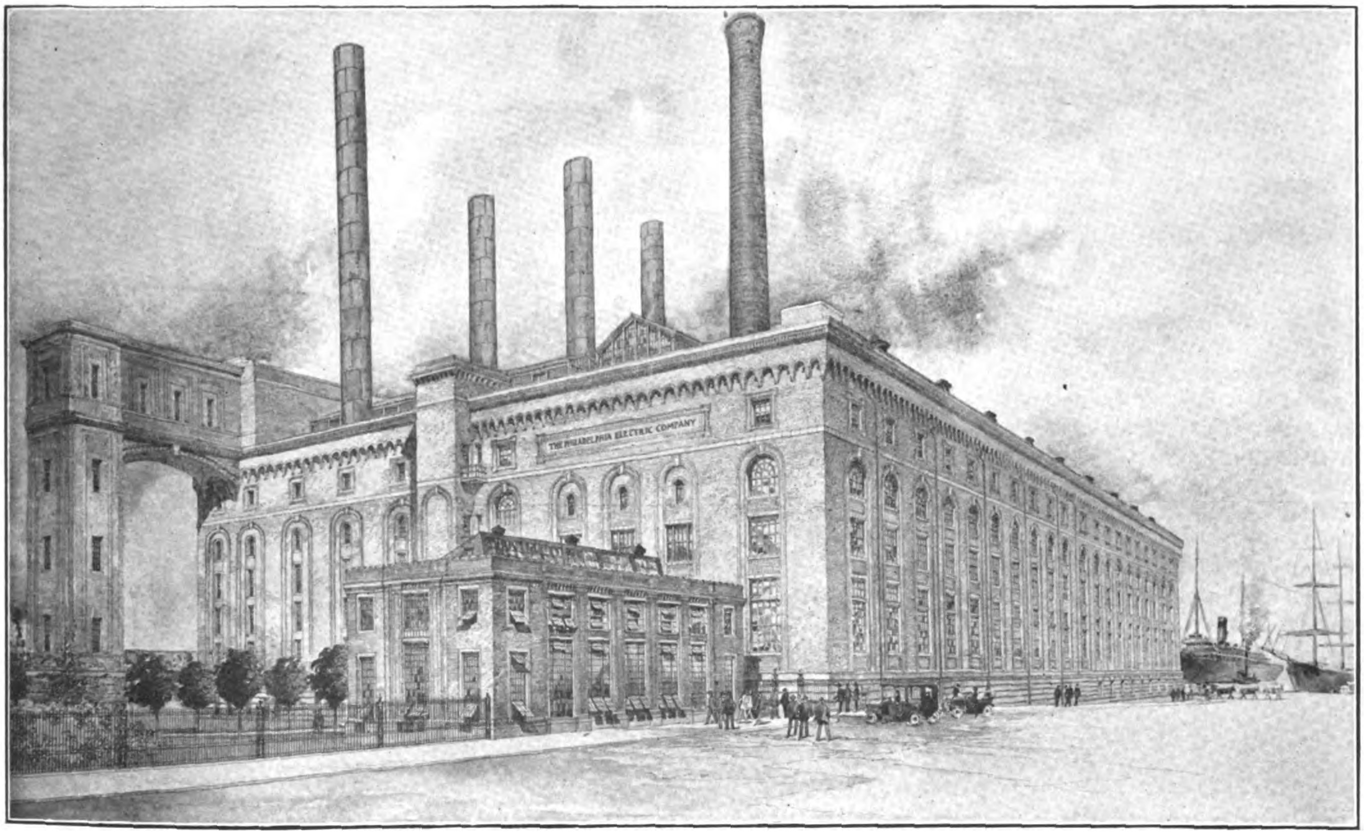


Fig. 1.—Architect's Drawing of Power Stations.

At the present time the generating system comprises three generating stations and a stand-by emergency station. Ground has been broken for a fifth station, which is of special interest because of the fact that it will house the largest turbogenerator in the world, the revolving field of which is shown in Fig. 4. It is a polyphase unit of 35,000 kilowatts capacity, and is under construction, together with another almost equally large unit of 30,000 kilowatts capacity. It is a description of these machines and the large central power station which will house them that forms the subject of the present article. An architect's drawing, showing the combined new stations, which includes the old main generating station "A-1" and the new section which will house the two large turbogenerators, is reproduced in Fig. 1. The smaller building in the foreground is the new machine shop for the mechanical department.

In order to fully appreciate the rapid increase in energy demand made upon the company during the last few years, it is necessary to note the development of the company's property during that period—a development which has led to the necessity of now building this new generating station with its very large turbines.

In 1911, when the company was called upon to supply 25-cycle high-voltage energy to the street-railway system of Philadelphia, no 25-cycle generating units had been installed. A frequency-changer substation to be supplied by the company's 60-cycle system was therefore designed, built and the apparatus put into operation within four months' time. This railway load has steadily grown and 25-cycle generating capacity has since been added from time to time. The next year, because of rapidly increasing demand on the 60-cycle system, a material increase in the company's transmission voltage at that frequency was found necessary. It was at that time that the decision was made to change the 6,000-volt two-phase system to 13,200 volts, three-phase. In certain districts the conversion to the higher pressure has already been accomplished, and the other substations of the system are gradually being changed over. However, in no case will the distribution voltages from substations be changed, but throughout will remain 2,400 volts, two phase, three wire, 60 cycles, for alternating-current districts, and 115-230 volts, three-wire for the Edison direct-current section occupying the center of the city. Scott-connected transformer banks of large capacity installed in the alternating-current substations, will effect the conversion from three-phase to two-phase at voltages required, as stated above.

In 1913, the street-railway system again made demand for energy, this time to an outlying district towards the northwest section of the city. The demand was met by the extension of 13,200-volt three-phase 60-cycle lines from one of the company's generating plants to the several steam stations of the railway company, where 60-cycle rotary-converter equipments were installed to supplant the steam-driven generators, since dismantled. In all of these railway installations the electric company operates the stations and energy is billed at 600 volts direct-current at the trolley fuses.

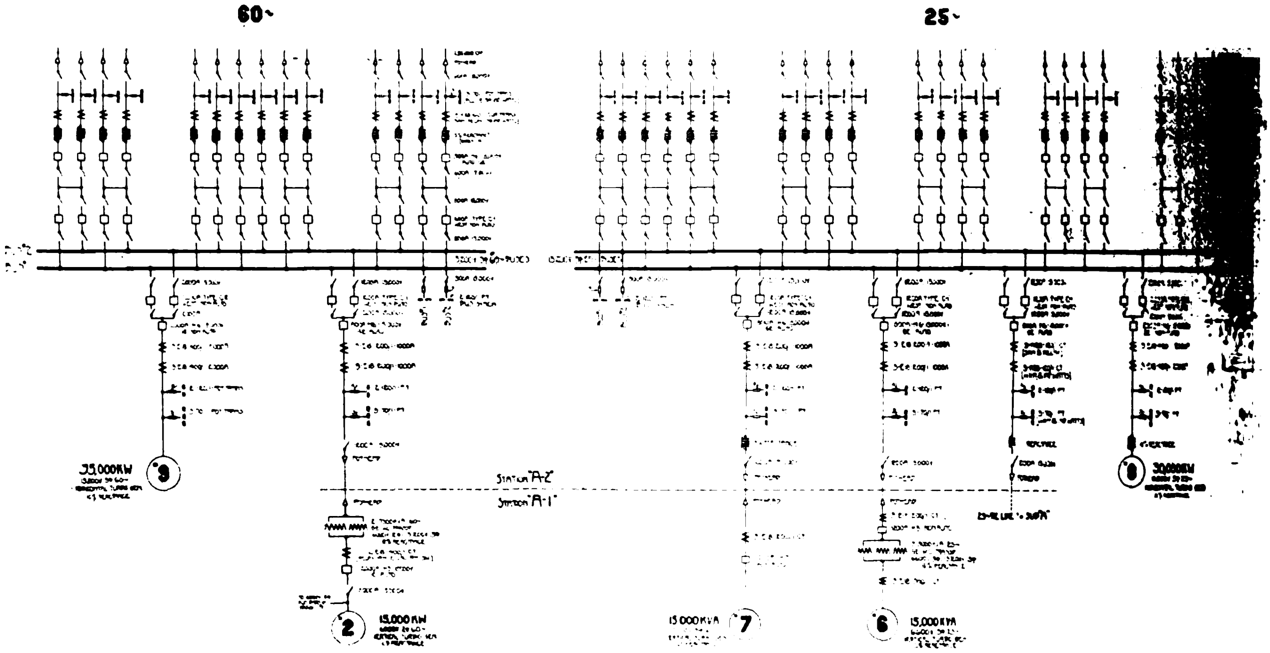


Fig. 2.—Layout of Station Circuits.

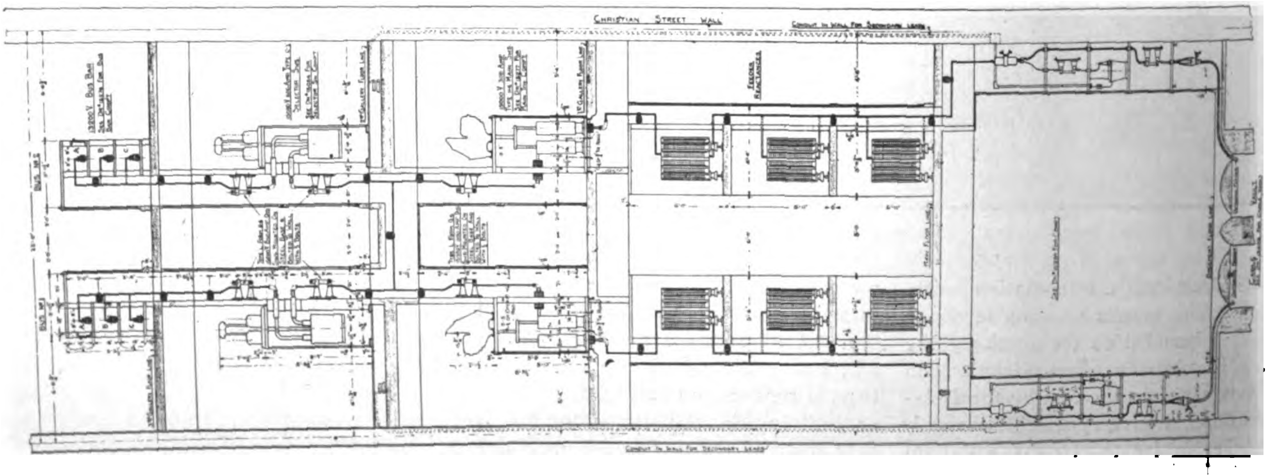


Fig. 3.—Cross-Section of Busbar and Switching Galleries.

During the present year, still further increases in demands at both frequencies have been coincident with the added necessity of supplying energy for electrification of steam-railroad lines in and around Philadelphia. This rapid expansion has therefore been the cause of erection of the new generating station "A-2", which will augment the present generating capacity necessary for the delivery of electrical energy to the company's 34 substations and to those of the railway and the railroad companies—a supply of energy of which the magnitude may be appreciated from the official figures for the company's output during the year 1913; a total of 253,000,000 kilowatt-hours.

Generating Station.

At the present time the Philadelphia Electric Company is erecting a new generating station at Twenty-eighth and Christian Streets, Philadelphia. This station will be contiguous to the company's present main station "A-1" and will contain complete electrical and mechanical equipment for two very large horizontal Curtis steam turbogenerators, one of which is a 25-cycle unit of 30,000 kilowatts rating and the other a 60-cycle unit of 35,000 kilowatts capacity. Both machines are now under construction at the Schenectady works of the General Electric Company, the larger of the two units being the largest electric generating unit in the world.

The new station will be 188 feet in length by 262 feet in maximum width, and will house a modern steam-turbine generating plant. It will be adjacent to the older station, but will be separated from it by permanent building walls, thus presenting the appearance of a long single building when viewed from the north. No steam or physical connections will be maintained between the two stations other than the water intake and discharge tunnels, which have been extended from the old station to the new installation. On the other hand, the arrangements of electrical connections between the two plants will be such as to unify in a measure the operation of both.

General Features of the Electrical Installation.

The new power station will deliver

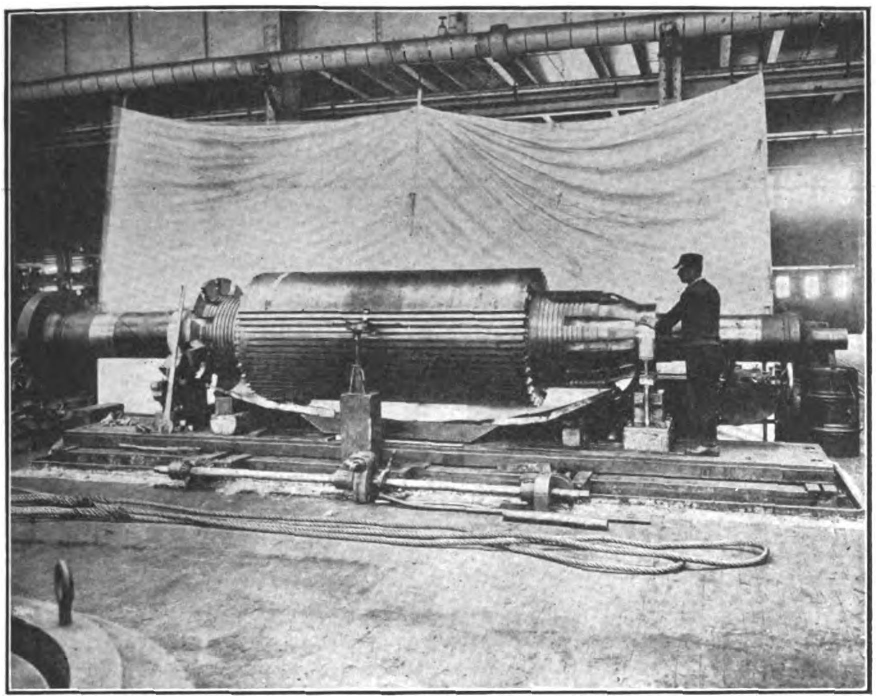


Fig. 4.—Revolving Field of the 35,000-Kilowatt Turbogenerator.

three-phase 13,200-volt energy at 25 cycles from the 30,000-kilowatt unit for railroad electrification and railway supply, and 60-cycle 13,200-volt energy from the 35,000-kilowatt unit for general power and lighting service, thus giving a total generating capacity of 65,000 kilowatts from the two units.

The new station will also control and accommodate the switching equipment for three large 15,000-kilowatt turbogenerators, which are in operation in the present main station. A 25-cycle tie line will be installed between the new plant and the company's frequency-changer substation, located nearby, and the control connections of the frequency-changers will be so arranged that these machines will be controlled from the new station. According to these plans, the new plant will have a generating capacity of 69,000 kilowatts of 25-cycle energy and 50,000 kilowatts of 60-cycle energy, making a total generating capacity of 119,000 kilowatts controlled by this one station.

The engineering features relating to the installation of apparatus of the two frequencies are in general similar. Both will be three-phase 13,200-volt equipment, and both of the new machines will be high-voltage generators, wound directly to give 13,200 volts. This feature of their electrical design is made possible by comparatively recent improvements in armature-insulation strengths, and is in strong contrast to the alternative of low-voltage machines with either compensators or step-up transformers, as used only a very few years ago to secure pressures of 13,200 volts in generating stations.

Duplicate sets of unsectionalized bus bars will be installed for each frequency, as shown in Fig. 2, and the construction of the bus-bar and oil-switch structures will be in accordance with accepted design for large stations, embodying concrete structures located in isolated fireproof switching galleries. These galleries will be separated from the turbine room by walls which form part of the building. On all circuits the separation of adjacent conductors by use of insulating barriers will be rigorously enforced. The several generators will be connected to the bus bars through main and selector oil-break switches of large current-rupturing capacity, and power-limiting reactance will be provided in the generator circuits. The company's usual practice as regards generator protection by automatic relays will be adhered to. The machine oil-break switches will be made nonautomatic, but overload relays will be arranged to light red pilot lamps at the switchboard in case of abnormal conditions.

All outgoing feeders will be 13,200 volts three phase. Provision will be made for an ultimate installation of 22 25-cycle and 14 60-cycle lines, each of 5,000 kilowatts normal rating. These feeders will be connected to the bus bars in accordance with a group system in which two outgoing feeders compose a group, as shown in Fig. 2. Cable connections will be made so that no substation is supplied by two feeders of the same group. In each individual feeder there will be connected three-per-cent reactance coils (at 5,000 kilovolt-amperes) to provide power-limiting protection against short-circuit currents. Similar protection will be afforded the 25-cycle tie line to the frequency-changer substation. All lines will leave the new station underground, and static ground-detecting instruments will be maintained on the cables. At the generating-station end of the feeder cables, no lightning arresters will be provided, inasmuch as the bus bars at

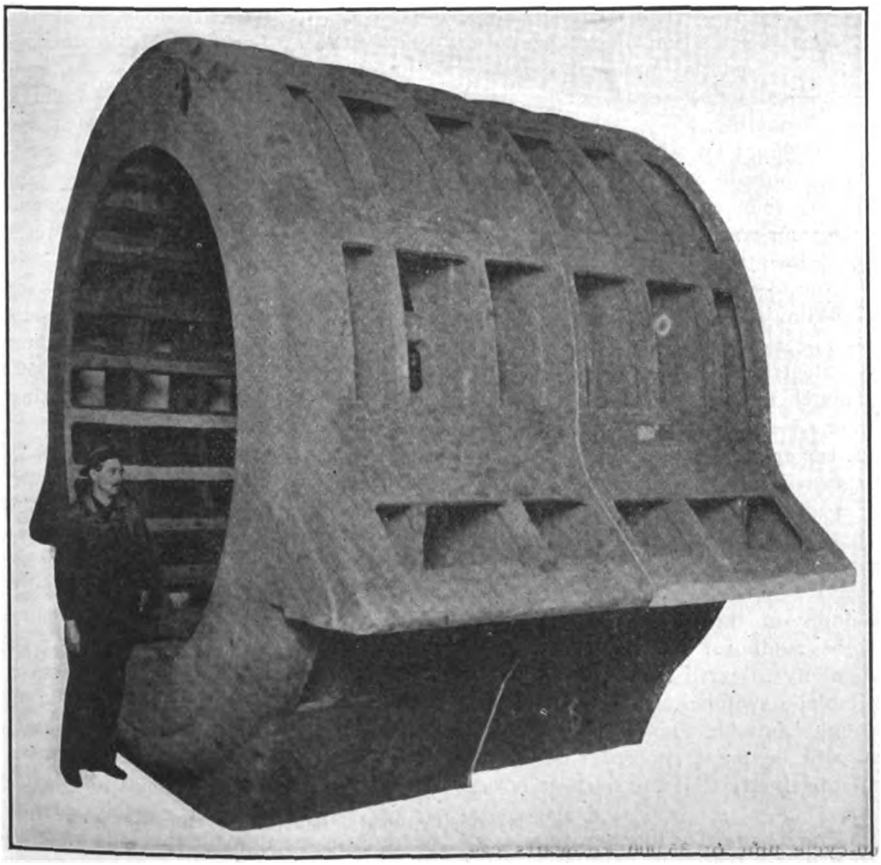


Fig. 5.—Stationary Armature of the 30,000-Kilowatt Turbogenerator.

substations are furnished with these. Usual protective relays will be installed in connection with the automatic oil-break switches in the feeder circuits.

Of the three alternators in the older generating station, the leads of which will be brought to the bus bars in the new plant, special interest attaches to one machine: a 15,000-kilowatt 60-cycle generator wound for 6,000 volts two-phase and provided with two 7,500-kilovolt-ampere water-cooled single-phase transformers connected according to the Scott method to transform to 13,200 volts three-phase. These power transformers are the largest ever built for the Scott system of transformation and were installed during the past year.

In accordance with the company's standard practice, all oil switches and auxiliary apparatus will be electrically remote-controlled from an operating room, and a method for securing a sectionalized control supply, which embodies departures from previous American central-station practice, has been designed and will be used. In the rheostat control of the alternator fields a pilot-light system has been devised to allow the operator always to know the position of the contact arm on the rheostat dial switch.

Both the new and old generating stations will have their separate operating rooms with telephonic communication maintained between them at all times. In addition, the switchboard operators in each operating room will be able to see the other through large glass windows suitably placed in the walls of the two buildings. The operation of the two polyphase systems of different frequencies in the new station will be under conditions of grounded neutral, with suitable resistance provided in the connection to earth. The ground connection will be separate for each, and automatic interlocks will prevent more than one generator of either frequency being connected to earth at any time. All ground switches for the machines will be remote-controlled. The main leads from each of the two large turbines will consist of two 1,000,000-circular-mil stranded rope-core cables per leg. These will have braided covers.

The electrical switchboard equipment which is to be installed for the several generator circuits and the feeders, will conform closely to the standards already established by the company's engineers. The output of the generators will be measured by watt-hour meters employing the three-wattmeter method of three-phase energy measurement. Also in accordance with the company's standard practice, no relays or other instruments will be connected to those current transformers which operate the watt-hour meters. No watt-hour meters will be installed on the feeders.

Excitation for the two large machines will be furnished normally by bracketed exciters mounted on each turbine. In addition there will be installed in station "A-2", a 500-kilowatt steam-turbine-driven exciter arranged with gear reduction drive. This machine can be connected to the duplicate sets of excitation bus bars in the old station, upon which an emergency storage battery will at all times be kept floating.

As elsewhere throughout the system, so in the new station all synchronizing will be between machine and bus-potential transformers connected in open delta across the three-phase circuits. By means of suitable low-voltage knife-blade switches the process of synchronizing may be effected on either one of two phases as selected. Through the agency of an interlock it is impossible for an operator to close a main oil switch for a machine without the synchronism indicator first showing the phase relationship between machine and bus. The several synchronism indicators will be furnished with a recording device which in every instance will show the position of synchroscope pointed at time the main oil switch is closed, thus giving record of accuracy of synchronizing.

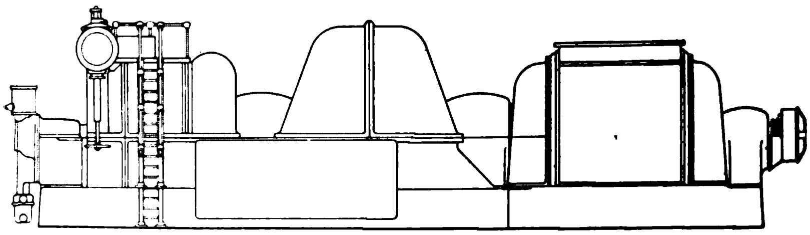


Fig. 6.—Outline Drawing of the Large Turbogenerators.

The turbines are air-cooled, the cooling-air supply to each turbine being secured by induced draft through independent air-washing equipments. The 30,000-kilowatt generator requires 60,000 cubic feet of air per minute and the 35,000-kilowatt generator requires 85,000 cubic feet of air per minute.

All electrical conductors between the oil switches and the bus bars will be composed of bare strap copper. However, the requirements of safety to operators will be cared for by isolating all live parts in concrete compartments with asbestos lumber or other insulating enclosures. In order to safeguard operators and others when work is to be done on the buses, arrangements will be made for connecting any bus bar solidly to earth through permanent knife-blade switches. Test connections through suitable high-voltage fuses first will be made, in order to determine absolutely that the bus bar is not alive.

The Large Turbogenerators.

The 35,000-kilowatt 60-cycle turbogenerator, the revolving field of which is shown in Fig. 4, is wound for 13,200 volts, three phase. It has six poles and will run at 1,200 revolutions per minute. The amperes per phase at 90-per-cent power-factor will be 1,460 and the internal reactance, 10 per cent. The exciter will be a direct-connected 150-kilowatt six-pole 250-volt shunt-wound machine, operating at 1,200 revolutions per minute.

The stationary armature of the 30,000-kilowatt 25-cycle alternator is shown in Fig. 5. The machine is wound for 13,200 volts, three phase, and runs at 1,500 revolutions per minute. It is a two-pole machine, the amperes per phase at 100-per-cent power-factor being 1,313. The internal reactance is eight per cent and the external reactance is four per cent. It has a direct-connected 250-volt shunt-wound exciter of 110 kilowatts capacity. It is a six-pole machine, operating at 1,300 revolutions per minute.

Each of these machines will have temperature coils located permanently in the stator windings and connected to recording instruments located at the switchboard. This will enable the operators at all times to know the temperatures of the high-tension windings, which is an additional safeguard in the operation of the machines. The armature insulation tests (200 per cent of normal voltage) for each alternator will be 26,400 volts and field insulation tests 1,500 volts.

The 500-kilowatt turbo-exciter set comprises a Curtis steam turbine operating at 5,000 revolutions per minute and a geared shunt-wound six-pole 250-volt direct-current generator operating at 900 revolutions per minute.

Water Supply.

As shown in Fig. 7, station "A-1" obtains its water supply from the Schuylkill River through a 10-foot common-supply intake tunnel, which will supply station "A-2" through a 7.5-foot diameter extension tunnel with 38.48 square feet area. The circulating water required in station "A-2" for condensation will be approximately 110,000 gallons per minute during the summer season, for full load of 65,000 kilowatts, which is the maximum capacity of the turbines in the new plant. This amount of water will require a speed of approximately 6 feet per second in the intake tunnel.

The forebay located at face of station wharf will embody recent practice in forebay construction for large generating stations. This will include a motor-operated revolving screen for the elimination of small floating matter such as leaves, etc., together with heavy iron screens of I-beam construction to prevent entrance of heavy ice or other floating matter.

Feed water for steam boilers will be the pure distilled water of condensation from the condensers, with "make-up" water from the station's own filtration and purifying plant. Each of the two generating units in the new station will be treated as a separate station by itself, as each will have its own boiler equipment and auxiliaries throughout, even to separate coal bunkers as later indicated.

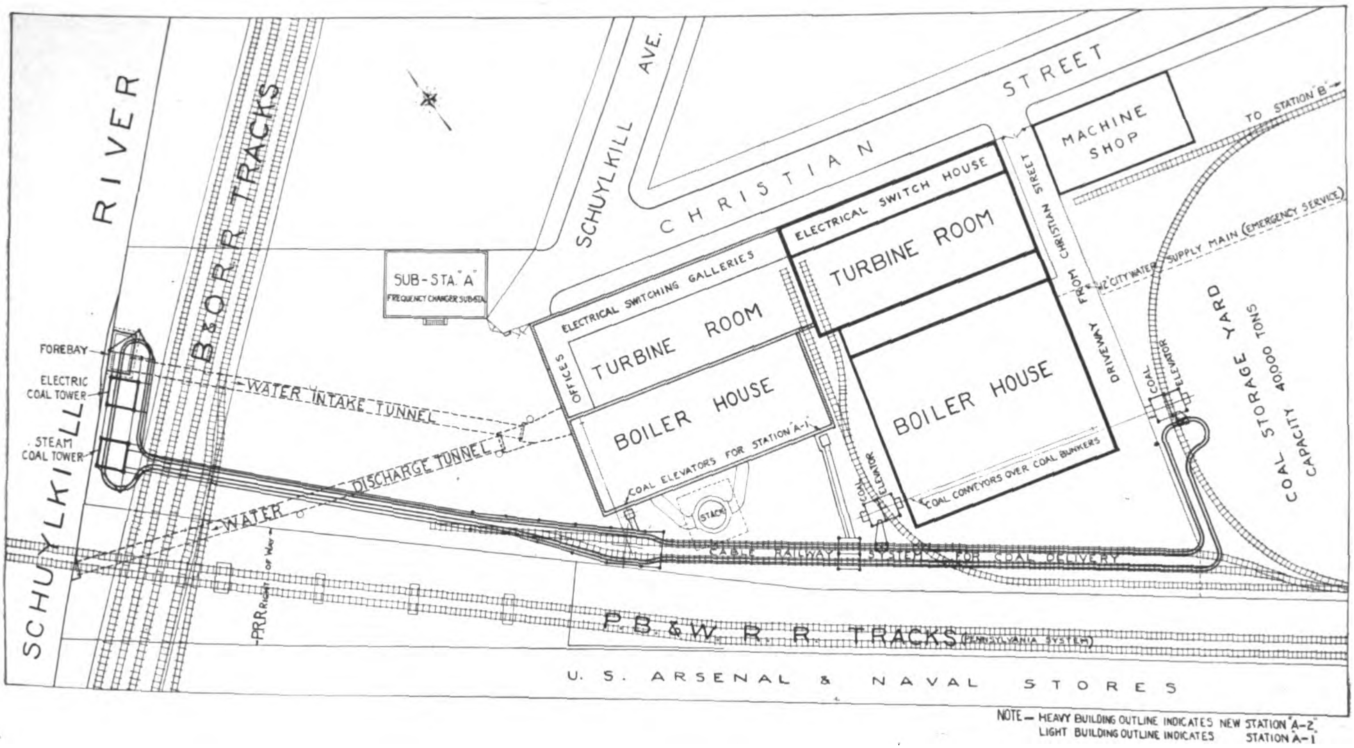

SCHUYLKILL RIVER
B & O R R TRACKS
FOREBAY
ELECTRIC COAL TOWER
STEAM COAL TOWER
SUB-STA. "A"
FREQUENCY CHANGER SUBSTA.
WATER INTAKE TUNNEL
DISCHARGE TUNNEL
WATER
P.R.R. RIGHT OF WAY
SCHUYLKILL AVE.
CHRISTIAN STREET
ELECTRICAL SWITCHING GALLERIES
OFFICES
TURBINE ROOM
BOILER HOUSE
COAL ELEVATORS FOR STATION A-1
STACK
ELECTRICAL SWITCH HOUSE
TURBINE ROOM
BOILER HOUSE
COAL ELEVATOR
COAL CONVEYORS OVER COAL BUNKERS
CHRISTIAN STREET
DRIVEWAY FROM
MACHINE SHOP
TO STATION "B"
12" CITY WATER SUPPLY MAIN (EMERGENCY SERVICE)
COAL ELEVATOR
COAL STORAGE YARD
CAPACITY 40000 TONS
CABLE RAILWAY SYSTEM FOR COAL DELIVERY
P.B. & W. R. R. TRACKS (PENNSYLVANIA SYSTEM)
U. S. ARSENAL & NAVAL STORES
NOTE— HEAVY BUILDING OUTLINE INDICATES NEW STATION "A-2"
LIGHT BUILDING OUTLINE INDICATES STATION "A-1"

Fig. 7.—Property Plan of Generating Stations, Showing Water Lines and Coal-Handling Layout.

Turbine Installations.

Especial interest attaches to the over-all dimensions, weights and speeds of rotation, which are given in the accompanying table.

Foundations of massive design, comprising steel and concrete construction, will support these very large units, and in every case the subfoundation will be laid on rock bed.

The turbines will be supplied with superheated steam of 215 pounds pressure at the throttle and superheat not to exceed 200 degrees Fahrenheit through a 20-inch throttle valve. Under steam conditions given above and with a back pressure not to exceed 1.5 inches of mercury absolute, the guaranteed consumption of the two machines will be as follows:

Size of Turbine in Kilowatts.	Steam Consumption in Pounds per Kilowatt-hour.
30,000 (25 cycles)	12.45 at 15,000 kilowatts 11.9 at 22,500 kilowatts 12.75 at 30,000 kilowatts
35,000 (60 cycles)	12.9 at 15,000 kilowatts 11.9 at 25,000 kilowatts 12.0 at 30,000 kilowatts 12.6 at 35,000 kilowatts

All of these guaranteed rates it is expected will be bettered under conditions of actual operation.

The main bearings of each machine will be 24 inches in diameter by 52 inches in length, and will be water-cooled by the circulation of 60 gallons of water per minute for the 30,000-kilowatt machine and 100 gallons per minute for the 35,000-kilowatt machine, both at minimum pressure of 20 pounds per square inch from turbine-driven pumps.

For lubrication of turbine bearings 40 gallons of oil per minute will be required at minimum pressure of 30 pounds per square inch. In each instance this oil is drawn from a tank of 15 barrels capacity cast into the base of the machine, and is normally circulated by a geared pump driven from the shaft of the machine itself. There will also be provided a duplex steam pump of ample capacity for use in case of trouble with the gear pump.

Provision has been made by the company's engineers for maintaining a constant supply of clean fresh oil in the tanks in the turbine base, by means of the respective gravity oil-filtering and cooling system in the station. By this means the necessity of independent coolers is eliminated, with their otherwise unavoidable complexities.

The turbine governors will be of the usual hydraulic pattern as made standard for Curtis horizontal units, and the valve gear will be of the usual mechanical type, controlled by the hydraulic governor.

Condensers and Auxiliaries.

The condensers, which are the largest ever built for stationary practice, will be of the two-pass radial-flow surface type, each containing 50,000 square feet of cooling surface. The tubes will be one inch in diameter and of No. 18 Birmingham gauge, special composition,

TURBINE-INSTALLATION DATA

Size of turbine in kilowatts.	Length over all in feet.	Extreme width in feet.	Extreme height from floor in feet.	Weight in 1,000,000 pounds.	Speed of rotation in R.P.M.	Throttle valve. Inches diameter.	Diameter in feet of exhaust outlet to condenser.	Diameter in inches of free exhaust to atmosphere.
30,000 (25-cycle)	59.38	19.66	15.18	.975	1,500	18	14x12	36
35,000 (60-cycle)	63.16	21.42	15.85	1.2	1,200	20	14x12	36

as will be found most suitable for the local conditions.

The unique design of this huge condenser demands attention. Its tubes will be arranged eccentrically within the shell in circular rows, and the air will be removed from the center in order to give the steam a minimum path of flow through the condenser tubes. By means of the counter-flow principle, the condensate will be allowed to pass down over the hottest tubes and will be removed at a temperature within a few degrees of the exhaust steam.

In order to facilitate ready examination and cleaning, the company's engineers have provided for a number of openings of their own design at each end of the condenser. These will be arranged with swinging doors in place of the usual bolted plates, and the doors when closed will be clamped tight by means of hinged bolts. This general practice has been adhered to for some years past in station "A-1" and has proved itself most efficient, both from the point of view of a labor-saver and of making a tight joint.

The circulating water to each condenser will be supplied through three-rotor centrifugal geared turbine-driven pumps. For each generating unit there will be installed two of these pumps, with a maximum capacity each of 37,500 gallons per minute. Besides these there will be provided one additional pump of like type and capacity, as a spare unit coupled for emergency service to either condenser. The reduction gear used for these pumping outfits will be of the well known Herringbone type with a gear ratio of 9:1, the turbine operating at 2,880 revolutions per minute and the pump at 320 revolutions per minute.

The injection water, which will be delivered to the condenser through a 48-inch pipe, enters at the bottom and discharges from the top, through a pipe of similar size, and the end of this discharge pipe will be sealed so as to form a perfect syphon system. This arrangement of piping reduces the actual work performed by the circulating pumps to that required to overcome the friction of the tubes and piping.

Another interesting feature lies in the means adopted for flushing out any leaves or other matter, which, having got past the forebay screens, may find its way into the condenser. In accordance with standard Philadelphia Electric Company's practice, which has been successfully used during several years past, arrangements will be made for by-passing a part of the circulating water by means of auxiliary piping in the condenser itself and through motor-operated valves controlled at a central point.

The condensate pumps will be of the two-stage centrifugal type, direct-connected to steam turbines; each generating unit is to be provided with two pumps, the capacity of which will be 1,500 gallons per minute each. The water of condensation which passes through these pumps will discharge into a "sweet water" tank from which it will flow by gravity into a boiler feed-water heater of the open type. As a further precaution and warning to the operating engineers in case of failure of the condensate pumps, the company's standard high-water alarm will be connected to each condenser; this consists essentially of an electromechanical device which closes an alarm circuit when the water in the condenser base has reached a predetermined and abnormal level.

The air pumps will be of the well-known Le Blanc type direct-connected to steam turbines; these pumping outfits also will be in duplicate, and will be placed immediately below the condensers. The "hurling" or sealing water required will be supplied by circulating pumps and be discharged directly into the discharge tunnel.

Coal Supply.

Coal for both stations will be supplied by both rail and river barge, 90 per cent of the fuel now being used in the old station being delivered by water.

The unloading of coal from river barges is done by means of one steam-driven two-man tower and one electrically operated one-man tower with combined unloading, crushing and weighing capacity of three hundred tons per hour. The coal is conveyed from these towers at the face of the wharf to the station by a motor-operated cable railway. The transfer cars are of three-ton capacity and discharge into standard track hoppers. Electric elevators raise the coal in the hoppers to the top of the boiler house, where it is then distributed to the coal bunkers by means of motor-driven conveyors. The elevators in use at the old station are of the link-belt type, and are in duplicate, one elevator being placed at each end of the bunkers, the conveyors being of the reversible scraper type arranged with motor drive to handle coal from either elevator. The elevators for the new station will be of McCaslin design, with overlapping buckets and gravity discharge, and the conveyors of the same character as those already installed in the old station.

The Boiler House and Equipment.

The boiler equipment of the new station will consist of 20 Babcock & Wilcox water-tube boilers, each 32 tubes wide, 14 tubes high, by 20 feet long, and four steam and water drums each 42 inches in diameter by 22 feet, 3.25 inches long. The superheater will be of standard Babcock & Wilcox type. Some idea of the size of the furnaces may be obtained from the fact that the depth of furnace is 8 feet, 7.5 inches, its width 19 feet, and the height from floor line to lower row of boiler tubes measured at the front header, is 11 feet.

Each boiler is guaranteed to evaporate 60,000 pounds of water per hour from a temperature of 160 degrees Fahrenheit, to a pressure of 250 pounds per square inch and a maximum temperature of 600 degrees Fahrenheit; and each will be furnished with recording steam-flow meter, recording carbon-dioxide meter, and recording thermometers for flue-gas temperature measurements.

These boilers will be set singly, in every instance with five-foot alleys between and arranged in four rows of five boilers each. Two rows, or ten boilers, will be piped to each of the two turbines. Each row of five boilers will be provided with one steel stack 12 feet in diameter at top, 19 feet in diameter at base, and extended to a height of 207 feet above the boiler-room floor line, the location of stacks being directly above the boilers, and their support being the heavy structural work of the building.

In the new station there will be two separate and distinct coal-storage bunkers, each having a capacity of 3,500 tons, and each bunker will be divided longitudinally into four sections by fireproof partitions to prevent the spread of any combustion which might occur.

From these bunkers the coal flows by gravity to the stoker hoppers through coal-feed pipes, which are supplied with cut-off valves conveniently located beneath the bunkers; the lower half of the coal pipe is arranged to swing clear of the path of the boiler tubes to facilitate the cleaning of tubes or their removal. Each boiler will be equipped with one ten-retort underfeed automatic stoker of the Taylor type with extension grate and automatic clinker crusher and feeder, the ashes dropping directly into ash hopper located immediately below the furnace.

For air supply to each furnace there will be provided one multivane blower driven by a 60-horsepower Terry steam turbine through a reduction gear of the Herringbone type. Turbine speed will be 3,600 revolutions per minute reduced to 510 revolutions per minute at the fan. Each blower will deliver 35,000 cubic feet of air per minute against a static pressure of five inches of water in the wind box. When operating under these conditions the water-rate guarantee of the turbine is not to exceed 28 pounds per brake-horsepower-hour.

The stokers under each group of five boilers will be driven from one line shaft by means of silent chain, and in turn the line shaft driven through a Reeves speed transmission, with speed ratio of 2:1, direct-connected by Herringbone gear to a 60-horsepower Terry steam turbine guaranteed not to exceed 30 pounds of water per brake-horsepower-hour. The flexibility of this arrangement is apparent, and will enable the boilers to be operated at ratings from 125 to 250-per-cent normal rating. Under conditions at which it is expected the new plant will operate, one of these stoker line shafts will be maintained at a constant speed determined by the most efficient boiler output as found by test. The speed of the other line shaft will be varied according to the load fluctuations which will occur, and in this manner maximum boiler plant efficiency will be secured.

Ash-Handling Facilities.

The wet-down ashes from the ash hoppers located directly beneath the furnaces will be drawn off into side-dumping tramway cars, which will be drawn by electric locomotives to an ash-pit located at rear of station building. Here they will be raised by an electric elevator and discharged into large storage bin of steel and concrete construction of 1,000 tons capacity. This bin will be arranged to discharge either into railroad cars or into large automobile ash trucks for removal of the ashes from the grounds. The final disposition of station ashes is one of the serious problems which today confronts all large steam central stations.

General Features.

A number of conveniences for employees will be incorporated in the new building, among which are a lunch room, a kitchen, a refrigerating plant for drinking water and storage of food, locker rooms with individual lockers for each man, shower baths and the usual sanitary lavoratory equipment.

A railroad siding will extend inside the plant within reach of a 150-ton station crane, thus furnishing excellent railroad facilities.

The plant which will house the world's largest generating unit will be modern in all its mechanical and the electrical details as no feature has been omitted which is recognized today as making for over-all plant economy and reliability, and many original features have been incorporated. The station as well as the generators will hence represent the trend of modern electrical progress.

◆

Chicago Electric Club Meeting.

At the meeting of the Electric Club of Chicago, on May 21, an address was made by J. Paul Goode, professor at the University of Chicago, on "Educating the Filipino." This was illustrated by an excellent collection of lantern slides.

At the conclusion of the talk, a vote of thanks to Professor Goode was passed and also a vote of thanks to the Chicago Telephone Company for supplying the stereopticon lantern at the meetings of the club during the current year.

◆

Utah Electric Club.

The first summer outing of the Utah Electric Club was held at Lehi, Saturday, May 16. The trip of 30 miles was made over the new Orem interurban electric line. The special train, in two sections, left at 1:30 in the afternoon. Two hundred and fifty members of the club enjoyed the outing, elaborate preparations for which had been made by the Entertainment Committee. The local electrical jobbers, retailers, contractors and central station companies closed their establishments at noon so that their employees could participate.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club, Thursday, May 21. The speaker of the day was Dean Byron Cummings, of the University of Utah, who told of the extensive explorations in southeastern Utah, principally in San Juan County, made under his direction by the University. The natural bridges to be found in this locality far exceed in magnitude and beauty those existing at any other known locality in the world, the largest having a span of 345 feet, and an arch of 241 feet in height.

The University exploration parties were able to find in some of these remote and practically inaccessible canyons the remains of large villages of cliff dwellers which had not been previously visited by white men. They were thus able to secure some of the most interesting works of the cliff dwellers that are available in this country.

◆

Reducing Electrical Accidents in Pennsylvania.

Much interest has been manifested among the officials of Pennsylvania electric power and light and electrical manufacturing plants over the recent declaration of John Price Jackson, the Pennsylvania Commissioner of Labor and Industry, that hereafter all accidents that prevent a person from working two or more days must be reported to the Department of Labor and Industry. After these accidents have been filed at the department they will be tabulated, classified and carefully studied. Where it is found that unusually dangerous conditions exist, measures will be taken to rectify the trouble. Thus, for instance, if a particular piece of apparatus in an electric shop, or plant, shows a great number of accidents, a study is made of the machine, and the users of the machine are instructed upon the best way to avoid accidents in the future through that cause.

Chicago Jovian League.

Fred R. Jenkins, secretary of the Chicago Central Station Institute, was the principal speaker at the meeting of the Chicago Jovian League on May 25. He outlined the work of the Institute which was established primarily to educate men for positions with the Insull group of properties but no contracts are made with students and they are free to obtain employment wherever they desire. Details of the courses were described and information given as to entrance requirements, studies, etc.

W. W. Winship, of Philadelphia, then spoke briefly endorsing the candidacy of Homer E. Niesz for Jupiter of the Jovian Order and pledging his support to the cause.

Thomas G. Grier, who is campaign manager for Mr. Niesz, outlined the activities that are planned for his committee.

◆

Lexington Jovian League's Meeting.

The Lexington (Ky.) Jovian League recently held its first luncheon at Hotel Phoenix, Lexington, Ky. Sidney G. Vigo of the Middle West Utilities Company, Chicago, Ill., was the guest of honor and chief speaker of the afternoon. The league's activities for the present will be devoted to the promotion of electric power in the great coal-mining and agriculture section of Kentucky, of which their city is the hub. Luncheons will be held on the second Tuesday of each month. A genuine "Kentucky Welcome" being extended to all traveling Jovians to stop over on the luncheon dates. The officers of the local league are: Professor W. E. Freeman, president; C. J. Eaton, statesman and vice-president; J. B. Fitzgerald, secretary-treasurer.

◆

Rejuvenation in Philadelphia.

The Philadelphia Jovian League will hold a mammoth rejuvenation during the convention of the National Electric Light Association in Philadelphia. The ceremony will take place at Willow Grove Park, on Tuesday, June 2, at 7:30 p. m. A number of awards will be made to the men securing the greatest number of candidates. These awards consist of solid gold rings, brooches, sleeve links and scarf pins. It is expected to inaugurate a record class. Statesman George L. Thompson, with the assistance of other league officers, is bending every effort to make this a memorable occasion.

◆

Copper Exports.

Exports of copper for the week ending May 21, totaled 8,585 tons; since May 1, 26,838 tons; same period last year 31,207 tons.

Philadelphia's Garage Service.

By R. L. Lloyd.

The electric garage situation in Philadelphia has, after a number of years of unrest, taken on a condition of satisfied contentment. The Electric Vehicle Association of America, has, through its Garage Committee and sub-committees, aided in bringing about a better understanding and unity of action among all parties concerned.

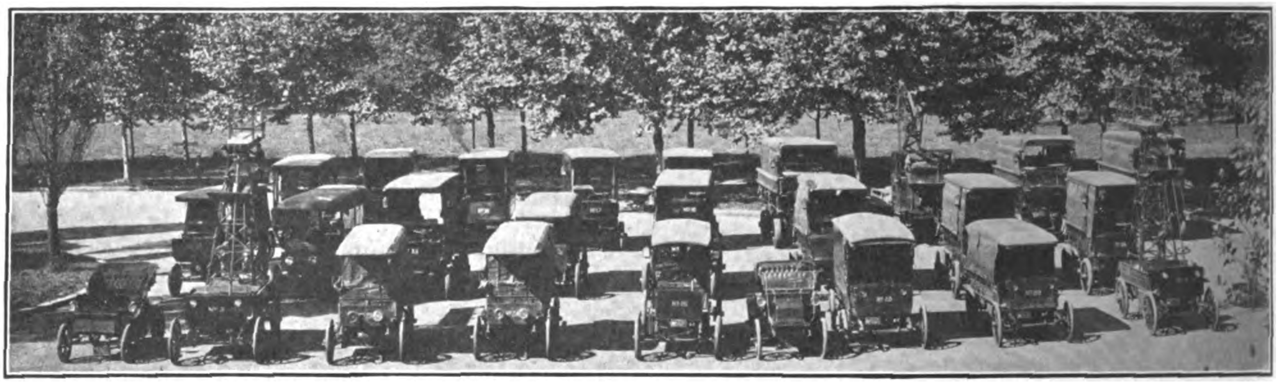


Fig. 1.—Part of Fleet of Philadelphia Electric Company.

Also, the Philadelphia Electric Company has issued a new contract rate for electricity used by the public garage, which enables the small garage to sell current at a low rate and thereby compete with the large garage and also with the owner who has his private charging apparatus.

The new contract referred to contains these paragraphs:

> "The current used as registered by the said meter or meters shall be paid for at the rate of six cents per 1,000 watt-hours, provided that the consumer agrees to conform to the following restrictions, viz: to use no current for charging purposes between the hours of 4 p. m. and 7 p. m. during the period between October 15 and March 15 succeeding, in any year, of the life of this contract and agreement without the written consent of the company, and the consumer agrees that the charge in each bill rendered shall be subject to a minimum payment of $5.00 per charging set for each and every month of the life of this contract and agreement.
>
> "The consumer further agrees that the rate to be charged all customers shall be not over six cents per 1,000 watt-hours, except that the consumer shall have the right to maintain a minimum of fifty cents per charge.
>
> "The company agrees to pay the consumer a commission (for the distribution and sale of its electric current, for the purposes specified herein) equivalent to 33⅓ per cent of the gross price to said consumer of the current delivered to him under this contract. Said commission shall be calculated on the monthly bills rendered to the consumer and shall be payable by the company: provided, however, that no commission shall be allowed or payable upon any bill unless the same has been paid in full by the consumer within ten days from presentation."

There are now in Philadelphia 20 public electric garages, most of which have adopted six cents per kilowatt-hour as the maximum rate for electric current. Some of these offer a sliding schedule, making the rate five cents when the net amount per month reaches $25, four cents similarly for $50, and three cents if $75 worth is used. This applies to business houses owning large trucks or several smaller ones.

The other schedule of charges for current sold to the garages by the Philadelphia Electric Company is its regular wholesale power rate, on which the scale descends below three cents per unit.

In addition to the 20 public garages referred to above, there are also a number of charging stations where current can be secured, but no garage facilities are offered. They are largely owned by the electric storage battery companies, the Philadelphia Electric Company, the United Gas Improvement Company and the agencies of the several electric cars. Arrangements

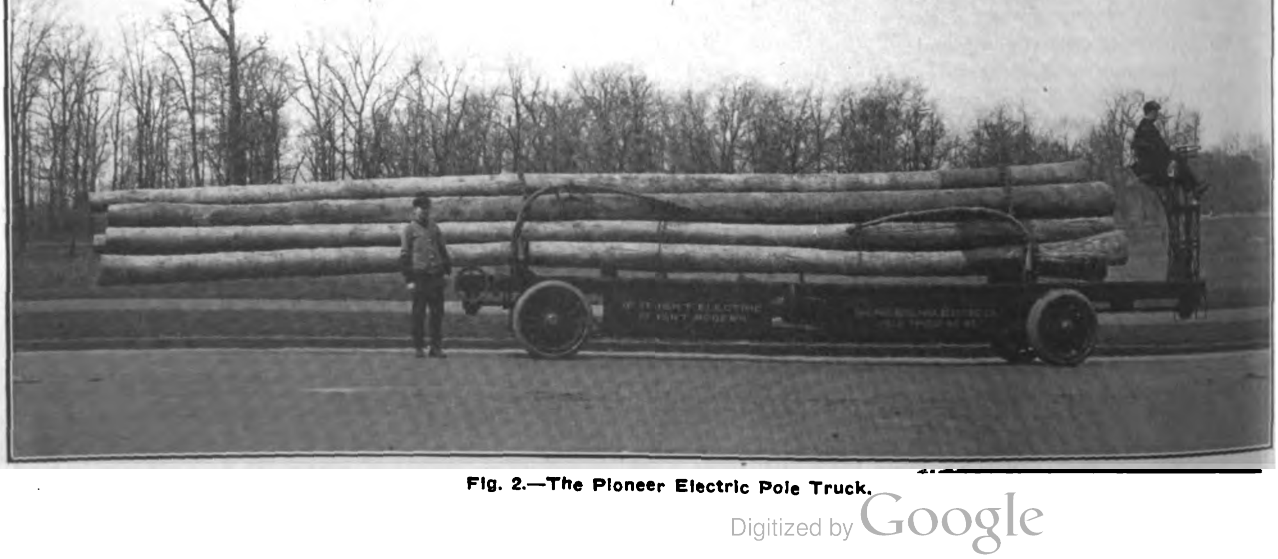
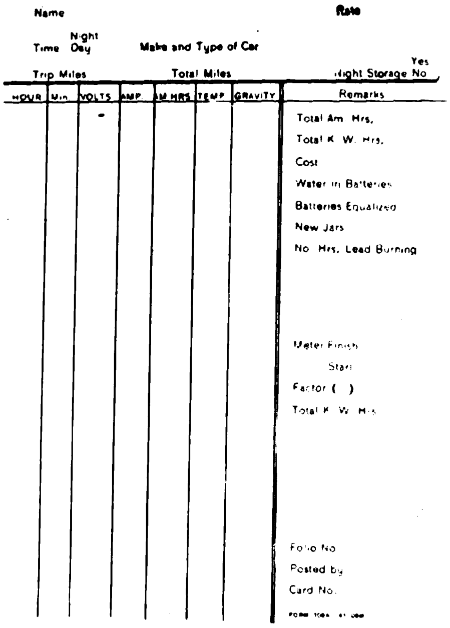


Fig. 2.—The Pioneer Electric Pole Truck.

are also being made to list the owners of private apparatus who signify their willingness to help out in time of need. This is being done by the local garage committee, which hopes to have the list ready for distribution at the time of the convention of the Electric Vehicle Association of America in October.

Probably the largest electric garage in Philadelphia is that of the Bartlett Garage's Inc., on Twenty-first Street, above Market Street, right in the heart of the city. It has a capacity for 150 cars and circuits for charging 33 of them at one time. A new panel has recently been installed for the purpose of giving a heavy boosting charge, lately becoming popular and necessary for the large Edison batteries in some trucks. This panel has a capacity of 150 amperes on each of three circuits.

A view of this garage is shown in Fig. 6 and of the battery room in Fig. 7. Mr. Bartlett has been a consistent booster of electric vehicles for a number of years and has probably sold more passenger cars than any other agent in this territory. About five years ago he became convinced that the best way to promote the use of electric cars was to provide ample and reliable facilities for their proper care. To that end he incorporated a company and built this "Woods Electric Garage." It took its name from the Woods electric passenger car, of which he was the Philadelphia agent. It is complete in every detail, having the main vehicle floor, a battery room, repair shop, store room, chauffeurs' rooms, sales offices and private offices for the officials.



Name Rate

Time Night Day Make and Type of Car

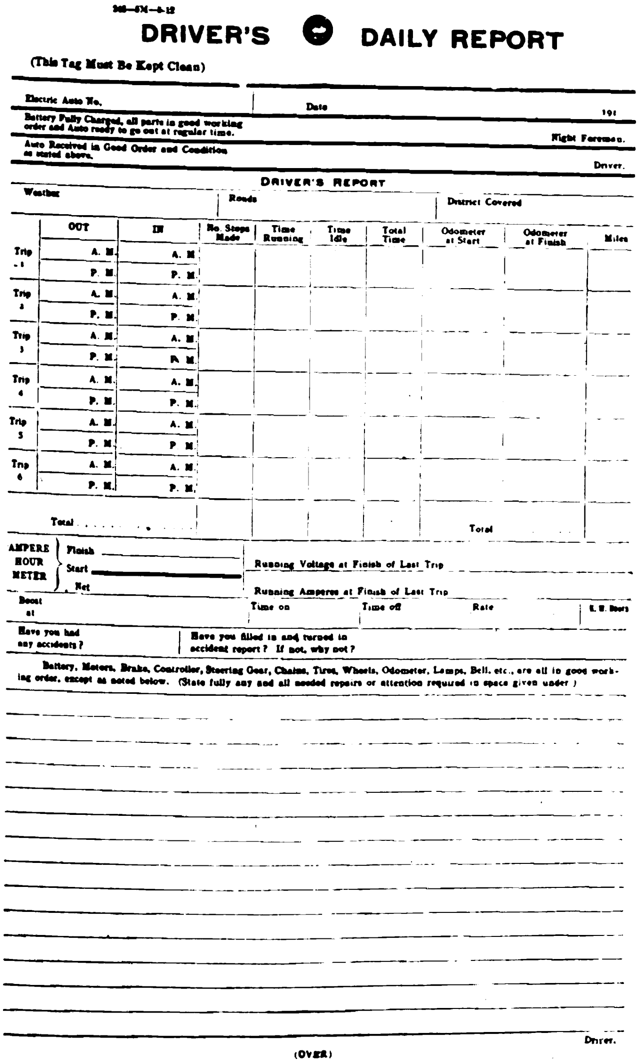
Trip Miles Total Miles Night Storage Yes No

HOUR	Min.	VOLTS	AMP.	AM HRS	TEMP	GRAVITY	Remarks
							Total Am. Hrs. Total K. W. Hrs. Cost Water in Batteries Batteries Equalized New Jars No. Hrs. Lead Burning Meter Finish Start Factor ( ) Total K. W. Hrs. Folio No. Posted by Card No.

Fig. 3.—Battery-Charging Record.

Business systems were adopted from the start. A set of 11 separate printed forms was prepared to keep all records properly and in order. Each car has a form for its daily history. When the battery is charged, the record is kept on the form shown in Fig. 3. If repairs are necessary, material is issued from the stock room only on the proper memorandum. Labor is recorded on the regular labor sheet and also on the work-order card. Cars ordered out have forms filled by the telephone operator and passed to the messengers, who enter time, distance, carfare, etc. Every car leaving the garage is recorded on a time clock and this system has been instrumental in preventing joy-riding. Purchase orders, shipping orders, cash vouchers, etc., in fact, every item, is systematically arranged for and carried on to the bookkeeper's ledger, so that at the end of a day any customer can be presented with a bill correct to date.

A corps of experts is engaged for the various departments, and day or night



300—6M—6-12

DRIVER'S DAILY REPORT

(This Tag Must Be Kept Clean)

Electric Auto No. Date 191

Battery Fully Charged, all parts in good working order and Auto ready to go out at regular time. Night Foreman.

Auto Received in Good Order and Condition as stated above. Driver.

DRIVER'S REPORT

Weather Roads District Covered

	OUT	IN	No. Stops Made	Time Running	Time Idle	Total Time	Odometer at Start	Odometer at Finish	Miles
Trip 1	A. M.	A. M.							
	P. M.	P. M.							
Trip 2	A. M.	A. M.							
	P. M.	P. M.							
Trip 3	A. M.	A. M.							
	P. M.	P. M.							
Trip 4	A. M.	A. M.							
	P. M.	P. M.							
Trip 5	A. M.	A. M.							
	P. M.	P. M.							
Trip 6	A. M.	A. M.							
	P. M.	P. M.							
Total							Total		

AMPERE HOUR METER Finish Start Net

Running Voltage at Finish of Last Trip

Running Amperes at Finish of Last Trip

Boost at Time on Time off Rate K. W. Hours

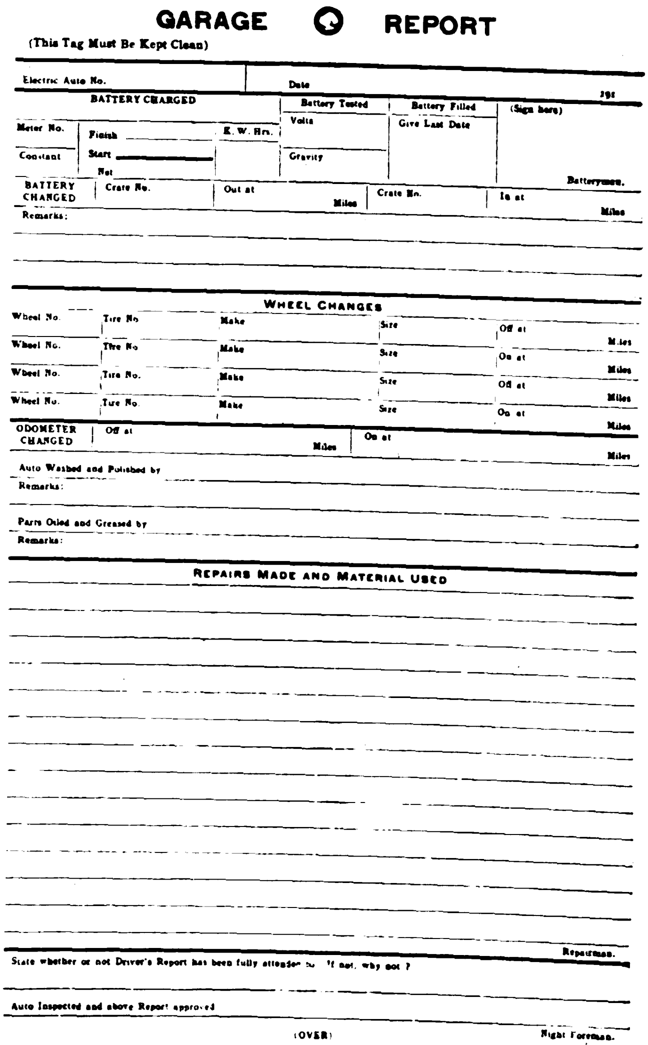
Have you had any accidents? Have you filled in and turned in accident report? If not, why not?

Battery, Motors, Brake, Controller, Steering Gear, Chains, Tires, Wheels, Odometer, Lamps, Bell, etc., are all in good working order, except as noted below. (State fully any and all needed repairs or attention required in space given under.)

Driver.

(OVER)

Fig. 4.—Driver's Report Blank.



GARAGE REPORT

(This Tag Must Be Kept Clean)

Electric Auto No. Date 191

BATTERY CHARGED Battery Tested Battery Filled (Sign here)

Meter No. Finish K. W. Hrs. Volts Give Last Date

Constant Start Gravity

Net Batteryman.

BATTERY CHANGED Crate No. Out at Miles Crate No. In at Miles

Remarks:

WHEEL CHANGES

Wheel No. Tire No. Make Size Off at Miles

Wheel No. Tire No. Make Size On at Miles

Wheel No. Tire No. Make Size Off at Miles

Wheel No. Tire No. Make Size On at Miles

ODOMETER CHANGED Off at Miles On at Miles

Auto Washed and Polished by

Remarks:

Parts Oiled and Greased by

Remarks:

REPAIRS MADE AND MATERIAL USED

Repairman.

State whether or not Driver's Report has been fully attended to. If not, why not?

Auto Inspected and above Report approved

(OVER) Night Foreman.

Fig. 5.—Garage Report Blank.

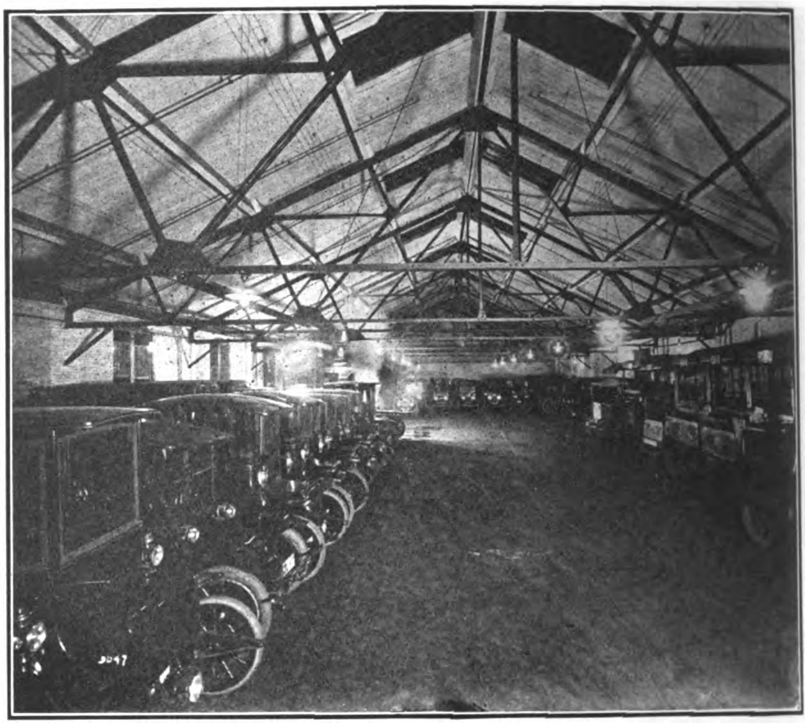


Fig. 6.—The Bartlett Electric Garage.

there is a responsible foreman in charge. At the present time some gasoline cars are also cared for, but these are to be removed when the capacity of the garage is reached with all electric vehicles.

The Wanamaker Garage, the Park Garage and the Regent Garage are other large electric houses catering almost exclusively to passenger cars. There are in this territory about 275 passenger cars, about 75 of which are cared for on their owners' premises.

The method of charge universally adopted in the public garages here is to make a storage or space charge for either active or dead cars and pay for all current used at so much per kilowatt-hour. The latter amount is either read directly from a meter or calculated by half-hourly readings of the ampere output. This makes a much more satisfactory service than the flat rate, including current, adpoted in some cities. The latter encourages extravagance and leads to careless charging. For if a user knows that, irrespective of how he drives his car, good roads or bad, uphill or down, the expense will be the same, there will be no incentive to economy or careful driving. The garage man must strike an average or else make his charge to cover the extravagant user, and hence some car owners will be paying for more than they get. The garage man also knows that the more current he puts in a battery, the less is his profit on that car, so his tendency is to give undercharges, or to put it more mildly, to give the soaking charge less frequently. The result is lower battery efficiency and shorter life.

In the Philadelphia method each user pays according to his current consumption; he will use care in his driving and give instructions to have the battery charged only when needed, and the garage man will see to it that the soaking charges are given when necessary. Their interests become more nearly mutual and higher efficiency results.

The main garage of the Philadelphia Electric Company, shown in Fig. 8, is at 1208 North Thirty-first Street. Here are cared for nightly most of its fleet of 43 electric cars. The equipment consists of two motor-generators, 125 volts each, one of 120 kilowatts and the other of 30 kilowatts, making a total capacity of 1,200 amperes. There are 36 charging outlets equipped with rheostats, giving a range of 0 to 200 amperes.

When the fleet of electrics outgrew the capacity of this garage, a second depot was arranged for three blocks above. Here a 75-kilowatt motor-generator was installed, equipped with six charging outlets of 50 amperes capacity each. The seven tower wagons and the pole truck are charged here.

Very complete records are kept of each car, wheel, tire, battery and motor, so that it is possible to tell to a penny each item of expense properly chargeable against any vehicle. Each vehicle is numbered and each morning a tag headed "Driver's Daily Report" (see Fig. 4) is attached. The report must be turned in at the end of the day, stating the time running and idle, miles, ampere-hours used, condition of equipment, roads, boosts, etc.—in fact, a day's history. On the reverse of this tag is the "Garage Report" which is similarly for a record of treatment over night and is filled in by the garage attendant and certified to by the forearm (see Fig. 5). These tags are, the next day, turned in to the record keeper, who has one page in a ledger for a month's record of each car. Columns are reserved for name of driver, meter readings, kilo-

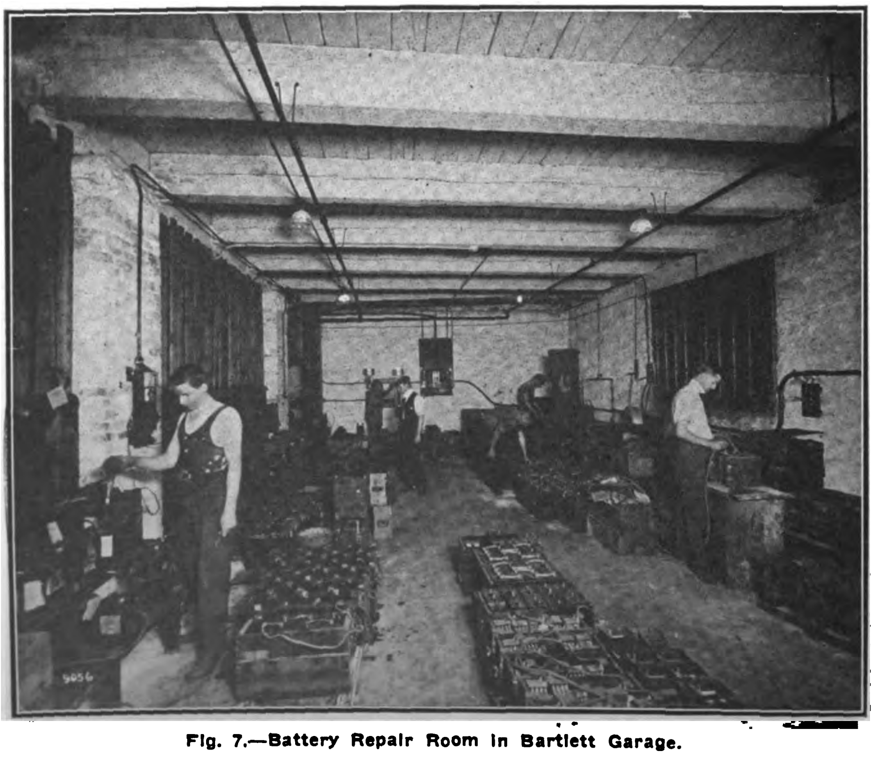


Fig. 7.—Battery Repair Room in Bartlett Garage.

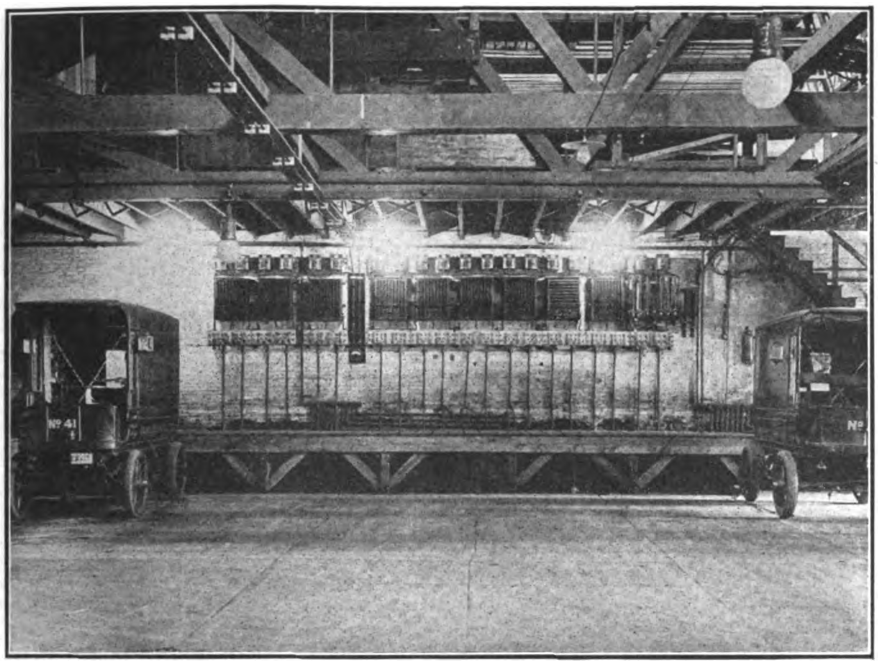


Fig. 8.—Garage of Philadelphia Electric Company.

watt-hours, ampere-hours, miles per trip and per day, time, time per trip, time per day in use, number of stops, remarks, etc. At the bottom are totals for the month.

Following are statistics taken from some of these records:

Data covered a period of 24 months, on 11 one-ton trucks purchased in 1905:

Average number days in service per month	24
Average number of miles traveled per month	409
Average kilowatt-hours supplied	488.9
Average kilowatt-hours per mile	1.21

Data on 2 three-ton trucks covering 18 months, equipped with batteries of 216 ampere-hour capacity; trucks five years old:

Average number days in service per month	23
Average miles per month	207
Average kilowatt-hours per month	433.1
Average kilowatt-hour per mile	2.14

Very much more complete and detailed data can be, and are, secured from these records. The above are given merely as examples.

The electric pole truck shown in Fig. 2 is the first of its kind and illustrates Philadelphia's progressiveness.

◆

The Electrolysis of Peat.

Electrical processes have been applied to the fixation of nitrogen from the air for use as a fertilizer, and such processes are commercially carried on in Norway. Another method of obtaining nitrates for this purpose by electrical means is to apply the current directly to deposits of peat, the electrolysis of which furnishes nitric acid.

This process has been perfected by Albert Nodon in France. Peat usually contains about two per cent of nitrogen. After this has become fixed by the simultaneous action of nitric ferments, oxygen, and water (aided by the heat developed by the passage of an electric current) it may be separated by electrolysis, nitric acid appearing at the anode and lime at the cathode.

The operation is carried on by installing porous pots filled with coke directly in the peat deposits. The coke forms the anode and is saturated with a weak solution of nitric acid. A pipe is provided for pumping out the liquid when it has become strongly saturated with the nitric acid, which is then replaced with water. The cathode consists of iron rods sunk into the deposits in rows at a distance of 18 inches from the anode pots. Quantities of these anodes and cathodes are arranged for parallel series operation upon a direct-current circuit. It is found that one gram of nitric acid is produced for one ampere-hour, about 10 volts being used. This is equivalent to 190 kilowatt-hours per 1,000 pounds.

◆

Conductivity of Aluminum.

The conductivity of commercial aluminum is subject to considerable variations due to small quantities of impurities and to the mechanical treatment which it has received. Aluminum which is 99 per cent pure may have differences of 15 per cent in conductivity. This is largely due to the mechanical treatment and the material of poor conductivity can be improved by annealing, often to the extent of 10 per cent. Experiments demonstrating this were carried out by H. Gewecke and described in the *Zeitschrift des Vereines Deutcher Ingenieure.*

Annealing, however, causes loss of mechanical strength and is sometimes objectionable on this account. It may also result in a permanent set being given to sheet metal. The effect of the heat treatment was found to increase with the time and with the temperature to which the metal was subjected, temperatures from 160 to 270 degrees centigrade being used. Improvement is always obtained in metal which has been rolled at too low temperature, but where the metal has been properly heated during the rolling process the conductivity will not be much improved by the annealing process.

Wire can be handled in a manner similar to the sheet metal, but the loss of mechanical strength is usually more serious. The strength was in some cases reduced as much as 35 per cent.

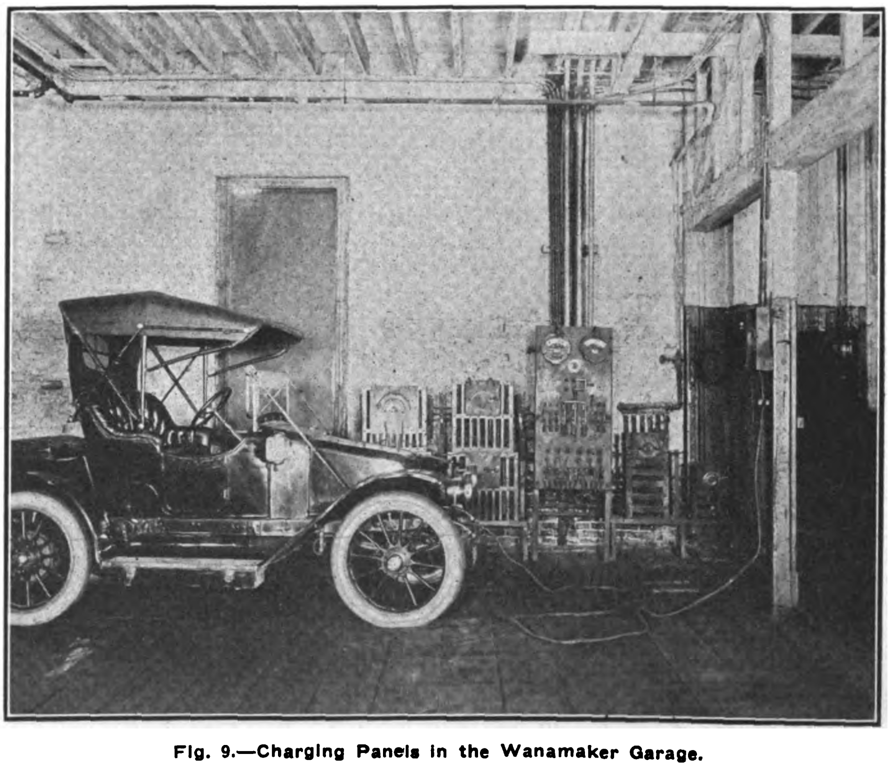


Fig. 9.—Charging Panels in the Wanamaker Garage.

Missouri Electric, Gas, Street Railway and Waterworks Association.

St. Louis-Keokuk Convention Cruise, May 20-23.

The eighth annual convention of the Missouri Electric, Gas, Street Railway & Waterworks Association, which was held on the last three days of last week, was unique in the annals of the Association, both on account of its pleasant nature and its complete success. The convention was happily combined with a special excursion on the steamer *Quincy* from St. Louis, Mo., to Keokuk, Iowa, and return. Nearly 225 members and guests made the trip up and down the Mississippi River.

At 10:35 a. m. Thursday the steamer left its dock at the Eads Bridge, St. Louis, and arrived at the dock in Keokuk shortly after noon on Friday. Here officials of the Mississippi River Power Company and of the city of Keokuk were taken on board. The steamer then passed through the lock and continued several miles up Lake Cooper, which has replaced the former DesMoines Rapids. Returning, the entire party was landed at the power house where an inspection of the entire hydroelectric plant, including the dam, was made. After a number of entertainment features, the steamer left Keokuk at midnight on Friday, stopping on the return trip at 5 a. m. Saturday for about two hours near Hannibal, Mo., where the early risers made a short trip inland to view the celebrated Mark Twain Cave. The steamer returned to St. Louis at 5:45 p. m. Saturday.

The first of the three convention sessions was opened in the cabin of the steamer on Thursday afternoon by Acting President A. C. Einstein. A communication was read from Governor Elliot W. Major, of Missouri, expressing his regret at not being able to join the trip as he expected. Other telegrams were presented from J. E. Harsh, who had been elected president of the Association at the last convention but subsequently retired from office, and from H. B. Shaw, of the Missouri Public Service Commission. Mayor Henry W. Kiel of St. Louis, who accompanied the party on the entire trip, made a friendly address thanking the Association for the kind invitation to be its guest and also bespeaking cordial relations between the utilities and the public.

J. D. Bowles, of the engineering staff of the Missouri Public Service Commission, read letters from J. M. Atkinson, one of the commissioners, and J. C. McShane, of its accounting staff. These thanked the Association for the aid rendered by its Accounting Committee in the consideration and drafting of the standard classification of utility accounts which would soon be promulgated, also for the valuable publicity work done by the Association's officers and representatives in explaining the Missouri public service law and the work of the Commission to the utilities of the state.

President's Address.

Mr. Einstein then presented the annual presidential address. He spoke first of the objects of the Association and of the present trip. Since both President Harsh and Vice-president Clary resigned their respective offices during the past year on account of leaving Missouri, he had been chosen acting president, for as second vice-president he was next in line of succession; since February he had tried to direct the activities of the Association as its presiding officer. He dwelt on the need of all Missouri utilities keeping in close touch with the work of the Missouri Public Service Commission, particularly at the present time while the classification of accounts to be finally approved was still under discussion. He called attention to the important work accomplished by the Association's Accounting Committee, whose reports had been given careful consideration by the Commission. Touching on other activities of the organization, he pointed out that the Association had grown both in strength and in influence. He suggested that a Committee on Public Affairs be chosen. There should also be taken up as a help to the small utilities especially, an effort to systematize the forms of rate schedules. Mr. Einstein commended the work of the Association's special representative, John C. Hall, in increasing the membership of the body and the knowledge of its aims and work. The joint use of poles should be given further careful study, since local conditions may make it difficult to follow the National Electric Light Association's 1911 report on this matter, which is the standard at the present time. A workmen's compensation law should be enacted in Missouri and the "Safety First" movement should be encouraged by all the utilities. Finally, touching on the internal affairs of the Association, he recommended that the revision of its constitution and by-laws, which would be brought up at the convention, should be carefully considered in order to make these fully up to date. He also recommended that the Association be incorporated.

The convention then went into executive session to consider business matters relating more particularly to the Association. The report of the Executive Committee was presented by Herman Spoehrer, St. Louis. F. D. Beardslee, St. Louis, then presented his annual report as secretary-treasurer. Mr. Spoehrer also presented the report of a special committee of the Association. The subject of the revision of the constitution and by-laws was then brought up and after thorough discussion and many suggestions for amendments was referred to a special committee for further consideration and report at a subsequent session.

The Indeterminate Permit.

A paper entitled "Complete Regulation Under the Indeterminate Permit" was then presented by William J. Norton, of Chicago. In this paper Mr. Norton pointed out first that when utilities are subject to commission regulation and to the restrictions imposed thereby they should be granted some compensating features which are needed in order to make the regulation complete. He strongly advocated the granting of indeterminate franchises, pointing out that since this is not now permitted by the Missouri law, regulation in that state is still incomplete. Mr. Norton then cited the state of Massachusetts as being the first to grant indeterminate franchises to street-railway companies. This type of franchise has been adopted by the Federal Government in most of its recent grants to public-service corporations under its immediate jurisdiction. He then dwelt at length on the practice in Wisconsin. He quoted from the Wisconsin law on this matter, showing how in the later revision thereof the indeterminate franchise was made mandatory throughout the state; public utilities surrendered their former franchises and received in lieu thereof indeterminate permits. The legality of this procedure has not been questioned in the courts. The indeterminate permit is also in force in Indiana, New York, Pennsylvania and Maryland, in each of these states the Commission requiring both private and municipal utilities to secure a certificate of public convenience and necessity before beginning operations. In Arizona, California, Colorado, Idaho, Illinois, Kansas, Maine, Michigan, Missouri, New Hampshire and New Jersey this protection is granted against the competition of private utility companies only. No provision at all is made for such protection in the utility laws of Georgia, Oklahoma, Connecticut, Montana, Nevada and Rhode Island; the Vermont law states specifically that competition must not be restricted. Mr.

Norton dwelt also on the constitutional or legislative restrictions in some states limiting the franchise terms to various periods up to 50 years. In the state of Michigan this matter is now before the courts. Mr. Norton said that the reasonableness of the indeterminate permit is being better appreciated in many quarters. Public utilities are coming to be looked upon as natural monopolies, which while regulated must also be protected from competition and unnecessary risks to the capital invested. Those commissions which do not have the right to grant this type of permit are in many cases realizing the disadvantages of their limitation. He pointed out the undesirable features of the short-term franchise, among which are that it hinders financing of the utility, hampers its desire for additions and betterments to the property, forces it frequently into local politics in order to secure renewal of franchises without arbitrary restrictions, etc.

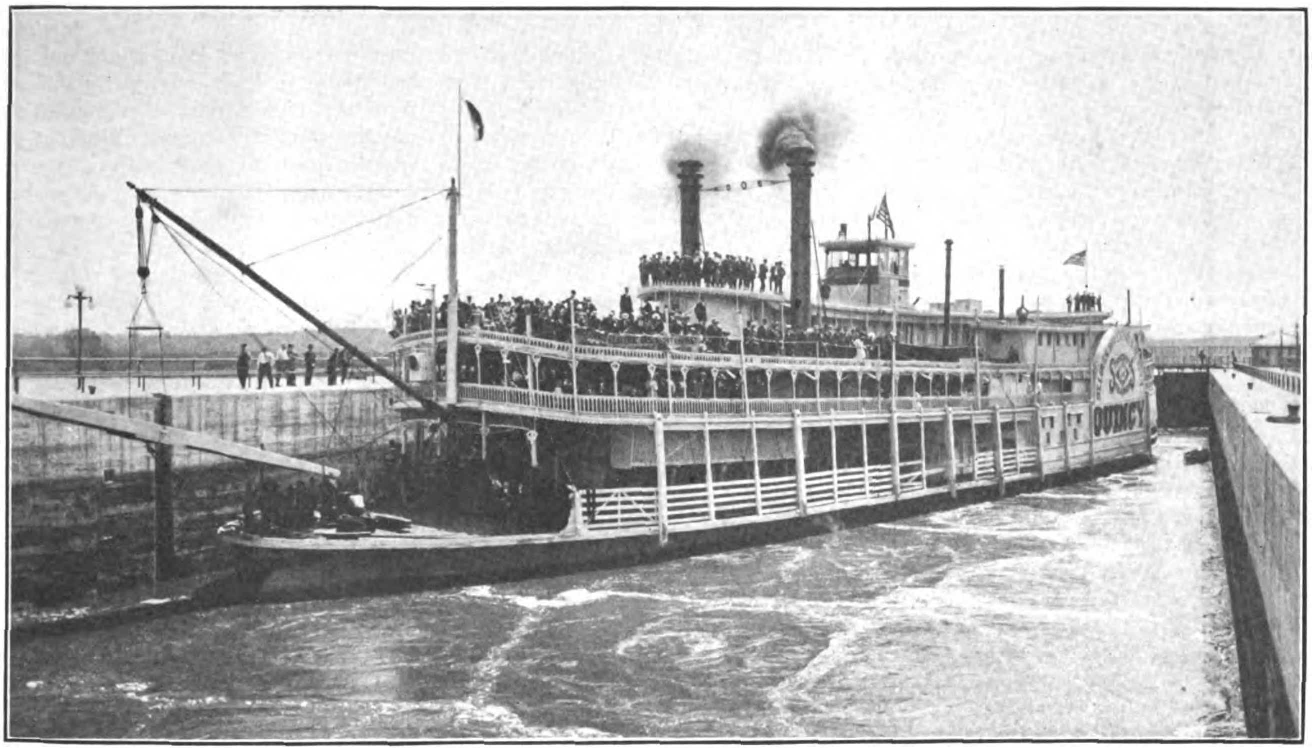
The discussion of this subject consisted chiefly in questions to which Mr. Norton replied. He said that municipal ownership is on the part of many almost like a religious belief; the trend toward municipal ownership has been largely due to the ill effects of the short-term franchise with its hampering of the utility in the giving of good and adequate service. Fortunately the advantages of the indeterminate franchise are becoming better understood and Mr. Norton believes that nearly all the states in the Middle West will grant indeterminate franchises within possibly 10 years. I. R. Kelso brought out that the constitution of Missouri does not prohibit the indeterminate permit, but does prohibit perpetual franchises. In the state of Michigan, Mr. Norton said a similar provision has been overcome by the day-to-day permit. The difference in the requirements of the utility laws in the different states respecting the duration of franchises and the competition of utilities was also touched on.

A paper was then presented by John C. Hall, who had during a part of the last year acted as the special representative of the Association in visiting the utilities in nearly all parts of the state. The title of this paper was "Visits to Member Companies and Others." In the smaller cities, particularly, Mr. Hall found considerable ignorance on the part of utility managers respecting the requirements of the public service commission law. He therefore explained the functions of the Commission and the various requirements of the law in considerable detail to these utilities. Mr. Hall visited 52 utility plants, of whom 25 were not members of the Association. Of the latter he had during the trip and subsequently secured membership applications from 24. He called attention, however, to the fact that since there are 221 utility companies furnishing electric, gas, street railway and water service in the state, about two-thirds are not yet members of the Association. He therefore urged the members to co-operate in extending the knowledge and work of the Association among the smaller plants that have not yet understood these matters.

P. J. Kealy, Kansas City, reported briefly on the work of the Association's special Accounting Committee, which has been actively conducted within the last two months. This work is not yet concluded, however. The classification of accounts originally announced by the Missouri Commission was considered disadvantageous in a number of particulars, one being in its treatment of the depreciation reserve; another the requirement that even small companies shall maintain as complete accounts as the larger utilities, which evidently is a hardship. The committee's study of the matter has enabled it to complete a tentative draft of accounts for gas and electric utilities. In general, this is quite similar to the standard accounts recommended by the National Electric Light Association. Mr. Kealy was glad that the committee had secured the cordial co-operation of Mr. McShane, of the Commission's accounting staff, and he believed that the final accounting system to be adopted in the near future will be fair alike to the small as well as the large companies.

President Einstein explained further about the detailed steps taken by the Association and its Accounting Committee in regard to this matter, calling attention to the special meetings held by the Association and its committee, which have already been mentioned in these columns. On motion it was decided to continue the committee.

C. H. Jaccard, Webb City, then presented a paper entitled "Meters versus Flat Rates for Water Works." He explained the systems by which rates are determined on the usual flat-rate basis which is always more or less arbitrary and apt to impose hardship on a very large number of consumers. He strongly


Missouri Convention Steamer Being Raised in Keokuk Lock.

advocated the meter system and showed many of its advantages.

Revision of Constitution and By-Laws.

On Friday morning the session opened at 9:15 o'clock, the first subject taken up being the report of the Committee on Revision of Constitution and By-Laws. The main features of the revision adopted were as follows: The name of the Association was recommended to be changed to the Missouri Public Utilities Association, this being both on account of its more compact and yet more general title. Five classes of membership are provided for. Class A consists of member companies or firms operating privately owned electric light, electric railway, gas or waterworks plants; Class B members are officers or employees of Class A members; Class C members are firms or companies engaged in the manufacture or sale of supplies for utility companies or otherwise interested in the utility business; Class D are officers and employees of Class C members; Class E, which are practically honorary members, are those noted for their scientific or practical knowledge of the utility business. As finally amended the annual dues of Class A members are $5 for companies operating in cities or towns of 5,000 or under in population; $10 in towns from 5,000 to 15,000 population; $15 in towns from 15,000 to 50,000 population; one two-hundred-fortieth of one per cent of the annual gross revenues of companies operating in towns having a population in excess of over 50,000, but in no case are the dues of these companies to be less than $15, nor more than $250.

The report of the Finance Committee was approved and a Resolutions Committee composed of Messrs. Kelso, Scott and Gallagher was appointed; also a Nominating Committee composed of Messrs. Irvine, Wallace and Elbert.

A paper was then presented by F. M. Wilkes, of Poplar Bluff. This was entitled "A Trip Through the Small Power Plant," and recorded the disclosures made when the manager of the plant made an inspection through it with the president of the company. A great many sources of poor efficiency, lack of economy and even careless losses were pointed out to the manager, who had been accustomed to regard them as such matters of fact that he did not appreciate their importance. Among these features were serious leaks in the steam pipe lines, uneconomical method of firing boilers, poor arrangement of pumps, belts operating too tight, accumulation of dirt and rubbish behind the switchboard, etc. As a result of this visit, these conditions were not only remedied, but the attention of the manager directed to other features in themselves small but in the aggregate amounting to serious defects in plant operation.

S. H. Wallace, Webster Groves, then presented a paper entitled "High-Pressure Gas Distribution and Its Advantages." This paper dwelt on the growing tendency of artificial-gas companies using pressures of five pounds and more on their main distributing lines. Great economy in initial equipment and in other ways has been achieved similar to the high-tension transmission in electrical systems.

P. J. Kealy then spoke further concerning the work of the Accounting Committee, of which he was chairman, and the recommendations it has made regarding the handling of depreciation reserve.

Electric Signs.

The Friday session was concluded by the presentation of a short paper by F. T. Hopkins, St. Louis representative of the Thomas Cusack Company. The title of this paper was "Electric Advertising." Just as electric light is no longer a luxury but has become a necessity, so electrical advertising has made similar advances. Mr. Hopkins pointed out the great progress in the design and use of electric signs within the last few years. A few years ago the Commonwealth Edison Company had only six illuminated bulletin boards; now it has about 1,000 in service in Chicago. Similar conditions exist in most of the large cities. The smaller cities, while somewhat reluctant to take up the exploitation of electric signs, have in many cases realized the value of this sort of publicity. He urged all electric companies to make active efforts to push the use of electric signs. These are valuable sources of revenue. The electric company can secure the best results by co-operation with the sign manufacturer. Electric signs are an indication of a thoroughly up-to-date town and no matter how small the community may be the company should at least use a sign on its own premises.

In the discussion, F. A. Kehl, St. Louis, dwelt on the advantages of electric signs to the central station. This comes from not only the sale of the current for lighting, but a considerable source of revenue can also be derived from the maintenance of the sign. Since an electric sign nearly always brings about a more liberal window lighting, it is the means of selling additional current. Furthermore, the sign is a general booster of things electrical. Mr. Porter, St. Joseph, spoke of a new-business campaign started there last year, as the result of one feature of which there are now some 12,800 10-candlepower lamps used in signs. There has also been secured as a result of these additional signs much new window lighting. Many new prospects have been secured by the continuous and systematic canvass and advertising carried on by the utility company. About 1,400 houses were wired for electric service last year. Mr. Porter advocated using high-class signs, both to give a good aspect to the street and also to reduce the maintenance cost and on the whole to give the best result to the merchant. Animated signs are doubtless the best. By using a patrol system for controlling the sign and window circuits it is possible to give low flat rates for this service. Mr. Kehl said that time switches have come into considerable use in St. Louis for controlling sign and window lighting.

F. D. Beardslee, St. Louis, said that the greatest need for development of signs is in the small towns, since the larger cities many years ago became alive to the advantages of sign lighting. He advocated that the small companies get in touch with the sign manufacturers, rent signs from them and then rent these to their customers; this permits the installation of signs without much capital investment. While at first sight a sign may seem useless in a very small town, it has nevertheless been found that anything that popularizes electric service pays liberally. The company should use an electric sign on its office at least and also, if possible, on its plant. He called attention to the large sign at the Twelfth Street office of the Union Electric Light & Power Company, St. Louis.

Standards of Service.

The last session of the convention opened at 9:30 a. m. Saturday. J. D. Bowles, of the engineering staff of the Missouri Public Service Commission, read a short paper calling attention to some opportunities for co-operation between Missouri utilities and the Commission as to standards of service, safety rules, etc. The public service law provides that there shall be regulation of the service and that standards of service should be adopted. Although nothing definite as yet has been done in this line, the Commission is prepared soon to make rules and regulations covering gas, electric and water plants. The standards of electric service will touch on the voltage regulation, testing of meters, recording of time of starting and stopping of principal units, recording of total output of stations, information to be supplied by companies respecting the service, data to appear on bills, etc. Tentative rules on these matters will probably be issued within the next six weeks or shortly after the code of classified accounts will have been completed. Some time after that a public hearing will be held at which the tentative rules will be discussed before final adoption. Mr. Bowles suggested that the Association take up for consideration scientific rate schedules, especially for the smaller plants. Other matters worthy of consideration are clearances of overhead lines at crossings and the joint use of pole lines.

President Einstein suggested an early meeting of member companies to discuss and draft suitable rules of standards of service. On motion it was decided to carry out this plan.

A paper entitled "Employees Welfare" was presented by Hermann Spoehrer, St. Louis. This dealt especially with the work along this line carried out by the Union Electric Light & Power Company, St. Louis. Among the welfare activities are: Employees' Benefit Association, to which equal contributions are made by the company and employees; a loan fund; educational classes for the commercial, power and lighting and isolated-plant solicitors; a company bulletin circulated among the employees; a company section of the National Electric Light Association; athletic teams and contests; interdepartmental advancement; a library for employees; safety committees; bonus plan. All of these features were described in detail in the paper.

Election of Officers.

In the executive session, into which the convention then resolved itself, P. J. Kealy suggested a further amendment to the by-laws regarding membership dues, which has already been noted above. The report of the Nominating Committee was then presented and unanimously adopted, the officers for the ensuing year being elected as follows:

President, A. C. Einstein, St. Louis.

First vice-president, G. E. Hayler, Joplin.

Second vice-president, J. R. Woodfill, Aurora.

Third vice-president, Hugo Wurdack, St. Louis.

Secretary-treasurer, F. D. Beardslee, St. Louis.

Executive Committee: J. H. Van Brunt, St. Joseph; J. M. Scott, Kansas City. The hold-over members of this committee are H. Spoehrer, St. Louis, and S. W. Henderson, Excelsior Springs.

Public Affairs Committee: P. J. Kealy, Kansas City; C. C. Barnard, Marshall; E. R. Lackey, Mexico; S. D. Kelsey, Brookfield; Richard McCullough, St. Louis; A. Harbut, Kansas City; S. E. Bronson, Ozark.

A short discussion followed relative to the meeting place for the next annual convention. After many suggestions had been made the matter was left to the Executive Committee.

The report of the Resolutions Committee was then presented by Mr. Kelso. The resolutions adopted expressed the pleasure of the Association in the participation by Mayor Kiel and other St. Louis officials in the trip; thanked those who had been responsible for the success of the convention, particularly the Mississippi River Power Company for its hospitality; it was also urged that further co-operation be undertaken by the Association's Accounting Committee and the Missouri Commission respecting the classification of accounts; a consideration of service standards was also urged.

President Einstein closed the convention by making a brief address, thanking the Association for the honor conferred upon him by his formal election to the presidency and urging the hearty co-operation of all members in furthering the work of the Association.

Entertainment.

Throughout the trip there were almost no end of entertainment features. Both professional and amateur entertainers helped to pass away the time on the boat. During the convention sessions the ladies engaged in card games, word and guessing contests, for which numerous prizes in the form of electric heating and cooking appliances had been donated by several electrical manufacturers. On Friday afternoon, following the inspection of the hydroelectric plant, most of the gentlemen in the party were taken by street car to the city ball park to witness a game between the Keokuk and Burlington teams. The ladies were given an automobile ride through Keokuk and its environs. The Association was then tendered a dinner by the Mississippi River Power Company. After the dinner, numerous speeches were made, Judge Logan, of Keokuk, acting as toastmaster. Among the speakers were J. A. Trawick, manager of the Mississippi River Power Company; Mayor Kiel of St. Louis; Mayor Moorhead of Keokuk; President Einstein of the Association; R. McCullough, president of the United Railways Company, St. Louis; Montgomery Meigs, United States Government engineer at Keokuk, and several other members of the Association, engineers, local celebrities, etc.

New Central-Station Engine Wrecked.

Much excitement was caused recently at the plant of the Borough Electric Light Company, of Chambersburg, Pa., when a defective pedestal bearing caused the wreck of the large Frick engine. The big engine had not yet been used and was just undergoing a test. It had only been running fifteen minutes when the accident occurred. Consulting Engineer A. C. Woods, Superintendent Mowrey and Charles Frey were standing at the cylinder head of the compound engine and very narrowly escaped injury. The damage done is estimated to be about $3,000.

Two electrically driven pumps will be installed in the city water works at Dayton, O. Each will have a capacity of 3,500 gallons per minute.

Annual Convention of Oklahoma Association.

The third annual convention of the Gas, Electric and Street Railway Association of Oklahoma was held on May 13, 14 and 15, at Oklahoma City. The convention was called to order on Wednesday afternoon by F. E. Bowman, of Ada, president of the Association. An address of welcome was given by Judge Johnson, city counselor of Oklahoma City. Following this the president made an address outlining some of the present conditions of business in Oklahoma and some of the benefits to be derived from such associations as this.

Burton French, engineer to the Public Service Company of Oklahoma, presented a paper on the "Grounding of Secondaries," in which he urged that the general effects of grounding secondaries were benefical in regard to property as well as to life.

The next paper was by A. P. Little, associate professor of electrical engineering at the Agricultural and Mechanical College in which he urged strongly the encouragement of the use of motors in all sorts of industrial establishments as a means of increasing the day load.

F. W. Insull, of the Public Service Company of Oklahoma, tried to find out what was the best way to convince a prospective customer that motor drive is on the whole more economical than steam or gasoline-engine drive. He stated that the figures which he gave and which he knew to be correct were not believed nor given credit by the prospective customer, who always claimed that he could produce his power for about three-fourths the cost of electric power. It was advised that the central station might be able to induce prospective customers to submit their figures to a disinterested engineer. The objection to that plan is that many engineers would recommend that which would bring them the greatest return, irrespective of the real merits in the case; also, there are some jobs which seem too small to ask the opinion of an outside professional man.

On Wednesday evening a smoker was held at the Folly Theater in Oklahoma City, at which smoker the members were entertained by music by the University Four quartet, from the University of Oklahoma, and by motion pictures of the General Electric Company, showing the electric control of Panama Canal, and the House Electric.

Thursday morning's session was opened with an illustrated paper on "Telegraph Poles," by C. H. Talmage, sales manager of the Kansas City office of the Western Electric Company. This paper drew a very clear portrayal of the method of getting poles in from the lumber region and of latter treatment of the poles in order to give them the greatest possible life.

The second paper was by R. H. Lyon, of the Holophane Works. Mr. Lyon had a complete equipment demonstrating different sorts of shades and reflectors, which made his talk doubly interesting.

The session adjourned and as guests of the Oklahoma Railway Company took a special car to Norman, Okla., where lunch, which was specially prepared for the convention, was served. The guests then repaired to the Engineering Building of the University of Oklahoma, where the convention picture was taken and the afternoon session was held.

At this session a paper on the "Indeterminate Permit and the Proper Control of Competition," by W. J. Norton, of Chicago, was presented. Mr. Norton gave the history of the indeterminate permit and showed its effect upon public utilities. Considerable discussion followed on this paper, centering around the question of placing municipally owned and operated utilities under the control of the Commission. Mr. Cooper, of Weatherford, was of the opinon that the municipal plants should be left to run their own affairs, but his fellow municipal representative, W. E. Blackwell, of Afton, spoke as being very strong for Commission control.

The other paper of the afternoon was by L. W. W. Morrow, assistant professor of electrical engineering at the University of Oklahoma, who spoke on "Rates and Revenues in Oklahoma." A part of his paper follows:

> The private and corporation controlled electric plants of Oklahoma have an installed capacity of 31,912 kilowatts, varying from 30 to 6,610 kilowatts. The total receipts of 59 plants during 1913 were $2,972,918; expenses were $2,058,530; leaving a balance of $914,388, or a ratio of receipts to expenses of $1.45. The municipal electric plants of Oklahoma have an installed capacity of 6,855 kilowatts, ranging from 50 to 375 kilowatts. The total receipts of six municipal plants were $79,768; expenses $59,673, leaving a balance of $20,095, or a ratio of receipts to expenses of $2.98. These data are insufficient for comparative purposes. It is not within the province of this paper to advocate methods of accounting, operating or management, but rather to present present conditions in Oklahoma and attempt to compile data by which the companies may be compared as to ratio and revenues. It is evident that the electric companies are not becoming wealthy rapidly, and whether the fault lies in rates or in expenses is the problem for each company to decide.

The rest of the afternoon was spent in watching a ball game at the University, inspecting the building, laboratories, and the new power plant of the University and inspecting the newly installed Diesel engine of the Norman Milling and Grain Company. Return to Oklahoma City was by special car at 6:30 p. m.

The evening was spent at the annual banquet at the Lee Huckins Hotel. The principal address at this banquet was by Jerome Dowd, professor of economics and sociology at the Unversity of Oklahoma. He gave a most clear-cut impression of the present economic conditions in the state. He urged that men use their brains and not allow the enormous amount of natural resources to dull enterprise as so often happens. It appears that those communities which have the least natural resources are the most industrious and cultivated whereas those communities blessed with the most luxuriant growth and natural resources, such as the tropics, provide places for indolence and show no industry. He also urged against overcaptilization, land investment and too much banking.

Other speakers of the evening were: O. H. Caldwell, of the *Electrical World;* T. L. Miller, of the Southwest General Electric Company; William Dunn, of Holdenville; P. L. Lewis, of the Wagoner Electric Company; George W. Know, of the Oklahoma Railway Company; A. N. Patton, of the Oklahoma Corporation Commission, and others. Galen Crow, with the Public Service Company of Oklahoma, of Guthrie, acted as toastmaster.

On Friday one session was held, commencing at 10 o'clock in the morning. The first paper was by A. P. Watson, of the Corporation Commission of Oklahoma, on "Original Cost as a Factor in the Regulation of the Gas and Electric Utilities." This paper was mainly in refernce to Order No. 774, recently promulgated by the Commission, prescribing uniform accounts for property and operating expenses for all gas and electric utilities. The policy of the Commission as outlined by Col. Watson is that the Commission is arbiter between the public and corporations and that the Commission stands in readiness to assist the corporation to the extent of its ability to do so.

George B. Saunders, of the Complaint Department of the Oklahoma Gas & Electric Company, presented an excellent paper on "Handling of Complaints." This paper reflected the ability which Mr. Saunders has shown in providing an excellent public relationship between his company and the public of Oklahoma.

Frank Myer, head of the Meter Department of the same company, presented a paper on "Meter Tampering and How to Prevent It."

The annual report of the secretary-treasurer and reports of the commitees were then presented.

In the ensuing election of officers, George W. Knox was elected president; Hugh J. Cooper, of Weatherford, and W. J. Dibbens, of Guthrie, vice-presidents. Lincoln Beerbower, C. S. Dawley and W. R. Molinard were elected directors, R. D. Long holding over from a previous election. H. V. Bozell continues as secretary.

In all, the convention proved the most satisfactory yet held, in general character of the convention sessions, in the character of the papers presented and in general attendance, there being something like 125 men present.

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Universal Use of Electricity on the Panama Canal.

A joint meeting of the Chicago Section, American Institute of Electrical Engineers, and of the Electrical Section, Western Society of Engineers, was held in the Society's rooms, Chicago, on the evening of May 25, F. J. Postel presiding. An invitation was extended by the Spokane Section of the American Institute to the Pacific Coast convention to be held at Spokane, Wash., on September 9 to 11.

The paper of the evening was presented by D. P. Gaillard and was entitled "Universal Use of Electricity on the Panama Canal." Mr. Gaillard was for several years engaged on the electrical engineering staff of the Isthmian Canal Commission. His paper was illustrated with a large number of lantern slides. For the first time in the history of canal operation, there will be practically universal use of electricity for operating, controlling and protecting the Panama Canal. All the lighting and power, with a few minor exceptions of isolated lighthouses, will be electrically operated. The telephone, telegraph, wireless, coast and internal defenses and probably also later the electrification of the Panama Railroad will add to the use of electricity. All power is generated at the hydroelectric plant located at the Gatun spillway, where three units having a total rating of 6,000 kilowatts are installed. The effective head of this plant is 77 feet. Provision has been made in the design of this plant for the addition of three similar units to practically double the capacity, if later the demands warrant. Mr Gaillard described this station, showing many views of its construction.

On account of the excessive humidity on the Isthmus all iron and steel work must be thoroughly protected from the weather. This is usually done by covering with concrete. Ordinary paint has not been found satisfactory. In those places, such as the gates of the canal locks, where concrete could not readily be used, a sort of bitumen enamel has been employed. Mr. Gaillard described briefly the steam reserve plants and the transmission bridges which carry the 44,000-volt current from the main plant at Gatun along the entire canal. There are four centers of load, one being the Gatun locks; another the Miraflores and the Pedro Miguel locks; also the terminals at Balboa and Panama.

The electrical operation of the locks was described. This will entail for the operation of the Gatun locks a total of 98 motors. The total rating of all the lock motors is about 20,000 horsepower. All of the lock motors are three-phase squirrel-cage induction motors. All of the wiring is carefully protected from the prevailing dampness. The lighting along the lock walls will be with 400-candle-power tungsten lamps equipped with special reflectors to distribute the light over the lock walls and surface of the water in the locks, but mounted so as to prevent any light from interfering with the pilots on the vessels.

Very extensive repair shops are being built at Balboa and these also will be completely electrically equipped both for power and for tungsten lighting. A large number of electric searchlights five feet in diameter will be used and practically all of the coast-defense equipment will be electrically operated. As usual the equipment will be provided with auxiliary reserve generating units so as to prevent any hindrance from failure of the main generating or transmission equipment. Not only is electricity to be used almost exclusively for the operation and maintenance of the canal, but it was and is used extensively during construction.

The discussion of this paper consisted chiefly of questions to which Mr. Gaillard readily replied. He brought out that the equipment is in duplicate in almost all parts so as to make the liability of electrical breakdown hindering the operation extremely remote. Interlocking devices have been included in nearly all cases so as to prevent false operation. As a still further safeguard, hand operation of all of the lock machinery has been provided to be used as a last resort.

W. B. Jackson called attention to the fact that the electrical design of the canal equipment was developed by and under the immediate supervision of Edward Schildhauer, who was well known in Chicago, where he was formerly connected with the Commonwealth Edison Company. Furthermore he pointed out that the Government heretofore has been very conservative in adopting new types of equipment before these had been tried out extensively in practice. Notwithstanding this well known attitude, it is interesting to note that the Government has taken a most advanced step in the exceptionally complete electrical equipment throughout the Canal Zone.

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A recent publication by the Bureau of Foreign and Domestic Commerce, Washington, D. C., contained an interesting article on the wireless-telegraph service in the United States.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION.

Annual Convention, Galveston, Tex., May 20 to 23.

Splendid weather and a good attendance combined to make the tenth annual convention of the Southwestern Electrical and Gas Association, at Galveston, Tex., a very enjoyable and profitable meeting. The convention was held at Hotel Galvez, May 20-23, inclusive. The usual method of having prepared papers presented at the convention was partially done away with and instead a consensus of opinion on many problems of common interest was arrived at during the year through a sort of question box conducted through the secretary's office, while other problems not thus settled were submitted for further discussion at the convention—a plan which proved to be very successful. When H. S. Cooper, permanent secretary of the Association, read his report on membership a substantial increase over last year was shown, making a present total membership of 220. Owing to the heavy rains prior to the convention, which greatly interfered with the operation of the railroads, many of the members did not arrive until a late hour in the morning, which prevented carrying out the program as scheduled. On Wednesday, May 20, at 1:30 p. m., the convention was called to order, and after the preliminary addresses the meeting was divided into two sections, one devoting its attention to street-railway problems and the other to problems of interest to gas men.

Thursday's Session.

"Power Plants and Transmission Lines in the Central West," was the subject of a paper presented during the morning session of Thursday, May 21, by H. T. Edgar, former president of the Association, and district manager for Stone & Webster, Boston, Mass. Mr. Edgar's paper dealt largely with the historical development of power on the Mississippi River at Keokuk and the industrial development of the surrounding territory. He called attention to the fact that the company confines its operations to the wholesale business, selling power to local companies with a provision that local rates for power shall not exceed the rates established by the power company. About 750,000 tons of coal, he stated, may be considered as being saved at present by the utilization of the power of the Mississippi River at Keokuk. At the present time the company has contracted for about 80 per cent of its present capacity.

A lively discussion followed on the question, "Should an electric-light or a gas company sell appliances, in competition with local electrical concerns?" Secretary Cooper opened the discussion by reading a summary of opinions expressed in connection with the Question Box. The consensus of opinion as expressed in the answers he received seemed to indicate that such companies should not engage in the sale of appliances unless absolutely compelled to do so because of local conditions. Those replies that considered the selling price of such appliances were mainly based on local conditions.

J. C. Kennedy, of Brenham, Tex., stated that where the appliances were sold by contractors and others the customers still held the utility responsible for every detail of the operation of the appliance.

J. E. Cowles, of Shreveport, La., stated that a few years ago in his town the appliance business was handled by contractors and for some reason prices had been considerably inflated. The central station pointed out to the contractors that it was not to their best interest to ask high prices for such articles because by so doing they would perhaps lose a wiring job or some similar work. In this way hearty co-operation between the contractors and the central station was obtained.

W. J. Drury, Dallas, Tex., stated that one of the things that limited the sale of current-consuming devices was that no means for their use was provided. He cited the case of a high-class apartment building in Dallas which had been built with only one baseboard receptacle in the building, and with the lighting fixtures about nine feet from the floor. Mr. Drury suggested that action be taken by central stations to get architects and contractors to specify plenty of plugs and receptacles for household devices.

Others taking part in the discussion were George M. Cushman, of San Antonio, Tex.; A. W. Wallace, of Jacksonville, Tex.; and W. A. Guthrie, of San Angelo, Tex.

With reference to the question of free lamp renewals the sentiment as expressed in the Question Box seemed to be that the present idea of free renewals is not now a necessity nor a good policy, but that the practice is too extensive to be suddenly changed. Those taking part in the discussion were F. R. Slater, Dallas, Tex.; C. K. Chapin, Memphis, Tenn.; W. A Guthrie, J. A. Walker, M. S. Hegerty and A. W. Wallace.

"The Electric Vehicle and Its Relation to the Central-Station Industry" was the subject of the first paper presented before the convention at the afternoon session This paper was presented by C. K. Chapin, chief electrical engineer of the Memphis (Tenn.) Consolidated Gas & Electric Company. Mr. Chapin emphasized the importance of central stations boosting the sale of electric cars by demonstrating them by use in their own business. Speaking of the economy of the electric vehicle for central-station use, he stated that his own company found that electric vehicles were cheaper than horse-drawn vehicles. He also emphasized the necessity for numerous charging and repairing stations for this type of vehicle. Such stations, he believed, should be provided by central-station companies. After concluding the reading of his paper, Mr. Chapin called attention to the fact that a good off-peak business can be developed by providing charging stations in convenient locations, accessible to both pleasure and commercial car users. He stated that in Memphis, Tenn., there is such a station with a consumption of nearly 30,000 kilowatt-hours a month. This off-peak business is off both the lighting and power peaks as the majority of the current for this purpose is used after nine o'clock at night. He said that in New Jersey the Public Service Corporation is boosting the electric-vehicle business, and that 21 per cent of the cars in service in that district are electrics.

This was followed by a discussion of the subject, "Ice Plants as Paying Adjuncts to Small Light and Power Plants." The discussion was opened by A. W. Wallace, of Jacksonville, Tex., who stated that he had an absorption plant in a town of 5,000 inhabitants, and that his sales ran from 8 to 12 tons daily. Mr. Wallace stated that from his experience a 10-ton ice plant with a storage box will take care ordinarily of all the sales in a town of that size. He is also of the opinion that the mistake usually made is to provide too large an ice plant and in that way fail to make a profit.

Friday's Session.

The first paper to be presented at the morning session on Friday, May 22, was by James C. Kennedy, secretary and manager of the electric and ice plants of the Brenham Compress, Oil & Manufacturing Company, entitled "Organization in the Small Public Utility Plant." His paper was an outline of the organization of the company's 800-kilowatt electric plants, its 40-ton ice plant, and its 100-ton cottonseed-oil mill. In presenting this paper he emphasized the importance of organization and a clear division of responsibilities in even small plants.

"Public Policy of Public Utility Corporations," was the subject of a very able paper from F. R. Slater, general superintendent of the Texas Power & Light Company, at Dallas, Tex. The policy of the officers of the utility companies has been to be courteous to its customers, but that courtesy has not always revealed itself in the contact of the customer with the employee. Mr. Slater called attention to the fact that every little courtesy counts, regardless of whether the business is being conducted in person, by letter or by telephone.

A discussion of the Workmen's Compensation Law which was passed during the last session of the Texas State Legislature followed. In connection with the passage of this law there was concurrently created the Texas Employers' Insurance Association, the board of directors of which is made up of a representative from the twelve principal lines of business in the state. It is optional whether employing companies shall take insurance in the association, but it gives them the advantage of better protection at lower rates. In other respects the law is similar to those in other states.

The subject for discussion at the afternoon session was one that is being discussed in all parts of the country—"Safety First." Papers were presented along all lines affecting the membership of the association: from the claim department side, by H. W. Withers, claim agent of the Houston Electric Company, from the street-railway operating side, by R. T. Sullivan, general superintendent of the Houston Electric Company; from the electric light and power side, by F. N. Lawton, manager of the Wichita Falls Electric Company; from the gas companies' side, by F. L. Weisser, of the San Antonio Gas & Electric Company; and from the side of the public, by H. T. Warner, managing editor of the *Houston Post*. These papers covered the situation so fully that the secretary was authorized to have them reprinted in a little volume and distributed.

C. W. Kellogg, Jr., of El Paso, Tex., in a brief discussion of the safety-first movement with reference to lighting companies, stated in his experience he had seen a fatal accident from almost all the causes mentioned in Mr. Lawton's paper, and that he thought every lighting company would in no way waste money by carrying out every suggestion made in the paper. Mr. Lawton was asked to explain a little further the searchlight referred to in his paper as being used in pole-line work, to which he replied that the searchlight, which is a carbide light, was put on a tripod so as to swing in all directions. One man stands on the ground and throws the light on the pole where the lineman is working. "It has been one of the greatest helps we have ever had," he said. This searchlight is made a part of the emergency equipment.

W. L. Wood, Jr., manager of the Southwestern Gas & Electric Company, Texarkana, Tex., gave an interesting paper with reference to the construction of plants so as to make them as free from destruction by fire as possible. The title of his paper was "Prevention versus Protection from Fires and Fire Causes." Among other things cited by Mr. Wood were the use of wire glass, fire doors, department construction, maintenance of fire-fighting equipment, proper consideration of the construction of elevator shafts and other communicating passages between buildings, automatic sprinklers, fire drills and good housekeeping.

Secretary H. S. Cooper then presented his general report in which he called attention to the numerous questions that were answered by his office during the past year. His report emphasized the fact that the secretary's office was designed to answer inquiries and not to criticize them. For this reason no one should hesitate to ask the secretary any question of proper nature. His report showed a large growth in membership from interurban railways, street railways, central stations, etc.

Saturday's Session.

At the Saturday morning session were presented the reports of committees. One of the new things for the coming year will be a mid-winter meeting of the officers of the Association, including the Advisory Committee, and as many members as may find it convenient to attend. The principal object of this meeting will be to discuss plans for the coming convention, and to outline a list of subjects on which papers are to be presented. The supply men have been invited to be present.

The officers for the ensuing year are: president, D. G. Fisher, Dallas, Tex.; first vice-president, W. L. Wood, Jr., Texarkana, Tex.; second vice-president, C. W. Kellogg, Jr., El Paso, Tex.; third vice-president, F. R. Slater, Dallas, Tex.; treasurer, James B. Walker; and secretary, H. S. Cooper. The selection of the next place of meeting is left to the executive committee, but owing to a strong sentiment in favor of making Galveston the permanent headquarters it is more than likely that the next convention will be held there.

H. S. Cooper, the permanent secretary of the Association, was largely responsible for the splendid success of this year's convention. The tribute paid by the association to the retiring president, G. H. Clifford, and H. S. Cooper, the secretary, showed that the association realized the great benefit their untiring efforts had been to the advancement of the public utilities in Texas.

Pittsburgh Section, Illuminating Engineering Society.

The May meeting of the Pittsburgh Section, Illuminating Engineering Society, which also embraces Cleveland, was held at Nela Park, Cleveland, O., on Friday, May 22. About twenty members from Pittsburgh attended the meeting, coming in a special car, which left Pittsburgh at 2:30 p. m. The party was met at the station by the Cleveland delegation, and all motored to Nela Park, where supper was served, following which an inspection trip was made of the photometric and research laboratories. M. Luckiesh demonstrated many of the interesting experiments relative to color matching, which he has worked out, and in the photometric laboratory several innovations in light measurements were demonstrated.

Following the inspection trip the party convened in the convention hall of the Engineering Building, the meeting being called to order by S. E. Doan, chief engineer of the National Lamp Works of the General Electric Company. Mr. Doan welcomed the out-of-town members to Cleveland and called attention to some of the features of Nela Park. He stated that locating a large industrial corporation some distance from a city, as was done in this case, was somewhat of a departure, but the results so far obtained in increased efficiency of employees and greatly improved conditions of light and air, has made the venture a profitable one, and he hoped that other corporations would follow in the steps of the Lamp Works.

Prof. H. S. Hower was then called to the chair and presided during the meeting.

Following the report of Alan Bright, secretary of the Section, a paper entitled "The Latest Developments In Mazda Lamps" was presented by C. L. Dows, of Cleveland. This paper was illustrated with charts and curves showing the relative efficiency of various incandescent lamps, and by various experiments projected on a screen. Mr. Dows commented briefly on the various developments that had taken place in the manufacture of the incandescent lamp during the past few years, the efficiency having been increased from 7 watts per candle to 0.5 watt per candle. Speaking of the new high-efficiency lamp which has lately been developed, Mr. Dows said that the heat loss with the small filaments was relatively greater than with large filaments. This accounts for the development of the larger units at present, although the possibilities for manufacturing smaller sizes are good for the future.

The pressure in the bulb due to the presence of nitrogen gas increases the temperature at which the evaporation of the filaments takes place. This temperature was raised from 200 to 300 degrees over the previous vacuum-bulb incandescent lamps, and consequently gives greater efficiency and better color quality. Because of the heat losses with the small filaments, the new gas-filled lamps are made with concentrated filaments. The smallest size multiple lamp at present available is 750 watts, but Mr. Dows said there was no reason why smaller sizes cannot be developed.

Several experiments were conducted, showing the difference in the light given out by straight and concentrated filaments, and also demonstrating the heat losses in vacuum bulbs as compared with gas-filled lamps.

A paper entitled "The Lighting Of Building Exteriors" was then presented by Ward Harrison, of Cleveland. This paper was confined almost entirely to a description of the newly designed flood-lighting apparatus recently installed for the lighting of the building fronts at Nela Park. In this connection demonstrations of this equipment were made following the meeting. Mr. Harrison illustrated a new type of reflector which has been developed for this purpose, the characteristics of which are such that light rays in the back hemisphere are reflected out in practically straight lines. In planning for flood lighting of buildings, experiments conducted at Nela Park have indicated that the same wattage per square foot should be provided as for ordinary interior lighting. The Engineering Building, which was illuminated for the purpose of demonstration, was lighted by means of ten 750-watt nitrogen-filled lamps, the wattage per square foot of building surface being 0.75.

Mr. Harrison called attention to the possibilities that this class of lighting will open up, as it is dignified and will undoubtedly be used for advertising purposes by those who object to electric signs and outlined lighting.

The development of the reflectors for flood lighting in connection with the high-efficiency lamp has opened up another field, that of lighting photographic studios for night work. In this connection, however, there is a need for some good defusing screen with low absorption. The lighting of moving-picture studios is also possible with the new lamps. To demonstrate the merits of the light from the nitrogen-filled lamp for photographic purposes a photograph was taken preceding the meeting, using two 750-watt lamps, and a defusing screen made of ordinary tracing cloth. Mr. Harrison sat for the photograph, and an excellent reproduction was made, although the exposure was only of one second duration.

The papers were discussed briefly by Messrs. Stickney, Chapan, Kelley, Crist, and Luckiesh. Mr. Stickney called attention to the annual convention of the Illuminating Engineering Society, which will be held in Cleveland in September, and for which many excellent papers have already been contributed. He spoke of flood lighting as a means for central stations securing a great deal of additional profitable business.

Mr. Kelley, who is sales manager of the Dayton Power & Light Company, also spoke of the possibilities which the development of this flood-lighting apparatus opens up for profitable business.

Mr. Luckiesh, speaking of the use of the high-efficiency lamps for photographic purposes, stated that the luminous value of the light from these lamps could be reduced if desired without effecting the photographic characteristics of the light. He spoke briefly of a new line of glassware which is being perfected which will give any desired step toward daylight, although this is obtained at a slight sacrifice of wattage.

The Pittsburgh delegation met again on Saturday morning and made an inspection trip through the local lamp factories and also through the plant of the National Carbon Company. The afternoon was devoted to visiting the Electrical Exposition, headquarters being at the booth of the Illuminating Engineering Society.

Electrified Ocean Transit Model.

The London agency of the Compagnie Generale Transatlantique, or French Line of steamships, has in its window on Pall Mall, in London, England, an interesting display showing the movement of its steamers between France and the United States. Models of the four ships, about 4 and 4.5 inches long, float in a shallow tank of water three-fourths inch deep, at either end of which, in high relief, is a model of the shores of America and of Europe, constructed of sheet zinc and painted to represent the featuring of the land. The models of the ships, which are of wood, are drawn backward and forward across the mimic Atlantic by means of an endless chain operating just beneath the zinc bottom of the basin, to which are attached magnets which attract the corresponding magnets in the bow of each tiny steamship. The chain is operated by an electric motor installed in the space beneath the tank, which is 6 feet long and 3.5 wide.

The steamers are spaced at equal intervals, the eastbound track being just north of the returning westbound. The models turn about at the entrance to Havre and New York and it requires 55 seconds to make the crossing.

The Electric Vehicle in Parcel-Post Service.

There was a very live meeting of the joint committee of the Electric Vehicle Association and the National Electrical Light Association on the "Electric Vehicle in Parcel Post Service," Friday evening, May 22, in the Consolidated Gas Company's auditorium, 130 East Fifteenth Street, New York. The meeting was well attended by representative members of both Associations engaged in pushing the claims of the electric vehicle in this service for economy and reliability, and the chairman's report of progress of this propaganda to date and the additional information in the free discussion that followed gave ample evidence that the committee and its constituent associations are alive to the importance of the work which they have undertaken.

The entire meeting was characterized by a spirit of action and vitality, which showed that the members who are pushing this great work are thoroughly in earnest and rising to the immense importance of the subject of parcel-post delivery as it is unfolding to them in their efforts to make the electric vehicle the main factor in the transportation and delivery of parcel-post matter.

The meeting was in charge of President Frank W. Smith of the Electric Vehicle Association, vice-president of the United Electric Light & Power Company, New York. Mr. Smith's brief opening address struck the keynote of the proceedings. He announced the purpose of the meeting to present the actual status of the work of the joint committee for the information of all interested in the enterprise, the use of the electric vehicle by the parcel-post service of the United States Post Office, in the transportation and delivery of packages; and he stated that the work on which reports would be presented was only preliminary to the real work of the two associations. Gracefully referring to the labors of S. G. Thompson, of the Public Service Electric Company of Newark, N. J., and member of the Parcel Post Committee of the Vehicle Association, he called attention to the fact that it is often quite as important a service to think of an idea as to put the idea through. Speaking optimistically of growing membership of the Vehicle Association, now totaling 719 members, he announced that a new section, Los Angeles, had just been added and expressed hope that the association would go to the Philadelphia convention in October with a thousand members.

Mr. Thompson, the first speaker to be introduced, stated emphatically that there is no good reason why the handling of parcel-post matter was not the special province of the electric vehicle, on account of the pre-eminent qualities of this type of motor car as a short-radius carrier, and that the only reason the Post Office authorities had not given the proper consideration to the electric vehicle was that they had no adequate conception of the immense power behind the electric vehicle, viz., the backing of the two associations and of all their allied interests.

F. W. Frueauff, vice-president of the Denver Gas & Electric Light Company, and chairman of the National Electric Light Association Committee on Parcel Post Co-operation, heartily praised the work of the Vehicle Association. He and his associates, as central-station men, felt that the Vehicle Association had put its finger on a very live issue, and they wanted to co-operate to the utmost in their power. He characterized the work that had been done at Washington as not an attempt to "lobby" but to educate. Suggestions had been made to the Government authorities that they draw the attenion of the Postmasters all over the country to the successful commercial use of electric vehicles. No attempt had been made to influence the Post Office people as to the way in which electric vehicles should be employed, that is, whether the vehicles should be purchased by the Government or whether the system now employed with horse delivery be continued; viz., making contracts with outside concerns who operated their own wagons. The pamphlets which had been distributed to the members that evening, entitled "The Electric Vehicle in Parcel Post Service for Economy and Reliability" had been sent, with a letter, to about 5,000 representative central-station men, the influential personnel of the 6,000-odd electric light companies in the country. Tangible results (in actual adoption of the electric vehicle for the parcel-post work) might be slow in coming, but he predicted that it would be rapid as compared with the introduction of the first electric motors in the early days of electrical engineering. In closing, Mr. Frueauff cordially promised that central-station men would be glad to continue their share of the work under the direction of the Vehicle Association.

The chairman then introduced Mr. James H. McGraw, chairman of the Parcel Post Committee, remarking that the selection of Mr. McGraw had been a very happy one. The men connected with the great movement for securing had been fortunate in receiving the co-operation of Mr. McGraw, known to be actively interested in this as in all branches of electrical work, and knew of no man better fitted for the chairmanship of the Parcel Post Committee.

Mr. McGraw's address was informal but comprehensive, and evidenced his deep personal interest in the work of pushing the claims of the electric vehicle upon the attention of the Post Office authorities and his strong confidence in the unique fitness of the electric vehicle for the parcel-post service. He quoted occasionally from a written report, but in the main his remarks were more in the nature of a convincing, extemporaneous talk going into the present status and future possibilities of the parcel post and showing the natural adoption of the electric vehicle as measuring up to the requirements of a medium of transportation and delivery of the enormous quantities of matter that we might look forward to in this service. The results of the work of the committee to date were satisfactory and encouraging. Every one believed that the electric vehicle had come to stay, and that it had a great work to perform. He said that he thought the delay in the pushing of the electric vehicle had been due not to physical shortcomings of the vehicle or its means of operation and maintenance, but to a state of mind, or lack of appreciation on the part of central-station people and others: from which condition we were glad to feel that everyone interested, who had given the subject any thought, were rapidly emerging. Continuing, Mr. McGraw depreciated the talk in the magazine press of the electric vehicle as primarily a ladies' car, a pleasure vehicle—talk which ignored the great commercial use of this type of vehicle, including its utilization for the parcel-post service. He referred to the progress of the electric commercial vehicle propaganda in Canada and in England.

The work that the Government is preparing to do in the delivering of packages is almost beyond comprehension, and surely for a very large part of the work the electric vehicle has unique adaptability. Nothing can contribute more to the success of the parcel post than the use of electric vehicles. The magnitude of the project may be regarded from the estimate that six hundred million parcels will be handled annually in 50 of the principal cities of the country. This means two million a day. Assuming that an electric vehicle could handle an average of 200 packages per day, a total of 10,000 vehicles would be needed, or an average of 200 machines in each of these cities. Collection and delivery is said to be 90 per cent of the traffic in parcel-post transportation; therefore an estimate of five per cent of the receipts on the cost of power, is not unreasonable. This is business worth securing for manufacturers and for the central station. For the central station in each city it would bring an average income of $100 per day, or $1,500,000 in total per year, assuming the average power consumption of the vehicle to be 12.5 kilowatt-hours per vehicle.

On the other hand, the speaker mentioned with approval the attitude of Postmaster-General Burleson, that each step forward must be a positive one, taken cautiously. This situation calls for continuous hammering, especially at the beginning—because later on the merits of the electric vehicle will speak for themselves, and multiply its use almost automatically. The horse is well intrenched, and habit seems hard to change; and if motor cars are considered at all the gasoline machine has had the present advantage of familiarity to the public. But the electric vehicle is logically the most economical medium of transportation for this purpose. Bearing in mind that our campaign is hereby opened, let us consider that we have a good cause, powerful allies on every side, an unprecedented opportunity, and that we are sure to win. Then let us appreciate that we, in offering to our Government the means, in the electric vehicle, and the success-determining conditions, in the co-operation of every central station in every city, have a patriotic as well as a business incentive to put our shoulder to the electric vehicle wheel.

The general discussion which ensued following Mr. McGraw's address was participated in by W. P. Kennedy, consulting transportation engineer, New York, Mr. Young, Mr. Smith, Mr. Duck, Mr. Lupo (a Newark contractor serving the Post Office with horse vehicles), Mr. Thompson, Mr. A. Jackson Marshall, and several others. Mr. Kennedy gave an abstract of the non-technical pamphlet already mentioned, and said that the Washington people had expressed the hope that technical data would be forthcoming later. He emphasized Mr. McGraw's point that the work of pushing the electric vehicle in the parcel-post service should not be revolutionary, but gradual. Referring to that gentleman's figures, that six hundred million packages would be handled annually, he added that at the present time 80,000 packages per month are being handled in New York City. Anyone seeing the quantities of parcel-post matter now being carried by the letter carriers must perceive that the burden will become intolerable and will have to be taken up by vehicles of some kind. It will force the problem of providing vehicular equipment; and we hope to be ready to force the use of electric vehicles when the time comes.

Mr. Young asked if the local postmasters had any "say" in the matter of vehicles for transporting their mail. This was answered by Mr. Thompson, who cited the fact that a local postmaster would decide the matter of transportation on contract price alone and it was immaterial to him what type of vehicle was used. Mr. Kennedy stated that the country is divided into four sections, for four-year contracts for wagon service; therefore contracts come up for renewal once a year, in rotation throughout the four sections. A pamphlet is prepared giving instructions to bidders. Local conditions vary; for example, there are a large number of mail-order houses in Chicago as compared with New York City. Therefore it is advisable to convince the local postmaster of the advisability of the electric vehicle. Mr. Duck called attention to the fact that contracts are let in some cities on a mileage basis, in others on the weight basis. He suggested that the association bring pressure to bear on the Government at Washington; that a uniform contract for the four districts be suggested: that the Government be persuaded to look into the subject more deeply and deal more fairly with contractors.

Several members took part in a discussion on the question as to whether the propaganda should be urged through local postmasters, or at Washington. Mr. Lupo gave testimony urging the advisability of lengthening the contract period so that contractors could at least break even! He raised the question as to whether service with motor vehicles will be quick enough as compared with the present horse service which is cheaper and therefore at an advantage in covering several simultaneous schedules, because the contractor can afford to have more of them. The present specifications are ironclad, and favor active getting around by many vehicles.

Another gentleman stated that the Government was now disposed to recognize the difficulties of horse-vehicle contractors, and to reform the present oppressive specifications. If the electric vehicle can perform the service as well as the gasoline cars, it will get the business because of the lower investment required. The Government must have an equipment that will enable its employees to do more work. The parcel post has such different characteristics from ordinary mail handling that reforms must come in the Post Office methods all along the line. As soon as the public really utilizes the parcel post, the necessary changed and increased facilities will be provided. Let us therefore get the local postmasters to send their recommendations to Washington. The Philadelphia Committee is going to do this. He suggested that local committees get definite data, thus placing their local postmasters in a good position to back up their recommendations. Executive Secretary Marshall stated that the committee was endeavoring to obtain working data which will substantiate its claims for the value of the electric vehicle. He reported that the matter of the effectiveness of the vehicle is quite prominently before the Bureau of Standards in Washington, and that Mr. Egerton, purchasing agent of the Government, was favorably disposed to receive the suggestions of the committee. Supplementing the chairman's plea for ideas from all, operating cost data are especially needed by the committee.

Mr. Smith assured the meeting that the committee has this point well in mind, and referred to a comprehensive chapter in the Salesman's Handbook to be distributed at the Philadelphia convention of the National Electric Light Association next week.

Engineering Congress to Discuss Supply and Uses of Copper.

Among the general subjects to be treated before the International Engineering Congress in San Francisco, Cal., on September 20-25, 1915, one of considerable interest is that of Materials of Engineering Construction which will include the subject, "The Place of Copper in the Present Engineering Field, and the Economies of the World's Supply Thereof."

Foreign countries are continuing to take marked interest in the Congress, and there is every evidence that the attendance from abroad will be large. The Congress hopes that all engineers in this country who have not as yet subscribed as members of the Congress will give the matter their immediate attention and favorable action. The address of the Committee of Management is the Foxcroft Building, San Francisco, Cal.

Operation of Ohio Workmen's Compensation Law.

In connection with a report by the Ohio Industrial Commission indicating that during the two years that the workmen's compensation law has been in operation only 82 per cent of the premiums received have been paid out, it appears that electricians and men employed in electrical pursuits have received benefits amounting to 104 per cent of the premiums received by the board from companies engaged in those lines. It is probable that in the readjustment of premiums to be made within a few months rates for such concerns will be raised, on account of this showing, although other rates will be lowered in many cases.

ELECTRICITY IN MARINE SERVICE.

Meeting of the American Institute of Electrical Engineers.

The annual business meeting of the American Institute of Electrical Engineers, held in New York City on the evening of May 19, was followed by a technical session under the auspices of the committee on the Use of Electricity in Marine Service.

At the close of the business session, President C. O. Mailloux called upon C. S. McDowell, chairman of that committee, to preside during the technical session. The first paper to be presented was one by H. L. Hibbard, of the Cutler-Hammer Manufacturing Company, on "Electricity the Future Power for Steering Vessels."

Electricity for Steering.

This paper describes steam steering gear and its disadvantages and sets down the following results to be accomplished with electric drive: (1) reduction of weight and space of driving mechanism; (2) reduction of heat in steering-gear room; (3) elimination of accidents with steam pipes; (4) reduction of vibration and noise; (5) increase in efficiency; (5) simplification of control and ease of operation; (7) increase in rapidity and accuracy of rudder movement. He outlined the electric steering gears heretofore used, one of the first successful ones being the Pfatischer system used on a number of Russian naval vessels, the United States cruiser *Montgomery* and certain merchant vessels. This system employs a shunt motor for operating the rudder and it is controlled with varying voltage supplied by a motor-generator set. The field of the generator is controlled from the steering wheel on the Wheatstone-bridge principle, one arm of the bridge being a rheostat located at the steering wheel and another located at the rudder crosshead. The unbalancing of the bridge by the movement of the wheel gives current to the generator field and consequently to the rudder motor. The movement of the rudder crosshead cuts off current from the generator field and the motor is stopped. This constitutes an electric follow-up control. Objections to this system are the weight and cost of the motor-generator set and the fact that it is always using power. The available power decreases as the rudder approaches the balanced position, yet this is the point where maximum torque is frequently desired. Other systems have been tried in the Navy without much satisfaction. Two Argentine battleships just being completed have a system combining rheostatic and field control, whose system is described. The paper is mainly devoted to a description of the system used on the battleships *Texas* and *New York*. This system uses power directly from the dynamo mains. The motor has a disk brake and the main automatic controller and resistance are installed near it, with a limiting switch. Master controllers are furnished on the bridge, in the conning tower, in the central-control station, and in the steering-gear room. The reversing switch is operated by a lever which returns to its middle position when released. A small movement of this lever causes the motor to start and run at low speed and further movements cause the movement to accelerate more rapidly to full speed. There is no follow-up control. The rudder keeps moving as long as the operating lever is in the running position and stops when it is returned to the central point. A control panel contains the automatic contactors for reversal, acceleration and dynamic brake. The calculation of the necessary horsepower is given and tests on the complete equipment show this to agree very well with actual requirements. The trial tests have proven the gears satisfactory. Graphic charts are given showing the current requirements, which involve peaks of 1,600 amperes. There is a saving in weight, space and efficiency by the use of this system and an ease and accuracy of control. The rudder may be operated through 40 degrees in 16.5 seconds. A motor of slightly over 100 horsepower would be sufficient for the *Texas*. It is predicted that electricity will be used generally for steering vessels.

The discussion was opened by G. A. Pierce, Jr., of William Cramp & Sons Ship & Engine Building Company, who disagreed with the author as to a number of points brought out in his paper. He pointed out the extensive use of electric power upon the Russian battleships designed years ago and other examples of early adoption of electric power and heating, as well as electric steering gear. He did not think noise was greatly reduced in a system using contactors and considered electric control less simple than a wire-rope transmitter, as troubles are easily traced with the latter. He stated the requirements for an electric steering gear to be as follows: a gear for frequent starting and stopping and for short movements to either side of the central line; maximum torque regardless of speed; easy starting and stopping; minimum number of parts and contacts. He thought the Pfatischer gear nearer the solution of the problem from an engineering standpoint than rheostatic control, although the latter may have some commercial advantages. The latter is likely to draw so much current as to seriously affect the voltage of a general supply system. He saw no advantage in the elimination of the follow-up gear, as the latter furnishes an indicator of the rudder position and when eliminated must be replaced by some form of rudder indicator. The rheostatic control has perhaps 10 times as many pieces of apparatus and 30 times as many electric connections as that previously used and he inquired of the author whether its selection for use on the *New York* and *Texas* was for engineering or commercial reasons.

Mathias Pfatischer, of the Electro-Dynamic Company, said that the author had exaggerated the current requirements of the steering gear devised by him and that the supposed difficulties of getting sufficient voltage on wheatstone-bridge connections was not experienced in practice, as the voltage required in ordinary steering is only from 10 to 40 volts. This did not indicate that a constant-voltage system was the proper solution. Tests on the *Finnland* in crossing the Atlantic showed that 15 horsepower was the maximum required. This was a steamer of 10,000 tons, making 16 knots an hour. He did not consider the steering gear described in the paper as much of an advance in the art.

Maxwell W. Day, of the General Electric Company, referring to the criticism of the system using motor-generator sets, pointed out certain advantages of the latter. (1) Starting peaks on the *Texas* gear amounted to 1,600 amperes with a 150-horsepower motor, and would probably reach 3,700 amperes on a 350-horsepower motor at 120 volts. Tests made in the German Navy as to power requirements for certain angles for rudder movement indicate that the rheostatic system for some of the latter ships would require contactors operating with over 4,000 amperes. If large contactors are avoided by the use of two motors, a much larger number of contactors of smaller size would be required and the system would become very complicated. With a motor-generator, the contactors required are few in number and seldom used. (2) With the rheostatic system a heavy peak of current is occasioned at the instant of starting and a large amount of energy dissipated in the starting rheostat. With the shunt motor the energy lost in the rheostat is equivalent to the kinetic energy of the armature. The point of efficiency in this connection is not so important as the heavy load put upon the generating plant at starting. The motor-generator system avoids these peaks, as the load is gradually applied. (3) As rudder torque increases rapidly as the rudder moves away from the middle position it is desirable to increase the torque per ampere in the motor, which is done in the rheostatic system by compounding. In the motor-generator system the generator is provided with a drooping characteristic by means of a reversed series winding, so that the amount of power is reduced. (4) Stopping of the motor is accomplished in the rheostat system by a dynamic break and a mechanical break so that the kinetic energy is transformed into heat, but in the motor-generator system much of this energy is stored on account of the increased speed and is available for the next operation. (5) The motor-generator set permits the use of an extremely simple type of follow-up control.

The Russian cruiser *Palladia* and the German cruiser *Aegar* were equipped with the Esberger gear, consisting of two shunt motors running in opposite directions and connected to differential gearing. Speeds are controlled through the shunt fields and the rudder moves at a speed corresponding to the difference of motor speeds. These equipments do not have a follow-up control. They were not considered successful.

R. A. Beekman asked a question and Mr. Hibbard closed the discussion. He said that the elimination of the follow-up was an advantage on account of the simplification of the apparatus and because the response obtained is a little more rapid. There is also less tendency for the helmsman to keep moving the master switch. The ship is kept on its course with fewer movements of the helm. In the case of the *New York*, the contract for steering gear was given to the lowest bidder. In the case of the *Texas* he thought engineering considerations were the controlling factor. In ordinary steering, whether in harbors or at sea, the follow-up system and the indicator are unnecessary. When a ship is manuevering in a fleet an indicator is necessary. The starting peaks have been reduced on both the *New York* and the *Texas* since experimenting with them and they are now less than 900 amperes on any one generator. Comparing the two systems he said the rheostat system has more parts while the motor-generator system has larger parts, greater weight and higher first cost. There are now sufficient installations of each type so that figures covering power consumption for a considerable length of time will soon be available and he predicted less power consumption for the rheostatic system.

H. J. Mauger then presented a paper entitled "The Future of Electric Heating and Cooking in Marine Service."

The Future of Electric Heating and Cooking in Marine Service.

The future of electric cooking apparatus for marine use is assured by the progress already made in the United States Navy in adopting electric-cooking equipment. A number of battleships are partly equipped with electric heating and cooking devices and the new battleships, *Texas, New York, Nevada* and *Oklahoma,* will be completely equipped with such devices. On a trial trip of the battleship *Texas,* during which period a total of 715 men were served, the average was 1.7 kilowatt-hours, but this without doubt can be reduced to 1.25 kilowatt-hours. The average consumption per man per day of the crew's galley of 553 men was one kilowatt-hour, while that of the 175 officers averaged 3.2 kilowatt-hours per man per day. The average load-factor, taken as the ratio of the average to the maximum demand, was about 50 per cent. Electric cooking finds its greatest advantages in high-temperature operations, such as broiling, roasting, baking, frying, grilling, etc. Although the cooks employed on this battleship were unfamiliar with electric cooking, they experienced no difficulty in operating the devices. The problem of heating staterooms, cabins and saloons, may be solved through direct air heating by electric heaters, and radiant heating by luminous or incandescent lamp radiators.

W. S. Hadaway opened the discussion on this paper and noted the omission of any reference to an electric laundry on the *Texas.* The question of electric cooking is not as simple as would appear from the paper. The electric oven can be made a complete success but the consumption of one kilowatt per cubic foot he considered too high. Well insulated ovens require only about 800 watts. The electric broiler is also satisfactory but the electric range falls down on top-surface cooking. The input per square inch is about 18 watts, which represents only one-half the rate of work which can be obtained with a coal range. The temperature also is lower so that the same results cannot be obtained. He referred to an installation 20 years ago in the *Vermont,* where the Japanese galley attendants favored the new equipment and endeavored to get results with it. They could not, however, get the work out on time and the apparatus was discarded. The Navy specification permits a loss of 40 watts per square foot for the electric baking oven. This indicates poorer thermal insulation than is obtained in average practice. The future success of electric cooking depends upon devising a durable structure that will do top-surface cooking in small utensils in a manner to compete with the older types of apparatus. It is too much to expect cooks to change their present methods and consequently heat must be supplied in large volumes at high temperatures. The development of the chrome-nickel resistor makes this possible, but the difficulty is the load placed upon the generator.

E. F. Dutton referred to the improved quality of the product of electric baking and the reduction in waste, which largely overbalance any apparent disadvantages of the electric cooker. The cleanliness of the galley is another inherent advantage.

In closing the discussion, Mr. Mauger agreed that he would like to have hot plates work more rapidly. The cooks have made no complaint regarding the point raised by Mr. Hadaway that the wattage per square inch was not great enough. The present wattage seems satisfactory. The application of chrome-nickel found limitations with respect to insulation, as mica dehydrates and breaks down at 700 to 800 degrees centigrade. This prevents operation at higher temperatures. Doubtless much can yet be done regarding thermal insulation. The larger the apparatus the less radiating surface in proportion to power used, so that in ship galleys the insulation is not so important as in a residence kitchen.

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Electrical Mine Accidents.

Of the 2,785 fatal accidents in the coal mines of the United States in 1913, 88 or 3.2 per cent were due to electric shocks and burns. This is an increase in number but a decrease in percentage as compared with the year 1912.

The Cleveland Electrical Exposition.

The Cleveland Electrical Exposition, under the auspices of the Electrical League of Cleveland, Jovian Chapter, was held in the Coliseum in Cleveland, Ohio, May 20 to 30. There were over 100 exhibitors occupying space, and the attendance during the first week of the show was greatly in excess of the most optimistic estimate. The Executive Committee of the Electrical League, comprising George S. Milner, M. E. Turner, and W. G. Rose, is deserving of great credit for the manner in which the affair was arranged. The decorations in the building were most pleasing, the illumination particularly eliciting much favorable comment. The general lighting was taken care of by luminous bowls suspended from the ceiling, each enclosing four 60-watt tungsten lamps, equipped with Skidoo sockets. By means of these attractive color effects were obtained. This lighting was supplemented by bracket lamps hanging from each of the columns supporting the roof. The general lay-out of the exhibits, and the decorations, were arranged so that the maximum lighting and ventilation was everywhere available, without sacrificing the artistic appearance.

The streets in the neighborhood of the Coliseum were especially lighted during the show, the street lamps along Euclid Avenue for several blocks being adorned with lanterns of special design, which were ornamental both day and night. The street leading from Euclid Avenue directly to the entrance of the building was lighted by means of nitrogen-filled Mazda lamps, equipped with steel reflectors, and this equipment was supplemented with festoons of multi-colored incandescent lamps.

The show was auspiciously opened on Wednesday evening, the signal for the opening being transmitted by Thomas A. Edison, who at 7:30 p. m. touched a button in his laboratory at Orange, N. J., causing the lights to blaze forth, and setting the machinery in motion.

Immediately thereafter Rev. A. B. Meldrum formally opened the show with brief services, and George S. Milner, president of the Electrical League of Cleveland, delivered a brief address, commenting on the epoch in the electrical industry in Cleveland, which the opening of this show marked.

Charles F. Brush then was called upon and responded to Mr. Milner's remarks by further commenting on the rapidity of the growth of the electrical industry, particularly in Cleveland, which is now considered the second city electrically.

There were many noteworthy features among the exhibits, the most significant being the large number of new domestic electrical appliances exhibited, indicating a remarkable increase in the use of domestic electrical appliances. A noteworthy feature was the exhibit of several departments of the United States Government, these comprising the Navy Department, the Department of the Interior, Department of Commerce, Panama Canal, and the Bureau of Mines.

The exhibit of the Navy Department comprised an accurate model of the *U. S. S. Michigan.* The Department of the Interior, Reclamation Service, exhibited numerous bromide enlargements of photographs of the Salt River irrigation project. The Department of Commerce exhibit was maintained under the auspices of the Bureau of Standards, in charge of Dr. F. A. Wolff. This exhibit was for the purpose of demonstrating the various methods of testing electrical instruments by the Bureau, and also to show the work that this Department is doing in co-operating with the electrical industry. The Panama Canal exhibit was a working model of the canal, showing the utilization that is made of electrical energy for towing ships and for lighting purposes. The Bureau of Mines supplied several reels of motion pictures, which were displayed in the lecture hall of the Coliseum, indicating some of the activities of this Bureau in mine rescue work.

The educational field of the industry was well represented by the exhibits of the Case School of Applied Science, Cleveland, and the technical high schools, there being shown here the various apparatus constructed by students, and innumerable experiments of a spectacular nature were conducted during the course of the show. The Cleveland Public Schools, and the Public Library were also represented by exhibits with photographs and literature outlining their respective fields.

The Electrical Contractors' Association of Cleveland, the Electrical League of Cleveland, the local Electrical Workers' Union, and the Illuminating Engineering Society, all maintained headquarters at the show, where visitors were welcomed, the latter organization in addition displaying a booth demonstrating the proper application of lighting to school rooms, show windows, factories, and the home.

Among the Commercial exhibits were the following companies:

A. & W. Electric Sign Company, Cleveland, Ohio. Electric signs, electric time switches, Betts & Betts sign flashers, and color caps.

Adams-Bagnall Electric Company, Cleveland, Ohio. Flaming arc lamps, ornamental-lighting devices, electric fans, ABolites, transformers, automobile starting and lighting systems, lamps, horns, etc.

Adapti Manufacturing Company, Cleveland, Ohio. Adapti boxes, switch boxes, concrete outlet boxes, locknuts, bushings and fittings.

Walter P. Ambos Company, Cleveland, Ohio. Weston measuring instruments, Bristol instruments, Enamelled Metals Company devices, Steel City Electric Company products.

American Ironing Machinery Company, Chicago, Ill. Simplex ironing machines and electrical equipment for the laundry.

American Rotary Valve Company, Chicago, Ill. Jenney motors, generators, stationary vacuum cleaning machines, and pumps.

American Steel & Wire Company, Chicago, Ill. Electrical wires and cables and rail bonds.

Bell Electric Motor Company, Garwood, N. J. Single-phase, polyphase and direct-current motors and generators.

Brown Hoisting Machinery Company, Cleveland, Ohio. Automatic coal and ore-handling machinery, locomotive cranes, grab buckets, electrical hoists, and over-head tramrail systems.

Chicago Fuse Manufacturing Company, Chicago, Ill. Electrical protective materials, fuses, and conduit fittings.

Crocker-Wheeler Company, Ampere, N. J. Small motors, generators and transformers.

Detroit Fuse & Manufacturing Company, Detroit, Mich. Iron-clad fuses, switches, induction motor starters, inclosed fuses, etc.

Electric Controller & Manufacturing Company, Cleveland, Ohio. A complete line of automatic and manual controllers, solenoids, brakes, lifting magnets, etc.

Electric Storage Battery Company, Philadelphia, Pa. Storage-battery plates and ignition and lighting batteries for automobiles, and the various parts.

Elwell-Parker Electric Company, Cleveland, Ohio. Storage-battery truck for handling baggage and freight on railroad and steamship lines.

The Erner Electric Company, Cleveland, Ohio. American cooking and heating devices, Arrow and Bryant switches, Harvey Hubbell fittings, Hughes electric ranges, Phillips wire and cable, and other appliances.

Fairbanks-Morse & Company, Indianapolis, Ind. Alternating and direct-current motors and generators, oil engines, steam and power pumps.

General Motors Truck Company, Pontiac, Mich. Two-ton and five-ton electric vehicles.

Gill Bros. Company, Steubenville, Ohio. Parin reflectors and glassware.

Gould Storage Battery Company, New York. Battery plates, ignition and lighting batteries and parts.

Holophane Works of General Electric Company, Cleveland, Ohio. Holophane globes and reflectors, glass and steel, and various lighting specialties.

Holtzer-Cabot Electric Company, Brookline, Mass. Bells and annunciators, fire alarm and signal systems.

Lincoln Electric Company, Cleveland, Ohio. A complete line of alternating and direct-current motors and generators, electric welding outfits, and automobile battery-charging apparatus.

National Carbon Company, Cleveland, Ohio. Columbia dry cells, arc-lamp carbons, carbon brushes, electrodes, and other carbon products.

National Lamp Works, General Electric Company, Cleveland, Ohio. Various racks of incandescent lamps of all sizes, and a line of reflectors, shades, etc., of Holophane make.

Nunguesser Carbon & Battery Company, Cleveland. Dry batteries, carbon brushes, graphite brushes, metal brushes and arc-welding electrodes, cables, etc.

Packard Electric Company, Warren, Ohio. Transformers, cable, and insulation materials.

Reliance Electric & Engineering Company, Cleveland. Electric motors variable and constant-speed generators.

John A. Roebling's Sons Company, Chicago, Ill. Wire rope, bare and insulated iron, steel and copper wire and cables.

Standard Underground Cable Company, Pittsburgh, Pa. Wires and cables, cable accessories, terminals, cable boxes and junction boxes.

Western Electric Company, Chicago, Ill. Motors, generators, cable, telephone supplies, lamps, vacuum cleaners, washing machines and heating and cooking appliances.

Westinghouse Companies, Pittsburgh, Pa. Arc lamps, incandescent lamps, meters, fans, heating appliances, motors, generators, rectifiers, etc.

Western Conduit Company, Youngstown, Ohio. Conduit and fittings.

Willard Storage Battery Company, Cleveland, Ohio. Storage batteries, plates and parts.

Other companies maintaining exhibits at the show were the following: George H. Bowman Company, Cleveland; The Brookins Company, Cleveland; Burroughs Adding Machine Company, Detroit; Cleveland Electric & Machine Manufacturing Company, Cleveland; The Cleveland Switchboard Company, Cleveland; Cleveland Telephone Company, Cleveland; Electric Fountain Company, New York; Electric Welding Products Company, Cleveland; Electrical Distributors Company, Cleveland; Electric Steam Radiator Company, Portland, Me.; Elliott Electric Company, Cleveland; Enterprise Construction & Fixture Company, Cleveland; The Euclid Avenue Electric Fixture Company, Cleveland; Factory Appliances Company, Cleveland; P. A. Geier Company, Cleveland; Hertner Electric & Manufacturing Company, Cleveland; Hickok Electrical Instrument Company, Cleveland; Homer Commuter Company, Cleveland; Honeywell Heating Specialty Company, Wabash, Ind.; E. B. Horne Company, Cleveland; R. C. Hull Electric Company, Cleveland; Kemco Electric Manufacturing Company, Cleveland; King Electric & Manufacturing Company, Cleveland; Kinney & Levan Company, Cleveland; Konsrv Electric Company, Cleveland; Leonard-Bundy Electric Company, Cleveland; Luitwieler Pumping Engine Company, Rochester, N. Y.; Meade Electric Signal Company, Cleveland; National Electric Welder Company, Warren, Cleaner Company, Cleveland; Price Electric Company; Cleveland; Republic Electric Company, Cleveland; Salzer Electric Company; Cleveland; Scott-Ellben Company, Cleveland; Standard Car Manufacturing Company, Cleveland; Sterling Machine & Stamping Company, Cleveland; Sterling & Welch Company, Cleveland; Strong, Carlisle & Hammond Company, Cleveland; Vacuna Sales Company, New York; Vacuum Cleaner Equipment Company, Cleveland; Van Dorn Electric Tool Company, Cleveland; Victor Vacuum Cleaner Company, Cleveland; and the George Worthington Company, Cleveland.

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Electricity from Sweden to Denmark.

The various formalities which had to be arranged in connection with the transmission of electricity from Sweden to Denmark have been completed. As far as Sweden is concerned the official sanction has been granted, and the matter is also said to offer no further difficulties in Denmark. The electricity will be supplied by the company which exploits the power of the River Lagan, which company already supplies the towns on the Swedish coast opposite Sealand with electric current. The plant comprises the laying of two submarine cables from the Swedish to the Danish coast, just above Elsinore; no trouble is anticipated in this connection, three telegraph cables lying in the same locality, and they have needed no attention for ten years. The Swedish current will be transmitted at 25,000 volts to a large transformer station at Elsinore, and from thence to a second transformer station at Lyngby. The Danish company expects to supply the whole of North Sealand with electricity from Sweden, and the old plant will then only be held as a reserve. It is, of course, a question of price which has prompted this interesting scheme, which is expected to entail a tangible saving for the larger consumers, although the question of duty does not seem to have been settled yet. The company, however, expects that some duty will have to be paid.—*Engineering.*

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Efficiency Under Municipal and Private Ownership.

The greater efficiency of the management of public utility properties by private operators as contrasted with the management of similar properties by municipal administrators is proved with a startling directness from data recently compiled by the Bureau of the Census, says F. O. March, in *The Financial World.*

It is significant that from the data given out by the Government, no direct comparison between privately owned and publicly owned electric central stations is possible. But a careful analysis of the statements published by the Census Bureau brings out very clearly the difference in cost of operation between the two classes of administration.

TABLE I. — MUNICIPALLY OWNED PLANTS IN THE UNITED STATES.

Per Kilowatt-hour Output.	1912	1907	1902
Gross revenue, cents.....	4.31	4.84	3.55
Operating expenses	3.14	3.56	2.67
Net revenue	1.17	1.28	0.88
Per Horsepower Generating Capacity.	1912	1907	1902
Gross revenue	$41.51	$43.60	$43.52
Operating expenses ...	30.24	32.11	32.77
Net revenue	$11.27	$11.49	$10.75
Capacity in millions of kilowatt-hours	3,229	1,830	993
Actual kilowatt-hour output	527	289	196
Load-factor, per cent.	16.6	15.8	19.7

TABLE II. — PRIVATELY OWNED PLANTS IN THE UNITED STATES.

Per Kilowatt-hour Output.	1912	1907	1902
Gross revenue, cents.....	2.54	2.90	3.40
Operating expenses	1.98	2.22	2.71
Net revenue	0.56	0.68	0.69
Per Horsepower Capacity.	1912	1907	1902
Gross revenue	$40.01	$42.79	$46.72
Operating expenses ..	31.20	32.80	37.29
Net revenue	$ 8.81	$ 9.99	$ 9.43
Capacity in millions of kilowatt-hours	41,750	31,254	9,625
Actual kilowatt-hour output	10,965	5,573	2,311
Load-factor, per cent..	25.6	17.8	24

From the tables of statistics it will be noted that in 1912 the rate paid by the public for municipally produced electricity was 4.31 cents per kilowatt-hour, whereas the gross income of privately owned plants in the same year was but 2.54 cents. In other words the cost to the public was $1.70 in 1912 to obtain the same amount of electricity as was furnished by private plants for $1.00.

A comparison of the operating expenses is just as startling. The operating expenses of municipal plants per kilowatt-hour was 3.14 cents, while for private plants it was 1.98 cents. Although the privilege of having a municipal lighting plant costs the average citizen nearly 70 per cent more than he would have paid if he had purchased his electricity from a privately owned plant, the municipal plant ate up in operating expenses nearly all of the extra amount which it exacted from him. Had the administration of the municipal plants been applied to the privately operated plant with receipts of but 2.54 cents, these plants would have been operated in 1912 at an actual loss which would have amounted to 0.6 cent.

An infallible test of electric public utility operation and efficiency consists in the comparison of the load-factor. It will be noted that the actual load-factor of the privately operated plant in the United States for 1912 was 25.6 per cent. The load-factor of the municipally operated plant was but 16.6 per cent.

The owners of the securities of privately owned central-station plants in the United States are in an especially advantageous position when the rates obtained for the electricity their companies sell are as low as 2.54 cents per kilowatt-hour. It will be noted that the average rates received by the privately owned plants in the United States are steadily decreasing.

Without any action on the part of an interstate commerce commission, such as is now affecting the railroads, they have reduced their rates for the most part voluntarily and are in a much better technical position on this account, at this time, than are the railroads. Progressive central-station operators and their bankers have long recognized the precarious condition of plants with high rates for service. For such plants there is always the probability that the rates in the future will be lower of necessity, thus affecting the earnings materially. High rates almost invariably earn the ill will of the community served.

On the other hand the company whose rates are equal to or lower than the average is generally in a secure position, provided its management is efficient. Such a plant has little to fear from rate agitation. Its service becomes popular by reason of the low cost.

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Hamburg Power Station.

A new power station on the Hamburg (Germany) traction system has had unusual attention given to its architectural appearance on account of its proximity to the municipal park. Not only is the exterior of the station unusually ornate but the interior has had considerable attention given to decorative details.

The outer walls are broken by square figured panels and arched pilasters around the doorways and windows. The 260-foot chimney has the upper portion fluted. Tiling is used in the turbine room and the switchboard gallery.

Annual Report of Westinghouse Electric & Manufacturing Company.

The Board of Directors of the Westinghouse Electric & Manufacturing Company have prepared the report of the operations of the company and its subsidiary companies for the year ending March 31, 1914. The annual meeting of the company will be held on June 10.

The consolidated statement of income and profit and loss is as follows:

Gross Earnings:		
Sales billed		$43,733,645.77
Cost of Sales:		
Factory cost, including all expenditures for patterns, dies, new small tools and other betterments and extensions; also depreciations of property and plant, inventory adjustments and all selling, administration, general and development expenses..........................		39,016,423.39
Net manufacturing profit......................................		$ 4,717,222.38
Other Income:		
Interest and discount....................................	$ 454,998.94	
Dividends and interest on sundry stocks and bonds owned	718,282.12	
Miscellaneous—royalties, etc..............................	107,574.76	1,280,855.82
Gross income from all sources..............................		$ 5,998,078.20
Deductions from Income:		
Interest on bonds and debentures........................	$1,042,191.53	
Interest on collateral notes..................................	591,259.68	
Interest on long term notes and mortgages.............	72,554.06	
Proportion of expenses incidental to bond and note issues	133,750.00	
Miscellaneous	99,514.21	1,939,269.48
Net income available for dividends and other purposes.......		$ 4,058,808.72
Profit and Loss Credits:		
Profit and loss—surplus, March 31, 1913..................	$7,348,522.14	
Profit on bonds purchased...................................	3,010.00	
Profit on sales of sundry investments (net)..............	591,963.78	7,943,495.92
Gross surplus		$12,002,304.64
Profit and Loss Charges:		
Dividends on preferred capital stock.......................	$ 279,909.00	
Dividends on common capital stock.........................	1,405,989.00	
Depreciation and adjustments (net).........................	2,286,589.82	
Miscellaneous	370,686.77	4,343,174.59
Surplus, March 31, 1914, per balance sheet....................		$ 7,659,130.05

The Sales Billed and Net Income for the year are both in excess of the previous year. The ratio of manufacturing profit to sales billed decreased due to severe competition and to depreciation charges which were this year included in cost of sales.

The value of unfilled orders on March 31, 1913, was $12,061,473; on March 31, 1914, the value of unfilled orders was $7,951,385. The average number of employees during the year was 18,635 as compared with an average of 20,542 for the previous year.

The liquidation of the Russian Company has been proceeding in a most satisfactory manner, remittances of over $900,000 having been received during the year in reduction of the amount due for advances made. Advices indicate that in addition to the balance due the company for cash advances, there will be realized an amount sufficient to pay the greater part of the present book value of the stockholders' investment in the Russian Company, and that liquidation will be completed during the current fiscal year.

The reports of The British Westinghouse Electric & Manufacturing Company, Limited, for the year ended December 31, 1913, reflect a continued improvement in the affairs of that company. At the annual meeting of the shareholders on April 6, 1914, a dividend (the first since 1904) of five per cent on its preference shares was declared out of the results of the operations for 1913, which rate it is expected will be maintained, the company having now accumulated an ample cash working capital. On March 31, 1910, the book value of the stockholders' investment in the preference shares of the British Company was depreciated to approximately £1 per share. The market quotation for these shares on March 31, 1914, was slightly in excess of thirty shillings per share and the directors approved the appreciation to the approximate market value on that date. The present book value is still greatly below the cost of these shares.

The total liabilities of the company show a decrease of over $5,000,000 as compared with the previous year.

The funded debt shows a decrease of over $500,000 due to the payment of the outstanding balance of debenture certificates due July 1, 1913, and the sinking fund payment.

The Five-Year Notes, aggregating $429,500, issued to creditors under the plan for the discharge of the receivers in 1908, matured January 1, 1914, and were paid.

The collateral notes aggregating $3,500,000, placed during the previous year and to which reference was made in the report for that year, were paid in full during the current year. An additional collateral loan of $1,250,000 was placed during the year and will be paid at maturity on June 29, 1914.

The company's issue of Three-Year six-per cent Collateral Notes due August 1, 1913, was renewed to the extent of $3,250,000 for two years. All of the bonds and the majority of the capital stocks of the Scranton & Wilkes-Barre Traction Corporation pledged under these notes have been sold. With the funds already available from this sale part of these notes have been retired since April 1 and it is the intention to call any balance outstanding on August 1, 1914.

The payment of the above-mentioned notes aggregating $4,500,000 will be made from the proceeds of sales of securities and therefore will not deplete the working cash capital of the company; and further, their payment will return to the treasury a large amount of surplus securities pledged thereunder and will leave outstanding but one issue of collateral notes, viz.: the Ten-Year Five-Per Cent notes due October 1, 1917, amounting to $2,720,000.

Included in the report is a copy from the minutes of the Board of Directors of a memoriam to George Westinghouse and Anthony N. Brady, as follows:

George Westinghouse.

The Board of Directors of the Westinghouse Electric & Manufacturing Company records with deep grief the death in New York on the Twelfth day of March, Nineteen Hundred and Fourteen, of a member who was the founder of the company—Mr. George Westinghouse.

The history of this organization from the time of its creation by Mr. Westinghouse to its present magnitude is the story of the genius, wisdom, courage and foresight which placed him among the foremost men of his age.

By his death a high-minded and inspiring leader of men has been taken away. There has been a great public loss.

It is with sorrow that the Board registers this last sad memorial among the chronicles of the company built by him, and orders it engrossed and forwarded to his family.

Anthony N. Brady.

Whereas, the Board of Directors have learned with deep regret of the death of their fellow director, Mr. Anthony N. Brady, who became a member of the Board in September, 1898, and served continuously until his death.

Resolved: That the Directors record with sorrow the death on July 22, 1913, of Mr. Anthony N. Brady. In the deliberations of the Board throughout his long service as director, his opinions commanded the attention and respect of his fellow directors, and they desire here to record their high appreciation of his qualities and their sense of the loss which his death brings to them and to the company.

Further Resolved: That a copy of this resolution be sent to Mr. Brady's family with assurances of deep sympathy in their loss.

The Board of Directors of the Westinghouse Electric & Manufacturing Company is as follows:

A. G. Becker, president, A. G. Becker & Company, Chicago, Ill.; William McConway, president, The McConway & Torley Company, Pittsburgh, Pa.; George M. Verity, president, The American Rolling Mill Company, Middletown, Ohio; Paul M. Warburg, of Kuhn, Loeb & Company, New York, N. Y.; Edwin F. Atkins, of Atkins & Company, Boston, Mass.; Charles F. Brooker, president, American

Brass Company, Ansonia, Conn.; E. M. Herr, president, Westinghouse Electric & Manufacturing Company; John R. McCune, president, Union National Bank, Pittsburgh, Pa.; Joseph W. Marsh, president Standard Underground Cable Company, Pittsburgh, Pa.; Guy E. Tripp, chairman of board, Westinghouse Electric & Manufacturing Company; H. H. Westinghouse, New York, N. Y.; Albert H. Wiggin, president, Chase National Bank, New York, N. Y.; J. D. Callery, vice-president, Philadelphia Company, Pittsburgh, Pa.; Paul D. Cravath, of Cravath & Henderson, New York, N. Y.; Harrison Nesbit, president, Bank of Pittsburgh, N. A., Pittsburgh, Pa.; James N. Wallace, president, Central Trust Company, New York, N. Y.

Ohio Telephone Interests to Consolidate.

A big merger of Ohio telephhone interests is announced at Columbus, O. It means the retirement of J. P. Morgan & Company from a field in which they had become strongly entrenched. The telephone properties of the state in which this house is interested are to be taken over by a syndicate known as the Ohio State Telephone Company, along plans worked out by F. R. Huntington, president of the Huntington National Bank, Columbus. The properties include the following: Columbus Citizens Telephone Company, United States Telephone Company, Cuyahoga Telephone Company, Home Telephone Company of Dayton, Toledo Home Telephone Company, Washington Home Telephone Company, London Home Telephone Company, Stark County Telephone Company, Youngstown Telephone Company, Columbiana County Telephone Company, Zanesville Telephone & Telegraph Company, Findlay Home Telephone Company, Lancaster Telephone Company, Massillon Telephone Company, and the Citizens Telephone and Message Company of Fostoria.

The corporations mentioned now have combined capital liabilities of $25,815,976.77. These are composed of first mortgage bonds outstanding, $10,013,500; notes of subsidiary companies held by the United States Telephone Company, $82,595.03; preferred stocks outstanding, $4,239,550; common stocks outstanding, $8,964,087.50; surplus, $1,180,758.99; depreciation reserve, $1,335,535.25.

It is proposed to issue to stockholders of the various companies $5,206,000 common stock of the new company, $4,850,000 seven-per-cent cumulative preferred stock, and $1,500,000 mortgage bonds. The bonds of the constituent companies will be cancelled and the new company will assume the remaining $8,060,200 of outstanding bonds and also other legal obligations. The new company is to issue mortgage bonds in the amount of $2,850,000, of which $500,000 will be used as working capital and the balance for betterments and extensions.

Samuel G. McMeen, president of the Columbus Railway, Power & Light Company, is to be president of the new syndicate. He has had 30 years' experience in the telephone field in California, Illinois, Ohio, Canada and Mexico. Frank A. Davis, of Columbus, who has been the representative of the Morgan interests in Ohio and who is now ppresident of the Columbus Citizens Telehone Company, is to be chairman of the executive board. The board will include well-known telephone men from all over the state.

Full details of the merger have been worked out and the facts as herewith given come from the parties most prominently identified with it. Application will soon be made to the Ohio State Utilities Commission for authority to go ahead with the enterprise.

Electrolysis in Ferroconcrete.

In a recent article in the *Elektrotechnische Zeitschrift,* Kurt Lubowsky described some experiments upon electrolysis in concrete. The concrete was in the form of blocks, some of which contained pieces of iron entirely covered with the cement. Electrodes consisting of perforated sheets of iron were used, and tests were made with both direct and alternating currents, the frequency of the latter being 60 cycles. The concrete blocks were stored in air or in water. The resistance in air increased during the setting of the concrete, rising finally to a value of 16,000 ohms or more for a block 12 centimeters square and 25 centimeters long. The resistance of blocks lying in water decreased to about 200 ohms. The usual effect with direct currents was oxidation of the iron which swelled and cracked the concrete, giving access to moisture.

Some experiments were carried out at high voltages (11,000), the block taking a current of 0.22 ampere. This caused jets of steam to issue from the block after two hours, and these jets soon turned into arcs. Some of these fused the concrete, which finally split.

Effect of Mercury-Vapor Lamps on Laying Hens.

A maker of mercury-vapor lamps has received a report from Scotland that the operation of a mercury-vapor lamp in the hen house of the writer in February caused the hens to lay at the same rate as in summer weather. The results from 40 birds were increased from about one per day to 15 or 20 per day.

Cooking Apparatus Design.

English electrical engineers recently had a useful discussion of many points that have come under their observation in connection with electric cooking business. The occasion was a meeting of the Point Fives, a small but enterprising club consisting of electric supply engineers and managers who, by their membership, indicate that they are impressed with the supreme importance of the cooking and domestic-uses load and are prepared to go a long way in order to capture it. The opening statement was contributed by Mr. Hame, the city electrical engineer of York. Among the points covered by him was the difference of opinion that is found to exist among consumers concerning the respective merits of heating from the sides of electric ovens or from the top and bottom. He regards side heating as preferable for cooking roasts that are hung, and top and bottom heating for cooking done in drip pans. He questioned the wisdom of adding to the first cost of apparatus by fitting glass windows in the oven doors and by providing thermometers, holding that the user prefers to be guided by experience gained regarding how long it takes to heat an oven, rather than by instruments. A suggestion was made regarding an outlet for improved means being introduced to convey the electric supply to the table holding the apparatus when such table is placed in the center of the room. Where the lighting is effected from central indirect fittings a connector can be attached to the bottom of the inverted bowl and a connection brought down to the apparatus.

J. W. Beauchamp, borough electrical engineer of West Ham, considers illuminated signs the best means to employ for indicating whether switches in cooking stoves are "on" or "off." Another member sees little prospect of central stations renting stoves out at lower rates than at present until manufacturers can manufacture in such numbers as to enable them to reduce the selling cost; he also stated that the continual improvements that were being made in cookers had compelled him to modify his earlier views in favor of standardization.

A suggestion was thrown out to the effect that a central association or bureau of research be established to undertake expert tests of all kinds and types of cookers and apparatus, with a view to the publication of impartial test results for the benefit of the industry. This would lead to the elimination of faulty apparatus and work in the direction of standardization. A later speaker, however, thought that every engineer should personally make tests of all the types of oven in practical service. The opinion was several times expressed by different members that windows, thermometers, and such refinements in stoves were unnecessary; and it was remarked that most English makers were giving up top and bottom heating and using only side heating. The idea of standardization of a type of cooker by electrical engineers, following the course successfully adopted by gas companies, was favored by R. S. Downe, who suggested the drawing up of a model specification for electric cookers, and the secretary of the Club, A. H. Seabrook, advocated standardization of side heating, arguing that obsolete stoves could be cheaply brought up to date by modern elements being substituted for old ones.

Copper Recovered from Scrap.

The total amount of copper recovered in 1913, on the assumption that the brass remelted had an average copper content of 70 per cent, was 136,500 tons, of which 18,661 tons (about 4,000 tons more than in 1912) was recovered by plants refining primary metals and the remainder by plants treating only secondary, or recovered materials. The copper produced by smelters of the latter class includes 36,716 tons of pig copper, 11,603 tons of copper in alloys other than brass, and 69,520 tons of copper in remelted brass. These figures indicate a decrease for 1913 of about 6,000 tons of pig copper, and 1,500 tons of copper in brass and an increase of about 2,300 tons in alloys other than brass. At least 45,000 tons was recovered from clean scrap made in the course of manufacture of copper and brass ware.

The production of copper from secondary sources in 1913 was equal to about 17 per cent of the refinery output of primary copper in the United States from all sources, or about 22.4 per cent of the primary copper smelted from domestic ore.

Lighting the Dome of the Ohio State House.

H. H. Heistand, an electrical engineer of New York City, has drawn plans for a modern system of high-power lights and reflectors which will be used to properly light the State House at Columbus, Ohio. Under the plans the dome and flagstaff of the State House will be flooded with enough light at night to make a new center of beauty in the heart of the city and the national colors will be properly displayed. The cost of the illumination will be about $5,000 and the plans have been approved by the committee of the Columbus Conventions and Publicity Association and by Governor Cox, of Ohio. Work will be started at once.

Cost of Power and Breakdowns with Different Prime Movers.

In a paper read before the Manchester Association of Engineers, E. G. Hiller gave some interesting figures regarding the reliability of types of prime movers and the fuel cost for producing power by means of them.

As experience has accumulated the gas engine has become more and more reliable. This is especially true of the smaller sizes. Engines with large cylinders present much greater difficulties.

Table 1 shows the reliability of different types of prime movers, as indicated by the number of breakdowns in proportion to the number in the case of steam engines. As this is taken in terms of the number of engines involved the comparison is not entirely fair, since steam turbines, for instance, have much larger average individual outputs than other forms of prime movers. A comparison on the basis of repairs per horsepower per annum would be more fair, but such figures are not available.

Table 2 shows the approximate fuel costs for different types of engines. Superheaters are assumed in connection with steam engines and turbines. Here it is seen the steam turbine compares very favorably with its competitors. Coal is assumed to cost $3.15 per ton; oil, $22 per ton; gas, 43 cents per 1,000 cubic feet.

TABLE I.—RELIABILITY OF DIFFERENT TYPES AS INDICATED BY NUMBER OF BREAKDOWNS.

	Number of Breakdowns	Number of Breakdowns × Cost per Breakdown
Steam-engines.	1	1
Steam-turbines	3.36	6.3
Gas-engines up to 14 inches.	0.6	0.24
Gas-engines 15 to 24 inches.	2.82	3.01
Diesel engines ..,..	3	3.75

TABLE II.—APPROXIMATE FUEL COST.

	Cents per Horsepower-Hour Indicated	Brake
Steam-engine, 250 horsepower	0.25	0.28
Steam-engine, 1,000 horsepower	0.22	0.25
Steam-turbine, 1,000 horsepower	....	0.22
Steam-turbine, 2,000 horsepower	....	0.21
Steam-turbine, 5,000 horsepower	....	0.20
Diesel engine	....	0.43
Gas-engine	....	0.63
Gas-engine with producer gas .... (bituminous coal)	....	0.17

Utah Company Section Meeting.

The regular monthly meeting of the Utah Light & Railway Company section of the N. E. L. A. was held at the company's new commercial office and electric shop at 154 Main Street. Lloyd Garrison, in charge of the electric shop, gave a talk and demonstration of the various electrical appliances on exhibition there. At the conclusion of this demonstration an electrically cooked luncheon was served to the members under the direction of Mrs. Olive Huppert, the company's demonstrator.

The meeting then adjourned to the Consolidated Music Hall where the regular meetings are held and details for the section's summer outing at Pine Crest at the head of Emigration Canyon scheduled for June 13 were discussed.

Oxbow Power Plant to be Completed.

Judge Frank S. Dietrich, of the Federal Court at Boise, Idaho, has issued an order permitting the receiver of the Idaho-Oregon Light & Power Company to issue receivers' certificates up to $250,000, to be used in the completion of the Oxbow power plant located on the Snake River between Idaho and Oregon. The application of the receiver for his authority was made some time ago, and the stockholders of the company divided on defending and opposing it. The risk to the issuance of the certificates is to be attached to those stockholders who backed up the receiver in his application. They are said to have made arrangements for the disposal of their certificates, thereby raising the money to finish the work on the plant.

When the Oxbow tunnel plant was started some years ago by the Idaho-Oregon Company, its backers then had no idea that it would cost the amount of money that it has. The drilling of a tunnel through a mountain of rock and other difficulties that were unforeseen at the time the work was started, took all of the original estimate.

The plant is one of the most important to the development of electrical energy in southern Idaho. It represents a difficult piece of engineering. When the power war broke out among the various big power corporations in the southern Idaho field, and the stockholders of the different interests began to quarrel, work on the Oxbow plant was abandoned, and since then up to the present time there has been little done. Now the Idaho-Oregon Company needs the electricity from a large generating plant. A receiver having been appointed for that company to handle its affairs pending the outcome of the litigation that involves it and instituted in the Federal Court, proposed to supply this energy by going ahead with the completion of the Oxbow plant and has secured the approval of the court.

The New Zealand law requires all ships engaged in the foreign, intercolonial and coasting trades, carrying 50 or more persons, to be equipped with wireless telegraphy. The law goes into operation on July 1. Every passenger vessel in the Dominion has an installation.

Commercial Practice
Management, Rates, New Business

Convention of Commercial Men of Ohio Central Stations.

Representatives of the commercial departments of Ohio central stations, about 50 in number, gathered in Cleveland, Friday, May 22, on the occasion of the third meeting of the Committee on New Business Co-operations of the Ohio Electric Light Association. This Committee, which has held two previous meetings during the year, has been devoting particular attention to the problems concerning the commercial or new-business department of small central stations, and the experiment of holding conferences during the year has resulted in bringing together a large number of men, many of whom find it impossible to attend the annual convention of the Association and who, because of the round-table spirit prevailing at these conferences, have no hesitancy in expressing their ideas and taking an active part in the work of the Committee.

Chairman Thomas F. Kelly, sales manager of the Dayton Power & Light Company, called the meeting to order on Friday morning and introduced George S. Milner, chairman of the Executive Committee of the Electrical League of Cleveland, who welcomed the delegates to the sixth city and called particular attention to the electrical exposition which was in progress at the Coliseum, and which had dedicated the day to the Ohio Electric Light Association.

Secretary D. L. Gaskill, of the Ohio Association, who was then called upon, responded to Mr. Milner by praising the remarkable developments that have taken place in Cleveland from a civic standpoint and electrically. Speaking of the work of the Association, Mr. Gaskill said that the best results can only be obtained by making such an organization a continuous working body and not merely an association meeting once a year in annual convention. He complimented the Committee on New Business Co-operations and pointed out that the small companies are the ones who are receiving the greatest benefit from these frequent conferences.

Matthias Turner, contract agent of the Cleveland Electric Illuminating Company, then presented an illustrated paper entitled "Several Business-Getting Campaigns." Mr. Turner described a house-wiring and store-wiring campaign which is still in progress and also mentioned an industrial-power campaign which was inaugurated just recently. The house-wiring campaign for securing the business of old unwired houses has been in progress approximately eight years and at the present time 9,600 residences have been wired under this plan. A series of carefully prepared letters, which have been revised from time to time, have been sent out in connection with this work, the first being sent to the owners of residences, the second letter to those renting houses and the third to landlords owning buildings which they rent to tenants. Letters sent to tenants particularly urge them to induce landlords to provide the facilities for electric lighting, pointing out that in the present day electric lighting is as essential as good plumbing. To the landlords special emphasis is placed on the desirability of wiring houses and the difficulties that will be encountered in renting houses not provided for electric lighting. In connection with these letters, attractive booklets were gotten out illustrating various electrical appliances and fixtures and giving complete data on wiring installations. Through the co-operation of the local electrical contractors a minimum flat rate per outlet was decided upon for this campaign, and the data presented in the booklet enabled the prospect to estimate the cost of wiring a residence in accordance with his own ideas as to number of outlets, location of switches, etc.

In this plan as well as in the store-lighting campaign, the customer was allowed 10 months to pay, the electric company financing the installation and allowing 15 per cent of the cost of the wiring to apply on future lighting bills, providing such amount would not exceed $15. Coincident with the issuance of these booklets and letters, liberal newspaper space was used daily in the foreign as well as the English papers. In this connection a booklet along the lines mentioned was printed in the Bohemian language.

The store-wiring campaign was inaugurated on January 1, 1914, and the results so far obtained are as follows: January, 41 contracts; February, 49 contracts; March, 81 contracts; April, 78 contracts. Mr. Turner explained that these figures, it is expected, will be greatly increased during the summer months as very little in the way of extensions or improvements are made in stores during the spring. Altogether, there is a field of approximately 2,000 stores which are considered as prospects. These are divided into two general classes; owners occupying their own buildings, and tenants renting their stores. As in the residence campaign, three general letters supplemented by folders, booklets, etc., were sent out. Data also were given enabling the prospect to estimate the cost of his own installation a flat rate per outlet having been agreed upon by the contractors. A series of three letters was also sent to the tenant, the first letter urging him to influence the landlord to have the store wired. The second letter was sent to tenants having long leases, pointing out that the low cost of wiring under this plan enabled the tenant to pay for the installation and from the increased business that would result and the general improvement in appearance of the store would make the expenditure a wise one.

Wiring contracts received during both the house-wiring and store-wiring campaigns are turned over to the contractors on the same relative basis as the contractors turn over to the electric company contracts which they secure by their own efforts.

A campaign for large power business was inaugurated on April 8, and, of course, has not been in effect for a period sufficient to judge the results that will accrue. The feature of this campaign is a series of newspaper advertisements in the form of interviews with large power users. These interviews are reproduced verbatim. In inaugurating this campaign the company used a newspaper advertisement featuring a large outline picture of the City of Cleveland, showing the location of the company's generating and substations, indicating the accessibility of the power lines to the industrial centers. Dots pointed out the location of the large industrial establishments using central-station service. A series of letters pointing out the advantages of purchased power was sent out in connection with this campaign.

Adjournment was taken at this point for luncheon, following which Dr. F.

A. Wolff, of the National Bureau of Standards, Washington, D. C., delivered a brief address, outlining the work of the Bureau as it related to the electrical industry. It was pointed out that the Bureau is really an outgrowth of the Department of Weights and Measures, and was created by Congress as a result of the establishment of standards of electrical measurement by the Chicago Electrical Conference in 1901. Dr. Wolff spoke briefly of the testing of instruments by the Bureau, which is done for a nominal fee and also of the accuracy which has been obtained in electrical measurements and photometry. Mention was also made of the electrolysis investigation which the Bureau has undertaken and of the good which is being accomplished in this direction. He said that Congress has recently appropriated $25,000 for an investigation of life hazard in electrical transmission and co-operative work is also being done in the interest of fire prevention work.

Recently, Secreeary Redfield has recommended to Congress that the Bureau of Standards undertake an investigation of public utility regulation with the idea of assisting the various states and utilities in the solution of their problems. This work which is very likely to be undertaken will primarily educate the various commissions on the fundamentals of central-station practice as it pertains to regulation.

The convention convened after a vote of thanks had been extended to Dr. Wolff, and the paper by S. E. Doane, chief engineer of the National Lamp Works, entitled "European Central-Station Practice" was presented. Mr. Doane prefaced his remarks by the statement that the attitude in this country, and his attitude until his recent European trip, was that the small customer must be carried by the central station but at a loss. In Europe the reverse conditions were found. Very elaborate campaigns for securing the small customer's business are being carried on and in every case every customer is taken on at a profit. Mr. Doane spoke particularly of the situation in Milan, Italy, where central-station salesmen in the campaign for this business were only given credit for the small-customer business. It was believed by the Milan company that this class of business should be obtained for political reasons, as well as financial, as a company of the masses is not subjected to the same harmful treatment as a company of the classes. He said that there is no one thing that will solve the problem of the small customer business. Central stations must finance the wiring installations; they must turn over wiring contracts to the local contractors; they must establish friendly relations with the contractors and with the public generally. Mr. Doane presented details of the billing and collecting systems and the wiring systems employed in Europe, illustrating his remarks with stereopticon lantern slides. Considerable of the data on practices of European central stations were presented in our issue of January 24, 1914, in connection with a paper read by Mr. Doane at the Wisconsin Electrical Association meeting at Milwaukee.

E. B. Rowe, of the Holophane Company, Cleveland, then delivered an address on "Illumination as a Business Getter." It was pointed out that proper illumination is a community interest and should be strongly advocated by the central station. Good illumination in one place leads to good or better illumination in another, and so the general lighting of a community is improved. One field for advertising good illumination which in the past has been sadly neglected is in street cars, where the advertising value cannot be too strongly emphasized. Mr. Rowe referred specifically to the Toledo Railways & Light Company which has recently re-equipped all of its cars with modern illuminants and has carried on an extensive advertising campaign in the newspapers, calling attention to the lighting of these cars. In cases where the railway company and the central station are independent, there is considerable room for co-operative effort in this connection.

Show-window lighting was also mentioned as an important field and has practically the same advantages from the advertising standpoint as good street-car lighting. Exterior lighting in general is becoming more and more important as business producers for central-station companies. In this connection, the new high-efficiency lamp has opened up the new fields, one important one being the lighting for engineering and construction work.

Ornamental street lighting, Mr. Rowe said, has touched only the business sections of the various cities, but its effect is being felt in the residential sections and the tendency is for improved lighting in these districts. Another field which is worthy of serious consideration which has been opened up by the new so-called type C lamp is interurban highway lighting. The advertising value of these nitrogen-filled incandescent lamps has already been realized by motion-picture theaters, garages, and other similar institutions, and these are finding wide application at present.

Chairman Kelly, in adjourning the meeting, thanked the members of the Committee for the co-operation they had given him during the year and also predicted that the Committee of next year will be able to do a great deal of good in the line of power investigation.

Free Electric Fan Service at Byllesby Properties.

The free electric fan service for indigent invalids, in effect at all electric properties operated by H. M. Byllesby & Company during the past three summers will be continued in 1914. City officials, business men, bankers, physicians and members of families benefited have written many letters commending the local companies for this charity, and a number of newspapers have seen fit to praise the companies for what they term a "direct and personal act of charity." Where houses close to the lines are unwired, temporary connections and interior wiring are installed without charge. The fans are loaned as long as the attending physician thinks necessary. Company managers have handled the free fan offer creditably in the past, according to Vice-President A. S. Huey, and by doing so have given the public a visible sign that corporations are able to find at least some ways of serving people in distress without considering financial reward.

Big Central-Station Thermometer Attracts.

"Let the weather advertise your products," admonished a concern with a plan to place advertising on thermometers and depend on the curiosity of the public to do the rest. The Kansas City Electric Light Company conceived the value of this idea recently and proceeded to put it into effect. A thermometer measuring some eight feet in height has been placed on the exterior of the company's headquarters at Fifteenth Street and Grand Avenue, Kansas City, Mo., for the benefit of the general public. While pedestrians can easily note the temperature during the hot days, passengers on passing street cars can view the instrument with as much ease because of its size. Anyone looking at the thermometer can hardly avoid observing the attractive window display of the light company and the plan is working out well.

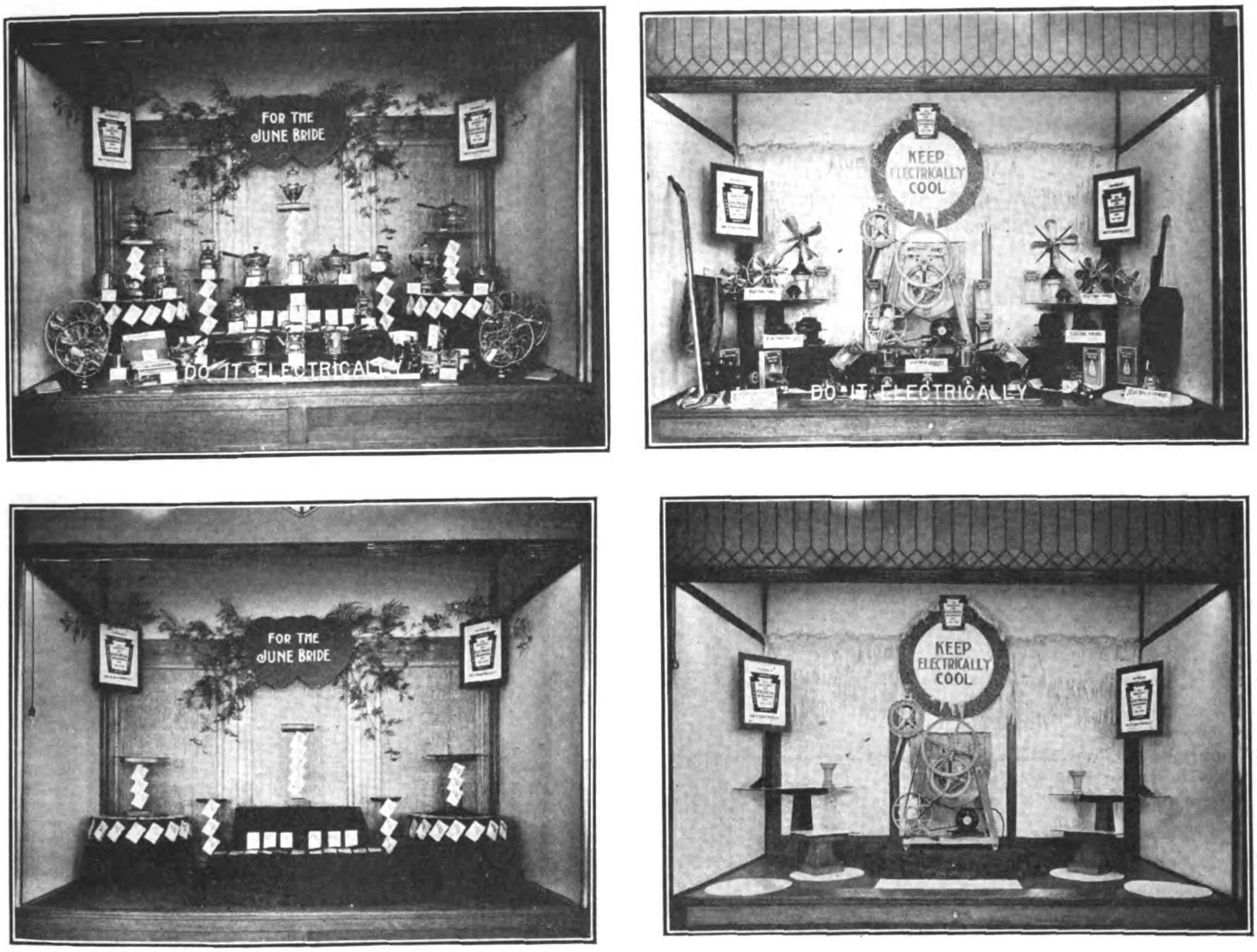
Municipal Plant Enjoined.

A temporary injunction has been issued at Upper Sandusky, O., restraining city officials from proceeding with the sale of an issue of $25,000 of bonds for the purpose of constructing a municipal electric plant. A taxpayer, Gen. I. M. Kirby, brought the suit at the instance of the Hardin-Wyandot Lighting Company.

Show Windows Prepared by Society for Electrical Development.

The Society for Electrical Development has engaged A. J. Edgell, a window trimmer and display manager of national reputation, to inaugurate a window-dressing department, which is one of the activities which the Society has undertaken to give to its members valuable service in the way of suggestions for seasonable displays.

Mr. Edgell is a member of the Educational Committee of the National Association of Window Trimmers, and is president of the Greater New York Display Managers and Window Trimmers' Association. He has contributed many practical articles to trade papers upon this subject and has had years' of experience in actual window trimming, so that he is familiar with display problems and knows how to solve them. Windows will be trimmed under Mr. Edgell's direction and then photographed. Two photographs will be taken of each window, one showing the fixture setting and the other the finished window. The accompanying illustrations represent the two views of each of the first two windows prepared for this purpose. Copies of these photographs will be sent to members, accompanied by instructions as to how to trim the window to secure the results shown in the photographs.



Suggestions for Dressing Two Show Windows. Finished Windows Above, Fixture Setting Below.

Electric Light Improves Real-Estate Values.

At a recent meeting of the Real Estate Board of Pittsburgh, Pa., Robert S. Orr, general manager of the Allegheny County Light Company, of Pittsburgh, made an interesting address on the importance of good light to real-estate values. Mr. Orr contended that the more a street or house is lighted the more desirable it is, and that in this way the development of electricity for lighting and power purposes had proven a great benefit to real estate.

Consumers' Company Secures Pumping Contract.

The village of Madison Lake, Minn., which recently granted a franchise to the Consumers Power Company for the distribution and sale of electricity has now contracted with the Company for its water pumping and city-lighting requirements. Construction of the line will be started at once.

Successful Electric Pumping in Utah.

The Big Spring Electric Company, at Fountain Green, Utah, has been experimenting with an electric pumping outfit on the premises of Warren Holman in the southern part of the city. A flow of 480 gallons is easily obtained from a 33-foot well using a five-horsepower motor, this flow being equivalent to about two-thirds of the regular irrigating stream. The cost of the well and pumping plant amounts of about $1,200. The results secured have been so satisfactory that it is quite likely that several other plants will be installed in that vicinity.

"Safety First" Campaigns in Kansas City.

The Metropolitan Street Railway Company, of Kansas City, Mo., which recently launched an aggressive "Safety First" campaign, has continued it by means of distributing 50,000 buttons, bearing the words "Safety First" and the company's name. The Kansas City Electric Light Company, a kindred concern, also has adopted the safety ideas, carrying it out in its newspaper advertising and on its stationery.

Electric Sign Data

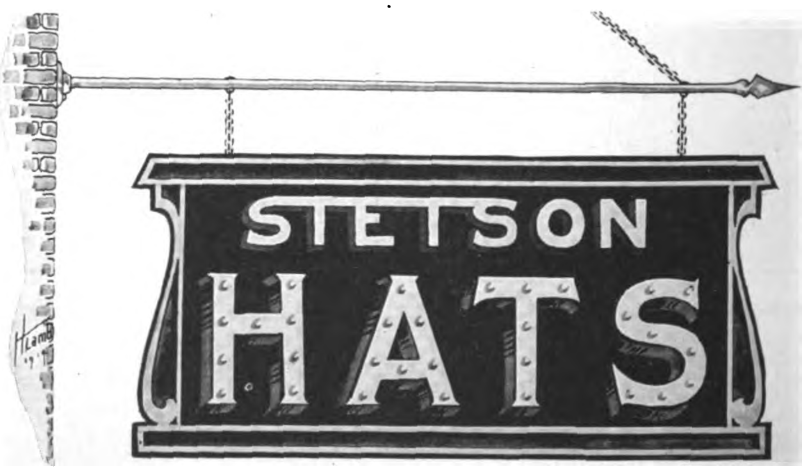
New Sign Ordinance in Providence —Other News.

A resolution asking passage by the General Assembly of an act providing stringent regulation of all signs suspended over sidewalks on public highways was presented in the Common Council of Providence, R. I., recently with recommendations of adoption by the Committee on Ordinances.

The draft act covering the regulations which the Committee believe should be in operation was approved by that body. It provides that no person or concern shall place a sign upon a building in such a manner that it projects over the sidewalk unless a permit is first secured from the Inspector of Buildings, following an investigation by him.

It also provides that no sign shall project more than three-quarters the width of the sidewalk over which it is suspended. All electric signs, in addition to requiring the permit from the Building Inspector, shall also be approved by the Public Service Engineer before being put in place.

The act was drawn by the Committee after a thorough investigation of the matter begun several months ago at the behest of Councilman Vito N. Famiglietti. A public hearing on the project was held some time ago by the Committee and the sentiment at the hearing, together with the conditions which the members found existing at the present time, led to the framing of the act.



Sign sketch contributed by the Greenwood Advertising Company, Knoxville, Tenn. Suitable for small hat stores.

Sign measures 12.5 by 4.5. There are 114 lamps used. Letters are 16-inch raised. Background is of glass smalt. Border is verde antique. Double faced.

Arranged to flash as desired, or steady burning.

A novel window attraction was recently put into operation by the Denver Gas & Electric Light Company. Five electric fans of different sizes were installed in one of the front windows of its new salesroom and office building. Over these fans was built a cabinet frame 4 by 6 feet and 10 feet high, covered with black cloth. Into this cabinet was placed a half-bushel of confetti, most of which was kept in motion by the continuous action of the fans, giving the appearance of a miniature snowstorm.

Placards at the side called attention to the fact that fans could be installed in the home or office and operated at the cost of an ordinary electric light. When first introduced, this scheme proved to be one of the best drawing cards on the street.

A Denver, Colo., drug store, on a corner where many transfers are made, shows two electric signs inside of the window, one reading: "Come in while you wait for the car." The other, a flasher in miniature pink lights, says: "Look over the latest magazines." A 12-foot settee is placed at one end affording seating room for those who enter. A schedule of running time on night cars hangs on a pillar, giving on a large placard the time when owl cars on two well patronized lines may be expected to pass the corner. No doubt many sales might be traced to the feeling of good will which this service and cordial invitation engenders.

Columbus, O.—At the price of $1,800, contract has been let by the Columbus (Ohio) Convention & Publicity Association for a sign 60 feet in length to be erected opposite the entrance to the Union Station. The Federal Sign System (Electric), of Columbus, is the successful bidder. The letters will be white porcelain on blue background, the structure to be of sheet steel. In the centre of the sign there will be an allegorical figure of Christopher Columbus, 20 feet high. The illumination will require 325 lamps.

A beautiful lighting effect will be installed in the Columbus, Ohio, State House dome, after plans drawn by H. H. Heistand, an electrical engineer of New York City. The cost will be $5,000, and will include a series of high candlepower lights and suitable reflectors, to display the national colors floating above the dome. The plans have been approved by the committee of local business men who have obtained permission from the state authorities to make this novel improvement.

The "Running Greyhound" is a large spectacular sign built by the Thomas Cusack Company for the ride called "Gee Whiz," at Riverview Park, Chicago, Ill. This is a double-faced sign twelve feet long and five feet high and contains 400 lamps. It is operated by a high-speed flasher for the desired effect of the greyhound in a running attitude. It is estimated that at least 85,000 people is the average daily attendance at this park.

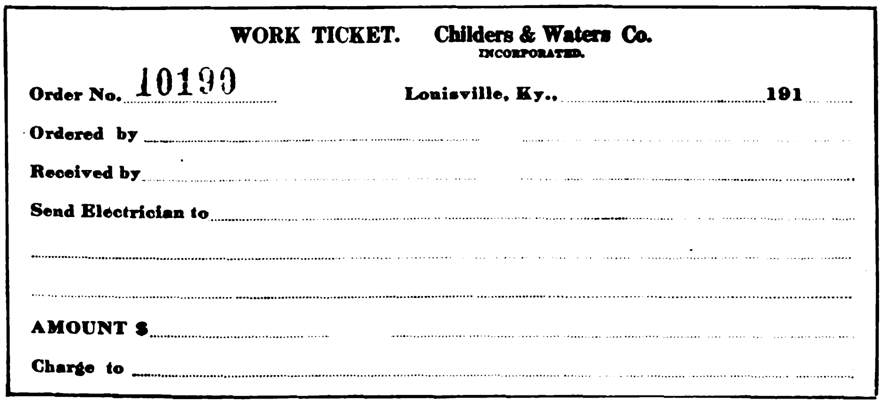
Electrical Construction

THE PERSONAL ELEMENT IN ELECTRICAL CONTRACTING.

By G. D. Crain, Jr.

While the technical side of electrical contracting is properly given emphasis, the fact must not be lost sight of that getting and holding business is largely a question of how the personal element is handled. This is true with regard to the men employed, and to an even greater extent with regard to the people for whom work is done. If the relationship between the customer and the contractor remains friendly, and reasonably good work is done, the matter of repeat orders will take care of itself.

Selection of workmen for their ability to make a good impression for the concern employing them is a phase of the situation which is sometimes overlooked. But it must not be forgotten that every electrician is a salesman for the house in the sense that he is selling its commodity, service. He must make a favorable impression on the customer if the latter is to be made a permanent patron.



WORK TICKET. Childers & Waters Co.
INCORPORATED.

Order No. 10190 Louisville, Ky., 191

Ordered by

Received by

Send Electrician to

AMOUNT $

Charge to

Work Ticket.

In this connection a leading electrical contractor recently declared that one of his men, though he is employed as a journeyman and has no order-book with him, is one of the best salesmen the firm employs.

"I get telephone calls almost daily," he said, "asking that Smith, this man, be sent out on a repair job or a fixture installation. He makes friends for himself and the house wherever he goes, and the result is that customers tell their friends, and the latter call us up and ask that he be put on the job. This is a bigger asset than many contractors appear to realize."

The fact that comparatively little work done in the average city is strictly new work, but the bulk of it consists of rewiring jobs and work in old houses generally, makes this a matter of more than ordinary importance. In other words, since work must be done in buildings that are already occupied, and since the electricians come in contact with the feminine members of the family for which the work is being done, they must conduct themselves with more than ordinary decorum in order to avoid displeasing the customer.

A little loud talking or unnecessary noise, which would be all right in a new house not yet occupied, is all wrong in one where the occupants are right at hand. Quiet, orderly operations, carried on in a gentlemanly way, are demanded; and while it may seem to some that requiring the journeyman electrician to be gentle as well as efficient in his work is drawing the proposition to a pretty fine point, it is just as easy to get men of that kind as of the "rough-neck" variety, and the results are a lot better.

It goes without saying that the contractor should impress upon his men that they are hired not merely to do certain work, but to get business for the house. Let them understand that they can sell just as effectively by making friends with people for whom work is done as by going out soliciting with an order-book and an estimate blank. This will not only assist in keeping the conduct of the men up to the mark in all repects, but will impress them with the idea of their responsibility and the fact that their job is more important than they may have expected it to be.

Taking a comparison from another line, a wholesale baker told recently that he had quit calling the men on the wagons, who distributed his bread, "drivers," and was now referring to them as "salesmen."

"Business has increased 20 per cent since I made the change," he said, "because every man got a new angle on his work and felt that he was holding down a bigger job than he used to."

In order to be sure of having not merely good workers, but men who work for the good of the house, a certain contractor declared recently that he never lays off a man who is regularly employed.

"I keep my men working all the time," he said, "and each gets a full pay-envelope on Saturday night. If there isn't any work to do, I make some. The reason is not only that I want to keep good workmen, but I want to be sure of having the sort of men who will make a good appearance and will act like gentlemen when they go out on a job. I don't care to trust to 'picking up' electricians for this or that job, but I want to know all about the personality of the men I employ."

Marshall Field is believed to have created the aphorism, "The customer is always right." However, while this is a good merchandising maxim, if the truth he sought to convey is grasped and not merely the superficial meaning taken account of, it often happens in practice that the customer is dead wrong. The job of the contractor is to show the customer his mistake without offending him. That is another phase of the personal equation which must be studied out.

Experience has shown that the only way to keep accounts in good order, avoid mistakes, and make the people who pay the bills pay them without kicking, is to have a record of the orders in such a form that some one person may be held accountable for having given it, and a record of the work done which will show who O. K.'d it, especially as to the time spent on the job.

One of the best systems of this kind, which commends itself by reason of its simplicity, is that which is used by the

Childers & Waters Company, of Louisville, Ky. C. C. Childers, who has been in the business for years, and was formerly with the Harry I. Wood Company, of Louisville, realized early in the action that it was bad business to leave anything to chance, or give the customer an opportunity to wrangle over a bill.

Consequently, every order that comes in is entered so as to show the person who ordered it and the person who received it; the details of the order and other information usually received. This work ticket is entered in duplicate, the original going to the office with a memorandum of the materials used, while the duplicate remains in the order book. If there is any question about a job having been done, reference to the work ticket shows who ordered it, and the man or woman in the office who received it can be called on for amplification of the information.

Frequently, especially in the case of a small job handled for a big concern, the contractors find that the customer has no record of the work, and delays payment of the bill. Giving the name of the man who placed the order, and likewise finding out the other circumstances from the person in the office who took the requisition, will straighten out the trouble, whereas if the names were left off, it might be extremely difficult to avoid friction.

Having the duplicate in the order book not only enables this information to be secured in the event that the original work ticket is lost, but also serves as a check in billing. Each order is checked with the letter "B" as bills are sent out. If a work ticket is lost and no bill is sent, the absence of the notation is immediately seen and the correction made. There is no telling how much money is lost to some firms by reason of failure to send out bills for little jobs which are overlooked by the office.

But avoidance of trouble and simplification of the records is accomplished by Childers & Waters in another way. Each workman who goes out on a job carries with him a certificate of time. This certificate must be signed by the customer before the workman leaves the job. The firm allows him a reasonable time for getting to and from jobs, and if the certificate turned in does not show that the proper time was spent on the job, the office demands the reason why.

Mr. Childers tells of innumerable instances in which the signature of the customer on the certificate saves argument and results in prompt payment of the account, whereas without it there would not only be delay and friction, but the amount might be lost along with the good will of the customer. In one instance, a fan job required several hours' overtime, the work being done for a clothing concern on Saturday night. The manager of the establishment declared, when the bill was presented, that no overtime was used in the work. When the card was shown him, he recognized his signature at once, of course, and acknoledged his mistake.

"But I would have seen you in Halifax before I paid that bill if you hadn't convinced me of my error," he declared good naturedly.

Contractors in the electrical business are dealing with materials and technical operations of all kinds; but at the same time they are dealing most of all with people. The man who studies out his personal relationship with his men and his customers, and handles that relationship in the best possible way, will succeed, even though he is not a genius in other departments of his business.

◆

New Form of Wiring Joint.

A new form of joint which has been proposed for exposed wires was recently described in *Der Elektrotechniker.*

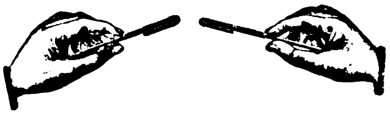


Fig. 1.

It is shown in the accompanying illustrations. The idea is to use a tube of oval cross-section, which is slipped over the lapping ends of the two wires.

The two wires are first bent back as shown in Fig. 1. The tube is then run over the end of one wire and the two wires brought together, as shown in Fig. 2. The tube is then slid along to the position shown in Fig. 3. At the ends of the tube the sides are pressed together at the points marked *a* so that the tube will not slip away from its proper position.

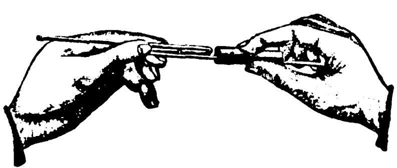


Fig. 2.

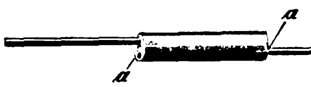


Fig. 3.

If the tube is of a size to fit tightly it will be found that this joint has a low resistance and high mechanical strength. Nevertheless, it is improved by running solder inside the tube in order to make a metallic connection between the two wires, which should be cleaned just before the operation is started.

TEMPORARY LIGHTING FOR SHIPS UNDER REPAIRS.

By Clifford T. Moore.

It is customary in ship, navy and dock yards, when a vessel comes in for repairs or a general overhauling, to shut down the engines, dynamos and boilers and connect up with the yard light and power plant. It has been my good fortune to observe an equipment that was almost ideal for this temporary work. At some of the piers and docks the overhead system on poles was used, and on the new and modern piers, the underground system was in vogue.

On the terminal poles, three single-pole heavy-duty fused terminal blocks were used, having a half-inch brass stud with wing nut for clamping lugs of portable cables or feeders.

These fuse blocks would take link fuses of from 75-ampere to about 1,000-ampere capacity. It was a three-wire 125-250-volt system, and the positive terminal block was painted a bright red, the neutral cable and terminal block were about half the size of the outside cables and therefore easily distinguished, and the negative was the third and unmarked cable and terminal block.

The underground connections were similar, excepting that the fuses were inclosed in a water-tight brass box with the three terminals extending through insulated fittings, one in each side and one in the top of the box, so as to keep the live connections as far away from each other as possible.

The positive terminal of each underground outlet was also painted red, the neutral came out the top of each box and the negative on the opposite side to the positive terminal.

The ship feeders were all made up in sets of different lengths and sizes and all the cables had standard lugs that would fit any terminal on the poles or in the manholes of the underground system, as well as the terminals of the service switches and meters which were temporarily fastened in the dynamo rooms of the different ships.

The feeders ranged in sizes from a No 4 stranded copper wire up to an 800,000-circular mil cable, and lengths from 75 feet to 350 feet each. Each set of three wires or cables was placed on a reel or set of reels and marked thus:

Shore Electrical Department.
Set No. 32.
Size 400,000 c. m.
Length 200 feet.

The positive wire of each set was painted a bright red for about a foot at each end. The neutral wire was about half the size of the positive or negative wire, and the negative wire was unmarked.

The number of each set was stamped on all six of the copper lugs, so in case the record of the feeder was lost, it could be placed on the proper reel when the ship went away.

The service switches were three-pole knife-type with slate backs and mounted on heavy boards painted with a moisture repellent, and having holes bored in the corners of these boards for lashing up with rope or marline in the dynamo rooms of the ships.

Two three-wire meters from 50 up to 800-ampere capacity were used, depending whether a two or three-wire service was run into a ship.

Short jumpers or connecting cables with the standard copper lugs were made up in lengths varying from 3 to 20 feet. Some were used to connect from the service switch to the meter, and others from the meter to the ship's switchboard or dynamo leads.

By having terminals, feeders, service switches and meter connections all standardized, and the polarities marked, it was possible to connect a ship to the shore plant in very short time after her arrival at the dock, and this would allow the engines and boilers to be shut down and cooled off so that repairs could be begun the next day if not sooner.

Frequently ships are moved from one pier to another or into drydock, and by having the positive terminals and feed wires marked red, it is simple enough to connect the feed wire painted red to the red terminal block, the small wire to the neutral terminal block and the last wire to the negative terminal block, then the instruments on the switchboard of the ship and the temporary wattmeter will record properly.

The overhead terminal poles have double reverse cross-arms for lashing the feeders from the ship, and the modern docks are provided with a duct from the side of the pier into the manhole for use of the portable feeders.

The ship feeder cables are all stranded copper, some insulated with two layers of rubber and two of braid, and others with two layers of cambric and three of braid. The ends of all the small cables are taped and braided, and the larger ones are served with fine marline for a distance of about a foot from each lug, which prevents the insulation from pulling back from the end of the lug, and it also strengthens the copper where it enters the lug.

This entire equipment has proven very satisfactory in all kinds of weather, and for small ships as well as vessels of the largest type.

It permits repairs to be made to the dynamos, engines, steam piping, condensers, auxiliaries and boilers, and still allows the lights aboard ship to burn, and the ventilating and pump motors to operate without any annoying interruption during the entire period of overhauling.

The Electrical Contractor and the Retail Business.

The electrical contractor of today who does not try to build up a retail business is overlooking a very profitable part of his business. It is true that the contractor is often busy with his jobs but in many cases it might be better for him to devote his time to the building up of a good retail business than to spend it running after unprofitable wiring jobs. In the average town there are several bidders for contracting work; while in the retail store, competition is not half so keen, as small articles are sold at a good profit and at an almost always uniform price.

There are several qualifications necessary for conducting a successful retail store, one of the fundamental requirements being a thorough knowledge of the use to which every article in stock is adapted. The writer recently helped a customer do a washing with an electric washing machine and an ironing with a motor-driven ironer, thus obtaining first-hand information on the operation of these devices. No one can put up an intelligent sales talk unless he understands thoroughly what a certain device will do. This is the argument that clinches the sale. If one can convince a buyer that the article one is selling is the best to be had for the price, will do the work and that he knows from his own experience that it will serve its purpose satisfactorily, the sale is readily made. It is interesting to go into some stores and see how one must coax the clerk to tell one about a certain article. Only lack of training is responsible for this.

It is most essential that one use electrical devices in one's home in order to carry on a successful retail trade. We sell a toaster in our store of the type which we use in our home, and in selling these toasters I casually mention the fact that we use one at home and that my family is well pleased with it.

We spent two years in attempting to sell our first washing machine and were only successful after we made a little campaign in the way of newspaper advertising and circularizing. We did not spend very much but now we sell an average of two machines a week. These results cannot be accomplished over night, for one must put in some patient, persistent effort. One should not give up if he advertises an article one week and people do not flock into his store the next week for the purpose of inquiring about the thing advertised. It may take weeks and months before people will become aware of what a good article one has. The way to do is to satisfy yourself that you have a good reliable article and then advertise and wait.

The one thing necessary in selling from a retail store is a good clean display of one's wares and a willingness to send articles out on approval. People do not like to pay money for an article which they have never tried and with which they are unfamiliar. We have had only one or two cases in our experience where we had to take back articles which were sent out on approval to responsible persons. In these cases the devices were not adapted to the use to which they were put and the devices were replaced by others which fulfilled the need. There was, hence, a compensation for the time spent in demonstrating the first article.

Another thing I want to mention is not to spend money advertising articles for which there is little demand. There are many articles for which the demand is almost universal. With some persistent effort a good business can be built up on the sale of popular household appliances. Considering the help given by the popular advertising now carried on by almost every large maker of electrical appliances, no electrical contractor should neglect to take advantage of the opportunity thus offered for profitable business—one that will net a good return with hardly any added investment. E. M. Raetz.

Cementing High-Tension Insulators.

High-tension insulators for 33,000 volts or less, are not infrequently provided at the place of erection without the iron supporting pin cemented in. It therefore sometimes becomes necessary to do the cementing in the field. Plaster of paris is the cement ordinarily used. The method pursued is to mix the cement and water in a separate dish, pack a paddle-full of the mixture into the hole inside the insulator, and then plunge the supporting pin into the hole surrounded by the cement, leaving it to harden.

After some experimenting the writer hit upon the plan of mixing the plaster of paris within the insulator itself and then inserting the iron supporting pin and leaving the cement to harden. A quantity of dry plaster of paris is first shaken into the hole in the inverted insulator—one soon learns how much of the cement is necessary—some water poured in, and the whole stirred with a stick. The pin is then inserted and the combination allowed to dry. With this method no wet cement is spilled over into the various petticoats of the insulator, and the whole makes a much neater job. Also it is much more rapid, since no mixing dishes and transferring operations are necessary. L. E. Darling.

Annual Convention of Contractors.

As the time draws near for the convention of the National Electrical Contractors' Association, to be held in Detroit, Mich., July 15 to 18 inclusive, the committees in charge are putting every possible effort in completing the minute details to make it a convention "worth while". The program for the entire four days has been well planned and every visiting contractor and his family are assured of a most pleasant and altogether satisfactory time. It is anticipated that there will be a very large attendance and arrangements have been made to care for the visitors in a way that will not only be a credit to Detroit, but to the national Electrical Contractors' Association. A special feature of the program for one day will be a sight-seeing tour. All the principal points of interest will be visited and Detroit boasts of a great number of interesting things, including the Ford Motor Company. This concern manufactures a complete automobile ready for shipment every 45 seconds. Power is furnished this plant by a 5,000-horsepower gas engine, the largest in the world.

One of the many points of interest to be seen by the visitors is Belle Isle Park, which is easily accessible by pleasure steamers leaving Woodward and Third Avenues every 15 minutes.

The new passenger station of the Michigan Central Railroad, which cost $2,500,000, is also worthy of attention.

St. Paul Wireman's Ordinance.

An ordinance has recently been passed in St. Paul, Minn., requiring all electrical workers to be licensed by the state. This was done upon the recommendation of the Electrical Workers' Union and makes it difficult to replace men by outsiders upon short notice, since the State Board of Electricity meets only three times a year. The contractors made little opposition to the passage of this ordinance on account of their lack of organization. Negotiations are now pending between the contractors and the union relative to a closed-shop agreement and wages.

Portland Contractors Meet.

At a meeting of the Portland Electrical Contractors' Association, of Portland, Ore., held on May 13, the following officers were elected for the ensuing year:

President, Robert Skeen.
Vice-president, J. H. Sroufe.
Secretary, F. C. Green.
Treasurer, J. R. Tomlinson.

Plans were outlined at this meeting for the convention of the Oregon Electrical Contractors' Association, which is to be held in Portland on June 8 and 9.

Electrical Workers Entertain Contractors at Youngstown.

The electrical contractors of Youngstown, O., were recently enjoyably entertained at the Ohio Hotel by Electrical Workers' Union No. 64. Informal addresses were made by City Wire Inspector William Buzzard, George Webster, Max Hain, William Griffiths and others. The dinner was a sort of get-together affair designed to bring those interested in the electrical business in closer harmony.

Among the Contractors.

The Bland Electric Company will do the wiring and installation of electric fixtures in the new Stock Yards Exchange which is in course of construction in Louisville, Ky. This is one of the larger building operations under way in Louisville this summer.

It is estimated that the electrical features of the Ohio State building for the Panama-Pacific International Exposition will cost about $5,000. General plans for the buildings have just been accepted by the Ohio State authorities at Columbus, O., calling for a total outlay of $100,000. The indirect method of lighting will be used. The extreme distance from home and the uncertain labor conditions on the coast are considered embarrassing features by Ohio contractors in the matter of submitting bids.

A. E. Mann, who was for several years connected with the Port Clinton Light & Power Company, Port Clinton, O., has severed his connection with that concern and gone into business for himself. He expects to handle fixtures and supplies as well as to do electrical contracting.

The Salt Lake Electric Supply Company has been awarded the contract for the electrical wiring for the new East Side High School, Salt Lake City, Utah. The contract amounts to $2,800.

The Lee Light Company, which will do an electrical contracting business, has recently opened at 326 West Breckinridge Street, Louisville, Ky. R. E. Lee, who was formerly with the Neal Electric Company, is at the head of the new venture.

C. A. Coppock, the well known Detroit electrical contractor and fixture dealer, has been experiencing a steady growth in business which has forced him to expand his organization. He has, therefore, entered into partnership with James Patterson, the firm name to be Coppock & Patterson hereafter. Under the new arrangement Mr. Coppock will devote the greater portion of his time supervising contracts and arranging specifications with patrons. Mr. Patterson will have charge of the office and sales rooms, which are located in the Bamlet Building, Detroit, Mich.

The West Side Electric Company, of Omaha, Neb., has recently completed the wiring installation in the new Knickerbocker Apartment House. This is a very modern building of 12 apartments, employing high class work throughout.

G. G. Kingham, Charles H. Wallick and Oscar Wallin have recently established the National Electric Company, at 122 South Twelfth Street, Lincoln, Neb., to engage in a general electrical contracting and supply business. The company makes a specialty of furnishing and installing isolated electric plants and motor, generator and elevator repairing. The members of the firm have had a wide electrical experience and are well and favorably known in their vicinity. The firm's store is well located and has had a very satisfactory business since its opening. "Safety-First Wiring" is the firm's slogan.

The Columbia Electric & Engineering Company, of Lincoln, Neb., has under way the installation of wiring for light and power electric clocks, etc., in both the new Lincoln High School and the Bancroft grade school in Lincoln. The high school equipment includes a private telephone system and complete electrical equipment for stage effects.

A recently completed installation of the company is that of the new wing of the Saint Elizabeth Hospital, Lincoln, Neb. This installation includes a 150-station hospital-signal system installed throughout the building.

Contracts for the fixtures and wiring of the new Holy Cross School in Louisville, Ky., have been let to Mooser-Hoeck & Company.

The firm of G. H. & J. T. Kelly has received the contract for rewiring the Court House Annex and county clerk's office in Atlanta, Ga.

The Sanborn Electric Company, 309 North Illinois Street, Indianapolis, Ind., has reproduced in neat booklet form the illustrations of its new home which were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN in the issue of April 18.

The Motor Exchange, of which Messrs. Err & Rickert are proprietors, is the name of a new company at 1322 Broadway, Denver. This company is doing a general electrical-contracting business and is specializing in repair work on motors, coils, magnets, etc.

Public Service Commissions

Conducted by William J. Norton

GEORGIA.

The Georgia Railway & Power Company was authorized to execute a new mortgage to secure the $30,000,000 bond issue approved by the Commission January 4, 1912. The additional $650,000 of bonds applied for by the company was also approved, the proceeds of which are to be used for new construction.

ILLINOIS.

The Streator Telephone Company. Certain subscribers to the applicant's exchange, both in the city of Streator and on rural lines, have been furnished service free and at rates lower than the regular schedule of rates, and in certain instances excess rates have been exacted. The applicant came to the Commission for authority to eliminate this discrimination and to charge the subscribers in each instance the rate provided in the schedule for the class of service rendered. The application was granted in full and the discriminatory rates are ordered discontinued. All rates are to be those named in the company's schedule in force July 1, 1913.

MARYLAND.

The Chesapeake and Potomac Telephone Company has applied for authority to purchase the Southern Maryland Telephone Company which has a monopoly throughout St. Mary's, Calvert, Charles and Prince George's counties, and the Farmers & Merchants' Telephone Company of Caroline county. The Commission recently approved the acquisition by the applicant of the Highland Telephone Company of Hartford county and the Rock Creek Marley Telephone Company of Anne Arundel County.

NEW YORK.

New Commissioner Appointed. Robert Colgate Wood has been appointed to succeed John E. Eustis as a member of the Public Service Commission for the First District. The appointment was made after George M. S. Schulz declined his appointment to the position.

The Long Island Lighting Company was authorized to issue $90,000 of its five-per-cent 25-year first-mortgage bonds to be sold at not less than 87.5 per cent of par value and $35,000 of capital stock to be sold for not less than par value. The proceeds are to be used for new construction and improvements to its transmission system.

OHIO.

Bucyrus Light & Power Company. The full text of the decision in the Bucyrus case, mentioned in last week's issue, has been received. Separate appraisals were made for the Commission, the city, and the company and a fourth appraisal was offered as an exhibit by the Manufacturers' Appraisal Company. The case has not been carried further than the determination of the valuation as a basis of rate making, and the Commission has not as yet indicated the rate of return considered reasonable or announced the rates to be charged. The decision fixing the valuation gives a discussion and comparison of the different appraisals and deals almost entirely with matters of interest only in this particular case. There is one matter, however, which should be noted. The Commission in discussing overhead charges throughout the decision has treated them as intangibles. For example, under the heading, "additions for intangible values" the Commission concludes as follows: "Mr. White's appraisal (made for the Commission) includes a sum slightly in excess of $14,000 that is termed 'overhead charges.' The Commission believes that $14,000—which is a little less than 19 per cent of the value of tangible property except land—is sufficient to include all proper and fair allowances for engineering, and superintendence, insurance, taxes and legal expenses, interest during construction, financing and development cost. The Commission believes that such an allowance is liberal for all those purposes." In discussing the questions of depreciating intangible values the Commission again refers to this allowance for overhead charges as follows: "Mr. White adds about $18,000 for 'overhead charges,' or intangible values, to the reproductive cost, which he depreciates to about $14,000 as he does the said reproductive cost, differing slightly from the experts of the company in this particular. We are inclined to think it is safer for the company and the public that whatever intangible values are allowed shall be depreciated in accordance with the average depreciation of the property."

In discussing the matter of early losses during the development period, the Commission attempts to show the fallacy of making any coniderable allowance for such costs on the ground that the business is not yet developed and concludes that "if $20,000 were necessary to develop that business, the results of a very small portion of the said sum of $20,000 is shown in the actual business of the company." Such a treatment of this matter entirely overlooks the fact that, where business is slow in attaching itself to a plant adequate to furnishing service, the development costs properly included as going value in a valuation for rate-making purposes are greater because of the longer period during which the company is forced to furnish service without securing proper return on its investment. It is not shown in the decision that these early losses were due to careless management or negligence on the part of the company or to mistakes that could have been foreseen and avoided. The Commission says, however, that such losses have not been shown on the company's books. Many utility companies have made the mistake of not recording such losses on their books. The treatment of going value has been clearly worked out by the Wisconsin and other Commissions and the recent decision of the New York Court of Appeals in the Kings County Lighting Company case gives complete discussion of allowance for going value in rate-making cases. According to these authorities the fact that these losses are not properly recorded in the company's accounts or that they are hard to determine, affords no excuse for refusing to make a separate allowance for such costs. There is practically no allowance in the Bucyrus case, for while the Commission in its discussion of this matter recognizes that such allowances are proper and shows how early losses are incurred and that they are a legitimate cost to the company, the commission concludes that the allowance of $14,000 for "intangibles" is ample to cover the cost of developing and financing the business. As was noted in the citation from the case, above given, this allowance of $14,000 is for overhead expenses and it does not appear that any allowance has been made for intangible values.

PENNSYLVANIA.

Transfer of Property. The Commission has approved the sale of the franchises and other property of the American Electric Light & Power Company to the Lehigh Valley Light & Power Company.

WISCONSIN.

H. Kittleson et al. vs. Elroy Municipal Water and Light Plant. Complaint was made to the Commission by residents of Elroy that the rates charged for service rendered by the municipal water and light plant were discriminatory and insufficient and that the records and accounts of the municipal utility were unsystematic and not in conformity with the rules prescribed by the Commission. A decision was rendered May 16. The Commission found that an adjustment of rates was necessary, it appearing that the municipality was paying for neither street lighting service nor fire protection. Rates were ordered in effect giving the utility a stated annual revenue from this service. The meter rates to commercial consumers were also ordered changed. The utility was ordered to install records and the system of accounts prescribed by the Commission in a separate order under date of April 20.

Because of the fact that estimates had to be made in a number of cases, the Commission points out that it will modify its order if experience shows that this will be necessary.

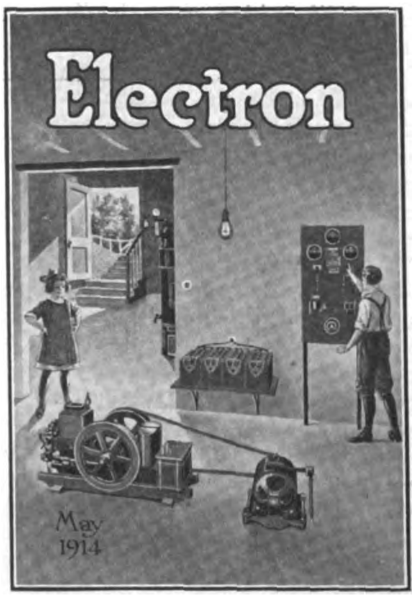
Telephone Rates and Charges. The Commission rendered a decision on May 16 in the matter of the application of the Trego Telephone Company to increase rates and also in the case of the Trego Telephone Company vs. the Earl Telephone Company. The application in the former case concerned the establishment of rates from Trego to Spooner and from Trego to Earl. The Commission found that a toll rate was justifiable between Trego and Spooner but that it would be inadvisable, because telephone business was not sufficiently developed, to place in effect a rate between Trego and Earl. In the other case, mentioned above, the petitioner asked for a more equitable division of the toll charges from Spooner to Earl and these rates were modified by the Commission so as to increase the petitioner's proportion of the revenue from this service.

Valuation for Purchase by Municipality. Action has been taken by the bondholders of the Racine Water Works Company to restrain the Commission from proceeding with the valuation of the plant. The suit has been filed in the United States District Court in Milwaukee, and is set for hearing on May 28. The valuation was being made by the Commission to determine proper compensation for the taking over of the plant by the municipality.

Among the Supply Men

The Barden Electric & Machinery Company, Houston, Texas, announces that the demand for induction motors is steadily increasing in its territory. Representing its factory output this company stood second on the list for the number of motors sold. Ed. F. Barden is preparing to make an extended trip north, spending practically all of July and August visiting factories for which his company is a representative.

The Capital Electric Company, Salt Lake City, Utah, announces that it has entered the automobile supply business, both wholesale and retail, and in combining this department with its already large electrical business it expects to accomplish exceptionally good results. The company has taken the agency for Montana, Utah and Idaho for the G. M. C. gasoline and electric trucks. The company has also taken the agency in those three states for the Union Metal Manufacturing Company's pressed steel posts for ornamental street lighting. The company reports business unusually good in Montana and Utah, especially with regard to demands for both bare and weatherproof wire. C. L. Evans is sales manager of the company.



Cover Design for May Issue of Electron.

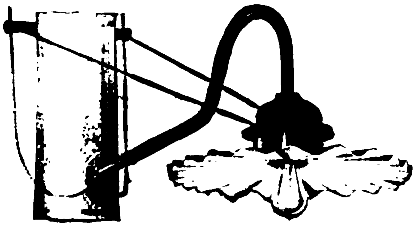
The May issue of *Electron*, the very interesting house organ published by the Central Electric Company, Chicago, Ill., is embellished with a unique cover design illustrating the mechanical and electrical features of a small isolated plant. The May issue comes out with an entirely new dress and new arrangement of text. The contents include articles relating to indirect lighting with Alexalite lamps, a short contribution respecting farm lighting plants, an article by J. F. McClelland on retailing electrical merchandise, and descriptions of various specialties handled by the Central Electric Company. The company has recently announced a new series of Alexalites adapted for high-efficiency Type C 750 and 1,000-watt Mazda lamps. Literature is now ready.

Two of the good window advertisers in Louisville, Ky., are the James Clark, Jr., Electric Company and the Harry I. Wood Company, both dealers in electrical appliances. The stores on Main Street of the two companies are making a special display at this time of fans, the season for which has opened with a rush. The Clark window is so arranged that a quantity of confetti is kept constantly in motion before the fans, giving the effect of a snowstorm. The Wood window takes advantage of the present marked interest in horse racing, the spring race meetings being in progress on the Louisville tracks. Fans at each end of an oval course, constructed of lath in the shape and manner of a race track, keep a number of celluloid balls in motion around the oval. A peculiar feature of this exhibition is that the speed of the several balls varies most unexpectedly and the window is the occasion for as many betting opportunities as a race track itself affords.

New Electrical and Mechanical Appliances

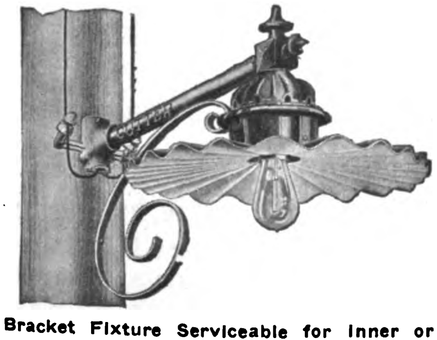
New Street-Lighting Fixtures for Gas-Filled Tungsten Lamps.

It is well known that the development of the gas-filled tungsten lamp has imposed new conditions in the design of street-lighting fixtures. A manufacturer that was among the first to see this need and to meet it with a new line of equipment is the George Cutter Company, South Bend, Ind. This firm has developed a line of fixtures which are adaptable for both series and multiple circuits and for use with the older types of incandescent lamps as well as with the new high-efficiency gas-filled units.



New One-Piece Fluted Streethood for Gas-Filled Tungsten Lamps.

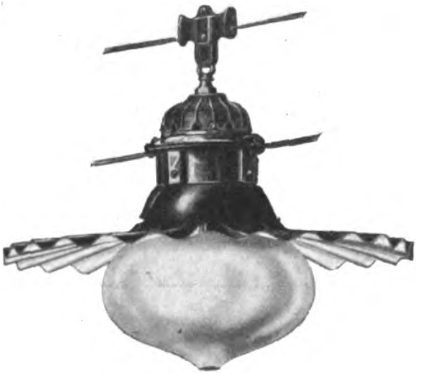
One of the new fixtures is a one-piece fluted streethood, an illustration of which is shown herewith. This consists of an iron canopy and porcelain housing with clips for holding the reflector. The canopy is ventilated by means of arches around its lower edge; these arches do not allow moisture to get inside of the porcelain body, but do permit free circulation of cool air from beneath the fixture up and through the porcelain body. By this means the metal parts of the socket as well as the neck of the lamp are kept from overheating, an important consideration in connection particularly with the larger sizes of the new gas-filled lamps.



Bracket Fixture Serviceable for Inner or Outer Wiring.

Since the larger sizes of these lamps must be protected from rain and sleet and since the intrinsic brilliancy of the exposed filament causes extremely annoying glare, further conditions are imposed on the design of the equipment. These have been met in a new efficient reflector known as the Cutter radial bowl. To this may be fastened an Alba or similar glass globe of artistic design. In one of the illustrations herewith is shown the one-piece fluted streethood body with 24-inch reflector and Alba globe; the latter has a 1.5-inch hole in the bottom which serves both to admit ventilating air and also to allow dust or other accumulation to drop out.

All of the Cutter fluted streethoods have interchangeable parts so that it is possible to convert from one style of fixture to another quite readily. This is an advantage that permits present lighting systems to be extended where multiple lamps are used and later the same fixtures may be adapted for series lamps, or the order of equipment may be reversed.



Cable-Grip Suspension Streethood With 24-Inch Radial Bowl Reflector and Diffusing Globe.

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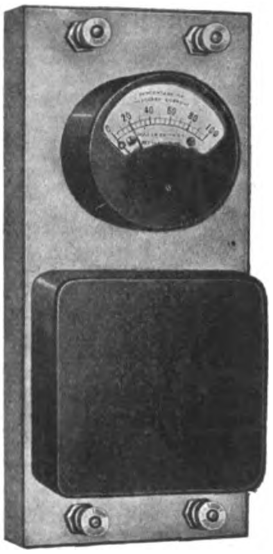
New Reverse-Current Relay for Direct-Current Circuits.

In the accompanying illustration is shown a new type of relay for use on direct-current circuits. This type of relay was designed primarily for use in connection with shunt-trip circuit-breakers. However, it can be used to close any type of external circuit. By connecting the indicating instrument, which is a part of the equipment, so that for normal direction of current flow the needle deflects backward from zero the trip circuit is maintained open until a reverse-current flow occurs, which will cause the circuit-breaker or other device in the circuit to be controlled to operate.

The equipment consists of a slate base, nine by four inches in dimensions, and on the upper portion of this is mounted an ammeter connected by flexible leads to a shunt in the main circuit, the current in which is to govern the actuation of the circuit-breaker or other auxiliary circuit. The indicating instrument carries a platinum contact attached to its needle; this co-operates with a smaller contact carried by an adjustable pilot needle, which may be set at any desired point between zero and full scale reading.



Reverse-Current Relay.

When the indicating needle of the ammeter engages the pilot needle the two contacts close the circuit of an electromagnet contained in the rectangular casing mounted on the lower part of the base. This electromagnet then closes the operating circuit of the circuit-breaker or other device for which the relay is used.

The relay may be mounted at any desired point more or less remote from the circuit to be governed. The dimensions of the relay are independent of the value of the current or the capacity of the circuit-breaker to be controlled, since it is of the separate shunt type. The same shunt may serve for ammeters and wattmeters as well as for the relay. The manufacturer of this instrument claims that the range of adjustment from zero to full shunt capacity is far greater than obtainable by any other reverse-current circuit-breaker. The indicating instrument makes it possible to read the value of the current flow up to the tripping point. Both the instrument and the magnet part of the relay are entirely inclosed by dustproof covers, which can be readily removed for inspection.

This type of relay is made by the Roller-Smith Company, 203 Broadway, New York City.

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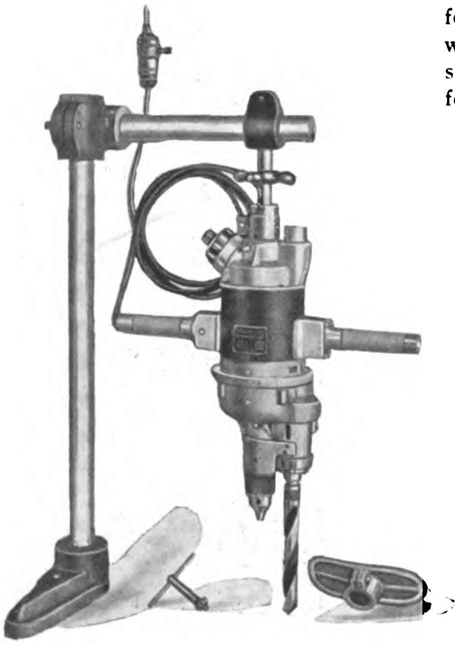
Stow Two-Spindle Electric Drill.

Among the extensive line of portable electric tools manufactured by the Stow Manufacturing Company, Binghamton, N. Y., is one that is unique. This is the two-spindle drill illustrated herewith. The No. 1 spindle of this drill runs at 450 revolutions per minute and can take all drills up to the one-half inch. It is equipped with Jacobs chuck. The No. 2 spindle has a speed of 225 revolutions per minute and takes all drills up to the three-fourths-inch. It has a Morse taper socket. If desired, this tool can be arranged at slight additional cost so as to permit removal of the chuck from the small to the large spindle.



Two-Spindle Electric Drill.

This type of tool is believed to have a number of advantages over tools having two speeds on a single spindle. Among these are the greater power for heavy drilling by using the larger spindle, also marked ease with which either spindle can be reversed; the latter is a decided advantage in light tapping and similar work.

The tool is built of the same rugged and high-class construction which characterizes all Stow tools. It is equipped with snap switch, extension cord and plug for attachment to any standard lighting outlet.

Both direct-current and alternating-current drills are made.

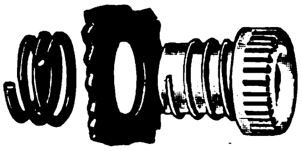
New Insulating Bushings for Outlet Boxes.

The accompanying illustrations show a new line of wire-insulating bushings for outlet boxes and cabinets recently put on the market by the Multi Refillable Fuse Company, 723 Fulton Street, Chicago, Ill.

These bushings consist of a threaded porcelain body made in sizes to fit the standard steel-box knockouts and are clamped securely in place by the threading on the helix spring coil of wire, which is made to engage the threads to the porcelain.

It is claimed for these bushings that when they are locked up securely in place they will not work loose under continued vibration, because of the great resiliency in the spring, which relieves the direct jar on the porcelain.

The coil springs are tempered and oxidized, so that they will not be affected by rusting, and their resiliency will last indefinitely. The small prong shown on the inner side of the coil is for the purpose of facilitating the removal of the spring, should it at any time be desired to withdraw the bushing.



Helical Spring and Porcelain Bushing.

Bushing Complete.

The manufacturer advises that bushings can now be furnished for all standard sizes of knockouts up to and including one inch, and other sizes are being developed.

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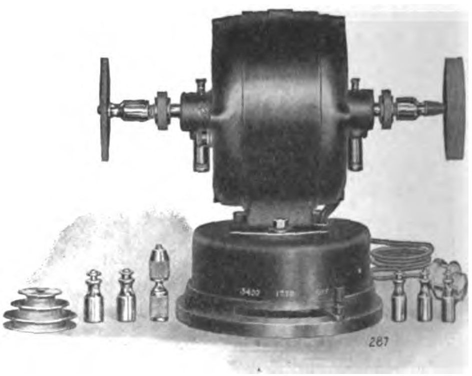
Alternating-Current Dental-Lathe Motor.

The acompanying illustration shows a new alternating-current motor for dentists' and jewelers' service, manufactured by the Robbins & Myers Company, Springfield, O.

The motor is rated at one-sixth horsepower, and is built for operation on 60-cycle current of 110 or 220 volts. A speed-changing device in the base gives speeds of 1,750 and 3,400 revolutions per minute. The motor will also operate successfully on 50-cycle circuits at speeds of 1,400 and 2,900 revolutions per minute. The end heads of the motor are solid and completely inclose the motor, protecting the working parts from dust and dirt. The rotor is of the clutchless type. The starting winding is cut out automatically when the motor comes up to speed.

The following special attachments are regularly supplied with each motor: ten feet of black reinforced cord and lamp socket; right-hand tapered chuck for buffing wheel; right and left-hand flange chucks for grinding wheels with five-sixteenth-inch hubs; buffing wheel, three inches diameter, 30 ply; carborundum wheel, three inches diameter, one-fourth-inch face, five-sixteenths-inch bore; brush wheel, three inches diameter; three-step V-grooved pulley with pitch diameters of 1.4375, 1.9375 and 2.375 inches for five-sixteenths-inch round belt.

A complete set of Ritter chucks can also be furnished, if desired. The set consists of three right and three left-hand flange chucks for grinding wheel with hub diameters of one-fourth, five-sixteenths and three-eighths inches; left-hand taper threaded chuck for buffing wheels; adjustable chuck for drills, burrs, etc.



Dental-Lathe Motor.

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Chain of Wireless Stations for United States Navy.

Rear Admiral Robert S. Griffin, chief of the Bureau of Construction, Washington, D. C., has announced that the Navy Department has changed its proposals of establishing a chain of wireless stations to complete wireless communication between the national capital and Manila. Wireless stations at Guam and Samoa are to be eliminated and high-power stations will be erected at San Diego, Panama, Honolulu and Manila. The station on the isthmus, which will be located at Darien, will be completed about January 1, 1915, according to present plans.

Unique Elevator Display for the Central-Station Window.

An interesting and novel window display has been designed by the Otis Elevator Company for the purpose of arousing a more extensive popular interest in the subject of electric elevators.

The display consists of attractively colored photographic enlargements of the Woolworth and other tall tower buildings, brightly illuminated from behind. By a clever mechanical arrangement, the six elevators in the tower of the building are shown in a continuous journey up and down. A small motor connected to batteries within the model supplies the necessary power, the lighting effects being obtained by connecting with any convenient lighting circuit.

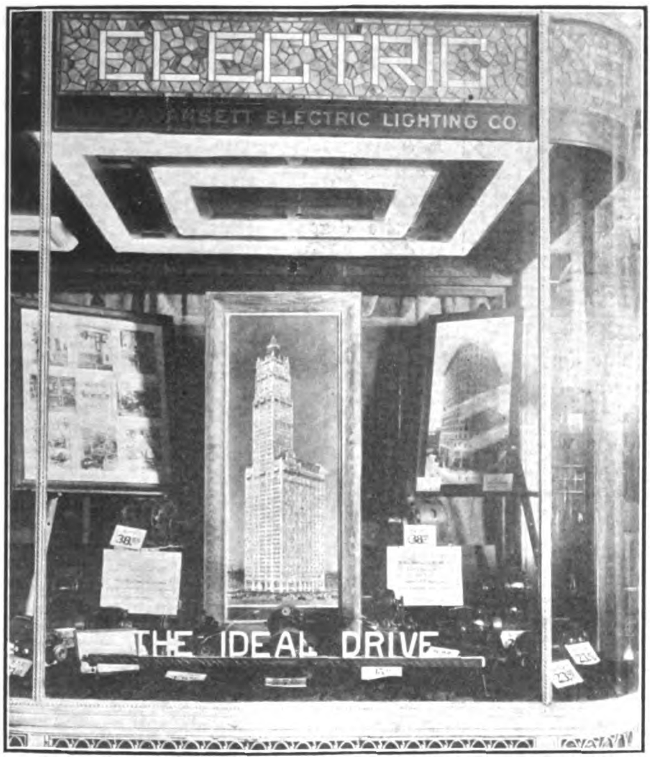


Fig. 1.—Electric Elevator Display in Central-Station Window.

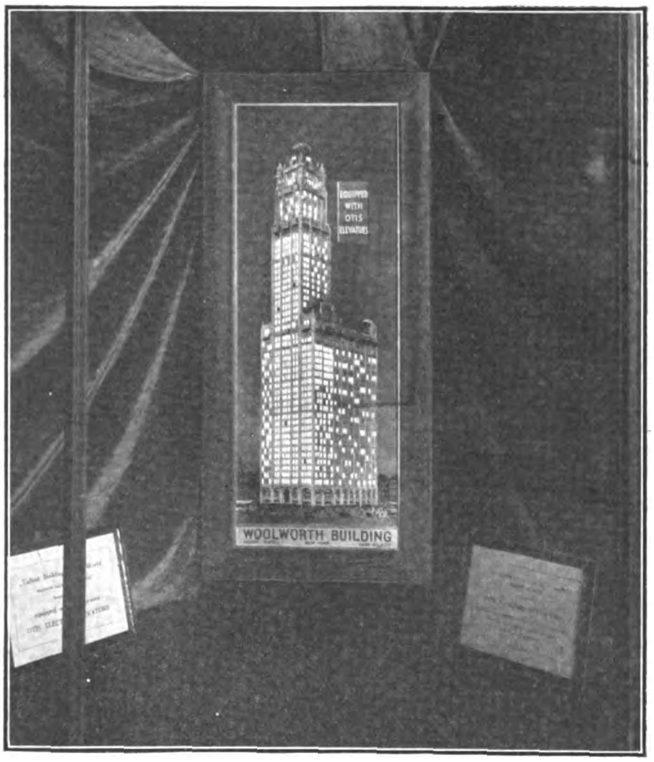


Fig. 2.—Night View of Woolworth Window Display.

Two printed cards which accompany the model, state the number of elevators in the building and call attention to the advantages of the electric type of elevator. The display is one that is particularly appropriate for the central-station window and is in line with the educational work now being done to increase the use of electric-current-consuming devices.

Fig. 1 herewith shows one of the models in the window of the Naragansett Electric Lighting Company, Providence. R. I. Fig. 2 is a night view of one of the models in a Broadway window of the Woolworth Building, New York City.

Arrangements for securing the model can be made by writing to the Otis Elevator Company, Eleventh Avenue and Twenty-sixth Street, New York City, or at the National Electric Light Association convention next week in Philadelphia, where the models of the Woolworth, Metropolitan and Singer buildings will be shown.

◆

A Small Battery-Charging Set.

The Commonwealth Edison Company, of Chicago, Ill., recently performed the final test on a small battery-charging rectifier designed to be carried by electric vehicles. The machine was invented by Henry Gandell, the inventor of the self-playing electric violin, and is to be manufactured by the Mills Novelty Company, of Chicago, Ill. The rectifier is essentially a single-phase synchronous converter, the machine under test weighing ten pounds and being capable of delivering 70 amperes at 130 volts with a transformation efficiency said to be 99 per cent between the alternating-current and direct-current converter terminals. This device is mounted on a panel 12x20 inches together with the necessary switches, instruments, and an automatic no-voltage release. The device can hence easily be carried on any electric vehicle and charging can be readily accomplished wherever alternating-current of approximately the correct voltage is available. When used on cars the voltage will be varied during charging by means of a resistance in the alternating-current circuit. This resistance can also be used to reduce an excessive alternating-current voltage. When this rectifier is used in a garage an autotransformer will be employed in place of the resistance.

The rectifier is self-starting, the field excitation being obtained from the direct-current terminals connected to the battery to be charged. This method of obtaining the exciting current, from the battery terminals of the machine, assures the correct direction of the charging current. The machine is so designed that the separation of the segments of the four-part commutator is such that the direct-current circuit is opened at the zero points of the alternating-current wave, thus preventing the flow of a discharging current from the battery during such periods.

The rectifier had previously been given a thorough test by the Commonwealth Edison Company, the recent test being designed to determine its performance when charging a totally discharged battery. A one-ton capacity electric bus of the Walker Vehicle Company, of Chicago, was selected for the test. It contained a 110-volt battery with a normal discharge rate of 40 amperes. The battery was successfully charged during this test.

A three-phase rectifier for use in garages is at present being developed. This rectifier will be capable of delivering a current of 1,000 amperes and will weigh about 60 pounds.

◆

There are, in this country, upwards of 9,000,000 telephones. The United States, with less than 6 per cent of the world's population, has more than 65 per cent of the world's telephone development. Europe, with four times the population of the United States, has less than half as many 'phones.

Long-Leaf Pine and Southern White Cedar for Overhead Construction.

The statement having been made that long-leaf pine can only be furnished from a limited territory in Georgia and Florida, the question was recently put to one of the largest producers of overhead construction material for electric light and power plants in the Southeast. The following report, in reply from the Southern Exchange Company, of 97 Warren Street, New York, is of interest:

"After careful investigation, we can quote from Bulletin No. 13, U. S. Department of Agriculture, showing the area of the long-leaf yellow pine territory in the east, as follows: 'From 50 to 135 miles wide, through North Carolina, South Carolina, Georgia, Alabama, Mississippi and Florida.'

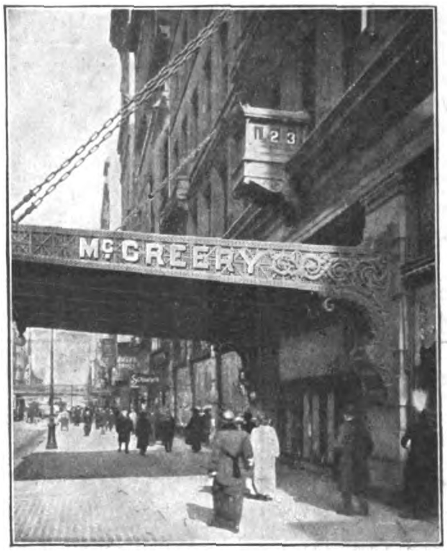
"Some of the finest long-leaf pine grown is in the east of North Carolina. Regarding the length of life and tensile strength of the long-leaf pine, particularly for cross-arms for both standard and high-tension work, it would seem that the following quotation from Bulletin No. 13, folio 53, United States Department of Agriculture, substantiates the claim made for the long-leaf pine as to strength and durability: 'In its stiffness and strength the wood of the long-leaf yellow pine is remarkable. The average of a great number of tests indicates for the dry wood of the long-leaf pine an elasticity of 1,540,000 pounds per square inch; strength in cross breaking, 10,900 pounds per square inch; strength in compression, 6,850 pounds per square inch; strength in tension, 15,200 pounds per square inch; strength in shearing, 706 pounds per square inch.'

"With reference to Southern white cedar pole, beg to advise that it is practically of the same family as the Michigan or Canadian cedar. It is grown almost exclusively in North Carolina; it is practically free from butt rot; it has a very small amount of sap wood, being practically all heart. The Southern cedar is particularly straight and when peeled off the bark has the appearance of being turned with a lathe. The Southern cedar poles have a larger base measurement and are lighter than chestnut and heavier woods, saving the cost of construction, and experience has proven the resistance to climatic conditions is particularly strong in the northern as well as southern climate. Compared with ten or fifteen years ago the supply of Southern white cedar is considerably less and the demand for that class of pole for overhead construction work is increasing."

The Southern Exchange Company makes a specialty of the Southern white cedar pole, having 21 different shipping points in North Carolina.

◆

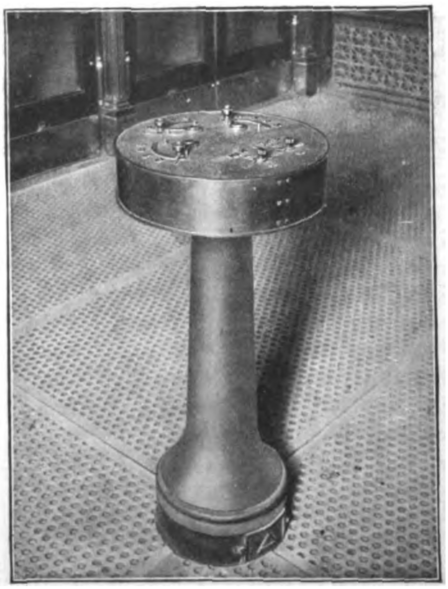
A New Electric Vehicle Call.



Electric Vehicle Call.

A new type of vehicle call has recently been installed for the department store of James McCreery & Company, New York City, for the convenience of shoppers. The feature of the call is that it is operated from a special form of pedestal switchboard and not from a panel in the wall as is generally the case with carriage calls.

The advantage of a pedestal form of switchboard is that it may be located in the center of the lobby where it will be in plain view of customers going out of the store. The wall type vehicle call was not considered for this installation, as it is usually a source of delay to shoppers on account of the difficulty experienced in finding it.



Control Pedestal for Vehicle Call.

The method of operating the switchboard, which was designed by the Western Electric Company, is extremely simple. When shoppers drive up to the store they receive a numbered check from the carriage man stationed at the curb. On leaving the store, the check is surrendered to the switchboard man, who moves the switch levers on the dial face of the pedestal to numbers corresponding to those on the check. This causes the numbers to be reproduced electrically on both sides of the vehicle call annunciator on the outside of the building.

The chauffeur or driver, who has received a duplicate check upon arriving at the store, can see immediately that he is wanted and drives to the entrance. If it is necessary to use the vehicle call after dark, another lever switch on the switchboard dial can be used to light a bank of lamps which will illuminate the numbers.

Although the pedestal-switchboard vehicle call has been in use but a short time, it has already proven its value in the dispatch with which carriages and automobiles are moved and the satisfaction derived by the customers from this fact.

◆

New Toy Transformer.

3-6-10-15-20 VOLTS
100-125 VOLTS ALTERNATING CURRENT
PATENTED A.E. RITTENHOUSE Co HONEOYE FALLS, N.Y.

Toy Transformer.

The A. E. Rittenhouse Company, Honeoye Falls, N. Y., has recently placed on the market a toy transformer especially designed to stand up under the hard usage that the average small boy would give it. The controller contacts are inside the pressed-steel case and the only exposed live parts are the binding-posts. There are five taps on the secondary winding so that it is possible to get either 3, 6, 10, 15, or 20 volts by simply moving the controlling lever.

◆

New Wireless Telephone Record.

Experiments with wireless telephony conducted by the Telefunken Company at Nauen, Germany, have resulted in further successes. Music transmitted by wireless from the station at Nauen was clearly heard at Vienna. On May

12 conversations took place between Nauen and Pola, the Austrian fortified seaport. The distance between the two stations is nearly 600 miles, and the wireless route is over land.

The General Devices and Fittings Company.

The development of the electrical industry is making necessary a continuous refinement in design and application of engineering devices and fittings especially adapted to meet the increasing severity of service requirements. In line with this development is the organization and incorporation earlier in the present year of the General Devices & Fittings Company. The company is incorporated under the Illinois statutes for the manufacture of high-grade and original power, light and railway plant appliances, and for substation and transmission services. These fittings and devices will consist of high-tension and low-tension appliances, such as outdoor type of high-tension disconnecting switches and other disconnecting high-tension devices, with a voltage range from 600 volts to 200,000 volts. This also includes busbar supports to hold any capacity and any voltage that may be used from the smallest to the largest plants.

The company will also manufacture bus tie, bus sectionalizing, transformer, feeder and generator disconnecting switches of all capacities and for all types of mounting.

This company intends to specialize on large plant equipments of all kinds with the exception of moving apparatus, transformers, instruments and oil switches. It will furnish and manufacture everything else, and will be in a position to furnish up-to-date material for any size plant, and will be glad to furnish complete plans for its own and customers' layouts as the case may be.

A complete line of malleable-iron fittings for pipe frame construction for the mounting of disconnecting switches, current and potential transformers, meter, choke coils, reactances, oil switches, panel boards and regulating and feeder appliances will also be manufactured. It will also specialize on copper-tube bus fittings of all sizes and types. Hundreds of these devices are already prepared by the company and it can furnish also laminated fittings for round buses, either the tube or the solid type.

The company will manufacture a complete line of busbar fittings for all sizes of busbar, and in addition thereto will furnish the terminals for all sizes and types of buses and cable. It will manufacture a complete line of high-tension insulator pins, there being about 300 different types in this line. There will also be a complete line of the wood top and separable thimble pins in this line, as well as all kinds of porcelain tubes, cleats, service bushings and roof entrances.

The company will bid upon complete line equipments, including steel towers for line and for outdoor stations.

The offices, engineering department, drafting rooms and factory, are located at 817-825 West Washington Boulevard, Chicago, where it has facilities for turning out the best possible product in the shortest possible time. A 200,000-volt testing outfit is part of the equipment so that every item containing porcelain or other insulation can be tested before leaving the factory. Arrangements with the customer's engineer for the witnessing of tests will be among the important features of this work.

The officers of the company are Edson O. Sessions, president; A. D. Fonger, treasurer; J. M. Van Splunter, secretary.

Mr. Sessions entered the employ of the Thompson-Houston Electric Company, at Lynn, in 1889, and has held many important positions since his entrance in the electrical field. He was with the Stanley-G. I. Electric & Manufacturing Company and the General Electric Company for many years and resigned from the General Electric Company to enter consultation work. Mr. Sessions is a fellow of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers, an associate member of the American Society of Civil Engineers, and a member of the Illuminating Engineering Society. He has been specializing upon engineering design and construction, particularly upon copper-tube buses and their various adaptations for many years, and has installed many plants featuring this equipment.

Mr. Fonger was connected with the General Electric Company from October, 1893, to September, 1910, in various positions, occupying the position of chief clerk at the time of his resignation to accept a position with the Electrical Engineers Equipment Company as assistant manager and treasurer. In this connection he has had considerable to do with manufacturing and selling of high-tension material. He resigned in November, 1913. He is an associate member of the Association of Iron and Steel Electrical Engineers.

Mr. Van Splunter was educated at the University of Michigan, in both electrical and mechanical engineering. For some time he was associated with the engineering department of Sargent & Lundy, consulting engineers, and as constructing engineer for the Stanley-G. I. Electric & Manufacturing Company. More recently he was connected with the sales organization of the General Electric Company, having had, altogether, a wide experience in the designing, manufacture and sales of high-tension, electrical transmission and power-station specialties.

Edson O. Sessions.

A. D. Fonger.

J. M. Van Splunter.

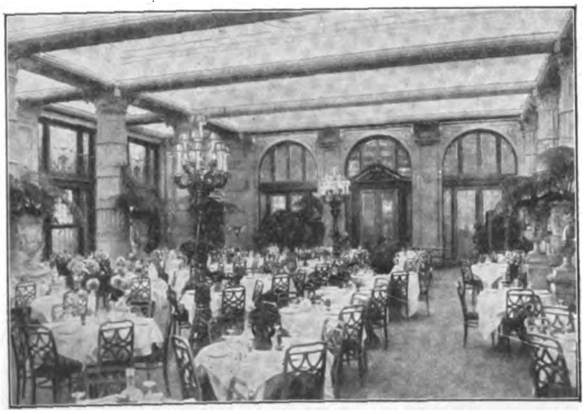
Some Notable Examples of Good Restaurant Illumination.

Illumination is coming to be recognized more and more as an exact science. What every architect formerly did for himself in this line is now being delegated to specialists in lighting, just as important problems in other branches have for some years been worked out by specialists in their respective lines.

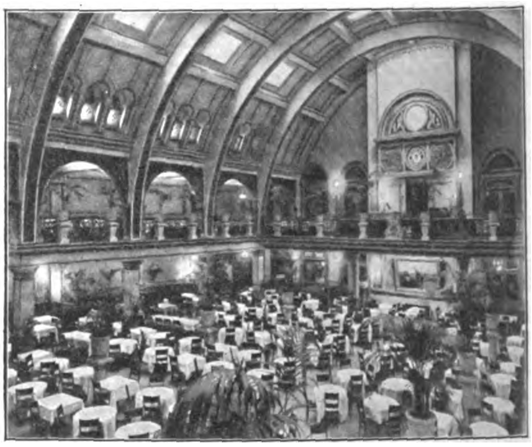
This is particularly true in the case of restaurant and cafe illumination where the elaborate and often delicate nature of the decorative scheme demands studied care in planning the lighting effects.

In this connection it is interesting to record that some of the most beautiful effects in restaurant lighting have been produced by the Frink and J-M Linolite systems. The Frink system consists of a large variety of fixtures scientifically designed to produce a soft, even distribution of illumination, the object being to get away from the deep shadows and glaring "spots" of light that are so trying to the eyes.

These fixtures may be roughly classified under three headings: the direct system in which the light is reflected in a downward or outward direction from an inverted bowl; the direct-indirect or so-called semi-direct system in which it is reflected downward through a transparent bowl and also thrown onto the ceiling; and the indirect system in which all the light is thrown onto the ceiling from an opaque bowl or means of concealed lights around the cornice, known as cove lights.



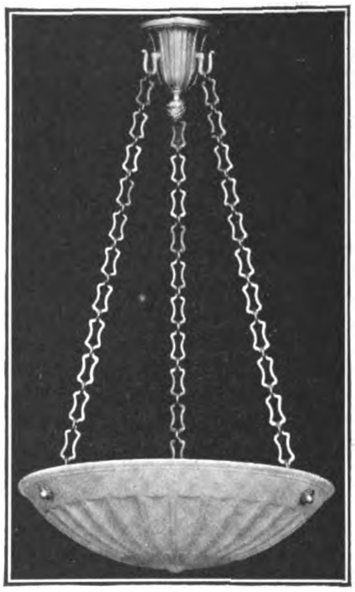
Cove and Candelabra Lighting, Palm Room, Bellevue-Stratford Hotel, Philadelphia.



Ceiling Diffusers and Direct-Indirect Fixtures, Pabst Harlem Restaurant, New York.

The fixtures employed to secure these various effects consist of chandeliers and electroliers of exceptionally artistic design. They are made in square, round or octagon shapes, of brass, bronze steel, copper, armor bronze or composition, in any desired finish. Statuary bronze, Pompeian green, or verde antique are finishes which blend appropriately with the scheme of lighting, and which harmonize with artistic architectural details. An almost unlimited variety of lighting effects is obtained by means of opalescent and frosted glass bowls in different colors.

The framework of Frink direct-indirect electroliers conceals powerful, correctly designed, silvered ripple-glass reflectors, which distribute the light evenly over the ceiling, while at the same time sufficient light passes through the translucent bowl at the bottom to furnish a soft, evenly diffused illumination. By revealing the source of the illumination this system eliminates the hollow, unnatural appearance of rooms lighted with indirect-lighting equipment only. These fixtures can be hung high above the line of vision, so that an uninterrupted view of the cafe is obtained without the necessity of using small units—a decided architectural advantage. When properly spaced, Frink direct-indirect electroliers throw a practically uniform light over the area to be illuminated, and at the same time afford just sufficient shadow to bring out the architectural details and furnishings without producing sharp and disagreeable contrasts.



Frink Direct-Indirect Electrolier in Bronze and Opalescent Glass.

One of the most notable examples of restaurant cove lighting is the Palm Room of the Bellevue-Stratford Hotel, Philadelphia, Pa., illuminated by means of the Frink indirect system. Concealed J-M Linolite lamps throw an ample illumination on the ceiling. A few soft rays of direct light from the candelabra shown on the tall uprights are included in the scheme. The brilliancy of these lights is cut down by means of soft brown silk shades, the object being twofold, to relieve the impression of coldness which is sometimes encountered in indirect lighting, and to offer rest to the eye by means of the soft color effect.

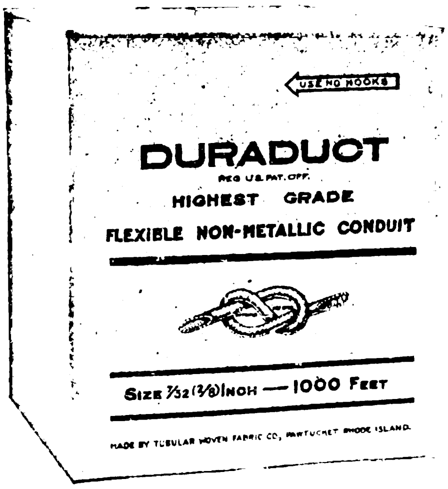
The Cafe Parisian of the Ritz-Carlton Hotel, Philadelphia, Pa., is another example of artistic concealed lighting obtained by the Frink and J-M Linolite systems. In New York City, the famous "Murray's", modeled to represent a Roman garden, the Pabst Harlem Restaurant and the Cafe of the Lawyers' Club also bear testimony to the beautiful effects which may be obtained by these systems.

The J-M Linolite lamp, which is largely used in Frink fixtures, instead of the pear-shaped bulb, is a tube nearly a foot long, having a uniform diameter of one inch. The current enters one end and is carried through a single filament to the other end, thus giving a single line of light, insuring even distribution and high efficiency.

The H. W. Johns-Manville Company, New York City, is sole selling agent for the Frink and Linolite equipment. It has branches in 49 cities and maintains a large staff of illuminating engineers, who have solved some of the most difficult artificial-lighting problems.

New Method of Shipping Smaller Sizes of Duraduct.

Another innovation has been made in shipping Duraduct, the non-metallic flexible single-wall conduit, manufactured by the Tubular Woven Fabric Company, Pawtucket, R. I. The company is now prepared to make shipments of all $\frac{7}{32}$-inch and $\frac{5}{16}$-inch Duraduct in standard corrugated-box containers, 1,000 feet to the package. The advantages of shipments of non-metallic conduit in this style of packing are manifest. The material is received by the customer in clean and unbruised condition and may be rehandled at minimum expense and delivered to the job in the same clean condition as forwarded from the factory. The package also permits of stocking to advantage and each container is marked with its contents so that at a moment's glance the stock of such material can be determined. The box is of sufficient strength to take the brunt of shipping damages and does away with the necessity of having numerous coils of loose material in a shipment, which are so liable to be lost in transit. Very shortly all of the two-eighths-inch and one-fourth-inch Duraduct will be shipped in these standard containers, the container itself being attractively illustrated with the manufacturer's trademark. A. Hall Berry, 97 Warren Street, New York City, is general sales agent of the company.


USE NO HOOKS
DURADUCT
REG U.S. PAT. OFF.
HIGHEST GRADE
FLEXIBLE NON-METALLIC CONDUIT
SIZE 7/32 (3/8) INCH — 1000 FEET
MADE BY TUBULAR WOVEN FABRIC CO, PAWTUCKET RHODE ISLAND.

New Shipping Container for Duraduct.

◆

Short-Circuiting Device Within Lamp Bulb.

The Z Electric Lamp Manufacturing Company, Limited, New Broad Street, London, England, has patented a device which is placed inside the bulbs of metal-filament lamps used on series circuits for the purpose of short-circuiting the filament in case of failure. The device is not at all complicated.

Within the tubular part of the foot of the lamp through which the leading-in wires pass, a tiny copper ring is placed so as to encircle and make mechanical contact with the wires. The copper ring is oxidized and under normal conditions is electrically insulated from the leading-in wires, although in contact with them. In case the lamp filament fails, the oxide film is broken down by the resulting high voltage across the lamp terminals, with the result that the broken filament is short-circuited.

This type of lamp is especially suited to temporary installations upon series circuits, as in the case of special lighting displays.

◆

Electrocution of Teredos.

A new method of destroying teredos, a pest which has caused enormous damage in the destruction of piles used in wharfage construction in north Pacific coast ports, particularly in Vancouver, Seattle, and Tacoma, by turning an electric current into the piles, is being tried in Seattle. These pests have so far successfully defied all attempts to eradicate them from the timbers supporting the various structures along the water front in the Puget Sound and British Columbia ports, and a means of destroying them will prove a great saving to individuals and companies maintaining docks and wharfage properties on the coast.

◆

Excellent Performance of Vehicle Batteries.

The data given below, which were prepared by the Philadelphia Electric Company, show the results obtained from a number of its electrics equipped with Ironclad-Exide storage batteries manufactured by the Electric Storage Battery Company, Philadelphia.

The first two vehicles of 2,000 pounds capacity are of an old type and were placed in service in 1905. Each weighs 6,100 pounds without load.

While the average daily mileage in some instances is far below the capacity of the vehicles, the batteries were recharged each day. This was done in order to prevent any pull-ins, should the vehicles be called upon unexpectedly to do any excessive amount of work.

The period covered by the data extends up to and includes March 31, 1914. Judging from a recent examination the plates are still good for considerable more life. This is interesting in connection with the Ironclad-Exide guarantee and shows how very conservative it is.

Craftsman Home Builders Have Permanent Exhibit.

The Craftsman Home Builders have been quick to realize that electricity is the keynote of convenience, helpfulness and refinement in the home. As a result they have featured its use in a permanent exhibit in their building at 6 East Thirty-ninth Street, New York City. Displayed there is the electrical equipment for the home, utilities that can be made to do everything from cooking meals to washing clothes. The list includes vacuum cleaners, intercommunicating telephones, percolators, toasters, chafing dishes and many more useful household helps.

In connection with this exhibit the organization is giving a series of lectures along this line, the first of which was given on Tuesday afternoon, May 12th, by Arthur W. Hartigan of the Western Electric Company. Mr. Hartigan took for his topic "The Home and How to Increase Its Convenience and Comfort." He showed that with the aid of electricity the home could be managed scientifically and that more could be done with less effort. Mr. Hartigan's talk was very enthusiastically received.

◆

Westinghouse Gas-Filled Tungsten Lamps to be Used in Chicago.

The Sanitary District of Chicago has just let the contract for 2,000 gas-filled tungsten lamps, complete with fixtures, for lighting the streets of the residence district of Chicago.

The ventilated fixture, which will be supplied by the Westinghouse Electric & Manufacturing Company, is similar in appearance to an arc lamp, and is complete with the glassware, proper reflector and compensator or autotransformer.

This transformer is designed to operate a 300-watt, 600-candlepower, 20-ampere Westinghouse Mazda lamp from a 10-ampere, 60-cycle, constant-current series circuit. It is especially arranged to protect the lamp from excess voltage in case of line surges and severe ground.

The lamps, which will be of the ratings above mentioned, will be furnished by the Westinghouse Lamp Company, Bloomfield, N. J.

This will be the first large installation of series-burning gas-filled incandescent lamps with fixtures for street lighting.

Kind of Vehicle	Capacity Vehicle	Size Battery	Battery Started New	Total Miles to 4-1-14	Total Days in Service
Service wagon.......	2,000 lbs.	13 MV I/C	2-15-11	13,511	942
Service wagon.......	2,000 lbs.	13 MV I/C	3-30-11	17,889	888
Delivery wagon......	1,000 lbs.	11 MV I/C	11-10-11	20,895	774
Delivery wagon.......	1,000 lbs.	11 MV I/C	8-18-11	18,676	884
Tower wagon........	1,000 lbs.	9 MV I/C	9- 8-11	14,282	802
Completed del. wagon	1,000 lbs.	11 MV I/C	8-18-11	19,594	742
Completed del. wagon	1,000 lbs.	11 MV I/C	8-19-11	22,970	879
Completed del. wagon	1,000 lbs.	9 MV I/C	8-18-11	17,510	844

Current Electrical News

NORTH ATLANTIC STATES.

SUNBURY, PA.—William Dechant, an engineer of Reading, Pa., has about completed the plans for the Sunbury Water Company's new plant which is to be used as a pumping station and power plant. N.

SOUTH ATLANTIC STATES.

LAKELAND, FLA.—An election will be held to decide the question of issuing $125,000 municipal bonds to be used for constructing an electric-light plant. Address Oscar M. Eaton, mayor, for general information.

NORTH CENTRAL STATES.

CINCINNATI, O.—A power plant, for which the contract has not yet been let, will be a part of the equipment of the new building of the Methodist Book Concern, which will be constructed by the Ferro Concrete Construction Company.

HUDSON, O.—An ornamental lighting system will be installed in the town, under plans being worked out by the Board of Control. Several streets will be taken in, with lights placed 125 feet apart. L.

MARYSVILLE, O.—The Marysville Light & Water Company is negotiating with several nearby towns with a view to furnishing current to them, which will involve considerable extensions of its lines, and perhaps an enlargement of its plans, as well as incidental equipment in the towns supplied. L.

MASSILLON, O.—The Massillon Electric & Gas Company, owned and operated by the Doherty Syndicate, of New York City, is planning to rebuild its power house in this city. W. G. Williams, of New York, a construction engineer, is in charge of the work. H.

FT. WAYNE, IND.—Bids for the construction of a new lighting plant and the installation of a traveling crane are to be asked for by the Board of Public Works of this city. G.

ROCHESTER, IND.—The Rochester Light & Power Company has been granted permission by the Public Service Commission to issue $50,000 in bonds to cover the cost of extending the lines of the company from Rochester and Argos to Bourbon.

THORNTON, IND.—Electrical appliances, including cooking outfits and electric irons, will be bought by the municipal electric plant. E. P. Rose is town clerk and treasurer. G.

PRINCETON, ILL.—The City Council of Princeton will shortly take up the matter of providing additional electric current to meet the growing demands of the community. Two propositions are being discussed. One is to add another unit to the city's electric light plant which will cost $3,000 or more and the other is to enter into a contract with the Spring Valley Utilities Company to run a line into the city. Z.

QUINCY, ILL.—The Adams County Mississippi River Power Company has been granted a license to incorporate. The capital stock of the company is given at $60,000 and it is to manufacture and deal in electricity for light, heat and power. The incorporators are John M. Schoeneman, Edward G. Hedrick and Randall B. Echols. Z.

STERLING, ILL.—Members of the Commercial Club and the mayor have completed plans for the installation of a boulevard system of lighting for Sterling. Single light standards are to be used and these are to be equipped with 500-candlepower nitrogen lamps. The contract for the work probably will be let in June. Z.

DETROIT, MICH.—For the purpose of increasing long-distance telephone facilities between Detroit and Battle Creek, an expenditure of $25,000 has been authorized by the Michigan State Telephone Company. The increase in wire mileage between these two points will be 300 miles. One new through route will be established from Detroit to Battle Creek and another to Albion. Two additional circuits will also be built between Marshall and Battle Creek. Address B. E. Sunny, president, 16 Clifford St., Detroit.

MUSKEGON, MICH.—Three more townships have granted franchises to the Muskegon-Saginaw Railway Company, to be incorporated at once by the stockholders of the Muskegon-Casnovia Land & Development Company, the promoters of the new trans-state interurban.

BEMIDJI, MINN.—A "White Way" lighting system will be installed on the business streets here. Address Mayor McCuiag for further information.

CARLTON, MINN.—Plans for the improvement of the street lighting system were approved at the May meeting of the Village Council. Many new lights are to be added. Address the village clerk in regard to the matter.

HENNING, MINN.—The construction of an electric light plant is being considered. Address the village recorder for information.

LONG PRAIRIE, MINN.—A. D. Day is chairman of a committee to secure a "White Way" lighting system for business streets.

PRESTON, MINN.—Root River Power & Light Company has been granted a five-year franchise for electric lights.

MADELIA, MINN.—The city will install a "White Way" lighting system. Address Thomas McGovern, manager of the Madelia Electric Company for further particulars.

SLAYTON, MINN.—Victor Klinger has made a proposition to install an electric light plant here. C.

ANAMOSA, IOWA.—Money has been secured for boulevard lighting. Address the village clerk for further information.

DUBUQUE, IOWA.—The boulevard electric-light system will be extended. Address the city electrician for further particulars.

JEWELL, IOWA.—The Fort Dodge, Des Moines & Southern Interurban Company is making a strong bid for electric-lighting franchises in the smaller towns adjacent to its lines which have no plants of their own. They are just now considering the matter of the extension of a high-tension power line from their big plant at Frasier, to Jewell, a distance of some 40 miles. Address J. R. Hone, 712 Central Avenue, Ft. Dodge, for further information.

LITTLE ROCK, IOWA.—The Little Rock Electric Light Company has been incorporated with a capital of $10,000 to construct and operate an electric light plant. Address Frank Turk, one of the incorporators, for desired information.

KAHOKA, MO.—The Council is planning to install electric street lighting. Address E. C. Bloom for further information.

MAPLETON, N. D.—The Mapleton Telephone company has been incorporated with a capital stock of $15,000 by A. Devine, C. F. Gibson and others.

WESINGTON, S. D.—The Council has voted to install a municipal street lighting system. Address the city clerk for further information.

ENTERPRISE, KANS.—The Council will consider ways and means to secure electric lighting. Address City Clerk Corbin for information.

TOPEKA, KANS.—The Board of Education is advertising for wiring and lighting bids on a high school addition The contract will be awarded separately from the general work. M.

SOUTH CENTRAL STATES.

HARRODSBURG, KY.—The city's Electric Light Commissioners contemplate installing a motor-generator set, to furnish power for a municipal waterworks, and a 30-horsepower 2,200-volt induction motor. Albert Riley is superintendent. G.

HODGENVILLE, KY.—Doubling the capacity of the Hodgenville Lighting Company's plant is being considered by the owner, C. L. Herron, of Liberty, Ky. New boiler, engine and generator equipment will be needed if the improvement is decided upon. G.

MIDDLESBORO, KY.—In connection with the recent sale to Fred Moomau, of Cincinnati, who is reputed to be representing a group of Cincinnati capitalists, of a franchise for the construction and operation of an electric railway, a project has developed for the making of Middlesboro a large electric light and power center. It is pointed out that the surrounding country is rich in coal, which will last for a hundred years or more, and that a series of electric lines is feasible out of this point.

JELLICO, TENN.—An electric plant will be installed by the East Tennessee Coal Company, which is preparing to develop 2,000 acres of coal land near Hazard, Ky. G.

NEWPORT TENN.—A franchise for the installation and operation of an electric light and power plant has been granted to C. L. Goughnoir, who will generate the current by means of water power. He is now constructing a dam across the Pigeon River at Hartford, Tenn. G.

FOLEY, ALA.—Swanstrom Brothers' Mill Company will install a plant for furnishing electric light and power.

MELVILLE, LA.—The town will establish an electric light plant. Address the mayor for further particulars.

WESTERN STATES.

LIVINGSTON, MONT.—Ornamental street lights and a fire system will be installed. Address the city clerk for particulars.

GRANGEVILLE, IDAHO.—Supplee & Adams are preparing to construct a power plant on the American River this summer with sufficient capacity for furnishing power to the mines in that section and electric lights for Elk City.

BOISE, IDAHO.—The Overlook Mining & Development Company, whose property is located 80 miles northeast of Boise City, will immediately begin the installation of a hydroelectric water-power plant on their property. O.

LAS VEGAS, NEV.—Articles of incorporation have been filed here for the Colorado River Hydro-Electric Company, with a capital stock of $5,000,000, to develop power in the Colorado River, a plant to be located at Boulder Canyon, east of Fort Callville. The directors are William Forman, Thomas Lindsey, W. R. Williams, Henry C. Schmidt and M. B. Schmidt, all of Tonopah.

PHOENIX, ARIZ.—Surveys for the lines of the Falls Power & Electric Company have been made and work will begin soon. The system will comprise eight miles of main line at 4,000 volts, 17 miles of secondary lines at 2,200 volts, and local service for both light and power at 110 volts.

REPUBLIC, WASH.—F. M. Shields and Mahlon McKain, of Spokane, recently petitioned the County Commissioners of Ferry County for a franchise to construct an electric-transmission line between this city and Danville, to connect with one between the International boundary line and Bonnington Falls, B. C. The length of the proposed transmission line is about 35 miles. The promoters have already negotiated with the West Kootenai Power Company for current from Bonnington Falls. The estimated cost of the proposed line is about $75,000. O.

DRAIN, ORE.—Residents of this city have authorized the issuance of bonds in the sum of $15,000 to be used in the construction of a municipal lighting plant. It is understood the plant will be built in the coming summer. O.

NEHALEM, ORE.—Steps are being taken here for the installation of a municipal lighting system.

RIDDLE, ORE.—W. Vaughn, owner of the Geer Box Factory here, contemplates the installation of an electric lighting plant to furnish lights for streets, business houses and residences of this city. O.

GREENVILLE, CAL.—The Indian Valley Electric Light & Power Company has asked the Railroad Commission to modify an order made in September, 1912, which authorized the company to issue none of the bonds authorized under the order, and wishes now to enter into an agreement with the Great Western Power Company to take power at the Big Meadow dam. The agreement if authorized, will require an outlay of $20,296 for the construction of a transmission line, 13 miles between the dam and Greenville. The company proposes to change its name to the Plumas Light & Power company.

MONETA, CAL.—The Southern California Edison Company is preparing to establish a substation at Western Avenue and Gladstone Street.

REDLANDS, CAL.—The City Trustees have granted a contract to the Independent Electric Company for an extension of the ornamental street light system on Orange Street from Colton Avenue to Lugonia Avenue. It will cost about $1,250.

STEGE, CAL.—The Board of Supervisors of Contra Costa County have granted the Pacific Gas & Electric Company a franchise along public roads in this vicinity.

PROPOSALS.

ELECTRIC WIRING.—Bids will be received on June 4 for electric wiring for the Madison County Court. Address Harry J. Mackinaw, county clerk, Edwardsville, Ill.

ELECTRICAL SUPPLIES.—Sealed bids will be received at the office of the secretary of the Board of Public Education, of Pittsburgh, Pa., until June 9, 1914, for furnishing electrical supplies for the public schools of Pittsburgh for the coming year. S.

ELECTRIC LIGHT FIXTURES. — The State Capital Commission is advertising for bids for the electric lighting fixtures for the new state capital, Salt Lake City, Utah. Bids must be received not later than June 5. Plans and specifications may be secured at the office of Richard Kletting, architect, 415 Felt Building, Salt Lake City. U.

ELECTRICAL WORK. — Contracts for the heating, lighting and electrical work in the new township high school at Georgetown, Ill., are yet to be let. Herbert B. Krauel has been given the contract for the construction of the building at approximately $36,000 and the other contracts to be let will bring the total up to about $45,000. County Superintendent Haworth is looking after the work. Z.

ELECTRICAL EQUIPMENT.—Bids will be received on June 1 for the construction of certain improvements consisting of approximately one 50-kilovolt-ampere generator direct connected to auto high-speed engine, one 75-kilovolt-ampere generator direct connected to auto high-speed engine, street-lighting system including switchboards, all to be erected complete. Address B. M. Archer, mayor, Halls, Tenn.

ELECTRIC ELEVATORS. — Sealed proposals will be received at the office of the superintendent, U. S. Capitol Building and Grounds, Washington, D. C., until June 1 for installing at Columbia Hospital for Women, Washington, D. C., two electric passenger elevators, one electric service elevator, six electric dumbwaiters. Information upon application to Elliott Woods, superintendent.

NEW INCORPORATIONS.

PHARR, TEX.—Pharr Ice, Light & Power Company has been incorporated with a capital of $40,000. The incorporators are S. R. Gawthorp, A. J. McColl, and John A. Cook.

NEW YORK, N. Y.—Otis Allen Kenyon, Inc., has been granted articles of incorporation, capitalized at $10,000. The incorporators are Otis A. Kenyon, Hastings, N. Y.; Wilhelm Schenstrom, New York City, and Anton Werner, Jr., Brooklyn.

NEW YORK, N. Y.—Planet Incandescent Lamp Company, Incorporated, has been granted articles of incorporation to deal in electrical supplies. The incorporators are Nathan Cohen, M. Angelo Wlias, Percy I. Elias, all of New York City.

NEW YORK, N. Y.—Acton Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $27,000, to deal in electrical supplies. The incorporators are George K. Hamblin, Oscar A. Hirsh and Edward S. Walsh, all of New York City.

CLEVELAND, O.—The American Electrical Display Company has been incorporated to engage in the business of electrical advertising. The capital stock is $10,000 and the incorporators are Mrs. E. R. Blite, Henry Baker, Max P. Goodman, M. E. Tollelbach and A. L. Dietz.

NEW ROCHELLE, N. Y.—Electro-Automatic Machine Corporation has been incorporated to manufacture electric machine tools, supplies, etc. The capital stock is $250,000 and the incorporators are James H. Reid, Ottawa, Canada; Frederick D. Lincoln, New Rochelle, N. Y.; and Elmer E. Sullivan, Newark, N. J.

NEW YORK, N. Y.—Amo Manufacturing Company, Incorporated, has been granted articles of incorporation to deal in and manufacture electric novelties. The capital stock is $5,000 and the incorporators are Frederick W. Schmidt, Jersey City, N. J.; Horace G. Wear, Belleville, N. J.; and Hermann H. Frieder, New York City.

NEW PUBLICATION.

MERCHANDISE IMPORTS AND EXPORTS.—A convenient reference book for the exporter or the manufacturer who is interested in foreign trade, is a bulletin of "Imports and Exports of Merchandise into and from the United States by Countries and Principal Articles." It has just been published by the Bureau of Foreign and Domestic Commerce and is sold by the superintendent of documents, Government Printing Office, Washington, D. C., for 15 cents a copy. A glance at this pamphlet affords the business man a bird's-eye view of the character and volume of our commerce with any foreign country, as it gives the quantity and value of its principal purchases from us and its sales to the United States for the years 1912 and 1913. The material was formerly included as table No. 19 in the large quarto annual volume "Commerce and Navigation of the United States," a costly and bulky publication available in a limited edition only. Issued in this convenient form it should take its place as a reference book essential to any business house with an interest in export and import trade.

FINANCIAL NOTES.

The special meeting of the stockholders of the Pacific Gas & Electric Company, which was scheduled in San Francisco May 19, was postponed until June 15.

It is announced that negotiations have been practically completed whereby the Commonwealth-Edison Company will take over control of the Chicago elevated system by the payment of $6,000,000 cash for $20,000,000 common stock of the Chicago Elevated Railways. It is stated this is an outright purchase of stock at the rate of $30 per share. Payment is to be made to a New York syndicate, of which the National City Bank is manager.

The New York Public Service Commission, Second District, has issued an order authorizing the Long Island Lighting Company to issue $90,000 five-per-cent twenty-five-year first-mortgage bonds and $35,000 capital stock; bonds to be sold at not less than 87.5 and stock for not less than its par value. Proceeds to be used for new construction and improvements to transmission system.

The American Gas & Electric Company has notified its shareholders that a special meeting will be held on June 3 to act on a proposition to increase the capital stock of the company by issuing $500,000 common stock, par value $50. No announcement was made as to when the new stock, if authorized, will be issued, or the basis upon which stockholders will be allowed to subscribe.

Directors of Stromberg-Carlson Telephone Manufacturing Company submit plan of reorganization to stockholders in which a reduction in the capital from $3,000,000 to $450,000 is urged. Net book value of assets placed at $1,363,019, of which $1,004,936 is in Rochester plant and $395,829 in securities of Atlanta Telephone & Telegraph Company. Liabilities of company $37,746. Annual business of company $1,000,000.

The Nevada-California Power Company is arranging to provide financing for the hydroelectric plant to be built on Bishop Creek this year and it is expected to have the first 13,000-horsepower unit in operation in 1915. It was first planned to erect two plants, but because of present financial conditions but one plant will be constructed now. Nevada-California Power Company has let contracts for an extension of its transmission lines into Imperial Valley and the new line will be 166 miles long. From its connection with the Bishop Creek power plants to its point of delivery the new line will form part of the longest electric transmission line in existance. From its extreme northern terminus at Wonder, Nev., to El Cenrto, Calif., will be 586 miles. It is expected to have the new line, which will furnish current for a territory of 500,000 square miles and to a population of 50,000, completed by July 1 of the present year.

The report of earnings of the Northern Ohio Traction & Light Company for the first quarter of the year indicates a very satisfactory business. The combined gross earnings of the company's light and power and railway departments for the three months ended March 31 increased $105,984 over the corresponding period of 1913, with a gain of $38,790 in net and of $24,047 in surplus after deducting charges. The light and power department made a gain for the quarter of $66,224 in gross earnings, and of $38,046 in net. For the month of March alone the gross earnings of the company increased $47,053 and net earnings $25,649 over March, 1913, the light and power department making a gross gain of $21,554 and a net gain of $15,584. The increase has continued, the second week of May showing a gain of satisfactory proportions.

Dividends.

	Term	Rate	Payable
Am. Tel. & Cable...	Q	1.25%	June 1
Chicago Elev........	Q	1.5%	June 1
Cities Service com..	**M**	0.5%	July 1
Cities Service pfd...	M	0.5%	July 1
Conn. Rvr. Pwr. com.	S-A	1.5%	July 1
El Paso Elec........	Q	2.25%	June 15
Gen. Elec...........	Q	2%	July 15
Tenn. Ry., Lt. & Pwr..............	Q	1.5%	June 1
West Kootenay Pr. & Lt.	Q	1.25%	June 1

Reports of Earnings.

The Philadelphia Company has issued its pamphlet report for the year ended March 31, 1914. The income account of the Philadelphia Company proper compares as follows:

	1914	1913
Total earnings..........	$7,657,644	$7,052,276
Expenses and taxes....	3,421,686	3,151,200
Net earnings...........	4,232,958	3,901,076
Other income...........	2,154,532	2,354,651
Total income...........	6,387,490	6,255,727
Charges, rents, etc.....	2,039,330	1,638,774
Balance	4,348,160	4,616,953
Improvements, betterments, etc............	531,512	1,198,811
Surplus	3,516,648	3,418,142
Preferred dividends....	399,122	303,467
Balance	*3,117,526	3,111,675
Common dividends....	2,732,758	2,729,967
Surplus	384,768	381,708

*Equal to 7.97 per cent on $39,043,000 common stock outstanding, compared with 7.96 per cent on $39,043,000 common stock previous year.

SOUTHWESTERN POWER & LIGHT.
(Combined earnings of subsidiaries.)

	1914	1913
April gross............	$ 211,385	$ 167,244
Expenses and taxes...	114,214	95,187
Net earnings	97,171	72,057
12 months' gross.......	2,427,103	2,039,227
Expenses and taxes...	1,317,430	1,151,902
Net earnings	1,109,673	887,325

KANSAS GAS & ELECTRIC.

	1914	1913
Aprill gross	$ 101,692	$ 87,853
Net after taxes.........	37,499	29,624
Surplus after charges...	23,377	14,834
Twelve months' gross...	1,089,459	940,724
Net after taxes.........	397,742	320,105
Surplus after charges....	221,720	155,501
Balance after preferred dividends	116,720	50,501

CENTRAL STATES ELECTRIC CORPORATION.
(Cleveland Electric Illuminating Co.)

	1914	1913
April gross............	$ 374,122	$ 333,951
Net after taxes	183,326	154,136
Balance after interest, preferred dividends & amortization	147,295	117,275
Surplus after depreciation	109,882	83,325
Twelve months' gross..	4,205,822	3,483,489
Net after taxes........	2,043,032	1,656,296
Balance after interest, preferred dividends & amortization	1,631,172	1,250,829
Surplus after depreciation	1,211,615	911,879

DETROIT EDISON.

	1914	1913
April gross............	$ 512,007	$ 438,922
Net	213,198	183,347
Surplus	106,561	92,509
Four months' gross....	2,215,409	1,870,050
Net	972,1720	841,611
Surplus	536,366	439,506

GRAND RAPIDS RAILWAY.

	1914	1913
March gross	$ 103,355	$ 106,423
Net after taxes........	36,980	44,194
Surplus after charges..	23,351	29,131
12 months' gross.......	1,299,756	1,255,172
Net after taxes........	480,499	536,200
Surplus after charges..	317,581	360,472
Balance after preferred dividends	242,581	285,472

DAYTON POWER & LIGHT.

	1914	1913
April gross...............	$ 75,577	$ 23,480
Net before interest.......	38,018	*1,713
Balance after preferred dividends	11,878	*26,291
Four months' gross.......	321,820	205,210
Net before interest chgs..	144,885	86,078
Balance after preferred dividend	40,899	*12,358

*Deficit.

NEW YORK ELECTRIC COMPANIES.

The New York Public Service Commission reports the earnings of the following companies for the year ended December 31, 1913:

Bronx Gas & Electric:

	1913	1912
Gross	$317,315	$291,970
Net	87,890	84,398
Surplus after charges......	33,176	33,889

Queens Borough Gas & Electric:

	1913	1912
Gross	$637,858	$565,318
Net	209,227	165,766
Surplus after charges......	86,507	58,688

NORTHERN STATES POWER.

Earnings of Consumers' Power of Minnesota and other subsidiary companies as follows:

	1914	1913
April gross.............	$ 340,588	$ 296,470
Net after taxes........	180,605	143,433
Four months' gross...	1,486,056	1,379,813
Net after taxes	790,312	679,175
Twelve months' gross.	4,006,151	3,564,315
Net after taxes........	2,080,570	1,779,220
Surplus after charges.	843,566	682,599
Balance after preferred dividends	260,416	161,961

CITIES SERVICE COMPANY.

	1914	1913
April gross.............	$ 337,223	$ 130,115
Net after expenses....	328,259	122,895
Balance after interest.	299,093	122,895
Surplus after dividends	83,759	25,900
Twelve months' gross.	3,076,961	1,371,616
Net after expenses....	2,983,098	1,304,310
Balance after interest..	2,743,369	1,304,310
Balance after preferred dividends	*1,541,128	642,734
Surplus after common dividends	894,798	362,125

*Equivalent to 11.42 percent on common stock.

Total accumulated surplus, April 30, 1914, $2,626,868.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 25.	May 18
American Tel. & Tel. (New York)........	121¾	128¼
Commonwealth Edison (Chicago........	131	[illegible]½
Edison Electric Illuminating (Boston)........	252	251
Electric Storage Battery common (Philadelphia)........	52	52¾
Electric Storage Battery preferred (Philadelphia)........	52	52¾
General Electric (New York)........	147	138
Kings County Electric (New York)	120	120
Manhattan Transit (New York)........	¾	⅞
Massachusetts Electric common (Boston)........	11	11
Massachusetts Electric preferred (Boston)........	60	61
National Carbon common (Chicago)........	108	108
National Carbon preferred (Chicago)........	118	118
New England Telephone (Boston)........	134½	135
Philadelphia Electric (Philadelphia)........	25¾	26
Postal Telegraph and Cables common (New York)........	82	82
Postal Telegraph and Cables preferred (New York)........	67½	68
Western Union (New York)........	66	61½
Westinghouse common (New York)........	62¾	75
Westinghouse preferred (New York)........	114	*120

*Last price quoted.

PERSONAL MENTION.

MR. L. A. SCOTT, of McKinney, Tex., has been elected president of the McKinney-Bonham-Paris Interurban Railroad Association.

MR. JOSEPH B. McCALL, president of the N. E. L. A. and of the Philadelphia Electric Company, celebrated his forty-fourth birthday on May 13 by working with his usual vigor all day and holding a family reunion in the evening.

MR. W. D. McDONALD, formerly branch manager of the Minneapolis office has been appointed to succeed Mr. Kollock and MR. C. C. CURRY has been appointed acting branch manager at Minneapolis to succeed Mr. McDonald.

MR. C. E. VANDEL, assistant treasurer of the Western Electric Company and also credit man for that concern, was elected a director of the Kansas City Association of Credit Men at the annual meeting on May 21. Mr. Vandel also was selected as a delegate to the National convention to be held at Rochester, N. Y., June 23 to 25.

MR. E. A. BROWN, a well known electrical contractor of Kansas City, Kans., has been appointed a member of a board of electrical examiners by the City Commissioners. The board is a new one, being composed, beside Mr. Brown, of City Electrician H. C. Marshal and Mr. Edward Henschel, who formerly was in the electrical contracting business.

MR. J. W. GILLETTE, who has been appointed sales engineer for the Electrical Engineers Equipment Company, of Chicago, was for six years manager of the Fort Smith (Ark.) Light & Traction Company. Mr. Gillette has made a special study of the engineering equipment of electric light, power and traction companies, and his selection for this important position is a very fortunate one upon the part of the company.

MR. F. N. KOLLOCK, JR., has resigned as district manager of the Seattle office of the Westinghouse Electric & Manufacturing Company to accept the position of treasurer and assistant secretary of the Westinghouse Lamp Company, Bloomfield, N. J.

MR. WILLIAM B. POLAND, vice-president and chief engineer of the Philippine Railway Company, Manila, who has been in charge of the construction and operation of that company's lines for a number of years, will leave the Philippines about June 1 to return to the United States, probably by way of Australia, Valparaiso, and the Trans-Andean line to Buenos Aires. After May 1 his address will be care J. G. White & Company, Inc., 43-49 Exchange Place, New York City. Mr. R. R. Hancock, at present general superintendent for the same company at Iloilo, P. I., will have charge of the management of the property.

MR. ROBERT COLGATE WOOD has been appointed public service commissioner of the First District of the State of New York, by Governor Glynn. The Senate has unanimously confirmed the appointment. Mr. Wood has been selected to take the place of Commissioner John E. Eustis, whose term expired on February 7. Mr. Eustis has been sitting with the Commission and will serve until Mr. Wood qualifies. The new commissioner is 45 years old, is a graduate of Harvard University, and lives at Riverdale, Borough of the Bronx, New York. He is a son of the late John Wood, merchant and manufacturer, and grandson of the late Robert Colgate, who was president of the Atlantic White Lead Company.

MR. GEORGE B. JOHNSON, manager of the Electric Shop of the Commonwealth Edison Company, was tendered a dinner at the Chicago Athletic Club on Wednesday evening, May 20, on the eve of his marriage to Miss Margaret Buck, of Springfield, Ill. Among Mr. Johnson's old friends and associates present at the dinner were the following: John F. Gilchrist, E. W. Lloyd, S. M. Bushnell, Homer E. Niesz, J. H. Goehst, John W. Ferguson, E. A. Edkins, Henry Jampolis, F. J. Arnold, O. R. Hogue, C. A. Cummings, J. C. Manley, E. J. Doyle, Fred R. Jenkins, George H. Lukes, F. D. Lyon, George H. Jones, J. C. Andrews, B. D. Buell, M. E. Poffinberger, C. Klusman, W. P. Lyon, A. R. Gerlach, W. J. Dooner, and D. H. Howard.

George B. Johnson.

MR. VICTOR L. CRAWFORD, known to every Jovian as "Happy Crawford," because of his smile which won't come off, has enlisted under a new banner. Hereafter he will be found bearing the slogan: "The hardware makes the line, Hubbard makes the hardware" and "There's a Peirce bracket for every purpose," into every corner of the country. "Happy" during his nine years' traveling for W. N. Matthews & Brother has been a loyal booster for everything electrical, and his smile and ready wit have been welcome features at Jovian gatherings everywhere. Hubbard & Company is to be congratulated on his addition to its forces.

Victor L. Crawford.

MR. WILLIAM SCOTT, superintendent of lines and electric service, Salt Lake City, was elected Grand Master of the Odd Fellows' Lodge for the State of Utah at the last Grand Chapter held in Logan.

OBITUARY.

MR. LEVI H. PAGE, reported to have been the inventor of the arc lamp, died in Chicago, Ill., on May 12 at the age of 78 years.

MR. JAMES A. CONNELL, special agent for the contract department of the Central District Telephone Company, died on May 14 at his home in Pittsburgh, Pa. Mr. Connell was 48 years of age and had been connected with the telephone company more than 20 years. He was a member of Fort Pitt Assembly, Knights of Columbus, and belonged to the Usher's Club of St. Paul's Cathedral.

DATES AHEAD.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, F. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Minnesota Electrical Contractors' Association. Annual Convention, St. Paul, Minn., June 22. Secretary, G. M. Jones, 14 North Seventh Street, Minneapolis, Minn.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 23-26. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Canadian Electrical Association. Annual Convention, Montreal, Canada, June 24-26. Secretary, H. G. Martin, Toronto, Ont.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 4. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 40 Martin Street, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Brown Instrument Company, Philadelphia, Pa., announces the change of its Pittsburgh office address in the Oliver Building, from Room 943 to Room 2138.

Technical Publishing Company, San Francisco, Cal., publisher of the *Journal of Electricity, Power and Gas,* announces the removal of its offices from the Rialto Building to the Crossley Building.

Electric Service Company, Cincinnati, O., has changed its name to the **Formica Insulation Company,** indicating more clearly the nature of its business, which involves the handling of a special insulating material.

The Bressan-Young Company, 6 Church Street, New York City, has been appointed eastern representative for the Menominee Electric Manufacturing Company, Menominee, Mich., manufacturer of fans, motors, telephones and telegraphic instruments.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the receipt of an order from the West Virginia Pulp & Paper Company for two 3,500-kilowatt, three-phase, 440-volt, 25-cycle turbogenerator outfits complete with Westinghouse-LeBlanc condensers to be installed at the Piedmont (W. Va.) plant.

The Robbins & Myers Company, Springfield, O., has ready for distribution a very neatly prepared sixteen-page booklet entitled "Doing the World's Work." It illustrates and describes in simple terms some of the many uses in the home, office, factory, store or shop, for which Robbins & Myers electric motors may be made the willing and ready servant.

Walter L. Thompson, New York and Eastern agent of the **Philadelphia Storage Battery Company,** announces that the demands of a rapidly growing business have necessitated the removal of the service station to 651-655 West Forty-third Street, New York City. The new station affords larger and better facilities for electric-vehicle storage-battery construction, renewals and repairs.

Universal Electrical Stage Lighting Company, 240 West Fiftieth Street, New York, N. Y., has ready for distribution a booklet entitled "New Lights for Studios." This is devoted to the Klieglight arc lamp which has been found so satisfactory in motion-picture and portrait studios. This lamp is automatic and a very powerful source of light peculiarly suited to studio work.

W. N. Matthews & Brother, 3722 Forest Park Boulevard, St. Louis, Mo., are sending out circulars calling attention to the Matthews Telefault, an instrument for quickly and accurately locating cable and line troubles. Several letters are included from plant superintendents of the Western Union Telegraph Company who have found the instrument invaluable for facilitating their work.

A. Hall Berry, 97 Warren Street, New York City, general sales agent of the **Tubular Woven Fabric Company,** is distributing folders calling attention to the extreme flexibility, great tensile strength and roller-bearing-wireway construction of Duraduct, the well known non-metallic flexible conduit. Mr. Berry is prepared to send samples of Duraduct to interested and responsible contractors and electricians.

Pittsburgh Transformer Company, Pittsburgh, Pa., has recently issued bulletin No. 1280, which describes pressed-steel-case distributing transformers. This bulletin contains 20 pages and is well illustrated. It considers the advantages of pressed-steel cases and describes with considerable detail the construction of these transformers. Two pages are devoted to line cuts showing the various methods of connecting transformers for polyphase work.

Pass & Seymour, Incorporated, Solvay, N. Y., has ready for distribution a set of neat and handy baseball schedules for the present season together with a score card that can be used indefinitely. Three schedules are given, for the National, American, and Federal Leagues. One side of the three leaves has a calendar for 1914. Copies of this set can be secured by any of our readers by writing to the home office of the Pass & Seymour firm.

The Electrose Manufacturing Company, Brooklyn, N. Y., has engaged a suite of rooms in the Hotel Walton, Philadelphia, where it will make a very interesting and extensive exhibit of its Electrose high-tension insulators during the week of the convention of the National Electric Light Association. The company will be represented by Louis Steinberger, president and general manager, and other members of the engineering and excutive departments.

Hale Garment Machine Company, Cincinnati, O., has undergone a change of management through the purchase by E. W. Edwards of a controlling interest in the company, which manufactures electric pressing machinery. At the company election the officers chosen were: E. W. Edwards, president; David Hale, Jr., vice-president; G. E. Meyer, secretary; William Schuchardt, treasurer. Mr. Edwards is a well known Cincinnati manufacturer, being president of the Edwards Manufacturing Company.

Roller-Smith Company, 203 Broadway, New York City, announces that in addition to its branch offices at 740 Monadnock Block, Chicago, and 711 Williamson Building, Cleveland, O., it now has additional representatives as follows: Boston, Mass., Tompkins-Stoddard Company, 77 Franklin Street; Detroit, Mich., H. I. Shire, 1310 Majestic Building; Minneapolis, Minn., The W. W. Geisse Company, McKnight Building; New Orleans, La., John S. Black, 908 Hennen Building; Portland, Ore., G. L. Priest, 229 Sherlock Building.

The United States Light & Heating Company, Niagara Falls, N. Y., announces that a sales office has been established in Washington, D. C., in the Evans Building, 1420 New York Avenue, with W. G. Davis in charge. Mr. Davis, who was formerly connected with the U-S-L sales department at New York City, will have under his direction the sale of U-S-L storage batteries, electric starter and lighter, and axle electric car-lighting equipment in this territory, which includes the states of Florida, Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, and part of Pennsylvania.

Line Material Company, South Milwaukee, Wis., maker of Kyle Line outdoor lighting fixtures and line construction material, has moved into its new plant. The building of the new plant was made necessary by the rapid growth of the company's business during the past few years. The floor area of about 35,000 square feet is occupied by a machine shop, forge, galvanizing plant, assembling shop, engineering department and office. The gray and malleable-iron foundry remain at the old location. A side track of the Chicago & Northwestern Railway runs into the property. Two acres of land adjoining the plant have also been purchased.

Crouse-Hinds Company, Syracuse, N. Y., has recently issued a very attractive 208-page cloth-bound catalog illustrating, listing and describing various types of condulets and condulet fittings. The first 18 pages of this catalog are devoted to a valuable and convenient pictorial index in which the various types of condulets and fittings are shown in excellent engraving, many of which are in three colors. Page references and type letters are given in the index, making it valuable as a convenience when looking for a particular device or class of devices. In the back of the catalog is given an alphabetical and numerical index of catalog numbers. The body of the catalog is well arranged and contains excellent reproductions of the various devices shown. Catalog numbers, list prices, shipping data, etc., are given in every case. A very wide range of condulets and fittings are listed, including besides the more common devices, such devices as various type of condulet plug, snap and knife switches, fuse holders, service-entrance boxes, heating-circuit control devices, lamp sockets, canopies, dust-proof lamps, ceiling-lamp outfits, side-bracket hoods, yard-charging condulets and condulet plugs, battery-charging devices, porcelain fittings, etc.

Record of Electrical Patents.

Issued by the United States Patent Office, May 19, 1914.

1,096,820. Electric Heating Unit. H. P. Ball, assignor to General Electric Co. An insulated resistance element is placed in a recessed plate and compressed by cover plate which tends to return recessed portion back to initial position.

1,096,839. Insulating Material. J. L. R. Hayden, assignor to General Electric Co. Contains a phenolic condensation product and hydrocarbon oil dissolved in a mixture of alcohol and amyl acetate.

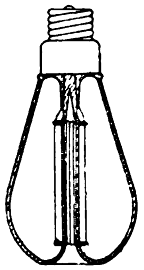
1,096,840. Squirrel-Cage Winding for Induction-Motors. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Includes a grid construction for rotor bars.

1,096,853. Magneto Ignition Apparatus. J. L. Milton, Chicago, Ill. Two sets of permanent magnets compose field structure.

1,096,855. Combined Door-Bell and Burglar-Alarm. C. B. Pace, Jackson, Tenn. A door-knob operated electric-bell alarm.

1,096,859. Electric Incandescent Lamp. J. E. Putter, St. Joseph, Mo. Bulb so shaped that it forms the supporting rod for the filament, this rod having concave reflecting surfaces. (See cut.)

1,096,866. Process of Drawing Wire and Apparatus for Same. H. Schinnerling, assignor to General Electric Co. A method of drawing tungsten wire through a die submerged in a heated oil.



1,096,859.—Incandescent Lamp.

1,096,879. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. An apparatus for use with internal-combustion engines comprising a storage battery and two dynamos, the dynamos being used as motors for starting the engine and one dynamo being used as an exciter for the other which charges the battery while running.

1,096,891. Circuit-Closing Device. W. W. Burke, Bennington, Vt., assignor of one-fourth to J. E. Burke and one-fourth to A. J. Cooper. A cord-operated mercury-contact switch.

1,096,908. Heater. W. S. Hadway, Jr., New Rochelle, N. Y. A hosiery-drying form in which electric-heating coils supply heat to form the circulating steam.

1,096,913. Pull-Button Controlling Switch. C. H. Hill, assignor to General Electric Co. An interlock device for switches including a switch-position indicator.

1,096,915. Thermostatic Cutout for Electric Circuits. W. F. Hoffman, assignor to F. Kuhn, Detroit, Mich. Electrodes held together by mixture which melts upon becoming heated, thus permitting a resilient electrode to break contact with the other.

1,096,916. Electrically Heated Warming-Pad. W. F. Hoffman, assignor to F. Kuhn. Includes use of cutouts described in 1,096,915.

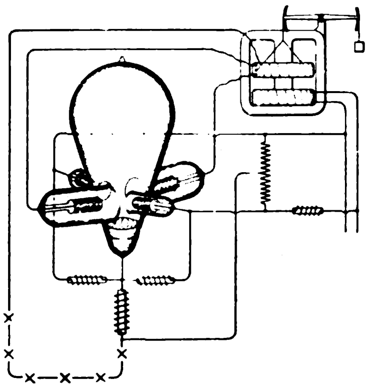
1,096,921. Elctric Riveting Apparatus. E. P. Kobert, New Haven, Conn. Includes the use of a heating electrode.

1,096,922. Method of and Apparatus for Starting Alternating-Current Motors. M. Korndörfer, assignor to General Electric Co. An induction motor starter arrangement in which starting device first acts as a series inductance and later as a compensator.

1,096,923. Converter. C. Kramer, assignor to General Electric Co. A motor-generator set for supplying a constant-current circuit from a constant-potential circuit.

1,096,926. Electrically Heated Sad-Iron. F. Kuhn, assignor to American Electrical Heater Company, Detroit, Mich. Covers details of attachment-plug arrangement.

1,096,927. Luminous Electric Heater. F. Kuhn, assignor to American Electrical Heater Co., Detroit, Mich. Covers details of arrangement of bulbs.



1,097,062.—Rectifier System.

1,096,928. Electric Heater. F. Kuhn, Detroit, Mich. A disk stove.

1,096,929. Electrically Heated Sad-Iron. F. Kuhn. Covers details of electrical terminals.

1,096,930. Load-Distributing Apparatus. H. A. Laycock, assignor to General Electric Co. Rotary converter and a direct-current generator connected in parallel with means of controlling the voltage of the alternating current supplied to the converter.

1,096,934. Automatic Current Controller. H. Meredith-Jones, New York, N. Y. A centrifugal contact-operating device in which excessive speed causes contacts to open circuit and to keep it open until speed becomes reduced.

1,096,935. Burglar Alarm for Door Knobs. L. Miesse, Oakland, Cal. An electric alarm.

1,096,942. Acceleration Inductor. R. B. Owens, assignor to General Electric Co. Comprises a special generator and inductively connected instrument indicating the rate of change of the current in the circuit.

1,096,955. Valve-Operating Mechanism. D. D. Rock, Detroit, Mich. Covers details of a solenoid-operated valve.

1,096,972. Burglar Alarm. A. L. Van Hauter, Dodi, N. J. Covers details of contact device for electric-bell alarm.

1,097,002. Selecting Mechanism. A. E. Case, assignor to Delta Electric Co., Marion, Ind. Covers details of an automatic telephone system.

1,097,005. Temperature Regulator. W. B. Dahl, assignor to B. P. Kimball, Minneapolis, Minn. Includes a thermostatic member for closing an electric circuit.

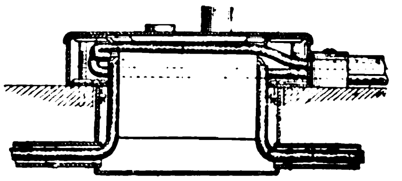
1,097,022 and 1,097,023. Portable Electric-Lighting Apparatus. H. H. Hirsch, Philadelphia, Pa. Covers details of reflector and supporting means.

1,097,030. Cable Telegraphy. I. Kitsee, assignor to American Telephone & Telegraph Co. A receiver comprising a shunted condenser and an inductive resistance in series with the cable and a local or receiving circuit containing a free condenser.

1,097,052. Magnet Rail for Electric Pianos. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Mfg. Co. Includes electromagnetic operation and controlling means for playing pianos.

1,097,053. Pedal-Controlled Rheostat for Musical Instruments. M. L. Severy, and G. B. Sinclair, assignors to Choralcelo Mfg. Co. A pedal-operated carbon rheostat for controlling the magnets mentioned in 1,097,052.

1,097,062. Vapor-Rectifier System. C. P. Steinmetz, assignor to General Electric Co. Reactances are connected in shunt to rectifier, a circuit connects these reactances and an impedance to a source of alternating current, the impedance preventing the discharge of the reactances through this circuit. (See cut.)



1,097,116.—Extension Box.

1,097,080. Railway Signaling System. C. J. Coleman, assignor to The Hall Signal Co. A track-operated home and distant railway electric block signal.

1,097,116. Circuit-Extension Box. C. W. Abbott, assignor to National Metal Molding Co., Pittsburgh, Pa. A two-part circuit extension box. (See cut.)

1,097,131. Telegraphy. I. Kitsee, assignor to International Quadruplex Co., Pittsburgh, Pa. A recording receiving system employing the static stress between a fluid at high tension and the ground.

1,097,136 and 1,097,137. System for Transferring Cars. T. F. Mullaney, New York, N. Y. A transfer car, having a source of energy is used to energize rails to be used.

1,097,154. Electrically Controlled Door-Lock. G. Wright, assignor to General Electric Co. Comprises a lock-nut, a strike-plate and means for preventing the entrance of the two when circuit is energized.

1,097,160. Railway System. C. E. Balzer, McKees Rocks, Pa. A motor-operated track switch.

1,097,175. Regulating Electric Arc Lamps. R. Friese, assignor to Siemens-

Schuckertwerke, G. M. B. H., Berlin, Germany. Includes regulating means for reducing operating current.

1,097,197. Railway Signaling System. J. C. Thullen and L. H. Thullen, assignors to The Union Switch & Signal Co., Swissvale, Pa. Has track circuits and inductive loads.

1,097,204. Telephone-Exchange System and Apparatus. S. B. Williams, assignor to Western Electric Co. Covers details of ringing circuits.

1,097,207. Electric Pull-Switch. F. Barb, New York, N. Y. A chain-operated flush switch.

1,097,208, 1,097,209 and 1,097,210. Electric Switch. F. Barb, New York, N. Y. Modification of 1,097,207.

1,097,220. Connecting Plug. O. M. Glunt, Rutherford, N. J., assignor to Western Electric Co. Comprises a tip contact, a ring contact and a bolt for securing the two.

1,097,227. Electrode for Electric Furnaces. A. T. Hinckley, assignor to National Carbon Co., Cleveland, O. A compound electrode.

1,097,232. Current - Discharge - Distributing System. J. P. July, assignor to Western Electric Co. Has means of varying discharge circuits and battery connections.

1,097,241. Siding Protection for Signaling Systems. W. H. Lane and C. W. Coleman; K. Coleman, administratrix of C. W. Coleman, deceased; assignors to Hall Switch & Signal Co. A track-operated siding signal.

1,097,250. Conduit Contact Plow for Electric Railways. J. S. McWhirter, New York, N. Y. Covers method of securing plow to frame.

1,097,256. Circuit - Breaker. E. J. Murphy, assignor to General Electric Co. A combination solenoid circuit-closing device and a relay-operated circuit-breaker.

1,097,282. Shade-Holding Means for Electric Fixtures. L. W. Andersen, assignor to The Plume & Atwood Mfg. Co., Waterbury, Conn. An adjustable shade for table lamps.

1,097,291. Coil-Supporting Post for Electrical Water-Heaters. R. A. Bower, San Francisco, Cal. Covers mechanical details of supporting arrangement.

1,097,292. Faucet Lever for Electrical Water-Heaters. R. A. Bower, San Francisco, Cal. Has an electrically heated water-chamber connected to faucet.

1,097,293. Faucet Bracket for Electrical Water-Heaters. R. A. Bower, San Francisco, Cal. Contains a conduit for electric wires.

1,097,294. Automatic Fuse-Plug. L. M. Bowman, Fort Worth, Tex., assignor of one-half to W. C. Farmer. A plug fuse with a number of fuse members each capable of being connected in circuit by rotating a knob.

1,097,307. Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co. Covers details of an automatic selecting system.

1,097,320. Method of Electrical Transmission. P. Cooper Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A rectifier having a vapor tube.

1,097,321. Single - Phase - Directional-Current Arrester. P. C. Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Co. A modification of 1,097,320.

1,097,334. Transmitting Means for Telegraphic Signals. I. Kitsee, Philadelphia, Pa. Includes two polarized relays connected to two inductoriums and current-controlled contacts in inductorium circuits.

1,097,336. Electric Furnace Working with an Electric Arc or Arcs for Melting and Extraction of Metal from Ore. P. Krefting, Christiania, Norway. A number of electrodes extend into furnace chamber.

1,097,344. Signal Apparatus for Elevators. J. F. McCarthy, Philadelphia, Pa., assignor of one-half to W. T. Brown, Jr. Elevator-signal lamps controlled from common mechanical position indicators.

1,097,348. Temperature Indicator. E. R. Murray, Alameda, Cal. Mercury in tube completes circuits as mercury expands.

1,097,358. Controlling Mechanism for Electrical Vehicles. F. G. Peck, assignor to Buffalo Electric Vehicle Co., Buffalo, N. Y. Covers details of hand-operated controller.

1,097,359. Desk Telephone. N. Pedersen, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Includes circuit-changing means.

1,097,360. Motor. G. E. Perry, Chicago, Ill. Covers controlling means.

1,097,363. Service Meter. J. N. Reynolds, assignor to Western Electric Co. Covers details.

1,097,366. Substation Service-Meter. J. G. Roberts, assignor to Western Electric Co. A recording meter with control of counting train.

1,097,388. Electrical Block-Signaling Apparatus for Railways. G. H. Brown, deceased, K. M. Brown and H. Brown, executors and trustees. Current supplied from engine.

1,097,392. Battery-Box Support and Insulator. A. C. Cremer and G. F. Molander, Baltimore, Md. An insulator-supported battery box.

1,097,400. Electromagnet. A. F. Dixon, assignor to Western Electric Co. Covers mounting and magnetic-circuit details.

1,097,414. Adjustable Insulator-Support. L. Fort, Jersey City, N. J. A two-insulator support for telephone or telegraph wires being so arranged as to permit of vertical adjustment of device.

1,097,428. Controller for Electric Motors. J. H. Hall, assignor to The Electric Controller and Mfg. Co., Cleveland, O. A transformer-starting arrangement for induction motors.

1,097,438. Indicating Fuse Holder. B. D. Horton, Detroit, Mich. Has an indicating spring.

1,097,473. Vapor Electric Apparatus. B. Schaefer, assignor to The Firm of Hartmann & Braun A.-G., Frankfort-on-the-Main, Germany. Covers arrangement of electrodes and chambers in a metal-vapor device.

1,097,540. Selective Switching Apparatus. A. F. Dixon, assignor to Western Electric Co. For an automatic telephone exchange.

1,097,547. Directional-Current Arrester. P. C. Hewitt, New York, N. Y., assignor to Cooper Hewitt Electric Co. The combination of an exhausted envelop, multiphase electrodes for the envelope, and supplemental means for continuously generating ionized vapor in said envelope.

1,097,559. Controlling Mechanism for Pneumatic-Despatch-Tube Apparatus. A. W. Pearsall, assignor to The Lamson Co., Boston, Mass. Has electromagnetic control.

1,097,587. Means for Vault Protection. W. D. Hammond, Los Angeles, Cal. A flexible conductor is embedded in vault wall which operates signal means when conductor is grounded.

1,097,602. Coupling for Electrical Conductors. W. L. Bliss, assignor to The United States Light & Heating Co., New York, N. Y. A plug connector.

Reissue 13,731. Original No. 1,014,869. Machine for Facilitating the Packing of Magnetic Objects of Oblong Shape. O. G. Münchwilen, Switzerland. Has a groove on the sides of which are magnetic poles.

Patents Expired.

The following United States electrical patents expired May 25, 1914.

583,026. System of Telegraphy. C. G. Burke, Brooklyn, N. Y.

583,039. Electric Signal Distributer. P. H. Fisk, North Branch, Minn.

583,043. Electric Heel Plate. J. W. Gibbs, New York, N. Y.

583,060. Electric Arc Lamp. F. A. LaRoche, New York, N. Y.

583,104. System of Generating and Using Hydrogen Gas and Electricity. L. H. Wattles, Providence, R. I.

583,109. Electric Race-Horse Carousel. J. W. Daniels, Paterson, N. J.

583,128. Galvanic Element. P. Schmidt, Berlin, Germany.

583,132. Primary Battery. H. M. Sutton and W. J. Steele, Dallas, Tex.

583,142. Telephone-Receiver Support. L. Duque and F. M. Cosgrove, San Francisco, Cal.

583,160. Maximum and Minimum Recording Electric Meter. A. Wright, Brighton, England.

583,173. Emergency Electric Generating Apparatus. C. E. Emery, Brooklyn, N. Y.

583,178. Underground Electromagnetic Railway Eystem. J. Hoffman, Schenectady, N. Y.

583,204. Incandescent Lamp. A. Swan, New York, N. Y.

583,210. Electric Motor. J. Connor, J. R. McMillan, and A. J. Fuller, Philadelphia, Pa.

583,213, 583,214. Electric Warp Stop Motion for Looms. R. J. Mommers, Manchester, Conn.

583,249. Electric Furnace and Method of Operating Same. A. H. Cowles, Cleveland, O.

583,250. Electric Furnace. A. H. Cowles, Cleveland, O.

583,264. Electric Motor or Dynamo-Electric Machine. R. Lundell, Brooklyn, N. Y.

583,273. Series-Multiple Controller. T. Von Zweigbergk, Cleveland, O.

583,303. Electric Gas-Lighting Attachment. W. H. Fargo, San Francisco, Cal.

583,309. Bond for Electric Railways. J. McLaughlin, Chicago, Ill.

583,316. Electric-Lamp Hanger. W. S. Weston, Chicago, Ill.

583,323. Method of and Apparatus for Charging Storage Batteries. C. Bramwell, Hyde Park, Mass.

583,324. Current-Collecting Device for Electric Railways. W. M. Brown, Johnstown, Pa.

583,354. Amalgamator. F. B. Austin, Temple, Ariz.

583,407. Electric Drill. C. E. Davis, Chicago, Ill.

583,411. Machine for Fastening Hangers in Electric Wire Cables. W. H. Johnston, St. Louis, Mo.

583,418. Telegraphy. O. R. Roberson, Glen Ridge, N. J.

583,423. Electric Signaling Apparatus. A. D. Wheeler, Hyde Park, Mass.

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THE THIRTY-SEVENTH ANNUAL CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The thirty-seventh annual convention of the National Electric Light Association, which is just closing as we go to press with this issue, has been in many ways unique. It has the distinction of being favored with perfect weather conditions throughout the entire week. The arrangements of both local committees were perfectly carried out and everyone visiting the Philadelphia convention has felt the highest degree of satisfaction with the convention. The location and the facilities of the meeting rooms where the various sessions of the convention were held were unexcelled, and the attendance and interest manifested in the papers and the committee reports were both remarkable. That there is a growing interest in the work of the Commercial Section was very manifest. This is as it should be, and the committees in charge of this particular feature of the convention program are entitled to the highest commendation for their selection of topics, of authors for the papers which were presented, and for the discussion which was elicited.

The recommendation of the Executive Committee providing for the discontinuance of the Hydroelectric and Transmission Section as a distinct organization and the placing of the work of this section in the hands of a special committee, was very well received and will, of course, be carried out.

The Public Policy Session, which was held on Wednesday evening, was in point of the interest shown and the large public attendance, one of the most brilliant affairs ever held under the auspices of the National Electric Light Association. The reading of the report of the Public Policy Committee by Mr. Samuel Insull and his earnest and well chosen advices with respect to considerations for the future development of the industry were classical in expression and were received with sincere and hearty enthusiasm. The participation of the Franklin Institute of the State of Pennsylvania in holding the exercises which commemorated the thirtieth anniversary of the first International Electrical Conference and Electrical Exhibition, which were held in Philadelphia in 1884, made the affair memorable, and the presence of such men, closely related to the development of the electrical industry, as Edison, Brush, Sprague, Rice and others, lent inspiration to this event of the week.

The setting of the exhibition of electrical apparatus and materials by the Class D members attracted spontaneous admiration from practically everyone present, and the Exposition Committee may well feel proud of the results of its endeavors.

STREET AND HIGHWAY LIGHTING.

Two reports were presented to the convention dealing with the lighting of streets and interurban highways. Both committees have included in their activities experiments along the line of actually equipping certain highways with lamps and determining what effects can be produced by definite types of equipment. The Committee on Street Lighting, of which Mr. John W. Lieb, of New York City, was chairman, has done some excellent work in studying the problem which confronts every city. Experiments have been made with both high-candlepower and low-candlepower units of both the arc and incandescent types. By the choice of proper accessories the distribution of light flux from such sources can be varied through a wide range. It is expected to continue these tests upon other streets, as well as those in New York City which have already been experimented upon, and the results should be extremely useful to other companies. Different equipment will be used in the new tests and the information thereby obtained will add greatly to that now available on this subject.

The Committee on the Lighting of Interurban Highways, of which Mr. George B. Tripp, of Harrisburg, Pa., is chairman, considered a subject which has received much less attention in the past than the lighting of city streets, and yet one which presents great possibilities of development in the future. The rapid increase in automobiling, among other causes, has created considerable demand for the lighting of country roads and many rural communities are now in a position to give attention to the adequate lighting of such highways. The experiments which have been carried out by the Committee show the value of this method of attacking the problem, and further installations of typical equipment chosen especially for its suitability to this purpose will give both central stations and consulting engineers data which will enable them to decide upon the type of units to be used in such installations in order to get an illumination which will be satisfactory, without running the expense to a point which will be prohibitive under the conditions involved. It is evident, of course, that funds will not usually be available to light country highways in the fashion that is prevalent in modern city streets. Units must be more widely spaced and the choice of wattage to meet such conditions is one which must receive the most careful attention. The study which has recently been given to outdoor illumination, the various ways in which it enables an observer to see, and the psychological factors which are involved, have greatly advanced this subject as an engineering problem.

The commercial possibilities involved in the development of this application of electric energy should appeal to every central station, but especially those which cover a territory extending beyond the limits of a single town or city. Where pole lines are already in existence along country highways for transmitting power between towns, the expense for providing highway lighting would not be so great as in other cases and a profitable field of development would seem to be opened by stirring up the enthusiasm of local residents along this line. If the proposed Lincoln Highway materializes, the central-station companies should make a determined effort to have it a model of good illumination throughout its length. While the same type of illuminating unit might not be desirable for all portions of such a highway, each unit selected should be suitable to the local requirements and should be made a model for other highways in adjacent territory.

FORMS FOR ELECTRIC RATE SCHEDULES.

The report of the Rate Research Committee this year includes a standard form for the construction of electric rate schedules. While a number of the state utility commissions have already adopted forms for filing electric schedules, there is, nevertheless, at the present considerable divergence in practice not only in different states but among electric companies not yet subject to such regulation. It will be for the benefit of all concerned if such schedules could be drawn up according to some uniform basis which would guarantee the inclusion of all necessary details and which would put the schedule in such form as to be easily understandable and avoid ambiguity. Members of the Association would do well to follow this standard form in preparing and filing their own schedules, and it would facilitate general convenience if the state commissions could find it possible to also adopt this uniform form.

At the present time one frequently comes in contact with forms of schedule which omit important items affecting the conditions of service under which such schedules are applicable, so as to make them ambiguous or leave doubt in the reader's mind as to whether they are applicable under given circumstances. The recommendation of the Committee that no abbreviations be used is also a good one, and the loose manner in which the term "kilowatts" has been used instead of "kilowatt-hours" by certain companies should be carefully avoided.

THE INDETERMINATE PERMIT.

In many minds it has been considered that a solution to the vexed problem of the proper length of time for the term of a franchise of a public utility company had been reached in the indeterminate permit, which is provided for in the public-utility laws of several states. Wisconsin, which has been a leader in the regulation of public service companies, in-

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stituted a provision for the indeterminate permit and other states have followed her example.

In certain states, such as Michigan, there exists, however, a constitutional provision placing a definite limit upon the length of term for which a franchise may be granted. In other states there are upon the statute books laws having the same purpose in view of setting a limit upon municipal action in this regard. Such provisions seem to place an obstacle in the way of adopting the indeterminate permit. A recent decision of the Michigan Supreme Court, which is referred to upon page 1151, indicates that the interpretation to be placed upon the Michigan constitutional provision is that a franchise cannot be granted for a definite term longer than the specified 30 years, but that this does not prohibit a franchise of indefinite term which is revocable by the authority granting it. Since the indeterminate permit is customarily accompanied by a provision for municipal purchase whenever this may be desired, it would seem that such a permit would be permissible under the terms of this decision.

SIDE LIGHTS ON ELECTRIC AUTOMOBILE TOURING.

The reader of the proceedings of the electric vehicle convention at Boston on May 19 and 20 will find much to interest him in relation to the present development of electric automobile touring, as set forth in the paper of Mr. J. S. Codman. Within the last year the runs of various members of the staff of the company with which the author is associated have been given a good deal of well deserved publicity. That of Colonel Bailey from Boston to Chicago in October last at an average road speed of 15.6 miles, including highway stops, and several lesser runs, including at least two notable trips between Boston and New York at 20 miles per hour or over, are convincing evidence that the pure roadster type of car is as practicable a machine for country and interurban travel as the more common gasoline type. It appears that only two difficulties of any importance now stand in the way of a general application of the electric passenger vehicle to cross-country travel: the concentration of most manufacturers upon types of cars specially suited to town and suburban service, and the still too common failure of the small central station to realize its duty in relation to the provision of charging facilities.

There is little doubt that as soon as charging facilities become general, manufacturers will awaken to the merits of roadster-type cars. The demand for luxurious plush-covered rolling boudoirs is not likely to slacken, for the electric car de luxe will be an increasing factor in transportation along the boulevards, from office and home to country club and opera; but just as soon as the simplicity and reliability, the convenience and last but not least the speed of the electric roadster over long stretches become known by the public, and just as soon as the central station makes provision to give the passing electric vehicle a boosting charge of from 100 to 200 amperes directly off the exciter bus, a new day will dawn in the industry. The key to the situation lies in the hand of the small central station, and at a merely nominal expense it should prepare to encourage and meet this desirable business. Rare, indeed, are the plants which today can give the motorist more than 30 or 40 amperes, when what he needs in practical touring is an hour's boost at from three to five times this rate. It is not generally realized how much a modern storage battery will stand in the way of temporary boosting, but it was clearly brought out in the Boston discussion that both the Edison and lead types of cell can be subjected to very high rates of current input, provided care is taken to cut down the current rate before overdoing the matter.

It is worth noting that an exciter of 12.5-kilowatt rating at 125 volts will yield 100 amperes and that an exciting plant of 25-kilowatt rating will meet the most urgent demands of the electric automobile tourist for a hurried boost. In this boost lies the degree of success with which the tourist can make his trip with at least approximately the convenience of the gasoline automobilist. It is significant that in one case Mr. Codman secured enough energy to propel his car 50 miles by feeding 200 amperes into a 45-ampere Edison battery for a one-hour period, the charge being transmitted through a cable run from the station exciter bus to the car through a convenient window.

One other point, which is of much importance in relation to the popularization of electric touring, may be mentioned. That is, the high average speed maintained by a suitably designed electric roadster surpasses that made by the average gasoline car. Owners of the latter type of vehicle will not easily believe that the electric maintains in many cases a faster road speed, but observations made over and over again by Colonel Bailey prove this to be so, there being a difference of from 2 to 5 miles per hour. The gasoline car doubtless will far exceed the electric in maximum speed, but the sustained average over all conditions of the road is what counts more than spurts. No one need fear to be classed among the snails in a modern electric roadster of high power; in fact, the speed which some of these cars make with no apparent effort is a revelation to the passenger, and as soon as the central station in each town awakens to the situation, we may look for an extension of cross-country travel by electric automobiles which will surpass the predictions of all but the most enthusiastic. The day is passing when the owner of the pleasure car feels genuine enjoyment in detecting and remedying the mishaps of the internal-combustion engine and all its tribe of accessories; simplicity of equipment is going to be more and more a drawing card, and a notable multiplication of electric roadsters accompanied by price reductions is likely to be witnessed in many parts of the country in the comparatively near future.

New York Electrical Society Meeting.

L. A. Bauer, director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, gave a lecture on May 25, before the New York Electrical Society at Columbia University, on the work and the cruises of the non-magnetic yacht *Carnegie*, in execution of the task of a general magnetic survey of the earth. This vessel was launched at Brooklyn, in June, 1909, and the following August started a cruise of 8,000 miles in the North Atlantic Ocean. She started out for a world cruise, in June, 1910, returning to Brooklyn last December, covering on this second cruise 92,600 miles. We now have a fairly complete magnetic survey of the oceans between the parallels of latitude 55 degrees North and 50 degrees South.

Simultaneously with the magnetic survey work on the oceans, expeditions have been sent out to map the magnetic elements in distant and more or less unexplored portions of the earth. Thus far there have been 38 of these expeditions covering regions from Greenland to the Antarctic Islands.

The *Carnegie* leaves early in June for a cruise in the North Atlantic Ocean towards Norway and Iceland, returning to Brooklyn at the end of the present year. During the two years, 1915 and 1916, she will be cruising in the South Pacific and South Atlantic Oceans between the parallels 50 and 70 degrees South. Thus within the next three years it will be possible to issue new magnetic charts for the greater part of the globe, based on the data acquired by a single organization, according to a uniform method, and using appliances yielding results with the requisite precision.

On the average the magnetic declination (variation of the compass), the magnetic dip and the strength of the earth's magnetic force have been completely determined at points at sea 150 miles apart. Owing to the fact that the *Carnegie* is non-magnetic, it is not necessary to apply corrections to the magnetic observations made aboard, and it is possible to make known the results of interest to mariners promptly. The principal hydrographic offices the world over have the results of the *Carnegie's* observations within three or four months after they have actually been made.

The result of immediate practical importance of this ocean magnetic work is to provide mariners with standard values of the variation of the compass, so that by comparing the values observed aboard their own vessels, which are generally now-a-days constructed of iron and steel, with the *Carnegie* results, they can immediately determine how much their compasses have been affected by the iron aboard and can make allowance accordingly. In order to compensate properly a compass on account of the ship's magnetism, it is also necessary for the mariners to have correct charts of the lines of equal magnetic dip and of equal magnetic force, and these are likewise being supplied.

Notable errors in past magnetic charts used by mariners have been disclosed, and in the charts being issued at present by the leading hydrographic establishments these errors have been rectified.

After Dr. Bauer's lecture, Lieut. John Cyril Porte, who will be the pilot of the Rodman-Wanamaker transatlantic flier, addressed the Society on "Aerial Navigation."

Seventeen members were elected. The Nominating Committee announced that for officers for 1914-1915, the following nominations had been made: president, Frederick A. Scheffler; vice-presidents, Bernard Rowntree, George Weiderman, Sr., O. A. Kenyon; secretary, George H. Guy; honorary treasurer, James H. McGraw; treasurer, Henry J. Hoeltge. The election will take place at the annual meeting on June 10, when William P. Kennedy will lecture on "The Electric Vehicle in New York City," with motion-picture illustrations.

Nela Research Laboratory News.

The Research Laboratory of the National Lamp Works, Cleveland, O., has made arrangements for three university professors to carry on research work at the laboratory during their summer vacations. These men are C. E. Mendenhall, of the University of Wisconsin; W. E. Burge, of the University of Illinois; and Knight Dunlap, of Johns Hopkins University; whose work will lie in the domains of physics, physiology and psychology, respectively.

The director of the Research Laboratory, Edward P. Hyde, has also in mind the establishment of research fellowships for a period of one year, somewhat similar to the fellowships connected with educational institutions. The incumbent will be expected to engage in research work along a line determined by his own qualifications. For the year 1914 it is desired to appoint a fellow to work in ophthalmology, with an honorarium of $700.

The staff of the laboratory will be augmented during the summer season by Willibald Weniger, professor of physics in the Oregon Agricultural College, and by A. F. Wagner, assistant in physics at Purdue University, who will spend their vacation at the Nela Laboratory.

There has recently been established in Nela Research Laboratory (formerly known as Physical Laboratory, National Electric Lamp Association) a Section of Applied Science in addition to the Section of Pure Science which was established over five years ago. The Section of Applied Science will be separate and distinct from the Section of Pure Science and will not restrict nor in any way affect the established work in pure science.

Utah Electric Club.

The regular weekly luncheon at the Commercial Club, Salt Lake City, on May 28, the Utah Electric Club listened to an interesting talk on the Mexican situation by Anthony W. Ivins, apostle of the Mormon Church, who has been in charge of the interests of the Mormon colonists in Mexico for a great many years and who has been a resident of that country for forty years. Apostle Ivins spoke intimately of Diaz, Madero, Carranza, Villa and other Mexican leaders, all of whom he has known personally and with whom he has found it necessary in his official capacity to have many dealings.

He outlined briefly the history of the country and the causes which lead up to the present conditions. He expressed confidence in the Constitutionalists and stated that he believed they are fighting for the principles of personal liberty and equal opportunities, and that they will ultimately be able to work out the solution, if permitted to continue. He is hopeful therefor that the United States will not find it necessary to go into Mexico. His talk was one of the most interesting given for the Electric Club this year. The club has now adjourned its regular luncheons until after the summer season.

Tablet to Wireless Operator.

On May 23 there was erected in the assembly room of Public School No. 40, in New York City, with suitable exercises, a Tablet of Record to Ferdinand J. Kuehn, the wireless operator who perished in the collision between the steamships *Monroe* and *Nantucket* on January 30, 1914. Mr. Kuehn sent signals for aid from the *Monroe* up to the last minute, and then put on a life preserver, but seeing a woman without one, he gave it to her. The ship sank directly afterwards, and he was drowned, the woman being rescued.

The tablet is the gift of the Alumni Association and has been executed in heavy metal. A wreath of crossed laurel leaves surrounds the following inscription: "Ferdinand J. Kuehn, A Graduate of New York Public School No. 40, Class of 1910. Wireless Telegrapher of the *S. S. Monroe*, Sacrificed His Life January 30, 1914. Greater Love Hath No Man Than This That A Man Lay Down His Life For Another."

John A. Britton.

The story of many of the most important developments in hydroelectric generation of energy, long-distance transmission of power, and intense cultivation of its application to domestic and industrial lighting, motive power, farming and irrigation is written largely in the West. It is a fine thing to have been a part of this great story. It is a fine thing to have contributed to the inspiration and material achievement that have marked each step in this march of progress. It is a fine thing to have accomplished so much and still be in the forefront, full of vigor and enthusiasm, looking forward to more and greater opportunities.

The career of John A. Britton is unique. He is a pioneer and still a leader. He was in at the beginnings of things electrical. He is still a dominating factor in their most modern developments. His experience has brought him in touch with every phase of the electrical industry, and his efforts have again and again established new standards.

Born in Boston, Mass., October 9, 1855, he received his early education at the grammar school and high school of the city of Roxbury. He went to California in 1868, pursuing various employments, studying law meanwhile. In 1874 he entered the employ of the Oakland Gas Light Company, of Oakland, Cal., and he has been continuously in the employ of that company and its successors in interest ever since.

That company, with which Mr. Britton was identified as secretary, manager, engineer and president, made its first electric lighting installation in January, 1885.

In 1903 Mr. Britton was elected vice-president and general manager of the California Gas & Electric Corporation, which at that time was operating hydroelectric plants in the northern part of the State. These were the pioneer plants in California. He became president of that company in 1905, and upon the formation of the Pacific Gas & Electric Company became its president, remaining so until 1907; since that time he has been its vice-president and general manager and chief engineer.

As vice-president and general manager, Mr. Britton has had entire and exclusive charge of all construction work of the company, both in its steam and hydroelectric plants, and also its gas manufacturing and distributing; its water development for domestic and irrigation purposes, and the operation of its street-railway system; having also to do with the financial and operating policies of the company.

Mr. Britton has taken an active part in the affairs of California. He is president and secretary of the Pacific Coast Gas Association, and is a member of the Board of Regents of the University of California. Serving upon this Board from 1902 to 1914, he was, at the latter date, reappointed by the Governor of the State, for a term of six years. He is a member of the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

John A. Britton,
Vice-President and General Manager of the Pacific Gas & Electric Company.

Last year Mr. Britton was elected vice-president of the National Electric Light Association.

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Outing at San Diego.

The Electrical Interests of San Diego, Cal., had a real old-fashioned "blow out" on Saturday, May 23, at the well known amusement park "Wonderland" at Ocean Beach, near that city. This was the climax to a number of successful weekly luncheons.

Promptly at 12:30 p. m. the parade of about 25 automobiles left the Plaza with the members and friends for the Beach, where a buffet luncheon was served. From that moment until the lights were out everyone was enjoying athletic events, cracker-eating contests, etc.

There were almost as many prizes as there were contestants. The most important event was the shot put, which was won by Mr. Hartwell, the dean of the electrical industry in San Diego, but it was discovered that the shot he used was made of aluminum instead of iron.

At 6 o'clock dinner was served to the 175 who were present, at the Casino, and then more talent was discovered as those called upon proved to be real entertainers instead of after-dinner speakers.

The success of the affair was mainly due to the efforts of Chairman Howell and Messrs. Nightingale, Crist, Holloway and Mayer.

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Vehicle Reception in New York.

The New York Electric Vehicle Association held a reception on Thursday afternoon, May 28, in connection with the special exhibition of electric pleasure vehicles at the show rooms of The New York Edison Company. An orchestra furnished music, and tea and other refreshments were served. The Ladies' Auxiliary of The New York Electric Vehicle Association comprised the Reception Committee for the occasion.

The special exhibition of electric pleasure vehicles has proven enormously successful from a financial, artistic and social standpoint. It has afforded the manufacturers of electric vehicles an opportunity to meet and exhibit their wares under the most favorable conditions and incidentally it has given them the impetus to join hands for the benefit and advancement of the electric-vehicle industry. A new type of four-outlet Cutler-Hammer charging board was installed so that cars might be charged if necessary during the exhibit.

On Thursday evening a private view of the motion picture entitled "Selling an Electric Truck" was given. The scenario for this motion picture was written by a member of The Electric Vehicle Association of America and a number of the people prominent in The New York Electric Vehicle Association took part in the presentation of the play.

Progress of Department of Machinery, Panama-Pacific Exposition.

Since the recent return of Lieutenant George W. Danfor .., United States Navy (retired), chief of the department of machinery of the Panama-Pacific International Exposition, from an extended tour of the eastern states, the department has been actively engaged in the allotment of space in the completed Palace of Machinery. The exhibits will comprise the finest collection of electrical and machinery exhibits ever assembled under one roof, and the exhibitors are co-operating with the Department of Machinery in associating their exhibits with exhibits of others, thus permitting the complete operation and demonstation of the working of the various machines and electrical exhibits. Preliminary work was recently started on the installation of the first exhibit, a 500-horsepower marine Diesel engine, by the Busch-Sulzer Brother's Diesel Engine Company. This installation will cost $70,000.

To attract the non-technical visitor many spectacular exhibits have been arranged, and is is believed that the building may be made the most popular of the exhibit buildings. Several of the exhibitors have arranged, through the use of pumps, etc., beautiful and artistic effects, such as waterfalls and illuminated fountains. The latest and most modern methods of illumination will be displayed in connection with the exhibits in the Palace of Machinery. These will be of interest to the layman as well as to the student and specialist. One interesting feature will be a complete isolated electric house-lighting system for farm use. The testing of high-potential insulators and transformers will be made possible by the arrangements which have been made with the largest manufacturers of high-voltage testing apparatus. Many special electrical effects will be shown by the use of high-voltage apparatus.

A feature of the Palace of Machinery will be the methods employed for the convenience of the visitors. A number of plans are now being tested to insure engineers and students the opportunity to make a careful examination of each exhibit in privacy and comfort. Reception spaces will be provided in connection with each exhibit and equipped with suitable fixtures which will enable technical visitors to prepare notes on the various features. All of the working exhibits will be equipped with the latest safety devices which will form one of the most interesting exhibits to the engineer and manufacturer.

Trade Excursion by Utah Electrical Men.

The electrical interests of Utah were well represented on the Commercial Club trade excursion which left Salt Lake City on May 31 to visit all of the principal towns in northern Utah and southern Idaho. One hundred of Salt Lake's principal business men made the trip. Among them were G. W. Williams, of the American Steel & Wire Company; E. H. Eardley, of Eardley Brothers Electric Company; F. S. Hartzell, General Electric Company; C. B. Hawley, Inter-Mountain Electric Company; A. H. Denike, Mountain States Telephone & Telegraph Company; B. W. Mendenhall, Utah Light & Railway Company; and A. R. Loughborough, Western Electric Company.

Official Opening of 30,000-Horsepower Plant Near Columbia, S. C.

The Parr Shoals Power Company's new 30,000-horsepower, hydroelectric development near Columbia, S. C., recently completed by the J. G. White Engineering Corporation, New York, was officially opened on Memorial Day with much ceremony and a great deal of enthusiasm. E. W. Robertson, president of the power company, was the host.

The completion of this development marks an epoch in the industrial development of Columbia, where natural facilities and fine location waited only for the introduction of cheap power for a boom in the progression of the city's enterprises.

The Parr Shoals Power Company is a subsidiary of the Columbia Railway, Gas & Electric Company, of Columbia, S. C., and the new plant supplements the steam and hydroelectric stations of the parent company, which are rated at 14,500 horsepower.

The new station comprises a concrete dam 2,200 feet long across the Broad River about 30 miles above Columbia. A modern fireproof power house has been provided for the power generating units. Provision has been made for the eventual development of about 30,000 horsepower. The present installation comprises five generating units, operating at 35-foot head, which will generate 18,000 horsepower. Current at 60,000 volts will be transmitted to Columbia over a double-circuit, steel-tower transmission line.

Continued Growth of Electric Vehicle Association.

The Electric Vehicle Association is maintaining its pace of acquiring one or more new sections per month. At the Board of Directors meeting, held in New York on May 22, the petition for a Los Angeles Section was received and approved. Sections are now established in Boston, Chicago, Philadelphia, Washington, New York, Cincinnati, San Francisco and Los Angeles. Other sections are anticipated.

Progress is being made on the program of the fifth annual convention of the Association, which is to be held in Philadelphia on October 19, 20 and 21, at the Bellevue-Stratford Hotel.

National Foreign Trade Convention.

A national convention on Foreign Trade was held at the Hotel Raleigh, Washington, D. C., on May 27 and 28, under the auspices of the American Manufacturers' Export Association, the Pan-American Society of the United States, and the American Asiatic Association.

Among the list of honorary vice-presidents were the names of E. W. Rice, Jr., president of the General Electric Company; Guy E. Tripp, of the Westinghouse Electric & Manufacturing Company, and James G. White, of New York City. Among the papers presented was one by M. A. Oudin, of the General Electric Company, entitled "Government Assistance in Foreign Trade."

Lynn Section Elects Officers.

On May 21 the annual meeting for election of officers of Lynn Section, American Institute of Electrical Engineers, resulted as follows:

Chairman: W. H. Pratt.

Secretary: F. S. Hall.

Executive Committee: E. R. Berry, A. H. Burritt, C. H. Stevens, G. N. Chamberlin, R. J. Rudd.

The present membership of the Section is 116 members of the national body and 514 local members, a net gain of 118 during the year. There is over $1,000 in the treasury.

After the election a lecture, illustrated by lantern slides, was given by Fred M. Kimball, on "Mexico."

Volunteers Install Municipal Lighting Circuits.

The cost of installation of a municipal electric lighting service in Jeffersontown, Ky., was markedly reduced by the merchants and public-spirited citizens of that town, who volunteered as laborers to dig post holes, erect poles and help string wires. Jeffersontown is a small village 12 miles from Louisville, Ky., and the current will be supplied by the Louisville Gas & Electric Company, which has built a service line to Jeffersontown. The volunteers worked willingly during the latter part of May and the first few days of June and were promised that the current would be turned on by the tenth of June. The streets will be lighted by 15 arc lamps, to be operated under contract by the Louisville Company, which will also furnish current for power or light.

National Electric Light Association.

Complete Report of Thirty-Seventh Annual Convention Held at Philadelphia, June 1-5—General, Commercial, Technical, Hydroelectric, Public Policy and Accounting Sessions—Convention Notes.

(*By Telegraph.*)

The thirty-seventh annual convention of the National Electric Light Association was held in Philadelphia, Pa., June 1 to 5. Headquarters were at the Bellevue-Stratford Hotel. The registration bureau was opened here on Monday, June 1, after special trains had brought the convention delegates from all parts of the country.

Opening General Session.

The convention was called to order by President Joseph B. McCall on Tuesday morning at 10:30 o'clock, and immediately thereafter the Hon. Rudolph Blankenburg, mayor of the city, addressed the convention, welcoming the delegates to the city in an impassioned address dealing principally with the elimination of politics from city administrations in order that the best interests of the social and business structures might be conserved. Mayor Blankenburg considered the City of Philadelphia as eminently suited to the requirements of the convention and suggested that its connection with the early developments of the industry made it the natural place to hold an electrical convention. No industry conferred upon civilization, in all its characteristics, greater benefits than followed the introduction and wide use of electrical energy both for illumination and motive power. The use of electrical energy had a potent influence upon the development of civilization in rendering happier every condition of labor and living.

Upon motion of Samuel Insull, president of the Commonwealth Edison Company, of Chicago, the mayor was tendered a rising vote of thanks.

President McCall, in delivering the presidential address, spoke particularly of his appreciation of the Company Section work. He suggested careful consideration of possible changes in policy in handling future conventions and indicated that undoubtedly some method which would relieve those in charge of affairs of a tremendous bulk of work now involved in catering to the demands of the extensive work of the Association would be welcome. In order that there might be greater opportunity for the hammering out of the solution of numerous problems there had been imposed a stringent limitation in the number of papers to be presented at the present convention and it was hoped that the discussion of the various papers would be complete.

Mr. McCall spoke very earnestly with respect to the work of the Public Policy Committee and paid tribute to the foresight and intelligence with which this committee in its report to the 1907 convention had forecast the development that has come about and is with us today in the tendency to establish a regulated monopoly of public-service utilities under state and national regulation. He stated also that the work of this committee in laying definite information before the various state regulating bodies had achieved a great amount of good in establishing a better understanding of the conditions involved as to the relation of the public-utility companies to their patrons and prospective patrons.

Sketching rapidly the work of the various committees, he dwelt particularly on the value of the work of the Rate Research Committee and the interest being taken in the publications of this committee by the member companies. He also called attention to the work and asked for careful consideration of the labors of the Accident Prevention Committee, the Welfare Work Committee and the Accounting Committee. He especially recommended that the member companies adopt, to as great a degree as possible the recommendations made by the Accounting Committee with respect to a standard form of accounting and report.

Discussing the financial plans for the future work of the Association, Mr. McCall suggested that the income derived from all of the members was not sufficient to carry on effectively the entire work involved in the opportunity that lay ahead of the Association. It was in order that there should be re-rating of the dues of the Class A and Class D members, as these classes undoubtedly received the greatest benefits of the work of the Association and should support it accordingly.

Holton H. Scott, chairman of the Committee on the Organization of the Industry, reported for 1914 and 1913 respectively as follows: Class A members, 1,091 and 1,093, Class B, 10,817 and 10,256; Class C, 73 and 53; Class D, 250 and 242; Class E, 785 and 798. Owing to an error in previous reports, it has been found under a careful audit that the present year shows a considerable gain in membership, although the figures apparently disprove this proposition.

Attention was called to the fact that, according to the latest statistics, there are 6,129 central stations serving a population of 46,000,000 people. Of these, 140 holding companies operated in 2,691 cities, serving a population of 36,000,000 people.

Referring to the European trip of Secretary T. C. Martin, the Committee reported a very definite increase in the interest of the Association abroad, and the formation of a foreign company section with 22 Class A members.

The report of Secretary T. C. Martin showed that the miscellaneous work of the executive office was greater than ever, owing to the increased demands of the larger membership and the greater ramifications of the work of the various standing and special committees. There had been over 150 requests for the loan of the rate schedules and as many requests for the use of the library of the Accounting Committee. These documents have also been inspected hundreds of times at the executive headquarters in New York City. The secretary's office had issued 19,000 volumes of the Association's *Proceedings* and had provided more than 150,000 copies of the monthly *Bulletin.* A very important gain for the Association was the securing of the second-class mail privilege for the *Bulletin,* which will result in a saving of over $2,000 in postage, a greater part of which was already going back in the *Bulletin,* in improved service to the members.

The growing volume of publishing work carried on by the secretary's office made important the consideration of the question as to how far the Association could go in this direction. The business was being handled the same as any publishing business and called for a special staff of assistants. It was a question whether the money expended could not be put to better use in other Association effort, but at the same time it was quite apparent that as a result of this expenditure a great deal of very valuable personal service was being secured and information made available that could hardly be secured in any other way. Mr. Martin referred particularly to the splendid volumes represented by the *Meterman's Handbook,* the *Handbook on Overhead Line Construction,* and the *Electrical Salesman's Handbook.*

The Lecture Bureau had provided 81 lectures, using 1,000 stereopticon slides and employing three motion-picture films.

The tendering of three prizes for the best suggestion as to the reason for attending company-section meetings by H. H. Scott had stimulated considerably the interest in company-section work.

The Rate Research Committee and the Accident Prevention Committee were carrying on their work outside of the secretary's office and Mr. Martin suggested that consideration be given to concentrating this work at New York.

A great deal of earnest work has been accomplished by the Association's committee in cooperation with the Electric Vehicle Association of America in bringing to the attention of post-office authorities the adaptability of the electric vehicle in government service, particularly as it related to the handling of parcel post.

Annual-report forms have been secured from 24 public-service commissions. These range in their requirements all the way from a single sheet in one state to 100 folios in another state.

The report of the Insurance Expert was presented in person by W. H. Blood, Jr., of Boston, Mass.

Speaking to this report, Leonard Fitzgerald, superintendent, gas and electric department, Gary Heat, Light & Water Company, Gary, Ind., stated that a considerable amount of friction had been eliminated in his city by having the City Council approve the idea of the underwriters' inspectors taking the place of the city electrical inspectors in passing upon electrical construction.

The report of the Committee on Progress was presented in abstract by Secretary Martin, and Assistant Secretary S. A. Sewall presented the report on the Question Box.

Referring to the work of the Question Box for the year, Mr. Sewall stated that there had been 254 new questions, 1,296 answers and 746 contributors.

The paper entitled "Safety First" was presented in person by Paul Lupke and the first session closed with a rising vote of thanks and enthusiastic applause.

First Commercial Session.

The first session of the Commercial Section was held on Tuesday afternoon, with Theodore I. Jones, of Brooklyn, N. Y., in the chair. Vice-president E. C. Deal introduced Mr. Jones, who delivered his address as chairman of the Commercial Section. This reviewed the work of the past year, pointing out that the membership had reached 1,500. It is expected that this will be materially increased when constitutional changes relative to the dues have been settled. He commented particularly upon the work of the Publications Committee, especially with regard to the issuing of the *Electrical Salesman's Handbook*. This, he said, is a monument to the industry of the members of the Committee.

The report of the Finance Committee was then presented by E. L. Callahan, of Chicago, Ill. This showed the Section to be in a sound financial condition, due principally to the gratifying sale of publications made during the year. The income from this source approximated $6,000.

J. C. McQuiston, East Pittsburgh, Pa., called attention to the commendable work which the Executive Committee and the Committee on Publications have done. This has placed the Section in a healthy financial condition for the first time in its career.

J. F. Becker, of New York City, then presented the report of the Membership Committee.

This was followed by the report of the Committee on Publications, which was presented by Douglas Burnett, of Baltimore, Md.

J. G. Learned, of Chicago, Ill., called attention to the wide use which is made of the booklet entitled "Electricity in the Home," by the Public Service Company of Northern Illinois. Copies of this booklet are sent to all prospective home builders and excellent results have been obtained by this activity.

Louis D. Gibbs, Boston, Mass., said that many companies which are included in the 86 per cent not making use of the publications of the Commercial Section feel that these publications are too general in their character. This, however, is not true, as it would be impossible to give more specific information and yet be elastic enough to cover practically all conditions. It is important that all companies use this literature for the good of the industry.

William A. Donkin, Pittsburgh, Pa., explained that his company advertises in the daily newspapers that all these booklets will be supplied to anyone interested in them. The results have been very gratifying, as about 20 telephone requests for copies are received daily. In April of this year, 185 house-wiring contracts were obtained and much of this business was traced directly to the literature issued by the Commercial Section.

M. S. Seelman, Brooklyn, N. Y., commented upon the new house-wiring literature which the Section is preparing. This comprises a campaign of 13 separate pieces of literature. He considered this superior to previous efforts made by the Section, because of the value of consistent and correlated advertising.

C. B. Yonts, Dixon, Ill., suggested that, in future publications, data be presented that will enable the customer to make a judicious selection of lamps and glassware.

R. R. Young, of Newark, thought that there was a lack of proper machinery in central-station organizations to adequately circularize prospects. Much in the way of results depends upon people to whom advertising is directed. He strongly urged a department to handle this phase of work regardless of the size of the company.

F. C. Pullen, of East St. Louis, Ill., felt that publications issued by the Section were too general in character and did not contain sufficient matter of interest of housewives.

H. K. Mohr, of Philadelphia, Pa., stated that it was a comparatively simple matter for companies to add such material to these publications as they felt necessary to give local color.

Mathias Turner, of Cleveland, O., pointed out that it was desirable to send copies of all circulars and booklets to local electrical contractors, advising them that copies will be sent to their individual prospects upon request. This has been found to gain their confidence and support.

W. R. Collier, of Atlanta, Ga., advised that excellent results had been obtained by circulating the various publications gotten out by the Section. He also thought that more care should be given to the question of distribution. A carefully prepared card index of prospects is used in this connection in Atlanta.

The report of the Committee on Electrical Salesman's Handbook was presented by Charles J. Russell, of Philadelphia, Pa.

Norman Macbeth, of New York City, explained the indexing system which was used and complimented the Committee on including data on actual lighting installations.

The report of the Committee on Education of Salesmen was presented by Fred Jenkins, Chicago, Ill.

W. R. Putnam, of Salt Lake City, Utah, called attention to the necessity for correspondence courses where employees are scattered over a considerable area.

C. A. S. Howlett, of Schenectady, N. Y., advocated the practice of holding examinations following the delivery of a lecture, in order to determine what degree of attention had been accorded to the speaker.

E. W. Lloyd, of Chicago, Ill., outlined the work of the Central Station Institute, which has been inaugurated in that city, and commented upon the reasons which led to the establishment of this school. College graduates were found lacking in knowledge of sales methods and central-station practice.

Mike Hart, of Chicago, Ill., called attention to the educational meetings which are held by the employees of the Middle West Utilities Company at its various properties.

S. E. Doane, of Cleveland, O., briefly outlined the work of educating employees at the National Lamp Works of the General Electric Company. He thought that this is an executive rather than a legislative or judicial function of the company.

First Technical Session.

The first technical session was held on Tuesday afternoon, with W. F. Wells in the chair. The report of the Committee on Meters was first presented by P. H. Bartlett, of the Philadelphia Electric Company. In opening the discussion, Mr. Wells commented upon the fact that the income of the company and the good will of its customers depended upon the accuracy of the meters. The consensus of opinion brought out in the discussion of this report was that the work of the Committee in developing a new form of inexpensive maximum-demand indicator was the most important that had been done of recent years.

John C. Parker, of Rochester, N. Y., suggested that wherever any matter coming up before a state utility commission involved a discussion of metering, member companies should call in the Meter Committee at the earliest possible opportunity, in order that the full value of its services might be secured.

S. J. Lisberger, of San Francisco, Cal., suggested that future reports of the committee should incorporate instructions for testing in service. The old methods are liable to considerable inaccuracy. Incidentally, operating companies should give the manufacturers more definite data with respect to the requirements regarding demand indicators, especially with respect to the time interval.

In closing the discussion, Mr. Bartlett welcomed Mr. Parker's suggestion and stated that the Committee had already done considerable work looking to the establishment of standard forms of meter tests, but the volume of information elicited became so large that the Committee decided to call a halt. The Committee has been investigating the testing of meters in service and will undoubtedly report upon its work in this connection at a later date.

The report of the Committee on Grounding Secondaries was then presented by W. H. Blood, Jr., of Boston, Mass. The discussion of this report disclosed that mandatory grounding was generally favored.

Charles P. Steinmetz, of Schenectady, N. Y., suggested that failure to ground secondaries should in case of accident be considered *prima facie* evidence of criminal negligence.

In closing the discussion, Mr. Blood said, with regard to the relative value of driven pipes, ground plates and piping system, reports indicated that any system of grounding other than connection to piping showed great variations in intial resistance and generally a lack of permanency of the ground. Plates buried in coke gave somewhat better results, but even these are not satisfactory.

The report of the Committee on Electrical Measurements and Values was, in the absence of Chairman Kennelly, presented by E. E. F. Creighton, of Schenectady, N. Y. There was no discussion.

W. P. Kennedy, of New York City, then presented a paper entitled "The Greater Electric-Vehicle Problems." This was followed by an address on "Electric Vehicles" by Charles P. Steinmetz, of Schenectady, N. Y.

Dr. Steinmetz discussed the relation of the automobile to the central-station industry. He related the historical development of sports in general and traced the parallel case of the bicycle, showing how this passed through three periods, namely: intense development, height of popularity when the bicycle presented the dominant sport of society, and finally, the period of decay when it became a part of business transportation. The automobile is passing through the same experience. In its use of the automobile, society is meeting more and more on common ground with people of moderate means who can afford cheap automobiles, and already the automobile as a sporting proposition is in a decadent position. The parallel with the bicycle will be apparent, and just so soon as the automobile ceases to be little short of exclusive, it will take its place as a commodity and an adjunct to the conduct of business. The limitations which heretofore handicapped the electric vehicle with respect to speed and long-distance travel are being eliminated, and with the construction of electric vehicles having light batteries, light frames and light motors, there will be a corresponding reduction in price. The electric car of the near future will cost less than $500 and Dr. Steinmetz expects to see over a million of them in use within less than ten years. Estimating 10 kilowatt-hours as an average charge, and assuming that only a half-charge per day would be required, this would mean an increased revenue to the central stations of $75,000,000, based upon a rate of five cents per kilowatt-hour. This estimate could easily be doubled when electric trucks, delivery wagons and business tricycles of every description are considered. He urged central-station men very strongly to take hold of this business and control it while it is still in their hands. It would be undesirable to let garages handle this business, because of the natural spirit of antagonism to the proposition at the present time. If it is left to private garages, the competition of the isolated plant will become more formidable than ever. The most feasible and promising method at the present time appears to be for the central station to maintain and charge the batteries at a reasonable rate. He believed that at the five-cent rate it would be entirely feasible for the central station to make a fixed charge of $5.00 per month for charging, and $2.50 per month for maintenance. With a monthly expense of $10, it would be possible for an enormous number of people who are now able to buy an automobile but cannot afford to keep it up, to utilize the cheap electric vehicle of the future.

A. J. Marshall, secretary of the Electric Vehicle Association of America, in closing the discussion, stated that the Vehicle Association was organized to cooperate with the central stations and welcomed their affiliation and support.

First Accounting Session.

The first accounting session was held on Tuesday afternoon, with Holton H. Scott in the chair. Mr. Scott introduced H. M. Edwards, chairman of the Accounting Section, and Mr. Edwards presented the report for this section, outlining its organization and the work of the Accounting Committee. He suggested careful attention to the details of cost-keeping, central-station accounting and standardization of data, so as to facilitate examinations upon the part of regulating commissions. He also outlined a plan for organizing the Accounting Section along national lines, so as to bring control of Section affairs directly into the hands of committees and officers thoroughly familiar with the methods and work of accounting departments.

This address was discussed briefly by Charles R. Price, of New Bedford, Mass., and Charles L. Campbell, of Waterbury, Conn. Mr. Price related an experience which his company had had with the Massachusetts commissioners, who carefully and studiously examined corporation accounts. With regard to a recent issue of new stock for his corporation, the Commission had examined every detail, scrutinizing its contracts minutely. He could not express too strongly the necessity for extremely careful accounting.

Mr. Campbell offered a resolution suggesting the elimination of separate dues for the Accounting Section and recommending to the Executive Committee of the National Electric Light Association that the Accounting Section be organized along national lines.

Replying to a question respecting unification of accounting systems, Mr. Edwards stated that the committee was in touch with various state commissions and at an early date effective work would be done towards securing a uniform system of preparing reports.

The report of the Library Committee was then presented by C. L. Campbell, of Waterbury, Conn.

E. C. Scobell, of Rochester, N. Y., then made the report of the Committee on Question Box. There was no discussion of either of these reports.

Thomas J. Walsh, of Chicago, Ill., then presented a paper entitled "Costs and Statistics." The discussion of this paper brought out a general consensus of opinion that in order for statistics to be of value there should be a definite understanding among department heads and the accounting department as to the use to which statistics are to be put. The general practice of accounting departments is to close the books between the fifth and tenth of each month and have a record complete by the fifteenth of the month for examination by heads of departments.

Peter Junkersfeld, of Chicago, Ill., emphasized the importance of cost-keeping in central-station work, and stated that the industry is considerably behind other industries in perfecting this practice.

Homer E. Niesz, of Chicago, Ill., explained the work of the Expense and Budget Committee of the Commonwealth Edison Company. Appropriations are made at the beginning of each year for each subdivision or group of accounts, for which the department head is responsible. These are distributed over each month of the year and the monthly expense is compared with the amount of budget expense authorized by the committee. There is thus secured a direct check upon the tendency of costs, and it has been found that department heads do not, as a rule, overrun the budget unless unusal conditions arise, which, of course, are explainable. The department heads take pride in keeping within the budget allowance. The main function of the Budget and Expense Committee is to utilize statistics prepared by the accounting department, so as to regulate the expenses and keep them in proper relation to the income.

Second Commercial Session.

The second commercial session was called to order on Wednesday morning by President Joseph B. McCall, who turned the gavel over to Theodore I. Jones, chairman of the Commercial Section. E. W. Lloyd, of Chicago, Ill., presented the report of the Committee on Rate Research.

The discussion was opened by William J. Norton, who advocated uniformity in the schedules used for filing rates. The Committee is working with this end in view and various state commissions have indorsed the efforts of the Committee along this line.

M. Barker, of New York City, contributed written discussion dealing with the theory of cost of service for rate-making. This should be taken as the basis for rate adjustments, with the value of service as a secondary consideration. Application of the value-of-service theory is found in determining the proportion of fixed charges which big customers should bear.

R. S. Hale read discussion which had been sent in by Arthur S. Knight, of Boston, Mass. Mr. Knight pointed out that the price paid does not always represent the value of the service to the customer. The basis of rate-making should be primarily the cost of service, for if it be based on the value of service it would ultimately be taken out of the hands of the utility company by a commission, as is now the case with steam railroads. The fundamental principles which govern the fixing of rates should be the same for all companies.

Mr. Hale added that the rate of return from various classes of customers should be on the basis of what portion of the investment is used in serving them.

W. J. Norton pointed out that the value-of-service theory, when applied to large customers such as railways, permits the lowering of rates to other customers who are paying rates fixed on the basis of the cost of service.

Henry Harris, of Pittsburgh, Pa., expressed doubts as to whether the various state commissions would indorse the value-of-service theory in rate-making. He said that commissions would hold a rate based upon this theory to be discriminative.

J. C. Parker, of Rochester, N. Y., thought that the report of the Committee made too great a distinction between value of service and cost of service. Any rate-making without regard to cost would eventually work a hardship on the company if reductions had to be made.

M. O. Dellplain, of Syracuse, N. Y., expressed the opinion that commissions would consider the value-of-service theory from the same standpoint as they now view the obsolete theory of charging whatever the traffic will bear. The tendency of public-service commissions is to meet companies on a fair basis and the utility company should take the same attitude.

L. H. Schreck, of Poughkeepsie, N. Y., thought that the rate for street-lighting service should be given consideration by the Rate Research Committee. In many instances these rates are fixed arbitrarily by municipal authorities or others without regard to cost, and in fact many utility managers do not, themselves, know what this service costs. He recommended that the fundamental basis to be considered in arriving at the proper rates should be presented by the Committee.

E. W. Lloyd, in closing the discussion, stated that commissions in several states have already indorsed the application of the value-of-service theory to rate-making. A concrete example of this application, as put into effect by the Commonwealth Edison Company in soliciting business from ice factories in Chicago, was given.

A Nominating Committee was then appointed, consisting of L. R. Wallis, J. C. McQuiston, M. O. Dellplain and F. D. Pembleton.

The report of the Lamp Committee was presented by Frank W. Smith, of New York City. Preston S. Millar, of the Electrical Testing Laboratories, then conducted a number of demonstrations on incandescent and arc lamps supplied by manufacturers. There was exhibited a case containing incandescent lamps representing the development from 1887 to the present time; also various sizes of the new gas-filled incandescent lamps. Among the arc lamps exhibited were the old inclosed-carbon arc, the long-burning flame arc, the luminous arc and a new lamp with an efficiency of 0.4 watt per candle. A quartz-tube mercury-vapor lamp was also shown, as well as a new incandescent lamp being developed by the Cooper-Hewitt Electric Company.

The discussion was opened by J. W. Howell, of Harrison, N. J., who spoke of the desirability of establishing standard voltages for the operation of incandescent lamps. When carbon lamps predominated it was desirable to have companies operating at slightly different voltages in order to take care of the entire output of the factory. With tungsten lamps, the manufacturers can supply lamps to operate at a predetermined voltage and there is no advantage in having different companies operating at different voltages. In fact, if all operated upon a standard voltage the output of the factory would be more uniform and lower prices and more satisfactory operation would result. He described the gas-filled lamp at some length adding that there seems to be no limit to the size in which it can be manfactured. The production of the smaller sizes depends upon injecting a suitable gas into the bulb.

S. E. Doane, of Cleveland, O., complimented the Committee upon its very efficient work and he also complimented the Association upon its cooperation with the lamp manufacturers. The future developments in the lamp industry depend upon a continuation of this co-operation and support.

Norman Macbeth, of New York City, called attention to some of the conclusions which could be drawn from the replies sent to the Committee by utility companies in answer to questions asked of them.

Frank W. Smith, in closing the discussion, pointed out that the liberality of central-station companies in the matter of lamp renewals has resulted in a higher average candlepower per customer in this country than in other countries where this practice does not obtain.

Second Technical Session.

The first report to be presented at this session was that of the Committee on Electrical Apparatus, of which L. L. Elden, of Boston, Mass., is chairman. F. D. Newbury, of Pittsburgh, Pa., then read a paper entitled "Temperature and Its Effect on the Power Capacity of Electrical Apparatus." The report and paper were discussed together.

C. W. Stone, Schenectady, N. Y., suggested that if we could get the air circulating within the electrical machine supersaturated, so that its water content would be evaporated just as the air struck the hottest part of the machine, the heat evolved could be very readily carried away from the machine. The question of insulation is a compromise. It we put in sufficient material of a fibrous nature to accomplish the purposes of design, the thickness involved runs the construction beyond reasonable limitations. The insulation must, therefore, be thinned down so as to get a rapid transference of heat. Apparently the best material for insulation, in order to get strength and compactness in design, must be mica or some material of a similar character. One other point to be kept in mind in designing electrical machinery is that the end turns should have ample space between them. If there is no opportunity for free access of air, or if the end coils touch each other, there is always liability of breakdown. With respect to the rise in temperature in the fields of turbogenerators, there is involved practically no limit to the temperature. Mica will withstand practically any temperature up to the melting point of the copper.

Mr. Stone also pointed out the necessity for careful investigation of temperature rise in machine conductors. An exploring coil placed either alongside of the conductor or at the bottom of the slot does not indicate the true condition. An exploring coil placed between two conductors will show more nearly the actual condition of affairs. Designers are often fooled by thermometer measurements. While the resistance method of measuring temperature will not always be infallible, it gives a close approximation in the case of electrical machinery.

E. E. F. Creighton, Schenectady, N. Y., suggested the use of an aluminum cell placed directly across the commutator terminals to practically eliminate flashing over due to heavy internal surges in the machine. Apparently one aluminum-cell arrester for every 500 kilowatts is necessary.

Mr. Newbury, in closing the discussion, raised the question as to the ultimate value of circuit-breakers with rotary converters. He was of the opinion that in many cases a bad flash-over is caused by the opening of a circuit-breaker upon overload, whereas, if the rotary converter were allowed to remain connected in the circuit, it would in all probability carry the temporary overload with only a little sparking at the brushes.

The report of the Committee on Underground Construction was then presented by L. L. Elden, as the chairman of the committee, Philip Torchio, was absent in Europe. The discussion of this report brought out the fact that very little satisfaction had been experienced in the ventilation of transformer manholes. The practice of installing transformers of large capacity in manholes should be avoided where possible. The necessity for uniformity in the rating of cables and thickness of insulation was also discussed. The committee will undoubtedly seek information with regard to the variation in the thickness of cable insulation for varying voltages, as found in the market at the present time.

The report of the Committee on Overhead Line Construction was then presented by Thomas Sproule, of the Philadelphia Electric Company.

John F. Gilchrist, of Chicago, Ill., opened the discussion by warmly indorsing the work of the Committee. Herbert A. Wagner, of Baltimore, Md., and A. C. Einstein, St. Louis, Mo., expressed similar sentiments. Mr. Einstein introduced a resolution relating to the approval given to the report of the Overhead Line Construction Committee in 1911 and asking for the rescinding of that approval. He suggested that the question of voltage limitation be eliminated. After considerable discussion the resolution was referred to a special committee to be appointed by the chairman.

This committee, under the chairmanship of Thomas Sproule, made a report at the session on Thursday afternoon.

Second General and Public Policy Session.

On Wednesday evening a notable meeting listened to the reading of the report of the Public Policy Committee by Samuel Insull, of Chicago, Ill. He dealt with an analysis of the development of the industry and the restriction of the confidence of the Association in the policy of adequate service to the public and the conduct of business along enlightened and broad-minded lines. Mr. Insull earnestly recommended a consideration of the future of the industry. He referred to the terrific check suffered by light and power companies in Great Britain through the iniquity of destructive measures and strongly advised the presentation to representatives in both branches of Congress of basic information relating to the benefit conferred by unrestricted developments, to the end that the greatest good to the greatest number might accrue. There is the possibility of great evil in the enactment by our Federal Congress of legislation concerning electrical business of an interstate nature which would tend to discourage national development. Only where the greatest opportunity is allowed through wide diversity of load and most extensive systems of generation and distribution, can full advantage be secured to all of the people. This is of the greatest importance to the people of small communities and rural districts, if they are ever to enjoy the comforts and conveniences which are now the privilege of those persons living in the large centers of population throughout the country.

The meeting was then turned over to the Franklin Institute of the State of Pennsylvania, and exercises were conducted in commemoration of the thirtieth anniversary of the first international electrical exhibition and conference, which were held in Philadelphia in 1884. Walton Clark, president of the Franklin Institute, occupied the chair, and Thomas A. Edison was present as the guest of honor. Short addresses full of spirit and inspiration were made by E. W. Rice, Jr., Charles Francis Brush and Frank J. Sprague.

Second Accounting Session.

The second accounting session was held on Wednesday afternoon. John L. Bailey, of Baltimore, Md., presented the report of the Sub-committee on Tentative Classification of Construction and Operating Accounts. He said that while the system of accounts presented is complete as to details, it does not necessarily cover the entire subject of accounting and should, therefore, receive additions before adoption. The classification is divided under the following heads: Assets, Liabilities, Reserves, Income, Operating Expenses, Commercial Expense, Deductions from Income, and Appropriations.

In opening the discussion, H. M. Edwards, of New York City, suggested that when the classification of accounts is publicly issued it becomes the expression of opinion of the entire electrical industry. It is, therefore, of particular importance. State commissions are awaiting a uniform system of accounts, so that the classification should represent accepted practice.

C. L. Campbell, of Waterbury, Conn., in discussing the question of uncollectible bills, advised the marking off of uncollectible bills on gross revenue receipts, in order that the account will really show the actual cash received.

T. J. Walsh, of Chicago, Ill., said that, as the Commonwealth Edison Company must share a certain portion of its revenue with the city of Chicago, it seems just that uncollectible bills be deducted from the earnings as indicated in the income accounts.

Dugald C. Jackson, of Boston, Mass., then made an address on "Appraisals," which was the feature of the session. He directed his attention to electric light and power properties. The interest on the investment in public-utility property is a much larger part of the total revenue than in a mercantile business. Instead of earning a gross annual revenue equal to or exceeding the capital investment, a public-service company ordinarily invests a sum in establishing its plant and business which is not less than four or five times, and frequently as much as 12 times, the gross annual revenue. This multiplies the proportion of revenue which must come to the investors if a reasonable return is to be paid on the investment. Competition does not introduce any inconvenience in the relations between the customer and the purveyor in ordinary business, nor is expensive duplication of capital caused where the fixed capital is small. But where general competition of utility companies furnishing a like service occurs, and there is duplication of investment, it causes a large inconvenience to the customers. When these considerations have been laid before the public in such a way that the ordinary individual can understand them, it has a remarkable enlightening influence and often leads to a fair appraisal of a utility property. The electric utilities might gain greater strength with the public and improve their stability by making annual statements of their investment and earnings of studied definiteness and completeness, whether required to do so by public service commissions or not.

W. W. Freeman, of Cincinnati, O., said that the demand for good accounting followed as a natural sequence to the advent of public-utility regulation. The real value of property may be established by appraisal. The public should be made to understand that demands for improved service must necessarily be met by increased rates. Mr. Freeman was of the decided opinion that appraisals would indicate that reasonable rates are being charged in nearly every case.

Third Commercial Session.

The third session of the Commercial Section was held on Thursday morning. H. H. Scott called the meeting to order at 10 a. m. George B. Tripp, of Harrisburg, Pa., was called upon to present the report of the Committee on Lighting of Interurban Highways. This report was illustrated with lantern slides showing experimental installations made by the Committee, as well as units recommended for use in this connection.

The discussion was opened by H. H. Newman, of Newark, who pointed out that the man who sells real estate should be considered as an important factor in securing this class of business. He is usually a prominent citizen in the community and can easily be made to realize the increased value which land will have if the highways are well lighted and if electric service is available to the purchasers of land.

S. G. Rhodes, of New York City, thought that the cost of maintenance for units of low intensity is one of the greatest factors in highway lighting. He considered the initial cost and maintenance of the refractors recommended by the Committee to be high and asked what reasons had governed the Committee in making this recommendation.

W. D'A. Ryan, of Schenectady, N. Y., assumed a case of lighting a highway between New York City and Buffalo, and recommended for such a case the use of 500-watt and 300-watt lamps spaced 300 feet apart and suspended at a height of 40 feet. He recommended the use of incandescent lamps on account of their simplicity, although later developments may serve to indicate the greater adaptability of arc lamps for this service. The present tendency is for states to undertake highway lighting, purchasing the lamps and maintaining them. Under these conditions, it is desirable that the equipment be standardized. A height of 40 feet is recommended, because this allows a suitable distribution of the light without bringing the lamps down within the line of vision. He thought there was a possibility for the use of concrete poles to be used jointly by all of the utility companies having lines upon public highways.

Mr. Ryan then called attention briefly to the lighting features which have been planned for the Panama-Pacific Exposition to be held at San Francisco next year. He pointed out particularly that it will be entirely different from any scheme of lighting which has heretofore been used. More than 22 new and unique effects will be obtained by special combinations of units and equipment. The principal feature of the spectacular display will be a bank of scintillators having an aggregate candlepower of 2,600,000,000. The light will be visible for 40 or 50 miles. Various effects of light projected on jets of steam issuing from several sources will be included.

All of the principal buildings will be lighted in accordance with a new system of flood lighting recently perfected. The towers of the buildings will be jeweled with multicolored glass upon which the beams of light will play continuously. Special poles and fixtures designed for the Exposition were illustrated.

George H. Stickney, of Harrison, N. J., spoke of the great possibilities of highway lighting from the central-station standpoint, particularly as a feeder for rural business. There is danger of making installations too pretentious at first, so that the cost will be prohibitive. He advised the use of small units with the substitution of larger ones when the conditions warranted it. Care should be used in selecting proper reflectors.

Thomas F. Kelly, of Dayton, O., called attention to three highway lighting installations in the vicinity of Dayton, aggregating seven miles. In these installations 75-watt series incandescent lamps are used, spaced 350 feet apart. The lamps are equipped with radial-wave reflectors. The cost of these installations has been extremely low and exceptionally satisfactory results have been attained. Mr. Kelly added that the state had appropriated a fund for improving the highways in Ohio and the Dayton Power & Light Company is perfecting plans for such lighting which will be presented to the state officials for consideration. He thought that the co-operation of other Ohio utility companies should be extended in order to make it a state-wide proposition.

C. G. M. Thomas, of New York City, referred to conditions in parts of New York City supplied by the Queens County Lighting Company, which approximate interurban highway lighting in so far as the physical conditions are concerned. Small sizes of incandescent lamps are used 110 feet apart and equipped with radial-wave reflectors. He thought that the central-station company should guard against attempting to cover too much territory in this campaign for lighting business.

W. H. Cole, of Boston, Mass., said that more information is needed by the central-station companies before they can undertake to educate their respective communities in regard to highway lighting. He thought it was too early to make any specific recommendation as to the equipment best suited for work of this kind, and he recommended that further tests be carried out by the Association Committee with the object of compiling more accurate working data.

J. G. Learned, of Chicago, Ill., called attention to conditions in the vicinity of Chicago, where suburban communities form practically a continuous series of towns. Some highway lighting on the main thoroughfares outside of these districts is also being considered.

A. T. Hicks, of Trenton, N. J., pointed out the need for reflectors that will concentrate the light on the roadway, thus saving in necessary wattage.

Edward Curry, of Joliet, Ill., referred to the proposed transcontinental Lincoln Highway and said that some movement should be undertaken by the Commercial Section which could be participated in by all of the companies serving the territory along this proposed highway.

Mr. Tripp, in closing the discussion, explained that the Committee had inspected about 100 miles of highway which were equipped with approximately 60 different types of units. Recommendations which the Committee had made as the result of this inspection were merely preliminary and should not be taken as the final word with respect to this practice. His company in Harrisburg is at present installing equipment using the refractors referred to in the report and data will shortly be available regarding the costs for this installation.

A very interesting address was then delivered by Elbert Hubbard, of East Aurora, N. Y., entitled "Co-operation." In the course of his remarks, Mr. Hubbard paid tribute to Thomas A. Edison, stating that the present era will go down in history as the age of Edison. The value of co-operation in the electrical industry was pointed out and many instances were cited emphasizing the value of co-operative efforts.

First Hydroelectric and Transmission Session.

The first session of the Hydroelectric and Transmission Section was held on Thursday morning, with W. W. Freeman, of the Cincinnati Gas & Electric Company, in the chair. In opening the meeting, Mr. Freeman said that the admirable report prepared by Secretary Martin made any address by the chairman or report on progress of the Hydroelectric and Transmission Section by the Executive Committee unnecessary. He stated, however, that one matter which had received distinct attention during the year was the appointment of delegates on behalf of the Association to participate in the Conservation Congress which was held at Washington, D. C. Current reports on this matter have been rather misleading. As a matter of fact the proponents of state rights and federal privileges had locked horns, but Congress really had accepted and indorsed an expression of opinion which to a considerable degree represented a satisfactory attitude upon the parts of the various conflicting interests involved with respect to the proper development of natural water-power resources. For the Association delegates he could say that while they were not entirely satisfied, it was considered that much good had already been accomplished and that the result of the conference was a decided step in advance.

Mr. Freeman stated that after careful and mature consideration the Executive Committee was of the opinion that there was no particular advantage in continuing the Hydroelectric and Transmission Section as a distinct organization. This did not indicate any lack of appreciation of the importance and value of the work of the Hydroelectric Section and the opportunity for its development; but it was felt that in view of the limited possibilities of participation as a distinct organization, members could be given greater advantages if the work of the Section was delegated to a special committee similar to the Public Policy Committee, and those outstanding developments which called for special treatment were handled for members interested by a carefully selected committee. The necessity for a distinct body of officers with corresponding responsibility and payment of additional dues would also be eliminated.

After a brief discussion it was unanimously voted to accept the suggestion of the Executive Committee.

Secretary Martin then presented a brief abstract of the report of the Committee on Hydroelectric Progress. He referred particularly to the extraordinary development which has taken place in recent years in extending the distance to which power is transmitted, in increasing the amount of energy transmitted, and in increasing the operating voltage which is used upon long transmission lines.

Three papers on transmission subjects were then presented and discussed together. The first was by D. B. Rushmore, of Schenectady, N. Y., entitled "The Nature of Electrical Disturbances in Transmission Work." The next paper, by Selby Haar, of New York City, was entitled "Data on Modern High-Voltage Transmission Systems."

This was a collection of data pertaining to all the transmission lines which operate at voltages of 70,000 or higher. The highest is that of the Pacific Light & Power Company, 150,000 volts. There are 31 in the world operating (or under construction) at 100,000 volts or higher, and 56 at 70,000 volts or higher. One of these is for direct current, six for 25 cycles and 42 for 50 or 60 cycles. The average voltage per mile is about 1,200. Details are given of transformer connections, lightning protection, size of cables and generators, type of insulators, etc.

O. B. Coldwell, of Portland, Ore., then presented a paper entitled "Water-Power-Plant Economics."

W. N. Ryerson, of Duluth, Minn., opened the discussion with a reference to Mr. Coldwell's paper. With respect to storage reservoirs, he called attention to the fact that it is often overlooked that there is a point where it is more expensive to develop storage than to put in some auxiliary system of power generation. The object of storage is to take advantage of the maximum river flow, to cut off the tops of the peaks of the flood season and put them into the valleys. He also suggested that with respect to the computation of penstock sizes, Kelvin's law could be used for close approximation.

A paper by John A. Britton entitled "Hydroelectric Development in California" was, in his absence, presented by S. J. Lisberger, of San Francisco, Cal. This paper described the topographical conditions which establish the relations for generating capacities and opportunities on the Pacific Coast and traced developments of the great systems which are today the technical wonders of the world.

Third Accounting Session.

The third session of the Accounting Section was called to order by President Joseph B. McCall on Thursday morning at 10 o'clock. H. M. Edwards then took the chair and called upon E. C. Scobell, of Rochester, N. Y., to present a paper which had been left over from the previous session, entitled "Variations in Public-Service Systems of Accounting."

H. M. Edwards presented suggestions made by a subcommittee of the Public Policy Committee for the classification of renewal, replacement and depreciation charges. This matter was investigated by the Public Policy Committee because the classification of these items involves financial rather than accounting principles. The report recommended that the Executive Committee authorize the Accounting Committee to refer to these subjects in its standard classification of accounts in the manner indicated.

John W. Lieb, of New York City, said that the subject of this report ranged in importance with those of rates and valuations of properties. All companies must consider the subject of depreciation, for every state regulatory commission included this item in determining a fair return upon the investment.

H. A. Givney suggested that the New Hampshire Public Service Commission be sent a copy of the report, as it is now holding a hearing on the subject of depreciation.

A paper by H. B. Lohmeyer, of Baltimore, Md., entitled "Accounting for Merchandise Sales" was then presented. This was followed by a paper by Frederick Schmitt, of New York City, entitled "Suspense Accounts."

A. H. Holm, of New York City, spoke of the difficulties encountered in apportioning overhead charges when a certain percentage of the store-room expense is not apportioned on each article as it is used.

Franklyn Heydecke, of Newark, N. J., advised setting up a monthly reserve to wipe out uncollectible bills.

J. C. Van Duyne, of Brooklyn, N. Y., thought that as the amount of uncollectible bills is usually negligible, averaging not more than one-half per cent of the earnings, it is not necessary to carry such a reserve. He called attention to the practices of the New York Edison Company and the Edison Electric Illuminating Company of Brooklyn in this connection.

Charles L. Campbell, of Waterbury, Conn., thought that if bad debts are carried from month to month they should be carried over from year to year.

Two papers were then presented on "Mechanical Sorting and Tabulating Systems." The first was by F. A. Birch, of Philadelphia, Pa., and considered the subject in connection with disbursement accounts. The second was by G. L. Knight and C. V. Woolsey, of Brooklyn, N. Y., and applied to the inventory of transmission and distributing systems.

Mr. Knight called attention to the fact that a continuous inventory can be kept by a single clerk if the forms are adapted to a mechanical tabulator and are employed with that system of tabulation. Mr. Woolsey spoke of the economies that can be effected in accounting systems by using the various mechanical devices which are now available for this service.

A paper was then presented by Charles R. Lehmann, of New York City, entitled "Purchasing, Storing and Accounting of Coal for the New York Edison Company." This paper was illustrated.

The session was then adjourned, after some remarks from Chairman Edwards expressing appreciation of the excellent attendance at the accounting sessions.

Third Technical and Second Hydroelectric Session.

W. C. L. Eglin occupied the chair at the Third Technical and Second Hydroelectric and Transmission Session, which was held on Thursday afternoon. Prior to the opening of the formal program, Thomas Sproule, of Philadelphia, made a report for the Committee on Overhead Line Construction. The Committee recommended that the approval of Section III of the 1911 report be rescinded and that Section IV of that report be changed to read as follows: "(1) Scope. These specifications shall apply to overhead electric light and power line crossings (except trolley contact wires) over railroad right-of-way tracks or lines of wires."

Section III of the 1911 report contained an intercompany agreement form and specifications for joint use of poles by lighting and telephone companies. Paragraph 1 of Section IV of the 1911 report contained, in addition to the above, the following: "And further, these specifications shall apply to overhead electric light and power wires of over 5,000 volts constant potential crossing or constructed over telephone, telegraph or other similar lines."

A. C. Einstein, of St. Louis, Mo., then introduced a resolution reading as follows: "Resolved, that the National Electric Light Association as an association believes that no specification for the joint occupancy of pole lines having a voltage-limitation feature by inference or otherwise should be approved or adopted as its standard."

In the absence of I. E. Moultrop, chairman of the Committee on Prime Movers, the report of this Committee was presented in two sections by J. B. Klumpp, of Philadelphia, Pa., and J. F. Vaughan, of Boston, Mass. In abstracting the two portions of the report, particular attention was called to the extensive experiments made at the Ashley Street power house in St. Louis in getting boilers under way with oil-burning apparatus. It was found that the quickest and cheapest way was to cover the grate with a bed of selected coal, through which several strips of rags were run and on top a covering of wood kindling was placed. The whole fuel bed was then soaked with oil. When the torch was applied there was almost instantaneously a full grate of fire and in a few minutes the stoker can be started, adding fresh coal to the furnace. If forced draft is used only to force the boilers at the time of greatest peak load and not for regular service, the cost of the equipment is of greater moment than its operating efficiency. That installation which will produce the desired boiler capacity with the smallest outlay should be the one selected.

The report also referred especially to a cinder catcher employed by the New York Edison Company. This causes the flue gases to impinge against a wet baffle plate, from which it is deflected downward to a trough of water in which the cinders are caught. Considering the storage of coal under water, a careful estimate of a reinforced-concrete pit with a capcity for 25,000 tons indicates a cost of $5.72 per ton of capacity. Allowing fixed charged of eight per cent on this investment, the charges would amount to 46 cents per ton per year; whereas fire insurance on a fair quality of coal costing $3.00 per ton would not exceed five cents per ton per year.

The steam-flow meter, particularly of the recording type, is coming into more general use and receiving the recognition which it deserves. It has been found, however, that the best results can be obtained only when the flow meter is supplemented with a good feed-water regulator. Attention was called to the tendency of turbine manufacturers to reduce the area of the exhaust nozzles to the condenser. Comparison was made with the Parsons unit of the Commonwealth Edison Company, Chicago, where there are 240 square feet of exhaust area through the nozzle to the condenser. This is more than double the area allowed by some American manufacturers.

The report suggests the measurement of discharge water of hydraulic turbines by using the water wheel as a meter, its discharge curve having been previously determined by a Holyoke test of the runners. By keeping track of head and gate opening, either by frequent observation or by a continuous automatic record, the power input of the wheel can be determined. It can also be accomplished by determining the head as before described and measuring the actual discharge corresponding to various gate openings after the installation has been completed.

The report indicates that the gas engine with gas-producer plant is on the decline, in marked contrast to the remarkable growth and development of steam-turbine power plants. There is also an increasing interest in the use of the oil engine manifested by a considerable number of prominent engine builders.

The discussion was opened by T. C. McBride, of Philadelphia, who suggested that the criticism of condensers was not entirely fair to American manufacturers. Condensers are not designed to accommodate steam but rather to get rid of it. Where the condenser is properly adapted to the work in hand, the manufacturer can arrange the design so as to provide adequate area for steam entrance.

C. C. Herschel suggested using only a permanent means of measuring water. He did not think that any one would consider the use of anything but a meter for a small pipe line, and it is only when pipes of large diameter are involved that engineers resort to other expedients. The only efficient way of measuring the discharge of a turbine and thus keeping a continuous check upon its performance is by having a Venturi meter installed either in the penstock or the tailrace as a permanent portion of the apparatus.

A paper by Charles V. Seastone entitled, "Selection of Hydraulic Turbines" was, in his absence, read by W. N. Ryerson. There was no discussion of this paper.

The report of the Committee on Street Lighting was then presented by John W. Lieb, of New York City. This report presented an historical review of what has been done by the committee, which was appointed in 1894 and has each year presented a statement of the advances made, along with recommendations for increasing the effectiveness of street lighting by means of electric lamps. The paper and the illustrations which accompanied it attracted considerable enthusiasm.

The committee has now a complete testing system and is approaching the problem from a new viewpoint. For the first time the element of psychology is entering into the consideration of adequate street illumination. Tests are being carried out on two streets in New York City with high-power and low-power arc and incandescent lamps, with both uniform and nonuniform lighting characteristics. Undoubtedly the future work of the Committee will soon produce very important results.

Replying to a question raised by Frank W. Smith, of New York City, Mr. Lieb stated that, after sufficient tests have been made on the comparison streets now under observation, other tests will be made on other streets, so that typical information respecting illumination requirements of dissimilar characteristics would be secured. With regard to the time when data would be available, he could merely say that the committee would actively continue its work and make ready for presentation information as fast as it could be developed.

The report of the Committee on Accident Prevention was presented by Martin J. Insull, of Chicago, Ill. The Committee has drafted important instructions to Association members involving the publication of a booklet dealing with the problems of establishing "Safety-First" aid; a uniform type of blank for reporting accidents; a uniform method of tabulating causes and results of accidents; the establishment of uniform danger and safety designs adopted by the National Electric Light Association and other associations. A motion-picture film contrasting careful and careless methods of linemen has been prepared and may be rented by member companies. A complete booklet giving adequate information relating to the introduction of safety work and the organization of safety committees has also been made available by this committee.

Following the Committee report, a motion-picture film was presented and received with great interest. This indicates the use of eye protectors, safety belts, insulating shields or covers of the Marshall lineman's protector type, proper method of removing cover from manhole and guarding it with railing and grated cover, proper method of climbing poles and making way among network of wires on overhead structures, careful way of handling, stacking and carrying tools, and methods of applying immediate resuscitation in event of injury or shock rendering the victim unconscious.

The committee strongly urged central stations to take the matter in their own hands and establish safety rules and schools of instruction before the law-making bodies of the nation enact rules for such matters and put into effect more stringent and burdensome compensation laws. Successful safety work must be characterized by enthusiasm and co-operation upon the part of the employer, the employee and the public, and the proper spirit must be engendered by example from the top down and not from the bottom up.

Fourth Commercial Session.

The fourth session of the Commercial Section was held on Thursday afternoon, with Theodore I. Jones in the chair. The report of the Committee on Non-Peak and High-Load Factor Business was presented by George H. Jones, of Chicago, Ill.

The discussion was opened by A. E. Oltz, of Hammond, Ind., who suggested that additional data be compiled on electrochemical business, as this is of decided importance.

R. M. Stephenson, of Brooklyn, N. Y., stated that the Edison Electric Illuminating Company of Brooklyn does not make a practice of taking on the business of isolated plants in summer, because of the effect which this practice may have upon other customers. It is assumed that every class of business can secure service from the central station at a rate approximating or cheaper than the cost of the isolated plant, where steam is used only in winter for heating purposes. These plants save enough in summer by using central-station service to compensate for the additional cost of coal for heating purposes during the winter months.

R. D. Donaldson, of Philadelphia, Pa., referring to procuring the business of brick plants, called attention to a drying system wherein a coal furnace supplies heat through a system of tunnels to various kilns. This method has many of the advantages of steam-drying and it still permits of purchasing power from central stations at a saving over the cost of operating an isolated plant. In connection with stone-crushing plants he thought it advisable, on account of the heavy demands for power for crushing machinery, that hoppers be provided wherein stone can be stored. It can then be crushed during the noon hour and at other periods of light load. This has been found to materially increase the load-factor of such plants. In connection with securing business of office buildings, hotels, etc., in the congested districts of the city, he thought that some system could be worked out by the central station whereby steam equipments in the various buildings, and perhaps also industrial plants, could be interconnected and thus effect a marked economy in coal consumption. This would permit of purchasing power from utility companies. He thought that some attention should be given to this subject by the committee.

H. H. Holding, of Newark, N. J., thought that the amount of off-peak business that a company can secure is very limited, as even a low rate for energy does not offer sufficient inducement to an industrial plant to change its manufacturing processes so that no current will be used during the periods of peak load on the generating station. He recommended that data be collected on the steam consumption of various manufacturing processes, as this has an important bearing on the power problem.

A. C. Smith, of Buffalo, N. Y., called attention to the desirability of the electrolytic load because of its off-peak characteristics and referred to the practice of the Buffalo company in offering especially low rates for this class of business. He described in detail an electric-furnace installation representing a load of 750 kilowatts, which is very profitable to the company, as well as economical for the customer.

M. O. Dellplain, of Syracuse, N. Y., called attention to the tendency in the industrial world toward greater efficiency in manufacturing processes and labor. He looks for a radical change in the present conditions relative to night work so that every employee will be allowed some time at night for sleep and some time during the day for recreation. This will mean an improvement in the load-factor of the central station and should be seriously considered in connection with this question as related to industrial policies.

J. C. Parker, of Rochester, N. Y., called attention to the load characteristics of the Rochester plant which may be considered typical of the well developed stations of the country. It was shown that one-third of the total investment in this property is in use less than one and one-half hours a day. He pointed out that this graphically indicates to what extent central stations can go to acquire additional off-peak business and to induce existing customers to stay off the company's peak. He stated that one manufacturer in Rochester, employing the highest class of labor has revised his manufacturing processes so as to use no power during certain hours of peak load in the winter months. Central stations must give manufacturers an incentive in the way of discounts to adopt this practice. He thought that a great many utility managers themselves did not appreciate the importance of this subject.

R. H. Knowlton, of Philadelphia, Pa., thought that no hesitation should be shown by central-station companies in publicly announcing that certain classes of business could not be served with profit to customers. He approved of the establishment of a low rate for isolated-plant business during summer months and thought that in many cases this would ultimately result in securing the business permanently.

F. C. Pullen, of East St. Louis, Ill., explained that by omitting stand-by charges for off-peak business considerable profitable business has been secured and the load curve appreciably improved.

R. H. Hillman, of Baltimore, Md., stated that the Consolidated Gas, Electric Light & Power Company has not found it necessary to make special low rates to get the business of office buildings, hotels and other establishments using considerable steam. The practice is to offer to connect such customers for a trial period of six months, with privilege of renewing this period, and if the service has been found satisfactory the customer is to enter into a five-year contract with the company.

J. W. Ruff, of Charleston, S. C., stated that although cottonseed-oil plants and fertilizer plants used considerable steam in their manufacturing processes no difficulty has been encountered in securing the business of these establishments when all the advantages of central-station service are pointed out to the customer. The company makes a rate of approximately 1.7 cents per kilowatt-hour for this business.

Mr. Jones closed the discussion by stating that the ice plants referred to in report were largely manufacturers of raw-water ice. The plants referred to in Chicago earn a rate of practically one cent per kilowatt-hour. Mr. Jones thought that in future conventions an entire session should be devoted to the discussion of power business.

The report of the Committee on Wiring of Existing Buildings was in three parts. Part I was read by R. S. Hale, of Boston, Mass.; Part II was presented in abstract by S. E. Doane, of Cleveland, O. These two parts were then discussed together. Chairman T. I. Jones opened the discussion by pointing out the necessity for eliminating small details in handling the small customer, if profit is to be made. The meter is the heaviest expense and if this can be substituted by an inexpensive control device, such as used in Europe, much business now impossible to secure can be obtained. Also the payment in advance for a stipulated amount of current per month opens the way for much new business from small customers.

E. W. Lloyd, of Chicago, Ill., thought that more simplified wiring is necessary if this business is to be secured at profit. In this connection the co-operation of the Underwriters must be secured.

W. M. Kerr, of New York, N. Y., referred to the political aspect of the question of the small customer. He thought that the report indicated the fact that the saturation point is a long way off.

J. E. Latta, of Chicago, Ill., explained the position of the Underwriters' Laboratories in co-operating with the electrical interests to promote still greater use of electricity. The code which is followed by inspection departments should voice the sentiments of the various interests comprising the industry.

W. A. Donkin, of Pittsburgh, Pa., described the house-wiring campaign carried on in that city recently in which business of small customers was solicited. This campaign resulted in securing approximately 3,000 customers having a connected load of about 100 watts each, controlled by an excess indicator. The revenue from this business aggregates $60,000 per year. There are still about 80,000 unwired houses in the territory served by the company which will be solicited on the same basis.

J. C. Weismandal, of Brooklyn, N. Y., spoke of the work by the Brooklyn Edison Company in securing the business of old unwired houses. Close co-operation with contractors exists. The central station finances the wiring where the customer desires to pay on the installment plan.

Parker Kemble, of Cincinnati, O., recited some experiences in securing small customers on a flat-rate basis. Fully 35 per cent of all customers on limiting devices have ultimately installed meters.

L. R. Wallis, of Boston, Mass., referred to the house-wiring campaign in Boston during which 769 houses were secured in the period of seven months. The average cost of wiring per house was $83.50. The company provides for financing the installation where a customer desires to make time payments, the only stipulation being that service will be used at least until the final payment is made.

R. W. Hoy, of Harrisburg, Pa., stated that 550 old houses were wired in 1913 by his company. A number of these are on a flat-rate basis with a limiting device and 25 per cent have already applied for meter service.

H. R. Sargent, of Schenectady, N. Y., recommended that a committee be appointed to co-operate with the manufacturers and underwriters in arriving at standardization of simplified wiring devices and fittings.

R. R. Young, of Newark, N. J., urged that receptacles be located three feet above the floor instead of along the baseboard. This location was much more convenient to the customer and also eliminates much of the unnecessary damage to plugs and wiring by reason of hard usage when used along baseboards.

In closing the discussion on the first two parts of the report, Mr. Doane stated that wiring costs from $2 to $3 per outlet in Europe and the average rate per kilowatt-hour is 12 to 14 cents.

Part III of the report was then presented by Mr. Hale.

J. E. Latta, of Chicago, Ill., called attention to the necessity of using only safe wiring and devices. Much of unnecessary fire and life loss could be prevented if sufficient care were exercised.

A. W. Young, of Camden, N. J., stated that the practice of his company is to use No. 10 wire in kitchen and dining-room circuits so that heating and cooking devices could be used without danger.

J. G. Swallow, of New York, N. Y., thought that the present sockets and plugs are too frail in construction. Even though their current-carrying capacity is sufficient, the hard usage to which they are subjected destroys them prematurely.

C. E. Robertson, of Baltimore, Md., spoke of the anticipated action by the Underwriters of preventing the installation of flexible conduit and wooden molding in wiring. He thought that should this ruling be effected it would work great hardship on central stations in securing the business of small customers.

W. D. Hodgeson, of Glens Falls, N. Y., urged the standardization of plugs and receptacles by manufacturers as essential to the success of residential service.

J. E. Latta, of Chicago, Ill., called attention to the biennial meeting for the revision of the National Electrical Code which will be held in New York City during next March and to which central stations are invited. Chairman T. I. Jones stated that the chairman of the Commercial Section and its vice-chairman would act as official representatives at this meeting.

The report of the Committee on Electrical Merchandising and Advertising was then presented by P. H. Kemble, of Cincinnati, O.

L. D. Gibbs, of Boston, opened the discussion, stating that the tendency of the times is to simplify merchandising methods and advertising. He spoke of the "Safety-First" movement, stating that nothing will contribute more to safety in the home than the use of electricity. Demand improves quality and consistent advertising on the part of central stations will necessarily increase demand.

F. D. Pendleton, of Newark, N. J., emphasized the importance of maintaining prices on appliances so that dealers could sell on an equal basis with central stations. If this were done universally the electrical business, he stated, would receive considerable impetus.

J. G. Learned, of Chicago, Ill., presented statistics showing the extent of merchandise business of the Public Service Company of Northern Illinois during the past year. There were 285 vacuum cleaners sold, 296 washing machines, 3,462 flatirons, and 3,805 toasters among 50,000 customers. The company carries on a campaign on a seasonable device each month.

Mike Hart, of Chicago, Ill., spoke of the importance of making periodic inspection of devices that are sold to see that they give satisfactory service.

M. S. Seelman, of Brooklyn, N. Y., commented on the advertising suggestions presented in the report, pointing out the value of copy that draws attention and creates a desire for the devices advertised.

H. H. Newman, of Newark, N. J., stated that the sales managers of central stations are largely responsible for the success of salesmen under their supervision and that they should not hesitate to give credit for good work done.

P. S. Dodd, of New York, N. Y., thought that national education of the public through the national journals and magazines was necessary before the greatest utilization of electrical appliances will be made. In this connection he called attention to the Society for Electrical Development and work it has planned and is beginning to carry out.

George B. Johnson, of Chicago, Ill., mentioned that the annual revenue from sale of appliances by the Commonwealth Edison Company approximated $180,000. Its Electric Shop tries not to conflict with the special sales of department stores and electrical dealers.

The report of the Nominating Committee was presented by L. R. Wallis, of Boston, Mass., and the following nominees were unanimously elected as officers of the Commercial Section for the ensuing year.

Chairman, E. L. Callahan, Chicago, Ill.

Vice-Chairman, Douglass Burnett, Baltimore, Md.

Vice-Chairman, J. F. Becker, New York, N. Y.

Members of Executive Committee for term ending 1917, F. D. Beardslee, St. Louis, Mo.; E. A. Edkins, Chicago, Ill.; G. V. Walton, San Francisco, Cal.; J. G. Learned, Chicago, Ill.; H. N. McConnell, New York, N. Y.; George Weiderman, Brooklyn, N. Y., the latter representing the Electrical Contractors' Association.

Mr. Callahan was called to the chair and delivered a brief address. Greater effort will be made to have the committee work of the Section divided over the entire year.

Final General Session.

The third general session, which was the final session of the convention, was opened on Friday morning by the presentation of the report of the Committee on the Doherty Medal and the Harriet Billings Medal. In the contest for the former prize, which is awarded to the best paper presented before any company section, thirteen papers had been submitted; the committee recommended that the Doherty Gold Medal be awarded to Harold Goodwin, Jr., of Philadelphia, Pa. It also recommended that the Harriet Billings Silver Medal be awarded to H. B. Gear, of the Commonwealth Edison Company, Chicago. Honorable mention was accorded to the paper presented by Thomas Spourle, of Philadelphia.

A notable address was then delivered by J. M. Wakeman in relation to the definite plans now being worked out by the Society for Electrical Development, of which he is general manager. The report of the Committee on Memorials was presented by Secretary T. C. Martin.

A report was presented recommending certain changes in the constitution and by-laws of the Association. These were adopted. The principal changes are in making the treasurer of the Association an elective officer, and in revising the dues of Class A and Class D members. The new schedule practically doubles the dues of Class A members in cities of 10,000 population and over; it also establishes graded dues for Class D members, with a maximum of $2,500 per year.

A report was then presented on the probable hotel facilities in San Francisco next year, which it was declared would be ample. The Association then voted to hold its next convention at San Francisco during the week beginning June 6, 1915.

The Nominating Committee submitted its report, which was unanimously adopted. The following were then declared elected as officers of the Association for the ensuing year:

President, Holton H. Scott, of Henry L. Doherty & Company, New York City.

First vice-president, E. W. Lloyd, Commonwealth Edison Company, Chicago, Ill.

Second vice-president, H. A. Wagner, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.

Third vice-president, L. D. Gibbs, Edison Electric Illuminating Company of Boston, Boston, Mass.

Fourth vice-president, John S. Bleecker, Columbus Power Company, Columbus, Ga.

Treasurer, W. F. Wells, Edison Electric Illuminating Company of Brooklyn, Brooklyn, N. Y.

Members of the Executive Committee, to serve for three years, Paul Spencer, United Gas Improvement Company, Philadelphia, Pa.; A. C. Einstein, Union Electric Light & Power Company, St. Louis, Mo.; Walter Neumuller, New York Edison Company, New York City.

The Nominating Committee recommended for re-appointment as secretary of the Association, Thomas Commerford Martin; this recommendation was heartily confirmed by the convention.

Convention Notes.

A great deal of attention was attracted by the arch of welcome which spanned Broad Street at Walnut Street, which was erected in honor of the convention by the Philadelphia Electric Company. It consisted of two graceful wooden pedestals at each side of the street, surmounted by a ball of openwork with lamps inside, and supporting a chain of lamps which ran from each pedestal to a medallion over the center of the street. Each string of lamps consisted of 24 1,000-watt gas-filled units in frosted globes. Four similar lamps occupied each ball at the top of the pedestals. Upon the medallion was displayed the emblem of the Association, the letters being outlined in frosted lamps. The decoration was designed by John T. Windrim.

A great many of the convention delegates from the West and South came to Philadelphia in the special trains which had been arranged for them. The Brown Special from Chicago, which proceeded over the Lake Shore and Lehigh Valley Railroads, carried 65 persons, including 11 ladies. In addition to delegates from Chicago, there were others from South Bend, Ind., Toledo and Cleveland, O., Buffalo, N. Y., and other points, including a special car from Kansas City, Mo. The trip was enlivened by a guessing contest, in which prizes were won by Mrs. W. E. Reese, S. E. Doane and M. T. Flynn.

The Green Special from Chicago went over the Pennsylvania Railroad and carried 110 delegates. This was a nine-car train including two diners and a special club car. A pool was arranged with three prizes for those guessing most closely the exact minute of arrival. These were won by R. W. Everson, C. B. Frayer and R. E. Lee.

Special cars brought delegates from Atlanta, Ga., and St. Louis, Mo.

An Information Bureau for convention delegates arriving at Broad Street Station was maintained near the center of the concourse, the Association emblem being displayed in the form of an electric sign eight feet high. The Bureau was open for business from Sunday noon until the end of the convention. Two shifts of members of the Philadelphia Company Section were in attendance.

The Edison Electric Illuminating Company of Brooklyn sent over a train load of its employees to attend the sessions on Wednesday. There were 120 in this party, which had the use of a special train.

Representatives of the Stone & Webster Corporation met at an informal dinner on Tuesday evening in the Red Room of the Bellevue-Stratford Hotel. There were about 50 present and D. P. Robinson presided.

Friends of Frank H. Gale, of Schenectady, N. Y., heard with deep regret of the death of his wife on Sunday, May 31, from an attack of heart trouble. The Commercial Section sent a telegram of condolence to Mr. Gale upon receipt of the news, and similar action was taken by the Transportation Committee and the Exhibition Committee, of both of which he was a member.

A very pleasant feature of the convention was a notable gathering of past-presidents of the Association, including Frederic Nicholls, Toronto, Canada; James I. Ayer, Boston, Mass.; Samuel Insull, Chicago, Ill.; Louis A. Ferguson, Chicago, Ill.; Charles L. Edgar, Boston, Mass.; W. C. L. Eglin, Philadelphia, Pa.; John F. Gilchrist, Chicago, Ill.; W. W. Freeman, Cincinnati, O.; Frank M. Tait, Dayton, O.; Frank W. Frueauff, New York City; Dudley Farrand, Newark, N. J.; C. R. Huntley, Buffalo, N. Y.; W. H. Blood, Jr., Boston, Mass.; Arthur Williams, New York City; Ernest H. Davis, Williamsport, Pa., and E. A. Armstrong, Philadelphia, Pa.

Entertainment.

The convention opened with a reception to the president and other officers of the Association on Monday evening at 9:00 o'clock, at which there was music and dancing. In addition to music by a professional orchestra there was a promenade concert by the Peconela Orchestra of the Philadelphia Electric Company Section.

On Tuesday evening there was an excursion to Willow Grove Park, for which special trains were provided. This park is one of the finest amusement parks in the world and the electrical decorations were very attractive. There was a special exhibit of the electric fountain and the entire seating capacity of the covered stand was reserved for convention delegates for the band concert. The Jovian Order held a rejuvenation prior to the concert.

Sixty candidates were initiated, the Degree team being made up as follows: Jupiter, J. C. Vogel; Vulcan, Sidney Greenfield; Neptune, E. H. Boudwin; Pluto, F. P. Groves; Mars, W. T. Conn; Hercules, Walter Wright; Apollo, J. A. Savage; Mercury, H. D. Stuard; Avrenim, R. L. Cunningham.

On Thursday evening there was music and dancing in the ball room of the hotel, with an exhibition of modern dances by Mr. and Mrs. Lew Quinn, Miss Pritchard and Mr. Hemmer.

During the dance held at the Bellevue-Stratford Hotel on Thursday evening, George H. Hughes, of Chicago, presented an electric range to the delegate drawing the lucky number in a contest which was conducted by Mrs. Joseph B. McCall. J H. M. Andrews of Philadelphia, held the winning number.

L. A. Osborne, vice-president of the Westinghouse Electric & Manufacturing Company, gave a dinner to the officers and members of the executive and Public Policy Committees at the Racquet Club on Thursday evening. There were fifty present and brief remarks of an optimistic nature were made by the host, and by Joseph B. McCall, E. W. Rice, Jr., Guy E. Tripp, Walton Clark and Judge Joseph Buffington, of the United State Court of Appeals. The occasion was particularly enjoyable and happy. Others present besides the speakers were E. M. Herr, Arthur Williams, A. W. Burchard, Walter Cary, W. W. Freeman, Samuel Insull, Walter H. Johnson, W. A. Layman, J. R. Lovejoy, T. Commerford Martin, James H. McGraw.

T. W. Siemon, C. A. Terry, J. M. Wakeman and Charles W. Price.

On Monday afternoon there was a preliminary baseball game between the Philadelphia and Baltimore teams for the Westinghouse baseball trophy, Baltimore being the winner. This team played for the championship on Wednesday afternoon against the team representing the New York Edison Company. The New York nine won by a score of 13 to 1 before a large audience of baseball enthusiasts. Both games took place upon Franklin Field, the athletic ground of the University of Pennsylvania. The prize cups donated by the Westinghouse Electric & Manufacturing Company for the winning team were on display during the convention and attracted much attention. This year the Westinghouse Company has given an individual cup to each of the players on the successful team. The New York Edison team now has two legs on the Westinghouse cup and the Wagner cup, donated by H. A. Wagner, vice-president of the Consolidated Gas, Electric Light & Power Company, of Baltimore, Md.

On Wednesday evening covers were laid for 50 guests at a dinner given to members of the Public Policy Committee and other distinguished persons by Arthur Williams, president of the committee, and President J. B. McCall. The table was decorated beautifully with ferns and cut flowers and electric fountains. A souvenir edition of the convention number of the Philadelphia Electric Company Section magazine, *Current News,* was given to each guest in individual illuminated leather binding. Informal addresses were made at the close of the dinner and Mr. Williams presented, as presiding officer of the last New York Electric Show, to Thomas A. Edison, the guest of honor, a solid-gold medal bearing on its face the great inventor's portrait.

Those present were E. A. Armstrong, James I. Ayer, W. H. Blood, Jr., Samuel T. Bodine, Charles F. Brush, A. W Burchard, R. A. Carter, Walton Clark, Charles L. Edgar, Thomas A. Edison, W. C. L. Eglin, H. M. Edwards, Dudley Farrand, Louis A. Ferguson, W. W. Freeman, Frank W. Frueauff, John F. Gilchrist, Carl Hering, Charles R. Huntley, Samuel Insull, Dugald C. Jackson, George J. Jackson, W. H. Johnson, John W. Lieb, Jr., J. R. Lovejoy, Joseph B. McCall, Thomas N. McCarter, James H. McGraw, T. C. Martin, A. H. Manwaring, T. E. Mitten, Randal Morgan, Frederic Nicholls, L. A. Osborne, Robert B. Owens, Laurence T. Paul, Charles W. Price, E. W. Rice, Jr., F. W. Smith, M. B. Snyder, Frank J. Sprague, F. M. Tait, Guy E. Tripp, H. A. Wagner, W. F. Wells, Arthur Williams and O. D. Young.

Special entertainment was provided during the week for the ladies attending the convention.

On Thursday morning visits were made to points of interest in the city, under the guidance of Mrs. R. B. Mac Creery, and in the afternoon there was a musicale at the Manufacturers' Club. The program of twenty selections was about evenly divided between Mr. Rich, Miss Susanna Dercum, contralto, and Nicholas Douty, tenor. Ellis Clark Hammann was the accompanist. On Wednesday morning an automobile trip through Fairmount Park was arranged by a number of local electrical manufacturers. In the afternoon a visit was made to the University of Pennsylvania. In the evening there was a card party at the Hotel Adelphia.

Prizes in the form of current-consuming devices were donated by the General Electric Company, Hurley Machine Company, Simplex Electric Heating Company, Western Electric Company, and Westinghouse Electric & Manufacturing Company.

On Thursday morning there was a steamer excursion on the Delaware River to League Island Navy Yard, and the plant of the New York Ship Building Company. On the return trip Cramp's ship yard and other points of interest were visited.

On Friday a visit to the hydroelectric plant of the Pennsylvania Water & Power Company on the Susquehanna River was arranged by Herbert A. Wagner, of the Consolidated Gas, Electric Light & Power Company, of Baltimore. An afternoon train was taken over the Pennsylvania Railroad, the return being made in the evening. A luncheon supper was served en route. About 70 of the convention delegates took this trip.

Meeting of Class D Members.

A meeting of Class D members was held at noon on Thursday. James I. Ayer, chairman of the Exhibition Committee, made a brief talk stating among other things that the membership now amounts to 250. Resolutions of thanks to the committees and to the management of the Bellevue-Stratford Hotel were adopted. A committe for the ensuing year was elected, composed of the following: J. I. Ayer, of Boston, Mass.; J. C. McQuiston, of Pittsburgh, Pa.; C. L. Peirce, Jr., of Pittsburgh, Pa., and H. J. McConnaughy, of New York City.

At the San Francisco convention next year there will be no separate exhibit in connection with the convention of the National Electric Light Association. It was suggested, however, that an exhibit be made on the steamship plying between New York and San Francisco by way of the Panama Canal.

Exhibits.

The Class D members conducted an exhibit of apparatus in the roof garden of the hotel, and this was open during the entire week beginning at 10:00 a. m., on Monday. The exhibition room was elaborately decorated for this feature of the convention, and it was the opinion of everyone present that the exhibit, under the direction of H. S. McConnaughy, secretary, was the most artistic and thoroughly satisfactory display ever made by the Association. The exhibits, which were described in last week's issue, were made by the following companies:

American District Steam Company, Tonawanda, N. Y.; American Ironing Machine Company, Chicago, Ill.; Barnes & Kobert, Manufacturing Company, New Haven, Conn.; Bell Electric Motor Company, Garwood, N. J.; James G. Biddle, Philadelphia, Pa.; Carbolineum Wood Preserving Company, Milwaukee, Wis.; Central Station, New York, N. Y.; Century Electric Company, St. Louis, Mo.; Copeman Electric Stove Company, Flint, Mich.; George Cutter Company, South Bend, Ind.; Delta-Star Electric Company, Chicago, Ill.; Harvey Deschere & Company, Hoboken, N. J.; Edison Lamp Works of General Electric Company, Harrison, N. J.; Edison Storage Battery Company, Orange, N. J.; Electrical Review Publishing Company, Chicago, Ill.; Electric Service Supplies Company, Philadelphia, Pa.; Electric Storage Battery Company, Philadelphia, Pa.; Electrical World, New York, N. Y.; Federal Sign System (Electric), Chicago, Ill.; G. & W. Electric Specialty Company, Chicago, Ill.; General Electric Company, Schenectady, N. Y.; General Vehicle Company, Incorporated, Long Island City, N. Y.; Hubbard & Company, Pittsburgh, Pa.; Hughes Electric Heating Company, Chicago, Ill.; Hurley Machine Company, Chicago, Ill.; H. W. Johns-Manville Company, New York, N. Y.; Lombard Governor Company, Ashland, Mass.; W. N. Matthews & Brother, St. Louis, Mo.; Metropolitan Engineering Company, New York, N. Y.; National Lamp Works of General Electric Company, Cleveland, O.; Naugle Pole & Tie Company, Chicago, Ill.; Ohio Brass Company, Mansfield, O.; Otis Elevator Company, New York, N. Y.; Philadelphia Electric Company's Supply Department, Philadelphia, Pa.; Philadelphia Electrical & Manufacturing Company, Philadelphia, Pa.; Philadelphia Storage Battery Company, Philadelphia, Pa.; Pittsburgh Transformer Company, Pittsburgh, Pa.; John A. Roebling's Sons Company, Trenton, N. J.; Rumsey Electric Company, Philadelphia, Pa.; Sangamo Electric Company, Springfield, Ill.; Simplex Electric Heating Company, Cambridge, Mass.; Southern Exchange Company, New York, N. Y.; Standard Underground Cable Company, Pittsburgh, Pa.; Wagner Electric Manufacturing Company, St. Louis, Mo.; Western Electric Company, New York and Chicago; Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; Westinghouse Lamp Company, Pittsburgh, Pa.; Westinghouse Machine Company, Pittsburgh, Pa.; Weston Electrical Instrument Company, Newark, N. J.

Abstracts of Papers and Reports Presented at Convention of National Electric Light Association.

General Sessions.

Report of the Insurance Expert.

The relations with the underwriters continue to be friendly. The insurance expert represents the Association on the Electrical Committee of the National Fire Protection Association and in this manner keeps in touch with all proposed changes in the National Electrical Code. The Code is generally recognized as good engineering practice. Many cities have adopted the Code, but a few are afflicted with home-made rules which cause various kinds of trouble. The curbstone contractor and competitive lighting plants are still responsible for a certain amount of poor wiring. Both of these can be eliminated to a large degree by applying certain remedies. The National Electrical Code is revised once in two years, and the insurance expert welcomes suggestions as to advantageous changes in rules which contain objectionable features. To matters which will receive careful consideration at the next conference to be held in April, 1915, are the rules on constant-potential pole lines, over 5,000 volts and the rule as to the use of renewable or refillable inclosed fuses. Attention is called to the Hobart (Okla) case, where a company having a total capitalization of $135,000 has been sued for $90,000 for alleged negligence in causing the burning of a department store. This case will be fought with energy and a decision will probably be reached this coming fall. The insurance expert is vitally interested in this case and holds himself in readiness to assist in all similar cases for members of the Association. The attention of the Association is again called to the good work which is being done by inspection bureaus and the insurance expert recommends that this year pamphlets be sent out to all members of the Association, these pamphlets to be prepared under the joint supervision of one of these inspection bureaus and the insurance expert, and to contain an explanation of fire hazards in electric-lighting plants and methods for remedying them. Recommendation is made that the incoming administration give this matter early and serious consideration.

Report of the Committee on Progress.

The Report on Progress deals as usual with the general conditions of the industry, and presents its statistics as based on the United States Census figures of 1912 issued recently with other data on development. Sections then follow taking up public questions, such as the relations and usefulness of holding companies; the public service commissions and regulation; municipal ownership. Various features of engineering work are then discussed, one or two typical new plants being described rather fully. Then come a number of sections reporting the advances in different fields, such as lamps and lighting, electric vehicles, electric heating and cooking, railway energy and industrial power, pumping and ice making, signs and slogans, and electricity on the farm. There is also a brief department covering some miscellaneous applications of central-station energy. The report concludes with details as to recent educational and welfare work.

Safety First.

By Paul Lupke.

The paper calls attenttion to the necessity of reiteration for the purpose of driving a matter home to those whom it is wished to reach; it appeals to the rank and file for development of the prevention spirit. It points out various causes for the lack of this spirit and emphasizes the fact that in the prevention of accidents more than in anything else the interests of employer and employed are identical.

Commercial Sessions.

Report of Committee on Membership.

There has been a gain in membership of the Commercial Section during the year of 239 members. The number would have been much larger except for the objection to paying additional dues for section membership. This matter is under consideration by the Executive Committee and when it is settled there will undoubtedly be an increase. A printed list of members has been issued during the year.

Report of Publications Committee.

This report is divided under nine sections. (1) The total number of publications issued from June 1, 1913, to May 1, 1914, was 129,436 making the general total for the last two years 349,092. (2) 144 companies ordered publications during the past year, this number being 13.4 per cent of the number of company members. In general the size of orders has doubled since the previous year. (3) It is estimated that in 1912, there were about 1,850,000 unwired houses within central-station districts. The committee through its publications aims to secure the wiring of these houses. (4) The aim of the Committee has been to produce such campaigns and booklets as may be used by the member companies in mail campaigns, personal solicitation, etc. (5) The publications aim to develop residence service, electric business in retail stores, church lighting and street lighting. These publications are generally used in conjunction with follow-up letters by central stations. The committee is willing to furnish the inside pages only of covers, in order that companies may use the covers for advertising. (6) Among the proposed publications is a residence service dummy which is designed to aid in keeping correct lists of prospective customers and to aid in follow-up campaigns. (7) The Committee thinks that company members do not take full advantage of its publications as the issues of the same fall short of the useful field for the same. (8) The Electrical Salesman's Handbook is a new feature of the Commercial Section. This publication replaces the Electrical Solicitor's Handbook. (9) The Committee is circularizing manufacturers and central stations to the end that the standards of the Handbook such as size, etc., may be adopted by them as standard for all such publications.

Report of Committee on Education of Salesmen.

The Committee, through a letter to Class A members of the Association, has endeavored to ascertain whether or not they desire to institute educational work at this time on behalf of the employees of their sales divisions and in what manner this Committee can best serve them. Replies to this letter were, it is considered, sufficient in number and definiteness of character to warrant the Committee in believing that educational work of the nature indicated should be undertaken at the present time. The Committee therefore presents an outline for a course of study suitable for young men with common-school education wishing to take up central-station commercial work, and suited, in its judgment, to the needs of central stations in training or educating members of their sales divisions. The Committee also indicates how such a course can be effectively given.

Report of Rate Research Committee.

This report shows that the weekly paper published by the committee, *Rate Research*, is upon a self-sustaining basis with a circulation of 579, of which 454 are paid subscriptions. The committee has devoted its time to the consideration of the theory of rates and differentials between the various classes of service. It concludes that maximum rates cannot be based upon an actual cost theory but must be governed largely by policy and by precedent. An appendix to the report is devoted to a study of the value-of-service theory under the title "Basis of Rates." This theory is developed upon the premise that the rate to each class of consumers, as well as rates as a whole, should be determined by actual or potential competition under fair and permanent conditions—not temporary or destructive competition. After explaining the application of this idea and pointing out the various factors that determine the value of service to the user and to the utility company, it proceeds to explain existing rates upon this basis. It concludes that new classes of business should be taken on wherever possible at rates that will provide additional revenue in excess of additional cost, and these rates should be no lower than are necessary to get the business. The committee has also prepared a general set of rules governing the form and construction of electric rate schedules. Member companies are urged to follow this form in listing their schedules and it is also recommended for general adoption by state commissions, with the end in view of having a standard uniform form in all parts of the country.

Report of Lamp Committee.

The report shows tables and curves similar to those prepared last year, but brought up to date as to the lamp sales of the different types, some information being included as to the average wattage of yearly sales for the past several years, the tabulation of the year's business by wattage and the percentage which this wattage bears to the total. The question of a possible uniform voltage for Mazda lamps has been touched upon, the practices of the several companies with regard to furnishing Mazda lamps on free renewal and otherwise, and the changes that have taken place throughout the year. An important chapter on "Development" shows the progress that manufacturers have made to date, together with the tabulation of new lamps standardized and types removed from the regular list during the year. There are other features of the report which make it a very interesting document.

Report of Committee on Lighting of Interurban Highways.

This report, the first to deal specifically with the Lighting of Interurban Highways, covers briefly this important subject. The Committee, however, after having given some serious consideration to the subject and having made an inspection of various forms of lighting and types of fixtures, lamps, appliances, etc., as installed and operating under practical working conditions, feels that more attention should be given to this particular classification of lighting in the future than has been evidenced up to the present time.

Inquiries both as a result of personal observation and by correspondence indicated two things: first, a great lack of information in hand about interurban lighting of highways; second, a unanimous desire on the part of central-station men to obtain information in detail regarding the latest developments in lighting units suitable for highway lighting. The report includes some practical references, suggestions and conclusions as to lighting units for this particular class of work.

Report of Committee on Non-Peak and High-Load-Factor Business.

This report treats of those classes of business recognized as the very heart of the central-station industry. Attention is directed to the necessity of adopting rate schedules and policies which will enable member companies to secure large volumes of business, the character of which requires the use of electricity at times when the central station can most cheaply furish it. This class of business may be included under two general headings: (1) Those which have at the present time been most highly developed, among the most promising of which may be included—such lines as electric-vehicle charging, the manufacture of ice, etc. (2) Those classes which give great promise for the future, but which are at the present time more or less in process of development, such as the electric furnace, electrochemical process, etc.

Report of Committee on Wiring of Existing Buildings.

Part I. The collection of data on how much business yet remains to be done in wiring old buildings shows that most of our cities still have an immense development before them and may look forward to doubling, tripling and quadrupling the number of their customers in some cases to serving nearly ten customers for each one they have now. Most of this development will come from residences (which now presumably use gas or kerosene) and most of these will be of fairly small size. The growth of companies at the present time is coming from new buildings and, except in cases of special campaigns, only a very small proportion of the possible number of old buildings is being wired each year. The Committee recommends that companies should encourage their solicitors to go after old buildings. It should be easier to get the business when the central-station solicitor can do so, by means of unit prices, closing contracts on behalf of the wiring contractor without waiting for a special estimate in each case. The report of the Committee shows that such a plan is already in use in a good many cities.

Part II. This is a special report by S. E. Doane on the successful handling of the small consumer in Europe, based upon a long study of the subject.

Part III. On stanardization of plugs and receptacles the Committee reports that the underwriters are as yet unwilling to take any action, even although their present rules actually have the effect of encouraging the installation of lamp sockets to take heating devices, when receptacles would be better practice. The Committee also reports that on account of the patent situation it has not been able to make progress with the manufacturers. This Committee recommends that some committee of the Association be charged with following the matter up next year.

Part IV. The Committee was asked by outside parties to take steps toward standard specification for combination gas and electric fixtures, but decided that such specification, except as far as included in the National Code, would not be desirable.

Report of Committee on Electrical Merchandising and Advertising.

Part 1. A Merchandising Section, so arranged that any company wishing to start an electric appliance department may find therein instruction for the organization and conduct of this activity, including the equipment of a satisfactory salesroom, purchase of appliances, handling of stock, keeping of records, deliveries, and policies to be pursued in relation both to the internal management and to the general public.

Part 2. An Advertising Section giving concrete examples of successful appliance sales and campaigns, with reproductions of the advertisements that affected these satisfactory results.

Part 3. An Addendum embodying brief notes on "The Training and Handling of the Sales Force," "Advertising Principles" and a biblography covering the subject-matter of the report.

Report of Committee on Electrical Salesman's Handbook.

It is important that all information and data issued in the handbook should be kept up-to-date and the loose-leaf system makes this possible with minimum expense. Each member of the Commercial Section has received a set of loose-leaf sheets comprising (1) The Salesman and His Work; (2) Illumination; (3) Electric Power; (4) Electric Vehicles; also a pocket binder and a desk file. The committee has in hand for future use data on (1) fans and blowers; (2) electric elevators; (3) steam heating; (4) power applications; (5) electric heating. The committee recommends efforts leading to the general use of this system for the collection and use of information and data by electrical salesmen; the general adoption by manufacturers and member companies of sheets conforming to the standard specifications of the Publication Committee; the general adoption of the handbook index; and the systematic collection of information and data by each member of the Commercial Section, making such material available through the Handbook Committee.

Technical Sessions.

Report of Committee on Meters.

This is essentially a report of the work of the Committee during the year, covering in more or less detail the activities of the Committee responsive to individual or general requests from the members. Consideration has been given to the legislative questions affecting metering, which have arisen throughout the country during the year. A chart of the various public-utility regulations relating to meters, together with extracts from the laws and copies of the various rulings which have been promulgated by public-service commissions during the year are also included, together with the conclusions reached by the Committee in its consideration of these questions. The interest evinced by the members in general in the measurement of demand has been recognized by the Commitee, and the investigative work under way in conjunction with other committees, together with a review of the available demand instruments, is included. References are made to the standardization of instrument diagrams and standardization of shunts for instruments and meters, also to the recent developments in meters and apparatus pertaining to meter work, and to other miscellaneous questions. A complete bibliography relating to meters, comprising some 600 to 700 references, is included as an appendix to the report.

Report of Committee on Grounding of Secondaries.

The report is an abstract of data obtained from the member companies.

The data were prepared for use by the member companies which are having difficulty in convincing municipally and privately owned water works that grounding secondaries on the water mains does not affect the integrity of such piping systems. The data collected show that the smaller companies throughout the country are not paying as much attention to grounding secondaries as they should; that many companies are grounding to driven pipes and buried cones, neither of which methods is allowed by the Code. The report emphasizes very strongly the advantages of grounding on water piping systems and shows the unreliability of other methods. The report strongly recommends that more attention be given to this important matter in the belief that entirely aside from the humanitarian aspect, grounding secondaries is good business and in the long run is a profitable investment for the company.

Report of Committee on Electrical Measurements.

A brief outline is given of the course of events which led to the adoption of an international standard of electrical conductivity for copper, by the International Electrotechnical Commission, in Berlin, last September. The meaning of this international agreement is touched upon, and the English text of the agreement is appended, verbatim, for reference.

The Greater Electric-Vehicle Problems.

By William P. Kennedy.

This paper points out a number of the important electric-vehicle problems as a prologue to the address by Dr. C. P. Steinmetz. In the past the difficulties surrounding the introduction of electric vehicles were of mental rather than of physical nature. It is only recently that the acknowledged potential possibilities of this class of power consumption has received administrative attention from central-station interests as a desirable source of load. The development of the electric-vehicle industry needs nothing more urgently than cohesive and comphehensive administrative effort on the part of central stations. As a business proposition commanding attention from capitalists, the efforts put forth by the Electric Vehicle Association of America in its parcel-post project and the recently suggested relief of freight-terminal congestion, are merely first steps in a great movement. Numerous charging stations located at convenient points would cause an almost universal employment of the electric vehicle for commercial and pleasure use.

Report of Committee on Electrical Apparatus.

The report deals with the design of the more recent types of generating and converting apparatus, air-cooling devices, switchboard equipment and protective devices necessarily included in complete modern systems of distributions. New methods of switchboard control and the use of synchronous condensers for voltage regulation of high-tension transmission lines are of more than passing interest. The design of outdoor and indoor stations, and the elimination of personal and fire hazards in electrical systems should receive attention. Important advances in the development of temperature-measuring devices suitable for use in connection with electrical apparatus are described. Standardization work in general, including participation in the revision of the American Illuminating Electrical Engineers Standardization Rules has engaged the attention of the Committee throughout the year and the details of this work are treated at some length in the report.

Temperature and its Effect on the Power Capacity of Electrical Apparatus.

By F. D. Newbury.

This paper presents the information at present available on the heat and temperature conditions within large alternating-current generators, the safe temperature limits of the various insulating materials commonly used, and the significance of temperature measurements by different methods. The heat and temperature conditions within generators are shown by a number of temperature diagrams for typical heat paths within the generator. Actual temperatures as measured in generators are also given, showing that total temperatures from 100 to 130 degrees at the hottest part of the generator are not uncommon. A safe temperature limit of 105 degrees is given for treated cotton, paper, silk and similar fibrous materials. A temperature limit of 105 to 125 degrees is given for combinations of the above materials with mica on similar heat-resisting materials when both classes of materials are depended upon for insulation strength. With combinations of the same materials, but in which mica and similar heat-resisting materials furnish the entire insulation strength, a limit of 150 degrees is given. Various tests and instances of generator burn-outs are cited to support the temperature limits given. The significance of temperature measurement by mercury thermometer, resistance of windings and by thermocouples is shown.

Report of Committee on Underground Construction.

The report deals with a number of problems treated by members of the Committee who have had particular experience in these problems. One of the contributions deals with alternating-current underground-distribution practice as to junction boxes, fuses, oil switches and other devices for sectionalizing and interconnecting purposes. Another section of the report discusses the question of underground transformers, their method of protection, cooling, etc. The omission of emergency relief valves is recommended in all cases. Illustrations of ventilating transformer manholes are given. The third section reviews the practice of joint making for high-tension cables and recommends the use of the vacuum process for extra high-voltage cable joints. Section IV gives experimental data on protection of cables in manholes by the use of cement covering in comparison with asbestos and steel tape, showing a marked advantage for the cement covering. The fifth section shows a fruitless effort to discover an inexpensive underground distributing system. The report describes some types of construction less expensive than the standard drawing-in system and gives cost figures and other details. Section VI gives operating data on high-tension cables collected from member companies. A marked difference is shown in the thickness of insulation used for cables of relatively low voltages, but greater uniformity for high-voltage cables. The maximum allowable loading for different companies gives temperatures varying from 90 to 150 degrees Fahrenheit for the lead sheath; and tests made to supplement this information show that the temperature of the conductor would be as much as 75 degrees higher than the sheath. Attention is called to the possibility of varying the maximum loading with the seasons of the year. The cable burn-outs for 2,300 miles of cables were 14.2 per 100 miles, of which 78 per cent were in cable section and 22 per cent in joints. The report makes reference to the organization of the Joint National Committee on Electrolysis, on which the National Electric Light Association is represented by three members, and advises member companies to co-operate with this National Committee. The Committee also co-operated with the Wire and Cable Sub-Committee of the Standards Committee of the American Institute of Electrical Engineers in the preparation of rules, which, however, are for the general trade and should not be applied to the specialized requirements of the member companies. A number of subjects on which the Committee could not report are recommended for action by the next Committee.

Report of Committee on Overhead Line Construction.

The report of this committee consists chiefly of a revision of the first two sections of its 1911 report covering primary and secondary line construction. This revised report is printed in full in a Handbook on Overhead Line Construction, which was prepared by a subcommittee. This handbook, in addition to the committee's report, contains descriptions of the methods and the materials employed in overhead line construction; also the necessary formulas for electrical and mechanical solutions of the various transmission and distribution problems. The handbook is in 11 sections and covers line construction for wood, steel and reinforced concrete poles and steel towers. The committee recommends that the subject of joint use of poles be very carefully considered. A joint pole committee, on which are representatives of the American Electric Railway Association, National Electric Light Association, American Institute of Electrical Engineers and the American Telephone & Telegraph Company, is now working on this subject, and its report will probably be presented to the convention of the American Electric Railway Association next fall.

Report of Committee on Prime Movers.

The Committee discusses twelve subjects which are of interest at this time, as follows: Cost of Steam-Power Stand-By Service, Forced Draft for Peak Work, Emission of Smoke and Cinders from Chimneys, Burning Pulverized Coal, Under-Water Storage of Coal, Fire Brick, Steam-Flow Meters, Surface Combustion, Condensers, Boiler Tubes, Foreign Practice and

Tendency, Letters from Manufacturers. The remarks on the "Cost of Steam-Power Stand-By Service" should be of interest to those who contemplate replacing steam power with water power, in that they show quite clearly what expenses cannot be eliminated if the continuity of the service is to be reasonably safeguarded. The article on "Forced Draft for Peak Work" is well worthy of consideration for existing stations where the boilers are subjected to extraordinary and unexpected demands for power or where they are overloaded. The review on "Foreign Practice and Tendency," is interesting as it shows what efforts the engineers of other countries are making to improve their plant efficiency. Apparently their mental processes have been similar to those of American engineers. In "Letters from Manufacturers," which the Committee received this year as heretofore, is a statement of what is newest in turbine and condenser development.

Water Power.—In continuing the work of last year on water power the following subjects have been taken up: Water-Power Plant Economies, Methods of Measurement of Water in Operation, General Principles Governing the Selection of Water Wheels, Use of Center Bearings Between Runners in Horizontal Double-Runner Center-Discharge Wheel Settings and Leveling of Shaft, Recent Results with Kingsbury Thrust Bearing, Water-Wheel Testing Flume.

Gas Power—A review is presented of the recent developments in oil-engine manufacture and the tendency in price of available fuel oils. A considerable discussion is given of the factors surrounding the use of the heavy-oil engine and of various conditions that should be taken into account when considering this type of prime mover. This part of the report is of a general character and is supplemented by tables and illustrations in order to present the status in an instructive manner. But little is mentioned of the gas engine and producer as nothing of particular note has been brought forward during the twelve months just ending. Casual notes on the Humphrey pump and on the high-pressure distribution of producer gas have been added in order to bring the information of previous reports up to date.

Hydroelectric and Transmission Sessions.

Report of Committee on Hydroelectric Progress.

This is Part 2 of the General Report on Progress and is devoted more particularly to work in the hydroelectric and power-transmission field. Attention is directed by it to the treatment of water-power and conservation problems in national and state legislation, and the various aspects of the question. Information is given as to a number of interesting plants and installation, as well as to the later feature of long-distance line construction, outdoor sub-stations and other features of the work, while especial notice is given to the rapid rise in voltage, distance of transmission, and other results due to improvement in the art. One section of the report deals with foreign progress and projects.

The Nature of Electrical Disturbances in Transmission Work.

By D. B. Rushmore.

Electrical disturbances in high-tension power-transmission systems may be divided into two general classes; first, those caused by high currents, and, second, those caused by high voltages. High currents may be the result of overloads, causing excessive heating with subsequent burn-outs. They may also be caused by short-circuits, and the very high momentary values of these currents may result in severe mechanical strains, and breakdowns of the apparatus on the system. The destructive effects of excessive currents may be reduced by increasing the reactance in the circuits, and this is now often accomplished by providing external power-limiting reactances. The system should furthermore be so sectionalized and provided with selective switching devices that any disturbance will be confined to the smallest possible area. High-voltage disturbances may also be divided into two broad classes; first, those covering actual high voltages, in which the excess voltage exists between the phase conductors, or between the phase conductors and ground; second, those covering localized high voltages in which the excess potential condition exists between two points along the same conductor. To the first class belong those disturbances which are caused by poor disturbances which are caused by poor regulation and resonance, while the nature of disturbances caused by switching and lightning may be such that they may belong to either class. Where the impulses or traveling waves set up are of comparatively low frequency with slopings wave front, the disturbance can generally be classed with the former, and where of high frequency and a steep wave front, to the latter. The regulation of modern transmission systems is generally improved by providing synchronous condensers with automatic voltage regulators. The field is then adjusted so as to make the condenser take a lagging current at no load and a leading current at full load, in the first case to offset the effect of the line capacity, and in the second, to offset the surplus lagging load current. The aluminum-cell lightning arrester possesses ideal characteristics to protect against such high-voltage disturbances, where the excess voltage occurs between the phase conductors or between the phase conductors and ground. Overhead ground wires are also very generally used to protect the lines against atmospheric charges. The nature of high-frequency disturbances, on the other hand, is a comparatively recent discovery, and the means and methods for protecting against them are still being studied and investigated. As such disturbances are liable to damage the interior of transformer windings it is advisable to heavily insulate not only the end turns of the windings, but the individual coil groups as well. Inductances and energy absorbing devices may have to be relied upon for protection against these disturbances.

Water-Power Plant Economics.

By O. B. Coldwell.

This paper is a general discussion of some important elements entering into the design, construction and operation of hydraulic plants which have to do with economy. As a general thing the operating cost in a water-power plant forms but a very small percentage of the total cost of production. For this reason the subject of economics in plants of this type has not been given as much attention as the economics of steam-driven plants. An interesting diagram is given to show the comparison of total costs of steam and water-power plants, which are analyzed into operating and investment costs. The author points out the need for careful consideration of the character of the stream and watershed in determining the design of the plant and shows how this influences the ultimate economy. He considers in detail various types of hydroelectric plants and shows the relative advantages of different types of headworks, intakes, conduits, penstocks, pondage, main units and auxiliaries, recording instruments, draft tubes and tail-races. He points out the influence of many features in connection with these details on economy. He advocates the extensive use of electrical control of gates and other auxiliary apparatus. Recording instruments showing the actual flow of water and the output should be available so that the operatives may know what is actually being done by the plant. In connection with a plant having a limited water supply it is important to conserve the water as much as possible so as to be able to carry the peak load without difficulty. The operators should therefore know the influence of each operating detail on the efficiency of the plant.

Selection of Hydraulic Turbines.

By Charles V. Seastone.

In this paper the author calls attention to the importance of a careful study of the design and characteristics of turbines needed for any particular installation in order to secure economy of operation under the varying conditions of head and load to which the plant may be subject. From Holyoke tests the engineer now has the data which will enable him to make a comprehensive study and intelligent selection of the type of runner best suited to his purpose. The subject is treated in a non-technical manner under four main divisions: first, type of unit; second, size of unit; third, type of runner; and fourth, general character of design. The author points out that the selection of the type of unit is largely dependent upon local conditions of head, head variations, economy in design of power house, etc., also that no general rule can be laid down covering the size of a unit, which is dependent upon the character and magnitude of the probable load and available head. The author gives some attention to the type of runner, pointing out the general features that should receive careful consideration in its selection, including efficiencies under the ordinary range of operating conditions and fluctuations of head. The various points are illustrated by diagram.

Accounting Sessions.

Report of Subcommittee on Library.

The collection of accounting forms kept on file at headquarters has proved very useful to visiting representatives of companies. A collection of forms is also sent to member companies for inspection and return. There has been added to the library this year a collection of forms for annual reports used by various state commissions and a set of accounting orders prescribed by commissions.

Costs and Statistics.

By Thomas J. Walsh.

The Commonwealth Edison Company has, as a part of its organization, a Budget and Expense Committee, whose duty it is to study and pass on investment budget work and operating expenses, and it is part of the purpose of this paper to describe the methods used by it in the study of expenses. This company has adopted the standard classification recommended by the Association and has subdivided the accounts to fit its requirements, that is, to enable a comprehensive analysis of the various expenses. The different accounts are computed on some appropriate unit basis and the data and statistics are plotted and typewritten on sheets designed for this purpose and illustrated in the paper, and show how a direct comparison of the money spent by the departments each month is made with the previous month and the corresponding month of a year ago, also the cost per unit shown graphically. The paper also describes the method by which each department head receives the information necessary to make a scientific study of the expenses for which he is held responsible.

Report of Committee on Uniform System of Accounts.

This is the report of a subcommittee giving a tentative classification of standard construction and operating accounts, with explanatory notes defining the scope of each heading. A decimal system of indexing is used in designating the subdivisions coming under the general headings.

Accounting for Merchandise Sales.

By H. B. Lohmeyer.

This paper describes the new accounting methods recently adopted by the Baltimore Consolidated Company which has branched out extensively in the merchandising business. The methods outlined cover the routine from the sale to the billing and entry on ledger and monthly profit-and-loss statement. It also shows a concise method of stock records which does away with the necessity of individual stock cards.

Suspense Accounts.

By Frederick Schmitt.

The paper describes the limited extent to which the term "Suspense" was used in former years in accounting phraseology and shows how, in modern times, this practice has been greatly diversified. For the purpose of discussion a list of suspense accounts now generally used is divided into two groups; first, those accounts which are of a doubtful nature; then those commonly known as "Clearance or Apportionment" accounts. The second group of accounts is subdivided into Work in Progress, Burden or Overhead Expenses, Deferred Charges and Miscellaneous Charges. A general description of all the accounts is given in the order in which they appear on the list —some described in a concise manner, others more at length. Special thought is given to the method of keeping Storeroom Expense account as well as the treatment of cash discount recovered through prompt payment, because these items brought forth considerable discussion at the last convention.

Mechanical Sorting and Tabulating Systems in Connection with Disbursements Accounts.

By F. A. Birch.

This paper describes in detail the operation of a very effective system of accounting for purchases and the distribution of charges to the classification expense accounts. It also describes the manner in which distribution of operating expenses may be very advantageously handled upon the Hollerith tabulating machines, with a resultant saving in time in getting out monthly reports. Congestion which formerly prevailed at certain very busy periods each month is now entirely eliminated, and the entire accounting procedure relating to voucher distribution is rendered very much more harmonious. The tabulating machines afford a very valuable check upon the mathematical accuracy of a month's work, and expedite posting to general and auxiliary ledgers, with a consequent ease reconciling details with controlling accounts. The paper also describes briefly the advantages in handling consumers' special deposits on the tabulating machines.

Mechanical Sorting and Tabulating System As Applied to the Inventory of Transmission and Distributing Systems.

By G. L. Knight and C. V. Woolsey.

This paper describes the use of sorting and tabulating machines in obtaining statistical data for reports on the physical property of transmission and distribution systems. The paper is intended to act as a handbook for systematizing the methods of taking the inventory either originally or during any given period, and for the design of forms and codes necessary in the use of the machines. Examples are given of the forms used in taking the data from record books or from the street, the code for getting this data on to the tabulating cards and the forms for summarizing information obtained after it has passed through the sorting and tabulating machines.

Purchasing, Storing and Accounting of Coal for the New York Edison Company.

By Charles R. Lehmann.

The writer gives a summary of the methods employed by the New York Edison Company in the purchase and delivery of its coal. In logical order, he takes up purchasing, transportation, storing, testing, insurance and accounting. Purchasing is described briefly. The company buys coal at the mines and its transportation requires detailed records, all of which are explained. The company's coal-storage plant and its lighting system are given in detail and illustrated by photographs. The way the coal is sampled and tested is also fully described. The various transportation and cost records are explained in detail, copies of many of the forms used being shown.

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Additional Submarine Cables Laid for Pittsburgh Central Station.

The Duquesne Light Company, of Pittsburgh, Pa., is laying 12 large, high-tension submarine cables beneath the bed of the Ohio River above the Ohio Connecting Railroad bridge between Brunots Island and Esplen. The laying of these new cables will make possible two separate and distinct transmission routes from the big power plant on Brunots Island and will insure even more perfect service than that which has hitherto existed. The cost of installation will be about $75,000. The back channel of the Ohio River at Esplen is about 850 feet wide. The cables are each 1,285 feet long, weighing approximately twenty pounds per foot and are made in one continuous section to avoid the necessity of submerged joints. Each cable is 4.5 inches in diameter and is made up of three copper wires, each a ½-inch in diameter, and heavily insulated for 13,000 volts. Each cable is capable of carrying 5,000 horsepower, making a total of 60,000 horsepower for the twelve cables. The total weight of the cable is 276,000 pounds. The object of this installation is to provide an outlet for the additional capacity installed and being installed at the Brunots Island power plant. This is the second submarine cable installation to be made at Brunots Island, the first one having been made last December, between the island and the Allegheny shore. These two installations will provide two separate routes, one via Allegheny and Sixth Street Bridge to Pittsburgh proper and the other via West Carson Street and the Point Bridge to the city.

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Electric Trucks in New York.

There are 75 different industries in New York City that use electric trucks. Brewers are most largely represented, 19 separate breweries using a total of 34 electric vehicles. The department stores are a close second with 17 owners and 262 individual cars. The seven express companies have altogether 197 storage-battery cars.

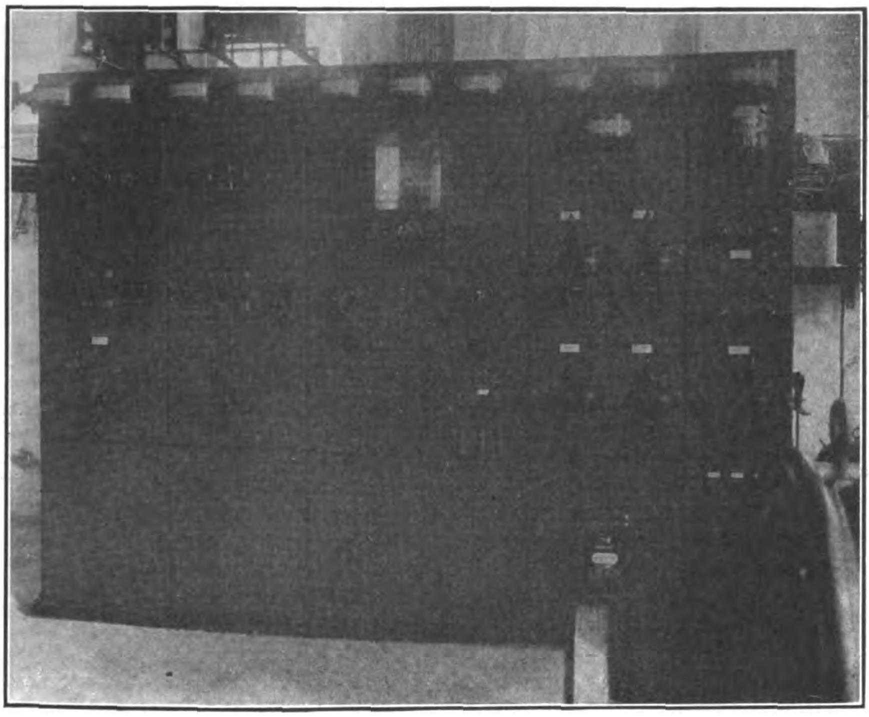
The bakeries come next with eight users of 161 cars, and the two central stations have between them 150 cars. Electric general-delivery wagons number 68 and eight meat-packers together use 67 electrics.

Five jewelers use 44 electric cars and ten wholesale dry goods stores employ 35.

Holstein Starts New Plant.

An example of what can be accomplished in a progressive small town by co-operation is shown by the Holstein Service Company, of Holstein, Iowa, which is now operating a new electric light and power plant.

Holstein is a town of about 1,000 inhabitants situated about 80 miles east of Sioux City. It is a farming center and has but one railroad. Up to the present the lighting has been by acetylene gas from a municipal plant, together with individual gasoline plants. The Holstein Service Company is a corporation composed entirely of local men. It was endeavored to place the stock generally among the townspeople to insure general use of the service and to promote good feeling. There are about 60 stockholders.



Switchboard of Holstein Service Company.

The plant is a brick building adjacent to the city waterworks. The ground floor, which is below the street level, houses the power plant. The second floor is used for the office and show room of the company, with a large space rented to the town for town-hall use. The power equipment consists of two Meitz and Weiss 50-horsepower oil engines belted to 37.5-kilowatt Fort Wayne, three-phase, 2,300-volt alternators. The plant is some distance from the railway and a storage tank is located near the tracks, the fuel being pumped to a smaller tank at the plant by a rotary motor-driven pump. The engines are started by compressed air. A small motor-driven air compressor is provided, which fills a storage tank. A five-panel, black-slate switchboard was built by the Fort Wayne Electric Works for the plant. Two generator panels are provided, an exciter panel with Tirrill regulator, a distributing panel for commercial circuits, and a panel to control the street lamps. The accompanying illustration shows the switchboard.

There are 43 sixty-watt incandescent street lamps located at all crossings, the blocks being 300 feet long. The town is the best illuminated in the vicinity. In the downtown district there are 20 electroliers provided with 40-watt lamps for the side lights and 60-watt lamps for the top light. There are 50 business places in town of which 35 are connected at present. Of the 200 residences, about one-half are connected, and others will be obtained when the acetylene plant is shut down. Service rates are on a sliding scale from 17 cents to 10 cents per kilowatt-hour. Power rates run from 10 cents down. The corner street lights run nightly until midnight and are paid for by the town at $2.00 per month. The electroliers are on a meter basis at 12.5 cents per kilowatt-hour with maintenance furnished by the company.

Twenty-four-hour service is to be started shortly. The power load connected will exceed 50 horsepower; a local elevator, a creamery and a small planing mill being the larger users. Small motors will replace practically every gasoline engine in town. An aggressive campaign will be made for residence day load in irons and miscellaneous home utilities.

Gas oil was used for the engine fuel during the cold weather but fuel oil will be used later. The cost of fuel is about 0.75 cent per kilowatt-hour. The attendant at this plant also operates the town waterworks adjacent, the expense being shared by the town. Co-operation has here materially lessened the cost of the service. A little figuring will make it evident that, although the town is small, a thoroly up-to-date plant will pay well because of the co-operation of all concerned.

At present the period from midnight to morning is a period of loss. It is intended to install a small storage battery and synchronous motor-generator set which will charge during the day and evening runs, and furnish the lighting service for the late night hours at a much lower cost. When this is completed the plant of the Holstein Service Company will be one of the best equipped for a town of its size in the country.

Edison on Low-Priced Electric.

Thomas A. Edison, speaking on general business conditions to a representative of *The Wall Street Journal,* said with reference to his partnership with Henry Ford for the production of a low-price family electric carriage:

"Mr. Ford is making plans for the tools, special machinery, factory buildings, and equipment for the production of this new electric. I have perfected the motors so that an electric machine can be run much more economically than a gasolene car. The machinery has been simplified, every non-essential part eliminated. It will be simplicity itself, so that it can be run by a child. The cost of the car will probably be between $500 and $700. There is so much special work to be done that no date can be fixed now as to when the new electric can be put on the market.

"I believe that ultimately the electric motor will be universally used for trucking in all large cities, and that the electric automobile will be the family carriage of the future. All trucking must come to electricity. With an electric truck, double the load and twice the speed can be obtained with half the space.

"The success I have achieved in any line, I attribute to constant work on one thing until it is perfected. This does not mean that I keep only one iron in the fire. Up to the present I have obtained over 1,200 patents from the United States Patent Office, and a very large number in foreign countries. But I have worked on the principle of keeping at it until I produced the desired result."

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A new district office and showroom was opened to the public by The New York Edison Company, on May 27, at Irving Place and Fifteenth Street. This office will transact all business for the district between Eighth and Twenty-eighth Streets.

Electrical Decorations for Shriners' Meeting in Atlanta.

The annual meeting of the Imperial Council of the Ancient Order of the Mystic Shrine was held in Atlanta, Ga., from May 11 to 16. One of the noteworthy features of this assembly was the very liberal use of electrical decorations, which were for the most part adapted to the "White Way" tungsten-cluster posts along the principal streets.

One of the designs is shown in Fig. 1; 137 of these designs were installed along Mitchell, Whitehall, Peachtree and Luckie Streets. The special design mounted on top of the post extended six feet above the level of the arms and was two and one-half feet wide. The camel shown in the center of the inclosure was 14 inches high. Most of the decorative design was made out of sheet iron painted white, with the Shriners' emblem in appropriate colors. The illustration in Fig. 1 was made from a drawing and not a photograph. In the actual carrying out of the design, the top globe was first removed and the ornamental housing mounted on top of the globeholder. The top lamp, therefore, illuminated the entire interior of the housing, giving it a very ornate effect.

With the design shown in Fig. 2, 80 posts were equipped along Marietta and North Pryor Streets. In this case the lamps were removed and the emblems, which had been molded from special composition material and painted white, were supported on metal bases painted a green color. The large crescent in the center was 36 inches high and the smaller crescents were mounted on each of the four arms of the post. From the center of the top crescent was hung a 500-watt frosted lamp; in the center of the star of each of the smaller emblems was a 25-watt tubular frosted lamp. All of these lamps were fed from the regular post-lighting circuits.

Two other designs were also used on posts along Broad and Forsyth Streets, about 90 posts being equipped with them. At each of 25 four-way street crossings a four-foot double-faced Shrine emblem was mounted by span wires across the street. This was illuminated by 50 lamps. At the intersection known as the "Five Points," a large 15-foot star studded with 300 lamps on each side was mounted. The center was illuminated by lamps of various colors suitable for the Shrine color scheme. The entire design was mounted 50 feet above the street and from the lower portion of the design festoons of electric lamps were strung to the White Way posts at each of the street corners, giving a canopy effect. In these streamers and the center design 1,500 lamps were used.

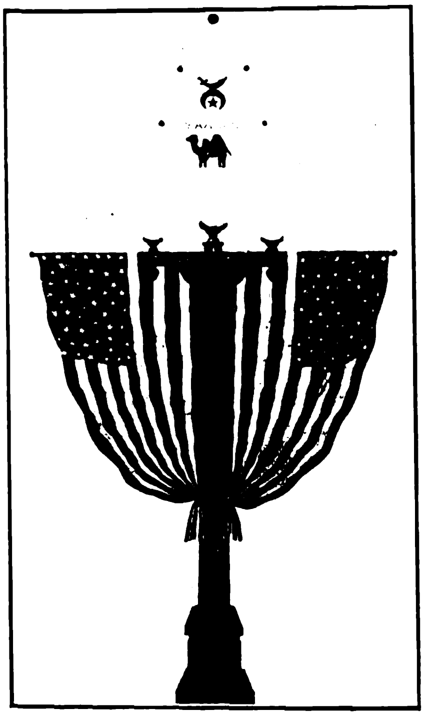

Fig. 1.—Decorated Lamppost.

From this five-point intersection to the Masonic Temple, three 36-inch double-faced metal Shrine emblems were suspended on each trolley span. Each of these was illuminated by 40 eight-candlepower lamps. At intervals large stars with a 500-watt lamp at the center were suspended at each side of the street from a wire span connected to the trolley poles.

At the Masonic Temple there was installed a large Shrine emblem about 20 feet square. This was illuminated by 1,060 lamps, those in the star of the emblem being red and in the other parts of colors corresponding to the Shrine colors. This emblem was mounted 110 feet above the ground and could be seen from nearly all parts of the city. Special lighting was also provided on many of the club and hotel buildings. All of the lighting was installed by the McGaughey Electric Company, of Atlanta. Carroll B. McGaughey, of this firm, was chairman of the Committee on Arrangements.

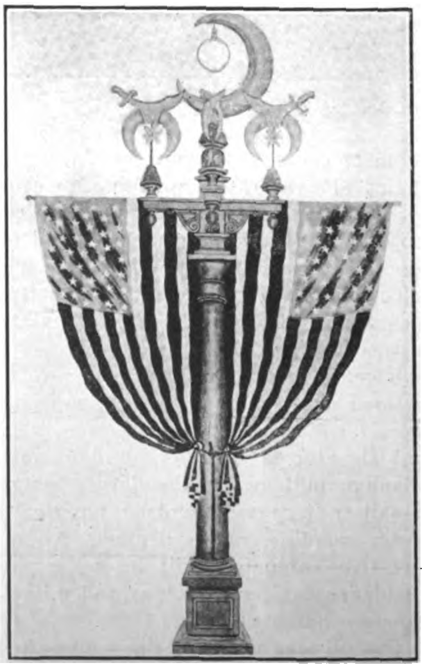

Fig. 2.—Another Example of the Decorations.

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College Students Design Complete Electric Power Plant.

Complete plans and specifications for the construction of a monster electric power plant at Hazard, in Perry County, Ky., await the promoter or the contractor who will undertake such an improvement in that part of the southeastern Kentucky coal field. These plans are to be found in the archives of the Mechanical College of the Kentucky State University at Lexington. They have just been completed and constituted the thesis work of this year's graduating class at that school.

Altogether there are about 100 blue prints and drawings and several hundred typewritten pages of specifications. The work was done by the students under the direction of Professor Anderson, who devised and superintended the execution of this unique educational plan. It is one of the first instances on record in which a technical college has required that sort of work from its senior students. Though the plans are largely theoretical, of course, they apply to a concrete situation and are capable of being carried out in all details.

The actual work on the plans was preceded by a trip to Hazard, in the center of a large and rich coal-mining field in which territory electricity for power is coming more and more into demand with the mine operators. On the ground the students made a selection of the site for the plant, surveyed it and staked it out, working under the direction of Professor Anderson. Then, with the requirement fixed in their minds and reduced to drawings, the students returned to Lexington where they began working out the solutions of the problem. The details as to the horsepower which could be realized by construction of a plant, according to the plans of the students, are not available at this time. In a general way, however, the generating power would come from steam, coal, plentiful and cheap, to be the fuel.

Eastern Kentucky is developing at a very rapid rate and it would not be in the least surprising if before long the plans of the students would be used.

NOTE ON PROPOSED SPECIFICATION FOR WAVE FORM.

By T. T. Fitch.

In order to limit the percentage of permissible harmonics in the wave form of commercial alternators, it has recently been proposed as a specification for the Standardization Rules of the American Institute of Electrical Engineers that the current drawn by a condenser shall not be more than 10 per cent in excess of that for a sine wave. The rule is a very simple one, but its practical application involves the use of instruments and these may introduce a serious error in the result.

The writer has, therefore, tested the proposed rule on two wave forms in commercial use, first with a Hartmann and Braun hot-wire ammeter, and second, with a Weston moving-iron ammeter, both of one-ampere range. The moving-iron instrument has an inductance of 2.35 millihenries, while that of the hot-wire instrument is negligible, being no more than that of a straight piece of wire 15 centimeters in length. The test was made at 125 volts, 61 cycles, using a condenser of 9.94 microfarads.

The computed value for a sine wave was 0.476 ampere.

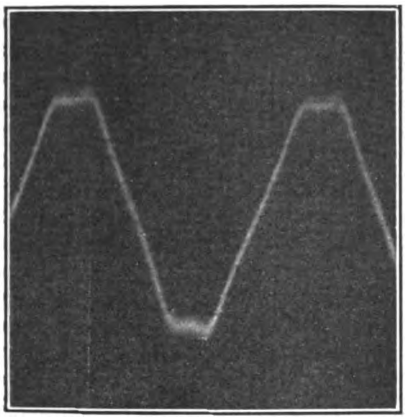
The following results were obtained:

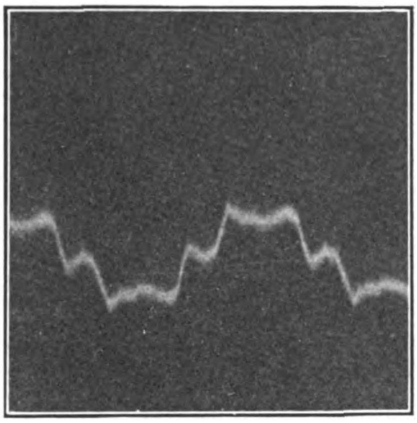
Generator No.	Ammeter	Observed Amperes
1	Hot-Wire	0.493
1	Moving-Iron	0.514
2	Hot-Wire	0.548
3	Moving-Iron	0.738

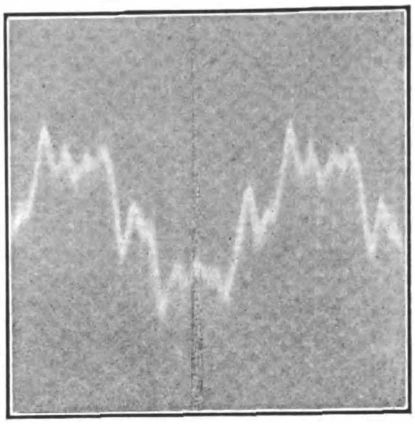
Oscillograms were taken of the voltage and current waves in each case, which are shown in the accompanying figures. The current for the oscillograph was taken from a 0.5-ohm shunt placed in series with the condenser.

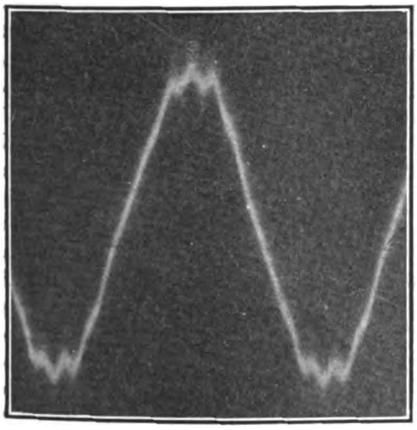
It is seen by reference to the table that there is considerable increase of current when using the inductive ammeter, this increase in fact amounting to 35 per cent in the case of generator No. 2. The oscillograms in this case indicate the presence of considerable thirteenth harmonic, though no analysis has been made. The increase of current is of the right order of magnitude to be explained by the inductance of the moving-iron ammeter, as may be seen by the following theoretical case. Take 125 volts at 60 cycles having 4 per cent of the thirteenth harmonic present. The current drawn by 10 microfarads with negligible resistance and inductance would be 0.521 ampere. By the addition of 2.35 millihenries of inductance in series with the condenser with the other conditions the same, the current would be 0.735 ampere. In the case of the experimental results given in the table, the errors are not due to failure of the moving-iron ammeter to indicate correctly the current passing through it, as tests at 600 cycles, as well as tests on distorted wave form, show ammeters of this type to be little in error.

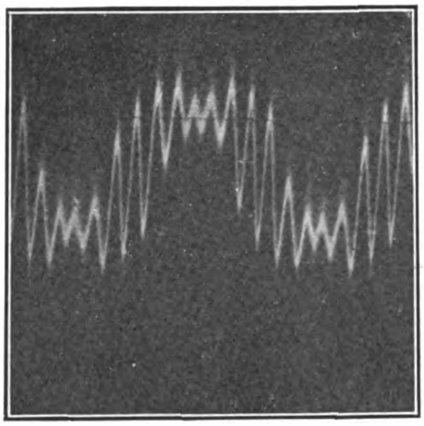
Evidently the proposed specification should have a note appended stating that the ammeter used must be of negligible inductance and that practically the only such instruments now available are those of the hot-wire type.

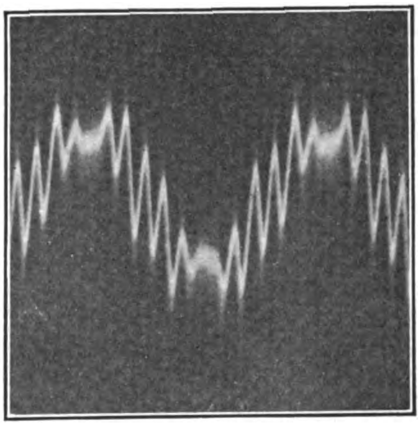

Generator No. 1—Voltage Curve.


Current Curve, Hot-Wire Ammeter.


Current Curve, Moving-Coil Ammeter.


Generator No. 2—Voltage Curve.


Current Curve, Hot-Wire Ammeter.


Current Curve, Moving-Coil Ammeter.

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New Submarine Cable from New York to Panama.

It has been announced by James A. Scrymser, president of the Mexican Telegraph Company and of the Central & South American Telegraph Company, that a second cable would be laid this summer from New Yorl. City to Colon on the Isthmus of Panama.

Increase in Central and South American trade has taxed the existing cable, and with the opening of the Panama Canal the increased business will be of such volume that it could not be taken care of without an extension of the existing facilities. Work on the laying of the new cable will be started at once and will be completed by the end of November.

BOOK REVIEWS.

"Investigating An Industry." By William Kent. New York: John Wiley & Sons, Incorporated. Cloth, 126 pages (5x7¼inches). Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This book is a reprint with slight alterations of a series of articles which appeared in *Industrial Engineering* last year. It deals with the application of the principles of scientific management to industrial problems, covering not only factory management but the selling force as well. The inclusion of the latter feature appeals to the reviewer as the most important feature of the book. The book is written in narrative form and puts forth the author's ideas in the form of application to a definite hypothetical case. After showing how an investigator goes about getting the desired information in a particular industry, he presents a report showing how the business should be organized and conducted. He emphasizes the desirability of a board of directors being what its name indicates rather than a mere stockholders' committee having power without responsibility. There is an introduction written by Henry L. Gantt and an appendix dealing with the "leak hunter," an individual whose duty it is to study the general problem of what things in a factory need to be improved and how to improve them.

"Camp Co-operation Book of Proceedings." East Aurora, N. Y.: The Roycrofters. Leather, 250 pages (6¼ x 9¼ inches), illustrated. Single copies, $1.25; 25 copies or more, $1.00 each. Paper binding, single copies, 50 cents; 25 copies or more, 40 cents each.

The book of proceedings of the Co-Operative Meeting held under the auspices of the Association Island Corporation at Henderson Harbor, N. Y., on September 3 to 6, 1913, has been published. The volume contains a very interesting introductory and notable addresses by J. B. McCall, president of the Philadelphia Electric Company and president of the National Electric Light Association; Anson W. Burchard, vice-president of the General Electric Company; Elbert Hubbard, S. O. Richardson, Jr., president of Association Island Corporation; Frank W. Smith, vice-president United Electric Light & Power Company; Norman Macbeth; Samuel Insull, president Commonwealth Edison Company; Dr. Thomas Darlington, Frank A. Vanderlip, Dr. Charles P. Steinmetz, Willard Howland, F. E. Watts, W. E. Robertson, J. M. Wakeman, F. P. Fish, E. McCleary, D. L. Gaskill, J. Robert Crouse and John H. Roemer. The book is illustrated with half-tone reproductions of the portraits of many of the prominent men of the industry, and with smaller illustrations depicting some of the scenes during the convention session at Association Island. A very interesting feature is a gravure of Thomas A. Edison and a copy of a personally autographed letter which was received by each person participating in the meeting. The book is a very handsome example of composition, printing and book binding.

"Elementary Magnetism and Electricity." By Cyril M. Jansky. New York: McGraw-Hill Book Company, Inc. Cloth, 212 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.50.

This volume was prepared in the Extension Division of the University of Wisconsin, for use in correspondence courses. It will be of value to non-technically trained men who have had some practical experience with electrical apparatus or machinery. It is intended for individual or home study and the apparatus required for the experiments is inexpensive and most of it can easily be made by an ingenious student. The book, however, is well adapted for class work in industrial schools. There are 10 chapters with the following headings: Magnetism, Electromagnetism, Some Practical Applications of Electromagnets, Electromagnetic Induction, Current Electricity, Electrolysis, Resistance, Flow of Current in a Circuit Electric Generator and Motor, and Work and Energy. Electrostatics has been intentionally omitted. It is written in a semipopular conversational style, and although it contains numerous mathematical formulas, they are comparatively simple and can easily be understood by one having a common-school education.

"Electric Light Accounts and Their Significance." By H. M. Edwards. New York: McGraw-Hill Book Company, Incorporated. Flexible leather, 172 pages (5x7½ inches). Supplied by the Electrical Review Publishing Company, Inc., for $2.00.

The author of this volume is the auditor for the New York Edison Company, and has consequently been in close touch with the subject with which he deals. The system which he presents, however, is not exactly the same in detail as that followed by the company named and it differs also in some respects from the system adopted by the National Electric Light Association. The book is divided into three parts, the first dealing with balance sheet indicant accounts, the second with income accounts and the third with miscellaneous matters. A complete list of the necessary accounts is given and the text is devoted largely to explaining their significance and how they should be handled. One chapter is given over to the symbols used in designating accounts, for which the author favors the decimal system. The book should prove of interest and value to any one connected with the accounting of an electric lighting company. It is well printed and attractively bound.

Meeting of the Society for Electrical Development.

The Society for Electrical Development, Incorporated, held a meeting in the Bellevue-Stratford Hotel, Philadelphia, Pa., on Monday, June 1. J. M. Wakeman, general manager, reported that the $200,000 required to start the Society in its permanent activities has been pledged and that the best talent available for pursuing the work of electrical development has been secured. The work will be divided into four sections: field co-operation, new development, publicity and advertising, and commercial exchange bureau. Robert N. Lee has been engaged to assist the man, not yet selected, who will manage the work in field co-operation. John P. Mallett has been engaged to investigate the present uses of electrical energy and determine how its applications can be extended. Theodore Dwight will have charge of the commercial exchange bureau. H. C. Spalding will have charge of the publicity and advertising department.

The Society has established a department in charge of L. G. Harkness-Smith for arranging and photographing on motion-picture films, scenarios illustrating the uses of electricity in the home, office, factory and farm. A window-trimming department has been organized under the direction of A. J. Edgell.

James Smieton, Jr., read his report as acting treasurer. It was decided to change the fiscal year to end April 30.

The following new members of the Board of Directors were elected to serve four years: J. E. Montague, Buffalo, N. Y.; H. B. Crouse, Syracuse, N. Y.; F. Bissell, Toledo, O.; G. M. Sanborn, Indianapolis, Ind.

A meeting of the Board of Directors followed, at which a resolution was adopted stating that the Society's efforts shall be devoted to developing the use of electrical energy by the general public, leaving the question of defining the channels through which and the methods by which the increased market shall be reached to experience and local co-operation.

The following officers were elected to serve for the ensuing year: president, Henry L. Doherty; first vice-president, W. H. Johnson; second vice-president, A. W. Burchard; third vice-president, W. E. Robertson; fourth vice-president, J. R. Crouse; fifth vice-president, Ernest Freeman; general nager, J. M. Wakeman; acting secretary-treasurer, James Smieton, Jr. The following were elected to serve as the executive committee during the ensuing year: H. L. Doherty, Ernest Freeman, A. W. Burchard, J. R. Strong, Gerard Swope, L. A. Osborne, W. E. Robertson, J. R. Crouse and W. H. Johnson, chairman.

Electrical Construction

ELECTRICAL INSTALLATION FOR CHILD'S RESTAURANT, LOUISVILLE.

By F. F. Valinoti.

This is the second installment of a report of progress in the installation of the lighting and power equipment of Child's restaurant, in Louisville, Ky. This installment covers the lighting of the basement and the entrance of the service wires.

Fig. 3 shows plan of basement. All outlets are for cord drops. In this case, as on the first floor, we tried to keep down the number of conduits, and also make the runs look as neat as possible. The ceiling is not plastered and, with the exception of the toilets, will not be. The joists in the basement run across the building, and the I-beams longitudinally. No ells were permitted on the flat work; only where we went up between the joists were we allowed to use them. The conduits were run exactly as shown on plan. The conduit marked "Up" on the north wall near service entrance carried the circuit which will feed eleven drops under the vent gallery on first floor. The conduit marked "Up" near lift goes to the top of lift shaft, and out to a bracket in alley over entrance to lift. This bracket is controlled by a switch on wall near lift. Flexible conduit was used for the three bracket-fan outlets on first floor. This was fished down the pilasters (which had been furred out) and into the outlet boxes shown, in conduit run along south wall of basement. The conduit marked "Up" on south wall in toilet room carries the circuit which feeds the outlets on the ceiling of balcony on first floor. A three-quarter-inch conduit carrying three circuits runs from the cabinet down and over in the basement as shown, and feeds the Marquise in front of building. This Marquise has receptacles (one on each corner) which are enclosed in large balls, and are controlled on one circuit. The balance, 48 in number, are wired alternately, and are controlled on two circuits.

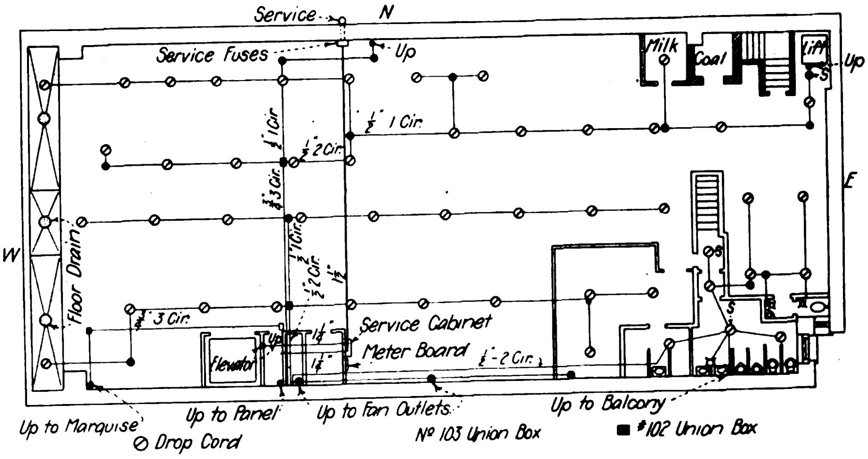
Service
N
Service Fuses
Up
Milk
Coal
Lift
Up
1/2" 1 Cir.
1" 1 Cir.
1/2" 2 Cir.
1" 3 Cir.
E
W
Floor Drain
1" 1 Cir.
1/2" 2 Cir.
1/2" 3 Cir.
Service Cabinet
Meter Board
1/2" 2 Cir.
Elevator
Up
Up to Marquise
Up to Panel
Up to Fan Outlets
Up to Balcony
⊘ Drop Cord
Nº 103 Union Box
■ #102 Union Box

Fig. 3.—Plan of Basement.

As almost the entire north wall will be used for tables, machines, etc., it was impossible for us to place our service cabinet at the point of entrance. The service wires were brought in as shown in Fig. 5, the entrance fuses being placed in an iron cabinet, as close to the ceiling as possible. From this a 1.5-inch conduit was taken across the building, up between the joists, and then down to the service cabinet, shown in Fig. 4. This conduit carries three No. 0 wires. Two main switches were placed in the cabinet, one 100-ampere, three-pole fused switch for the Childs Company, and one 60-ampere, three-pole fused switch for the upper floors. From the 100-ampere switch three No. 2 wires were taken through a 1.25-inch conduit to the distribution cabinet on first floor. From the 60-ampere switch three No. 6 wires were taken up through a 1.25-inch conduit to

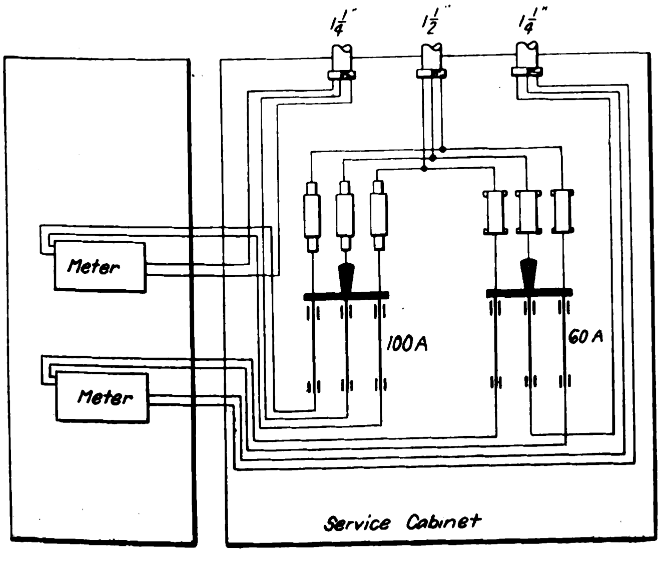
1 1/4"
1 1/2"
1 1/4"
Meter
Meter
100A
60A
Service Cabinet

Fig. 4.—Service Cabinet.

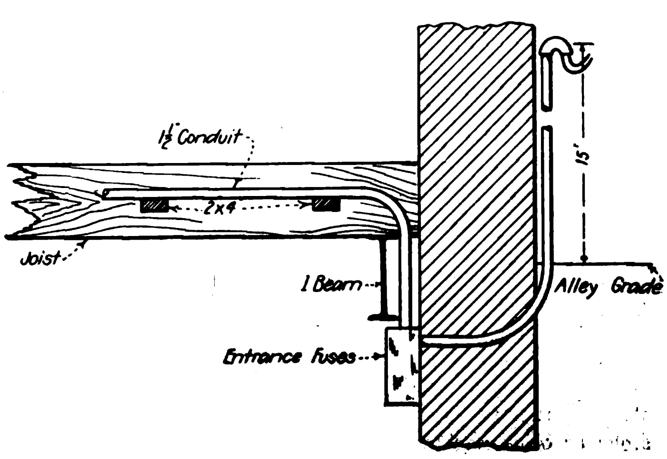
1 1/2" Conduit
2x4
Joist
I Beam
15'
Alley Grade
Entrance Fuses

Fig. 5.—Service Entrance.

the second, third and fourth floor panels. These floors will be occupied by other parties.

In the distribution cabinet, on the first floor, is mounted a three-to-two-wire Frank Idam panelboard with N. E. C. S. fused branch switches, lugs only on man bars. This panel will have a German-silver trim, which will be furnished by the W. D. Lewis Company, of New York, general contractors.

All the wire for the entire lighting installation has been pulled and connected to panel.

The drops in the basement have also been installed. They were made up of slicked braid No. 18 reinforced cord, Pass & Seymour porcelain key sockets, and No. 1172 porcelain outlet-box covers. The same was used on the drops under vent gallery on first floor, except the cord which, in this case, was white twisted-silk lamp-cord.

This completes the lighting, with the exception of the indirect fixtures and ceiling fans, which we are to hang as soon as they arrive.

We are now starting on the power wiring, which will be described in the next installment.

Meeting of the Electrical Contractors of Ohio.

An enthusiastic, aggressive and perspiring group of men, members of the Electrical Contractors' Association of Ohio, met in annual convention, May 27 and 28, in the Banquet Hall of the Hotel Euclid in Cleveland, O., to carry out what proved to be the most entertaining and instructive program yet arranged. Promptly at 10:00 a. m. on Wednesday the meeting was called to order by Past-president Partick McNerney, of Cleveland, in the absence of President Charles Aull, of Cincinnati, who was detained in Columbus at a hearing before the Utilities Commission.

George A. Rutherford, president of the Builders' Exchange, gave a welcome address in his characteristic style. Mr. Rutherford is of genial manner and pleasing personality and immediately won the hearts of his hearers, who enthusiastically cheered his remarks.

He was followed by S. E. Doane, chief engineer of the National Lamp Works of the General Electric Company, who spoke on "Observations on European Contractors, Construction and Conditions." It was a very instructive and interesting comparison of European and American conditions in the electrical field. Mr. Doane showed the advancement made in wire-making and electrical engineering, which enabled the small householder to have the benefits of electric light. He pointed out that the houses were mostly of stone or brick and that the plastering was done on the walls of the houses, and the wiring was incased in the plaster. The wire is of excellent copper and insulated with pure soft rubber, the whole being incased in a copper or brass flexible jacket, which is used in place of the two-wire circuit, the metal jacket taking the place of one wire and the peculiar installation making a continual ground on one side of the line. This arrangement, in connection with a circuit-breaker in place of a meter, enabled the central station to give a flat rate that came within the means of the poorest family. He pointed out how, in an investigation of the books of three hundred American illuminating companies, the meter service, including the billing, cost on the average from $7.50 to $15 per year, showing that a customer who bought less than $1.25 worth of energy was carried at a loss and that therefore our companies did not cater to the small consumer but rather to the larger one. His observation showed the reverse to be true in the old country and that under their system the solicitation for business after from three to five years of their plan was discontinued, for their applications for service after that time were in excess of their ability to care for them.

General discussion on the above brought out many interesting points in detail and all were agreed that they were abundantly repaid for being present. A recess and dinner found a continuation in the program by addresses by G. W. Hill, representative of the National Electrical Contractors' Association on "Uniform Accounting" and by Ernest McCleary, of Detroit, Mich., on "National Code." Both addresses were full of interest and well received.

The first day was concluded with an automobile ride through the parks and boulevards, an inspection of Nela Park and an elaborate menu at the famous Hofbrau.

With the exception of a talk by Harry C. Turnock, on "Overhead Expense," the second day was given over to business, election of officers, etc. The old officers were re-elected. An adjournment was taken at 12:30 p. m. and the invitation of the Electric League, Jovian Chapter, of Cleveland, to dinner was accepted, after which all adjourned to the Electrical Exposition, where the contractors proceeded to enjoy themselves in becoming acquainted with the show.

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The Gold Chain Mining Company's officials at Eureka, Utah, have placed an order for an electrically driven hoisting equipment for the operation of their mine, and expect to have the new machinery in working order within sixty days. The officers report that the installation of this electric hoist will effect a material reduction in the cost of operating over the present steam hoist now in use and will enable them to materially increase the output of the mine.

Meeting of Indiana Contractors.

The annual meeting of the Electrical Contractors' Association of Indiana, was held in the Palm Room of the Claypool Hotel, Indianapolis, Ind., on May 28 and 29. The meeting was called to order by President M. K. Foxworthy at 10.00 a. m. on Thursday, May 28, in a closed session with 11 members present. Following the roll call and the reports of the officers, the report of the By-Law Committee was presented by G. M. Sanborn, chairman, that of the Membership Committee, by A. L. Swanson, chairman, and that of the Finance Committee, by David Heimann, Jr., chairman. After a discussion of various miscellaneous business, the convention adjourned until 2:00 p. m.

The first paper to be presented at the afternoon session was one by J. E. Latta, of the Underwriters' Laboratories, on the subject, "Underwriters' Attitude." Mr. Latta called attention to the fact that although both the Underwriters' Laboratories and the various underwriters' bureaus have as their primary object the reduction of fire hazard, the Laboratories merely conduct tests and approve devices in accordance with the rules formulated by the National Fire Protection Association, while the various underwriters' bureaus are either rate-making or inspection bureaus. Mentioning the National Electrical Code, Mr. Latta said that the same is revised every two years by the Electrical Committee of the National Fire Protection Association sitting for that purpose in New York City. Before any changes in the Code are adopted, the meeting is opened to all that are interested in its revision, thus giving electrical contractors and other interests a voice in the making of the Code. All legimate contractors should consider it their duty, therefore, to see that the Code is promulgated into the smaller towns. Mr. Latta then showed a sample of a poor grade of old-code wire, which was found on sale in the Middle West. Showing, the poor quality of the insulation, he appealed to the members of the Association to aid the Laboratories in its efforts to abolish the use and the sale of this wire in the small towns of Indiana. In conclusion, Mr. Latta said that the Underwriters' Laboratories aim to lead and serve, rather than to force and drive.

A. L. Swanson, of Evansville, Ind., then asked Mr. Latta to explain how the Underwriters' Laboratories obtained its revenue. In reply, Mr. Latta, said that the Laboratories is incorporated under the laws of Illinois, there being a provision in its charter that prohibits the making of a profit. The buildings have been donated to the

Laboratories by insurance and other interests, while the expense of conducting the Laboratories' work is defrayed by the fees charged for testing and label service. In the case of the label service, the difference between the revenue derived from the labels and the actual expense of the service, is adjusted yearly between the Laboratories and the various manufacturers.

Others entering into the discussion were G. W. Hill, G. M. Sanborn, and D. Heimann, Jr.

C. C. Perry, of the Indianapolis Light & Heat Company, then talked informally on the attitude of central stations towards electrical contractors. He stated that the Indianapolis Light & Heat Company realized in about 1890, that the electrical contracting business was not a proper field for its activities. The company has, therefore, given the electrical contractor its hearty co-operation.

G. M. Sanborn verified Mr. Perry's remarks and stated that the company is expected to soon agree to discontinue selling lamps and motors.

A. J. Douglas, of the Merchants Heat & Light Company, of Indianapolis, then made a few remarks on the co-operation existing between that company and the electrical contractors of Indianapolis.

C. E. Roberts, of the Western Electric Company, made a few remarks on the subject of co-operation between manufacturers and contractors.

H. A. Roberson, of the Electric Service Company, of Evansville, talked on the subject of confidence in electrical contracting. Mr. Roberson stated that every contractor should have confidence in himself and in his fellow contractors, refusing to accept as true stories that may be circulated about legitimate competitors.

M. D. Cooper, of the National Lamp Works, Cleveland, O., then presented a paper entitled "The Electrical Contractor and Lighting Service." Considering first the importance of operating incandescent lamps at the voltages specified on the labels, he slowly led up to the subject of voltage drop, showing that the contractor loses in an installation where the drop is excessive because of the decreased amount of copper used, that the owner of the installation loses because of the uneconomical operation of lamps and heating devices, and that the central station loses because of the decreased wattage consumption. His paper concluded with a number of tables showing actual and average voltage drops for industrial, residence and commercial service, and a table giving the relation between size and length of wire and voltage drop. He also called attention to the importance of operating heating devices and the higher-wattage lamps at proper voltages.

The meeting was then thrown open to miscellaneous discussions. W. I. Stone of the Indiana, Inspection Bureau told of the efforts being made to abolish old code wire, the inspection bureau having the matter well underway, but requiring the co-operation of contractors and central stations. Much can be accomplished in this direction, he said, if central stations will refuse to supply power to installations wired with old-code wire.

D. Heimann, Jr., of Evansville, then made a few remarks about wiring practices in Evansville emphasizing the need for a city ordinance licensing electricians and contractors and requesting information regarding such ordinances in other cities.

G. W. Hill, special representative of the National Association of Electrical Contractors said that many cities had such ordinances, and that the National Association would aid and advise the contractors of any city or town in the enactment of wiring ordinances and ordinances covering the licensing of those engaged in electric-wiring and contracting business.

Friday's Sessions.

The morning session on Friday, May 29, was a closed session in which various miscellaneous business was discussed. At this session Ernest Freeman, of Chicago, Ill., president of the National Association, delivered a very interesting paper entitled, "Suggestions to State Associations." His first suggestion called attention to the advantages to be derived by holding frequent meetings and by co-operating and exchanging ideas. Mr. Freeman stated that he attributed much of his success to the state and national contractors' associations, saying that one can easily derive a return of five to one for every dollar invested in such associations. His next suggestion was that of improving one's credit. Much larger and more successful business can be conducted if a contractor improves his credit. To improve one's credit, Mr. Freeman said, that one should first make himself worthy of obtaining credit and second that he should conduct his business along modern standards. State organizations, he said, can do much in the way of improving credit conditions. His next suggestion was that state associations assume the duty of obtaining license laws in various municipalities. His fourth suggestion was that state associations put forth efforts to obtain uniform and reasonable liability-insurance rates. Mr. Freeman suggested that a special representative be employed for this purpose, his compensation being fully covered by the decrease in liability rates that he is able to perfect. This representative, he stated, could also be employed in educational work. His fifth suggestion recommended that state associations appoint supply committees whose object should be to forbid supply dealers and contractors from selling small quantities of wiring devices at almost wholesale prices. Mr. Freeman's last suggestion was on the subject of co-operation. In this connection he recommended that state associations and individual contractors co-operate with central stations in a very extensive manner.

George W. Hill, special representative of the National Association, told of the educational work that is being done by the National Association. He advocated the adoption of the National Electrical Conractors' Association's booking keeping system by all contractors. The Universal Sales and Data Book, he said, should prove of immense value to all, and its use ought to become national. In concluding his address, he emphasized the value of membership in the National Association.

The report of the Legislative Committee was also presented at this session. This report, which was adopted, recommended that efforts be made to obtain local laws governing the licensing of contractors, before atempting to obtain a state law.

At this session the present officers, namely: President M. K. Foxworthy, of Indianapolis; Vice-President, A. L. Swanson, of Evansville; Secretary, G. L. Skillman, of Indianapolis; and Treasurer, F. L. Meier, of Indianapolis, were re-elected to their respective positions.

The afternoon session opened with an address by H. H. Cudmore, of Cleveland, O., his subject being "The Society for Electrical Development." Mr. Cudmore stated that the working organization of the Society had been perfected. The board of directors includes four electrical contractors one of whom is Ernest Freeman, president of the National Electrical Contractors' Association, four electrical jobbers, four electrical manufacturers, and four members at large. There are now about 1,400 members in this society, of which Mr. Cudmore estimates about 500 are electrical contractors. The society is co-operating with national, state and local electrical societies and aims to have a representative at every electrical convention. Mr. Cudmore stated that the Society's plans may be grouped under four headings, namely, (1) Field Co-operation, (2) New Development, (3) Commercial Exchange Bureau, and (4) Editorial and Advertising. The editorial and advertising features of the Society's work, he said, should prove of great value to the contractor in that this department will provide advertising copy service, plans for window trimming and will educate the public in the use of electrical devices and their conveniences by means of well-written magazine stories and numerous motion-picture films.

E. Freeman, of Chicago and G. L. Skillman, of Indianapolis made a few remarks in which they called attention to the co-operation afforded by membership in this society.

The next paper was by T. A. Wynne, of Indianapolis, on the subject, "Jovianism." In the absence of Mr. Wynne, the secretary, G. L. Skillman, read the paper. Mr. Wynne's paper called attention to the advantages that can be derived by including in its membership men who are not directly interested in the electrical business. Such co-operation, Mr. Wynne holds, will do much to educate the general public in electrical matters. Co-operation between public utilities and the Jovians was strongly urged as being of benefit to both parties, as is shown by the co-operation and good will existing between these parties in Toledo, O.

H. H. Madgsick, of the National Lamps Works, Cleveland, O., then delivered a short address on the development of tungsten-filament lamps. The two recent developments of concentrated filaments and gas-filled lamps were considered. He called attention to the adaptability of the spiral filament to tube lighting, searchlight and projection lanterns, and to miniature lamps. The gas-filled lamps, he said, are well adapted for flood lighting, display lighting, and photographic work. Another important development, he said, was that of the prismatic reflecting globe which enables the light to be concentrated in desired regions. Considering, the theoretical details of the lamps, he showed that there was no upper limit of candlepower for these lamps, but that small high-voltage units are deemed impossible under the present conditions.

G. M. Sanborn, of Indianapolis, then gave a short talk on pitfalls in estimating a contract. Every successful contractor, he said, aims to estimate not on all work, but only on such work as he believes will benefit him and his business. A knowledge of when not to estimate, he deems of equal importance to a knowledge of when to estimate. He believes that it will pay every contractor to make a careful analysis of every contract before estimating and not after being awarded the contract. He also emphasized the necessity of keeping account of labor expenses. Experience is all that is necessary to permit a contractor to make an intelligent estimate on labor expense, and the sooner one obtains that experience by proper methods of cost keeping, the sooner he will be able to estimate his labor expense quite intelligently.

G. E. Varney, of the Varney Electric Supply Company, Indianapolis, made the concluding address. Mr. Varney stated that the electrical jobber of today is more a distributer and service man than a jobber, in that he conducts both a wholesale and retail business. He emphasized the necessity of every field of the electrical industry maintaining its identity and refusing to encroach on other fields. A jobber, he said, should not engage in a contracting business and a manufacturer should not engage in a jobbing business. The jobber is the proper middleman between the manufacturer and the contractor, and for this reason the contractor should support the jobber. Mr. Varney regrets the fact that many jobbers seek to do business in other towns than their own. Such methods he said can do no one any good.

In the evening the members of the association and their guests were the guests of the Indianapolis Electric Club at a boxing bout at the Federal League Park.

The following were present at the convention: F. H. Cheyne, C. A. Evans, M. K. Foxworthy, T. B. Hatfield, D. Heimann, Jr., F. L. Meier, B. H. Reid, G. M. Sanborn, R. Sieffert, G. L. Skillman, and A. L. Swanson.

Among the Contractors.

Russell H. Eddy, of St. Paul, Minn., recently secured a contract of the kind that is good to the heart of the eletrical contractor. It was for wiring a high-class residence, and the owner specified that Mr. Eddy was to do the work, subject to the supervision of the architect. The plans include underground feeds to the house and to the garage, with conduit used throughout. A very complete system of lighting is provided for, including gate posterns. There are also burglar alarms, telephones and bells. The garage is to be equipped for charging an electric vehicle. Outlets will be provided for a washing machine, vacuum cleaner, flatirons, fans, electric table devices, and bed blankets on the sleeping porch. One feature of the burglar-alarm system will be four 100-watt lamps under the eaves, so that the yard will be lighted on all sides of the house when the alarm is set off. This is one of four houses which Mr. Eddy has secured this season on Summit Avenue, one of the fashionable 'residence streets of St. Paul.

The Terrell-Hedges Company, of Chattanooga, Tenn., is installing the apparatus for the electrical control and operation of the gates at Hale's Bar lock on the Tennessee River, where the big hydroelectric power plant has been in operation for some time. The contract was let to the Terrell-Hedges Company several weeks ago by the Government.

Bailey & Reynolds, of Kansas City, Mo., were liberal advertisers in special editions of Topeka papers issued in connection with the dedication of the new G. A. R. Memorial Hall at the Kansas capital. The Kansas City concern provided and installed the electrical fixtures in the $50,000 structure.

The Des Moines Electric Contracting Company, of Des Moines, Iowa, has completed the installation of a 150-horsepower, three-phase motor for the Des Moines Clay Manufacturing Company to be used in the new addition to its brick-making plant. Another recent installation was that in the Des Moines Saw Mill, which included nine motors, varying in size from 1 to 50 horsepower.

LETTER TO THE EDITOR.

Percentage System in Electrical Contracting.

To the Editor:

While it is extremely doubtful that the percentage system will ever entirely replace the present method of hard-and-fast estimating for work, at the same time, speaking from experience, in certain cases and under well defined conditions, it has undoubtedly much to recommend it. A *sine qua non* is, however, the confidence of the customer, without which many irritating points will come up for discussion, more or less heated, at the final adjustment of the account.

If a clear understanding can be arrived at, at the beginning, as to the fundamental charges, material, labor and sundries, plus an agreed profit, including overhead charges and supervision, there is no reason why the transaction should not be mutually satisfactory.

No reasonable customer, and it is a wise policy to assume that all customers are reasonable, or will be, if handled judiciously, will expect to participate in any special discounts for cash payments, etc., made by the contractor.

Nothing is more calculated to impress a potential client who is approached with a view of securing an order on the percentage plan, than a frank statement that the contractor is willing to have the items making up the cost audited and to produce all vouchers called for.

H. BELL

Englewood, N. J., May 25, 1914.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President,
59 Deerfield Street, Hartford, Conn.
H. S. WYNKOOF, Vice-President,
13 Park Row, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer,
Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association,
11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Engle, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.

MEMBERS AT LARGE:
George L. Collison
Frank R. Daniel
James H. Fenton
F. G. Hartwell
J. E. Latta
James B. McCarthy
Thomas D. McColl
C. W. Mitchell
A. A. Moffitt
R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The secretary is pleased to announce that the full vote of the Executive Committee has been cast in favor of the admission of the California Association of Electrical Inspectors, as a section of the National Association. The new section has as secretary John W Carrell, 55 Fulton Street, San Francisco and our present member, C. W. Mitchell, as its president. These two gentlemen have been chosen to represent the section upon the Executive Committee. The section starts off with 19 members, of whom one was already with us.

The Secretary regrets to announce that Executive Committee Member Thomas D. MacColl has retired from the position of inside inspector of Toledo, O. The city loses so far as the Secretary can judge from his relations with Mr. MacColl, a very efficient and highly trained officer. Since the Secretary assumed this office, Mr. MacColl has never failed in answering the question bulletins, and the Secretary thinks the other members of the Committee will agree that his answers have been invariably characterized by a very accurate conception of the meaning and application of the Code as regards both its letter and its spirit. The Secretary is pleased to say that for the present Mr. MacColl under our constitution can, and he trusts will, remain on the Executive Committee, and feels confident that he will prove in the future, as in the past, one of its most valuable and conscientious members. Mr. MacColl's future address is Walova Road, Wildwood, Toledo, O.

The Secretary particularly requests that the members report to him any cases which come to their attention where old-code wire is detected with all the facts of the case in detail. In certain sections it is unquestionably being used to some extent. The Laboratories will supply any inspector with tags on request, and the Secretary urges all members to utilize this service for the testing of doubtful wire, remembering to use particular care to get as complete data as possible and all tags, labels, etc., that come or are found with the wire in question. Remember too that the forwarding of *good* wire with labels, etc., is equally of value.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Alternating-Current Bell-Transformer Wiring.

Question 261. In installing bell wiring where the bells are operated from an alternating-current 110 to 12-volt transformer, how does the secondary wiring have to be run, and what type of insulation should be used on the wire?

Answer 1 (U). When an approved transformer is used, ordinary bell construction may be employed.

Answer 2 (W). Rule 85*n* does not state.

Answer 3 (A). Wires should be damp proof and be run the same as in case of battery work.

Answer 4 (H). Rule 85 would seem to indicate that the secondary wiring must be run, must have the same insulation as fixture wires (1/64-rubber) and that it must be run with the same care as required for wires of higher potential.

Answer 5 (P). If an approved two-coil bell-ringing transformer is employed, I see no reason for requiring anything other than bell-wiring construction for the secondary. With an autotransformer the wiring should conform to the requirements of class *C*.

Answer 6 (O). If an approved bell-ringing transformer is used, the primary must be installed according to the rules for eletric-light wires. The secondary is an entirely separate and distinct circuit not connected with the primary and may be installed in any desirable manner.

Answer 7 (E). I do not understand that this point has been considered by the Code.

Answer 8 (Q). According to the 1913 edition of the Code, bell wiring connected to any transforming device, machine or combination of machines which develops a difference of potential between any two wires of over 12 volts, should be wired in accordance with the rules covering lighting circuits and the same class of insulation should be used.

Answer 9 (T). The Code has no restrictions, it relies on the efficiency of approved-type bell-ringing-transformer insulation.

Answer 10 (J). The manner of running and insulating secondary wires when supplied from an approved bell-ringing transformer is not specified by the Code except as indicated by sections 85*n* to *p*. The secondary wiring need not be installed and insulated according to class *C* rules if the transformer is one approved for bell-ringing service. The specifications for construction of bell-ringing transformers are given in section 81*d* of the Code.

Answer 11 (D). No type of insulation and no requirements for installation of bell wires supplied from transformers are specified by the Code.

Answer 12 (S). If transformer is of an approved type, as called for in rule 81*d* any kind of wire or type of insulation may be used.

Answer 13 (F). Class *C* wiring.

Answer 14 (M). The requirements will be found under rule 85*n* to *p*.

Answer 15 (N). The wiring of the primary must be in accordance with class *C* rules, but the secondary is not specified as to cover of wire except where they are bunched together in a vertical run rule 85*o*. I have known one case where a well made autotransformer was planned for. Here I demanded straight class *C* wiring in consequence of which a two-coil transformer was substituted.

Answer 16 (L). If the transformer is constructed according to rule 81*d*, item 3, second paragraph, the only rule that may be construed as bearing on the matter is rule 85*n* and the fine-print note apparently permitting any type of insulation to be used.

Answer 17 (Y). The wiring on the primary side must be in accordance with the requirements of class *C*. On the secondary side ordinary bell wiring may be used.

Answer 18 (B). As may be seen by referring to rule 85, section *p*, provision is made that where transformers or other devices for supplying current for signalling systems from light, heat or power circuits are used, they must be of a design expressly approved for this purpose. The primary wiring must be installed in accordance with the rules for class *C* which relates to low-potential systems, light, heat or power, and secondary wiring in accordance with class *E* which relates specifically to signalling systems.

Direct-Current Bell-Transformer Wiring.

Question 262. In case of the so-called direct-current transformer, that is, a potentiometer wire where a high resistance of sufficient carrying capacity is extended across the mains and the reduction in voltage made by looping the bell circuit around a suitable fraction of the whole resistance, what insulation is required on the bell wiring?

Answer 1 (U). If the so-called direct-current transformer is approved, I know of no rule covering the wiring.

Answer 2 (W). Rule 85*n* does not state.

Answer 3 (A). Wiring should be the same as low-potential system, that is No. 14 rubber-covered throughout.

Answer 4 (H). The insulation required for fixture wire would seem to be sufficient.

Answer 5 (P). In this territory we are opposed to direct-current transformers employing the potentiometer principle, and would approve same only if the secondary were of class *C* construction throughout.

Answer 6 (O). No device as described is listed as approved, therefore its use would not be considered under any circumstances. The bell circuit, however, is the same as the 110-volt lighting circuit and should not be considered as a safe installation, unless wired in full accordance with rules of class *C*.

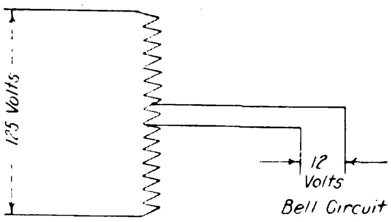

Diagram of Connections for Question 262.

Answer 7 (E). I am unable to find that this subject has ever been determined by the Code.

Answer 8 (Q). My reply would be the same as to the previous question, adding that we do not encourage the use of this system.

Answer 9 (T). If this device is ever approved, the secondary wiring should be installed in accordance with class *C*.

Answer 10 (J). Bell wiring supplied in this manner or electrically connected in any way with the 110-volt circuit, must be constructed and installed in all respects according to the regular class *C* rules. The pressure between the bell wiring and ground is the same as between the electric-light wiring and ground, and danger arising from leakage to earth is as great in the one case as in the other. The reduced voltage would lessen the danger of short-circuits between the bell wires themselves but that is all.

Answer 11 (D). There are no provisions in the Code covering this class of construction.

Answer 12 (S). This direct-current transformer is not in the same class as the alternating-current transformer which is aproved under rule 81*d*. See rule 85*h* and *l*.

Answer 13 (F). Class *C*.

Answer 14 (M). This system would not be approved.

Answer 15 (N). This is not specifically referred to in the Code. I would approve it under the following conditions:

(1) One terminal of the bell circuit should co-incide with one terminal of the appliance for the 110-volt lines, and this terminal should be connected to the neutral of the direct-current circuit if there be one.

(2) If there be no neutral, the bell circuit taps should be equally distant from the two 110-volt terminals, and the device should be so fitted as to make this change possible.

(3) All bells and fittings should be made so as to withstand satisfactorily 110 volts in case of accidental contact.

(4) The bell circuit should be fitted with a positive-action current-limiting device which can not be overset.

(5) All wiring throughout and all fittings should be of type and construction in accordance with class *C* work.

(6) As there is no such device on the approved list, any such device it was desired to use would have to be submitted to this department for test and approval.

Answer 16 (L). If the potential-reducing device is not constructed with a positively acting, current-limiting device, the attached wiring should be subject to rule 85*h*.

Answer 17 (Y). The wiring must be in accordance with the requirements of class *C*.

Answer 18 (B). In this case, as there is always a possibility resulting from grounded condition of the so-called bell wiring to permit of an excessive voltage on the bell circuit, wiring should be installed under rules for class *C*, or so-called low-potential wiring.

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It is reported that ground has been broken at Floodwood, O., in the heart of the Hocking Valley coal field, for the central power station of the Ohio Electric Power Company, and initial units will be in operation by fall

Public Service Commissions

DECISION OF THE SUPREME COURT OF MICHIGAN CONCERNING THE VALIDITY OF THE "DAY TO DAY PERMIT" UNDER THE CONSTITUTIONAL LIMITATION TO THE TERM FRANCHISE.

The Michigan Supreme Court has rendered a decision sustaining the validity of the permit or franchise agreement between the City of Detroit and the Detroit United Railway Company in the case of Peck v. Detroit United Railway (146 N. W. 977). Certain property owners filed a bill of complaint to restrain the company from constructing a line in compliance with the terms of the franchise granted to it.

The permit granted the company by the City of Detroit did not fix a term limit for the expiration of the contract but provided that it be revocable at any time at the pleasure of the city. The complainants in this case contended that such a permit was invalid under Article 8, Section 29 of the Michigan Constitution adopted in 1908 which provides that no franchise or license shall be granted by any municipality "for a longer period than thirty years."

The indeterminate-permit provision adopted in the public-utilities law of Wisconsin and Indiana provides for the issuing of indeterminate permits which are exactly comparable with the franchise here involved in that the grant to the utility does not terminate at the expiration of a definite period but is revocable at any time at the will of the municipality upon proper compliance with the provisions of the law for the taking over of the property of the utility by the municipality.

In a number of states special laws or constitutional provisions limit the term of contract from 25 to 50 years and the question has been raised as to whether indeterminate permits can be used in such states without the revocation of the law or the passing of a constitutional amendment. A similar contention has been raised as a hindrance to the general adoption of the indeterminate-permit provision in public utility laws such as have been adopted in the laws of Wisconsin and Indiana. The decision of the Michigan Supreme Court, however, holds that, inasmuch as the franchise may be revoked at any time, it is not a term franchise and therefore is not in violation of such constitutional provisions. The decision of the Supreme Court reads, in part, as follows:

"It is the complainants' contention that under section 29, article 8, of the Constitution, the grant in question is invalid, because it contains no maximum term limit beyond which it cannot run, although the right of revocation is reserved to the grantor. What is the grant in question? The most that can be claimed for it is that it is a revocable right. It is immaterial whether it is termed a grant, license, franchise, or permit. Its important feature in this discussion is that whatever it is termed, it is revocable at the will of the city, whenever the public interest requires its termination. By its terms this is to be determined by the common council or the people of the city of Detroit, at their pleasure or caprice. The resolution clearly provides that no term right shall be acquired by the railway company because of the acceptance of the grant by it, and by virtue of the provisions of said section 29, article 8, of the Constitution, which is a clear limitation on the power to grant franchises or licenses, this grant of power could not extend beyond the period of 30 years fixed by the section, even if it should not be revoked by the granting power before the expiration of that time. In the absence of a time limitation in the grant, it must be assumed that it cannot extend beyond the term fixed by the Constitution. (Boise Water Co. v. Boise City, 230 U. S. 84, 33 Sup. Ct. 997, 57 L. Ed. 1400.) Not being a grant for a longer period than 30 years, which is prohibited by the Constitution, and, complying with section 25 of article 8 in that it is 'subject to revocation at the will of the city,' we are clearly of the opinion that the resolution making the grant was not in violation of any constitutional prohibition. * * *"

It is provided in the Indiana law (Section 254, of the Towns and Cities Act of 1905) that "No such contract shall be entered into by any city or town for furnishing such city or town, or its inhabitants, with water, motive power, heat or light, upon or along the streets of such city or town, for a term longer than twenty-five years." This provision of the law is quoted in the decision of the Indiana Public Service Commission, City of Gary v. Gary Interurban Railroad Company, and the Commission makes the following statement:

"In Hester et al. vs. Town of Greenwood et al., 172 Ind. 279, the Supreme Court of this State held that this section did not prohibit a town from granting a franchise for more than twenty-five years. When construed with other acts, the evident meaning of section 254, so far as the term of the franchise is concerned, is that twenty-five years is fixed as the limit concerning the terms and conditions upon which the franchise is granted, and not to the franchise itself."

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CALIFORNIA.

Security Issues of Electric Companies. The San Joaquin Light & Power Corporation was authorized to issue $3,051,000 of five-per-cent bonds and the San Joaquin Light & Power Company was authorized to issue $129,000 of five-per-cent bonds. The proceeds are to be used for the purpose of retiring outstanding underlying bonds.

ILLINOIS.

Certificate of Public Convenience and Necessity. The Champaign County Electric Company was granted authority to construct and operate a plant and equipment for furnishing electricity for light, heat and power purposes in Thomasboro and adjacent territory.

MASSACHUSETTS.

Demonstration of Difficulties of Telephone Service. A switchboard with full equipment has been installed in the office of William H. O'Brien, chief of the telephone division of the Public Service Commission to enable the Commission to become acquainted with the operation of the telephone system by practical demonstration. This equipment is also to be used for demonstrations to the public. A subscriber having cause for complaint may ask for a demonstration in the office of the Commission so that he may understand the nature of the defect of which he is complaining, the reasonableness or unreasonableness of its continuance, and the prospects of a remedy. It is hoped that in this manner a better understanding between the telephone subscribers and the companies will be secured so that a company will not receive undeserved blame when considerable time is required in correcting service conditions, and on the other hand, so that subscribers will know when a matter can be quickly corrected and hold the company properly responsible for satisfying the complaint without unnecessary delay.

Bond Issue to Supply Working Capital. The Public Service Commission approved an issue of $1,000,000 of Boston Elevated 30-year bonds, to bear interest at a rate not exceeding five per cent. The proceeds of the issue are to supply working capital. A law of 1909 provided for the issue of bonds for this purpose.

NEW JERSEY.

"Seven Sisters Law." The State Supreme Court handed down a decision upholding the Board of Public Utility Commissioners in refusing to permit the American Malt Corporation and the American Malting Company to merge under the "Seven Sisters" anti-trust law. As stated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of May 23, the appeal to the Court contended that the Board did not have the right to exercise discretionary power in withholding approval of the proposed merger. The court finds that the merger would involve the issue of capital stock for less than its par value and that it would be unfair to the preferred stockholders of the malting company.

NEW YORK.

Extensions of Gas Mains. The Public Service Commission, Second District, issued an order, May 27, requiring the Buffalo Gas Company to make certain extensions of its gas mains. This matter has been before the Commission several times during the past year, and the order requiring extensions was withheld until the city of Buffalo had made settlement of its gas bill owing to the company. Now the settlement has been made, the extensions will be provided promptly.

PENNSYLVANIA.

Filing Rate Schedules. The time for filing rate schedules with the Commission has been extended to July 1. The schedules filed are to be those in effect January 1 and any changes since that date are to be filed as a separate supplement. The schedules may be submitted in typewritten form.

Uniform Accounts. Conferences are being held between those in charge of the divisions of accounting and of tariffs and rates for the Public Service Commission, and representatives of the electric, water and other public utility companies, with the exception of steam railroads and trolley lines, for the purpose of securing uniformity in the company reports required by the Commission.

WISCONSIN.

Security Issues of Telephone Companies. To the Watertown Telephone Company authority was granted to issue $150 of stock to replace a like amount of stock issued in ignorance of the stock and bond provisions of the Public Utilities Law. The Commission found that the proceeds of the sale of the void stock had been used in the manner prescribed by law.

The Oneida Farmers' Telephone Company was authorized to issue $4,000 of stock the proceeds to be used for the construction of a telephone line and system in the town of Cassian, Oneida County.

The application of the New Lisbon Mutual Telephone Company to issue $5,000 of notes was granted. The notes are to be of denomination of $500 and are to be sold at not less than 75 per cent of their par value. The proceeds are to be used in the purchase from the Juneau Electric Company of specified telephone properties. These properties had been valued by the Commission's engineers for the purpose of this proceeding.

The West Wisconsin Telephone Company was granted authority to issue $725 of capital stock the proceeds from the sale of which were to be used in paying indebtednesses incurred in the construction of lines and in extensions to existing lines.

Authority to issue $4,000 of stock was granted the Boyceville Telephone Company. The applicant is to use $2,500 of this issue in securing the properties of the Knapp Telephone Company in Boyceville. The Commission's engineers made an appraisal of this property. The additional $1,500 of stock is to be used in improving and extending the lines of the company.

Legal Notes

Occupational Disease Covered by Workmen's Compensation Act.

While few concerns in electrical lines are directly affected, a recent decision of one of the judges in Cincinnati on a phase of the workmen's compensation act is of interest to all manufacturers. It was held in this case that occupational diseases are within the meaning of the law providing compensation for personal injuries sustained in the course of employment, and that a workman employed by the Eagle White Lead Company, who had contracted lead poisoning was therefore entitled to compensation, which had been refused him by the Ohio Industrial Commission. This is the second decision on the point, but the first in which the Commission has been sued directly by an employee. The matter will undoubtedly be carried to the Supreme Court for a final review, in order that the point may be settled.

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Utah Special-Lighting Law Declared Defective.

City Attorney Harper J. Dinniny has made a report to the City Commission of Salt Lake City, Utah, declaring that the special-lighting-improvement law passed by the Utah Legislature in 1913, permitting cities to create special lighting districts and assess the cost of installing and maintaining special street lighting against property owners is impractical, if not impossible in these provisions, and pointed out numerous defects therein.

He reports that it is not in line with other state laws referring to public improvements, and recommends that no action be taken to make the provisions of this law effective in Salt Lake City until it can be amended so as to harmonize it with the present statutes pertaining to special assessments.

The law was passed by the Legislature so as to give the property owners in the business and residential districts an opportunity to improve their districts by installing special ornamental lighting therein, and to divide the cost of these installations equitably between the various property owners benefited.

Several of the city's most progressive business men who were instrumental in having the 1913 law passed are arranging to have such amendments made as will be needed to make the law effective.

New Electrical and Mechanical Appliances

The Union Carboy Inclinator.

The increasing use of nitric, hydrochloric, sulphuric and other acids in industrial establishments has called for some means of safely and economically handling the carboys in which these acids are usually shipped. Since a carboy when full may weigh above 200 pounds, it is an unwieldy thing to handle, particularly when it is remembered that it is filled with corrosive acid or other chemical. To drain the acid from one of these carboys usually has required two men, and even then there has been much spilling of acid, burning of clothes and hands, and occasionally breaking of carboys.

These difficulties have been overcome by a device known as the Union carboy inclinator, which is illustrated herewith. The base and uprights, which are assembled together, and the hanger arms for the box are made of strong, clear maple. The box is made of clear spruce lumber and is suspended by three-quarter-inch hanger bolts. At the front of the box is a hinged drop gate, which in Fig. 1 can be seen resting firmly on the base. This serves to take the impact when the heavy carboy is placed in the box. A safety key, shown at the right, protects the box from swinging.

When the carboy has been placed in the box, the gate is swung upwards, as shown in Fig. 2, and clasped by slotted spring steel fasteners, which hold it securely in place. At the back of the box is an adjustable steel clamp rod with broadened head which is brought down above the upper rear edge of the carboy. This clamp rod is adjustable through a vertical range of eight inches and its curved head extends inward five inches so as to permit engaging the top of carboys of any size. The clamp arrangement for this rod is shown in Fig. 2. By means of a lever bar the rod can be instantly adjusted and when forced down the bar is retained by a spur which engages a saw-tooth plate secured to the rear wall. This firmly holds the clamp rod in position and, as shown in Fig. 3, the rod keeps the carboy in place when the outfit is tilted.

In order to incline the carboy the safety key at the right is withdrawn. The center of gravity is so adjusted that even then the carboy is well balanced. It requires little effort, however, to tilt the carboy and permit withdrawing any quantity of the liquid. One man can easily do this, even to draining out the very last of the acid. All metal parts of the outfit are heavily painted. The entire equipment is shipped in knock-down condition, so as to make a compact crate.

The Union carboy indicator is manufactured by Horace M. McCord & Company, Lumber Exchange Building, Minneapolis, Minn.

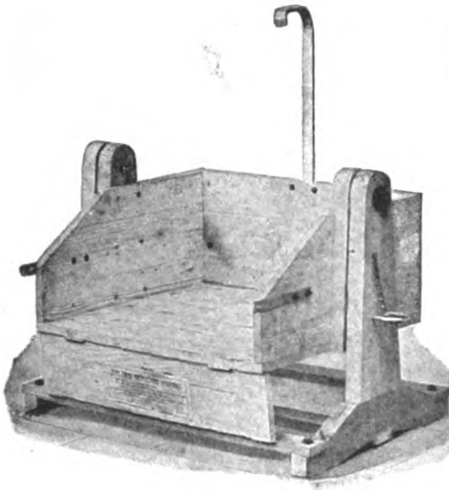
Fig. 1.—Union Carboy Inclinator.

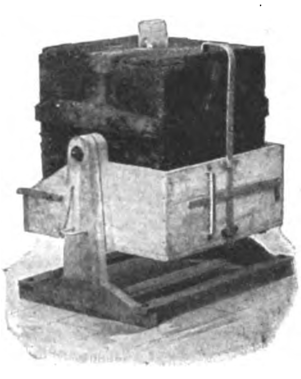
Fig. 2.—Rear View.

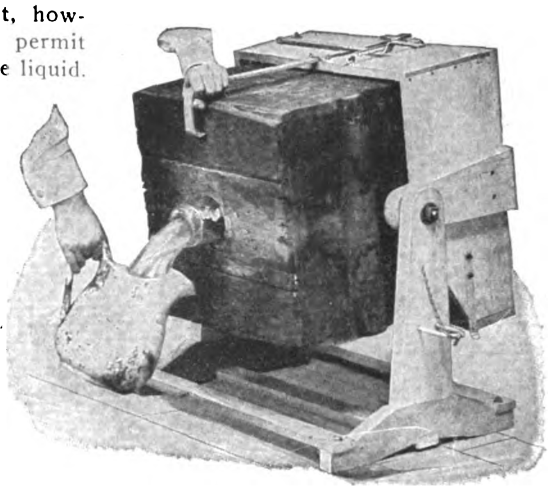
Fig. 3.—Tilting Carboy Easily.

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Watt-Hour Demand Meters.

For many years electric energy was sold altogether at a rate of so many cents per kilowatt-hour used, the rate depending only on the quantity. Recent years have seen a very decided change in this method of selling and other factors are now given due consideration. The most important of these is the rate of consumption called for, or the demand. There has, therefore, arisen a need for a watt-hour meter to measure this value.

Such a demand meter, known as the type RO, has been recently placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It meets the growing need on the part of central stations for a meter to determine by a simple reading the maximum demand of an installation. The new instrument is a single meter that records without the use of a clock mechanism both the kilowatt-hours consumed and the maximum kilowatt demand.

Because it fulfills both these purposes it is an ideal meter for determining maximum demand and load-factor as a basis for rates, as well as the diversity-factor of the station. It provides precisely the readings needed on systems that base their charges on maximum demand and power delivered; both readings can be taken monthly. The meter records the maximum demand of the connected load, but not the time at which the maximum occurs.

The watt-hour demand meter is installed in the same manner as an ordinary watt-hour meter and requires no additional apparatus or wiring. The maximum demand is indicated by a pointer sweeping over a four-inch dial, and the watt-hour load is recorded as usual on a four-dial counter.

The instrument has no clock, contacts, or other delicate parts that are likely to require attention, and the mechanism is so simple that maintenance costs are but little more than those of watt-hour meters. In one form of the instrument the cover is entirely of glass; in another, a glass window is provided for the dial, as shown in the illustration.

The meter is a combination of an induction watt-hour meter, an induction wattmeter, and an escapement form of time element. The instrument has a standard Westinghouse electric type OA watt-hour meter movement, including electromagnet, permanent magnet and aluminum disk. In addition, it has an auxiliary disk sector supported on a jewel-and-ball bearing so that it can move in the air gap of the electromagnet, in such a way that it does not interfere with the accuracy of the main disk, which always rotates at a speed proportional to the load. The rotation of the auxiliary disk is restrained by a spiral spring, making its final deflection proportional to the watts load. The auxiliary disk and its spring and pointer constitute an indicating wattmeter.

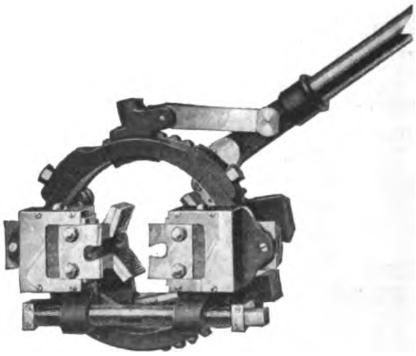
Combined Watt-Hour and Demand Meter.

The shaft of the auxiliary disk is geared to an escapement wheel, and the claw restricting this wheel is oscillated by an eccentric on the main shaft. The auxiliary disk therefore advances step by step at a speed determined by the speed of the main watt-hour meter disk, that is, at a speed proportional to the load. It continues to advance until the spring tension balances the torque produced in the auxiliary disk. The demand mechanism is then in equilibrium and the pointer indicates the watts.

As the total deflection and the rate of deflection of the auxiliary disk vary in direct proportion, the time required to reach the maximum position when any constant load is passed through the instrument is a constant. For example, if a load of 500 watts is applied to a five-ampere, 100-volt meter with 15-minute time element, the demand mechanism will reach equilibrium at the 500-watt point in 15 minute. If, instead, a load of 1,000 watts is applied to the meter, the demand mechanism will have to move twice as far, to the 1,000-watt point, to reach equilibrium; but the double load will move the watt-hour disk twice as fast, causing the escapement to allow the demand disk to move twice as fast, and it will cover the double arc in the same time.

A mathematical analysis of the instrument shows that the deflection for any varying load that does not continue long enough for the instrument to reach equilibrium is equal to the average load during the interval.

The auxiliary disk drives the demand pointer through a dog, and a fine-toothed ratchet and pawl holds the demand pointer in the position of a maximum deflection, until released by hand. A second ratchet and pawl allows the auxiliary disk to fall back to equilibrium under its spring tension if the load falls below that corresponding to its position at any moment, but prevents it from advancing except as controlled by the escapement as before.



Square-End Pipe Cutter.

The maximum-demand pointer can be reset instantly by pressing a sealed button on top of the cover. This raises the pawl that holds the pointer in its maximum position and a light spring returns the pointer to zero, or to the position of the auxiliary disk.

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New Beaver Square-End Pipe Cutter.

The Borden Company, Warren, O., has for some two years been making a number of square-end pipe cutters in the smaller sizes which have met with much success in service, about 20,000 of these tools being in use. The company has just placed on the market a new and larger size of this tool, known as the No. 10 size. This has a range for cutting pipe from two and one-half inches to four inches in diameter. Like the smaller sizes, the new tool has peculiarly shaped knives which are automatically fed, so that it is unnecessary to feed the knives separately, as is the ordinary practice.

The most distinctive feature of these knives, however, is that they cut out a very thin section of the pipe instead of depressing it. This makes a clean and square cut entirely free from burrs. It has been found that these cutters never split the pipe and that the pipe retains its full internal area. Thus it is unnecessary to ream out the pipe and if it is to be threaded the die can be started more easily than if the pipe has been cut by the ordinary type of cutter. This new four-inch cutter is practically like the smaller sizes, except that it is operated by a ratchet and therefore can be used in any position. It has been found in practice that a piece of heavy four-inch steel pipe can be cut off with this cutter in less than four minutes.

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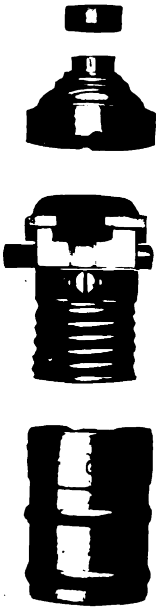
New Brass-Shell Sockets Operated by Push-Button.

The extensive and satisfactory use of Cutler-Hammer push-button pendent switches and porcelain sockets has been the means of creating a demand for a brass-shell socket having indicating push-buttons instead of the rotary key and employing the high-capacity switch mechanism as used in the above-mentioned switches and porcelain sockets. The rotary-key flush switch has given way to the push-button type and the push-button socket is therefore likely to come into favor also.

Push-Button Brass-Shell Socket.

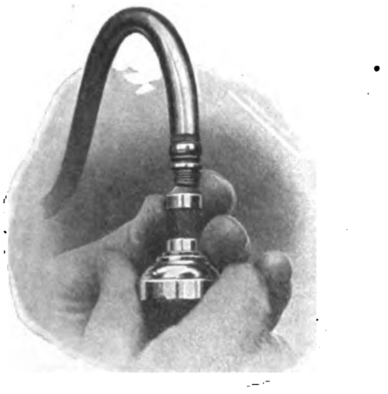
The new sockets shown in the accompanying illustrations have a number of important features: indicating push-button operation; quick make-and-break switch mechanism rated at 660 watts, 250 volts; automatic locking nozzle which eliminates the weak set-screw; cord-strain relief in all pendent sockets; and the strong simple snap lock for securing the cap to the shell. The mechanism used in these sockets is exactly the same as that used on other C-H devices rated at 750 watts and is only limited to 660 watts because there is no higher rating allowed on screw-shell sockets by the Underwriters. Because of the extensive use of electrical devices operated from lamp sockets, this high-capacity socket is particularly advantageous.

In spite of the many improvements in electrical devices, during the past 30 years the sockets have always been secured to the fixture by means of an iron set-screw and operated by a rotary key, the key being similar to that used on the gas fixture. The new C-H line of sockets has an automatic locking ring to replace the set-screw and has indicating push-buttons instead of the rotary key.



Exploded View of Push-Button Socket, Showing Main Parts.

In the new C-H sockets the use of the common electrical phrase, "Push the button," has been extended to one of the oldest electrical devices. The operation is very easy and natural. With pendent sockets this is especially desirable as only one hand need be used and the lamp is not twisted or jarred. In grasping the socket the thumb and finger are placed in the proper position to operate the socket. Where a husk is provided on the fixture extension buttons can be placed on the socket, which extend through small holes in the husk and allow operation.



Locking Ring is Placed Over Fixture Nozzle and Cap Then Screwed In Place.

The new locking ring of the C-H sockets makes it possible to attach the sockets securely on varying sizes of fixture nozzles even when a socket cover or husk is used. This is impossible where the set-screw is employed, as a screw-driver cannot be operated inside of the husk to tighten the screw.

In a recent test a C-H socket was secured to one end of a pipe and another socket with the ordinary set-screw secured to the other end. Grasping one in each hand and turning counter clock-wise the latter socket slipped, damaging the thread, then the joint where the threaded ferrule is fastened to the cap gave way and allowed the socket to slip around. The C-H socket did not loosen in this test.

Cord After Being Secured to Terminals is Placed in Groove and Socket Bushing and Cap Then Put in Place.

Another difficulty overcome by this locking feature is the positioning of the buttons. All work during the past few years has been along the lines of providing a multiplicity of catches for snapping the cap on the shell so that the key might be located where desired. This, however, may have a tendency to weaken the locking. The locking ring of C-H sockets allows the cap to be turned after it is secured so that the location of the buttons can be taken care of, while a strong and simple snap can be used which locks the cap and shell securely together. The shell is not weakened by many slots or perforations.

Keyless Brass-Shell Electroller Socket Similar to Push-Button Type.

A cord grip in the pendent type of sockets makes unnecessary the usual knots and removes all strain from the terminals. This cord grip does not require any threading through or twisting of the conductors. It is simply necessary to secure the conductor terminals to the binding-screws which are placed far down on the socket and are upset. The strength of this cord grip was indicated by a test which resulted in the breaking of a No. 18 two-conductor flexible cord without any appreciable strain being transmitted to the socket terminals.

This new socket line put on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., consists of push-button and keyless types for fixtures and pendent installations, besides a short keyless socket especially suitable for small fixtures. The approval of the Underwriters' Laboratories has been secured for the entire line.

A Play to Boost Electric Breakfasts.

A little one-act play entitled "Cooking Breakfast at the Table" has just been brought out by the Westinghouse Electric & Manufacturing Company, the personnel of which is as follows:

Toasty, a Westinghouse electric toaster stove.

Perky, the Westinghouse electric percolator.

Time O'Day, the grandfather's clock.

Mr. and Mrs. Thrifty, the exponents of Westinghouse electric ware, who have become well known to the public through the Westinghouse motion pictures.

The play describes the preparation of breakfast by Mr. and Mrs. Thrifty with the Westinghouse devices, which themselves take part in the discussion as to their relative merits.

German Wireless Combination.

According to cable dispatches from Berlin, Germany, the Goldschmidt High Frequency Wireless Telegraph Company has given to the German Telefunken Wireless Telegraph Company an option on its plants in Germany and the United States. It announces that a message of 3,000 words of consecutive text was transmitted within a few hours on May 26 from its American station at Tuckerton, N. J., and received perfectly at Eilvese, near Hanover, a distance of about 4,060 miles.

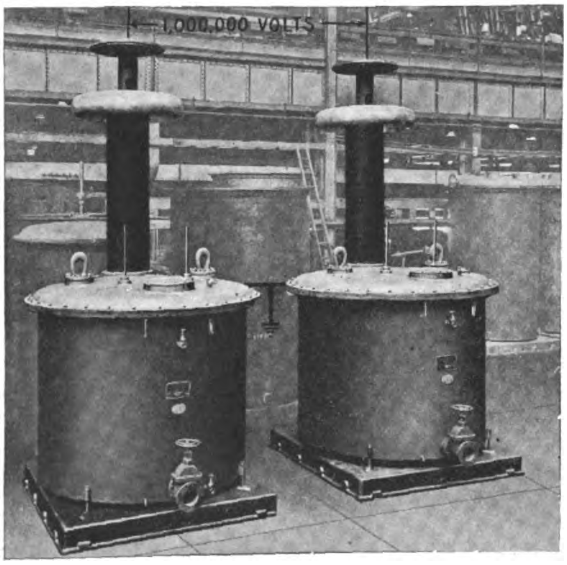
The High Frequency Company says it may now be expected that regular commercial traffic between Germany and the United States will soon be a practicable possibility. The Telefunken Company states that, if it eventually decides to take advantage of the option, it will then be decided which system will be used in a transatlantic service, its own or that of the High Frequency concern.

Large Testing Transformers Shipped to Japan.

The accompanying illustration shows two testing transformers, having a normal rating of 360,000 volts continuously, and 500,000 volts for short periods. These transformers were recently furnished the Inawashiro Hydro-Electric Power Company of Japan, one to be installed in the generating station on the Nippashi River at the outlet of Lake Inawashiro, about 145 miles from Tokio, the other in the receiving substation at Tokio, where they will be used for testing transmission lines and apparatus in the stations.

The design features of interest in these transformers are: the arrangement of the windings to give distributed static fields, the use of condenser terminals to give distributed stresses from terminals to ground, and the terminal "hat" to distribute stresses from terminal tip to ground. The transformers are 19 feet high from base to top of terminal, and the tanks are 9 feet high and 9 feet in diameter. One high-tension terminal of each transformer is grounded to the core and case, the other being brought out as shown in the illustration. By connecting the cases of the two transformers as shown one million volts can be developed between the two high-tension terminals.

These transformers were built by the Westinghouse Electric & Manufacturing Company, and are similar in construction to the 500,000-volt testing transformer built by the company and previously described in the technical press.



Two Westinghouse Testing Transformers Connected in Series for 1,000,000 Volts.

◆

The Thompson Single-Cord Cutout Hanger.

For some time tungsten lamps in the larger sizes have been used in railroad depots, steel plants and other industrial establishments, but the development of the new gas-filled lamps is expected to increase the use of incandescents for such interior and yard lighting very materially. In many plants of this type the lamps must be hung very high. In the case of gas-filled tungsten lamps this is particularly necessary because of their intense intrinsic brilliancy. In order to get the best results out of an incandescent lamp installation of this type it is imperative to use a reflector to throw into useful downward directions light that otherwise would be lost on the ceiling or trusses of the building. All of these requirements, together with the necessity for frequent cleaning in order to maintain the efficiency of the lighting units approximately at the highest point, require that the lamps and reflectors should be made readily accessible, and for this purpose the Thompson Electric Company, 102 St. Clair Avenue, N. W., Cleveland, O., has placed on the market a new form of its cutout hangers.

This hanger is a development, with certain improvements, of the Thompson double-cord hanger which has been extensively used for arc lamps in industrial establishments. The new hanger, however, is operated by a single cord or wire rope. A general view of one of these hangers with lamp attached is shown in Fig. 1. These hangers are intended for automatically cutting out any lamp in a multiple circuit and to permit lowering to the floor for cleaning, trimming or lamp renewal. While designed particularly for use with the former standard or new gas-filled tungsten lamps, they also are serviceable for any type of arc lamp. They make the lamp readily accessible without the need of ladders or cranes. The lamp trimmer or cleaner is therefore at all times safe, both because he works on the ground and because the lamp is disconnected from the circuit while he is working on it. The wiring for the lamp circuit can be carried in straight lines directly to the hanger without the need of dangling loops of live wire. The wiring may be open or in conduit as desired. Since the hanger permits caring for the lamps without using a traveling crane, the time of the latter and more expensive equipment is not taken up with lamp trimming or maintenance, and it can be used entirely for the purpose for which it was installed.

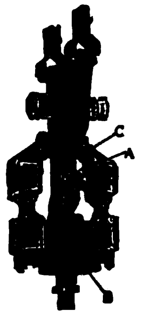


Fig. 2.—Hanger in Operating Position.

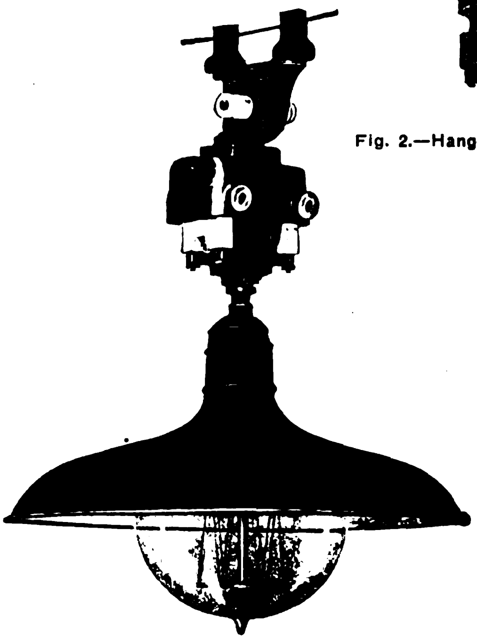


Fig. 1.—Single-Cord Medium-Canopy Cutout Hanger with Reflector and Lamp.

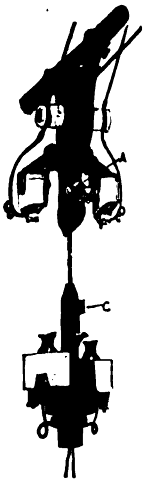


Fig. 3.—Lamp Being Lowered.

In Fig. 2 is shown a slightly different form of the new hanger, known as the skeleton type. This illustration also makes clear the arrangement of the cutout mechanism. Electrical connection is obtained by two simple knife contacts which are forced together by a powerful spring *B*. When in operating position, as shown in Fig. 2, the pawl *A* holds the lamp, and this together with the spring *B* prevents loosening of the electrical or mechanical connection through jarring or vibration.

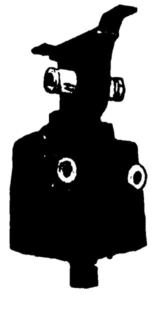


Fig. 4.—Deep-Canopy Hanger.

An ingenious feature of the lowering

mechanism is that it works somewhat on the principle of a spring window-shade roller, that is, in order to release and lower the lamp the cord is first pulled as far as it will go and then by giving a quick release the pawl *A* is thrown out of the catch *C* and the latter passes out before the pawl can drop back into place. When raising the lamp again to the operating position, the cord is pulled up as far as it will go and then released slowly; this allows the pawl to fall into place and secure the lamp in operating position. In Fig. 3 is shown another ingenious feature which insures that when the lamp is again pulled up its contacts will be brought perfectly in line with the stationary contacts on the hanger. Thus, no matter how much the rope twists the lamp is always brought up in perfect alinement and the polarity of the lamp cannot be reversed, nor will any reflectors of the angle type be turned in the wrong direction.

These hangers are made for two kinds of suspension. For most purposes it has been found that the span wire has important advantages, especially in the installation of large lamps in mills, since it enables the lamps to be located where their light will be most useful; the span wire aso acts as a natural shock absorber and is therefore useful in the protection of lamps in forge shops and similar plants where violent vibration is liable to occur. For this type of mounting cable clamps are secured to the top of the hanger as shown in Figs. 1 and 2. Another method of suspension is to a girder or bracket arm for which the hanger is provided with a small cleat bail as shown at the top of Fig. 4; this permits the hanger to be substantially bolted or clamped either to a flat surface or to a pipe, as in Fig. 3.

Where lamps are to be used indoors or in places where there is no exposure to the weather the skeleton type of hanger shown in Figs. 2 and 3 is employed. A hanger known as the medium canopy type is shown in Fig. 1. This permits mounting either indoors or outdoors and protects the hanger mechanism against ordinary weather conditions, except sleet. Where the hanger is to be used in very exposed situations the deep-canopy type shown in Fig. 4 has been found to give protection against rain, snow and sleet. Two types of shade-holder for tungsten lamps are made to suit these hangers. One is threaded on the outside to screw into the reflector and the other is threaded on the inside to be secured by a nipple or tubing in case the lamp is to hang some distance below the hanger itself. If arc lamps are to be used, a U-shaped bail is used in place of the shade-holder. This type of hanger has been installed by some of the largest steel mills and railroads, and has been found to give excellent service. All parts of the hanger that are subjected to strain are made of malleable iron or phosphor bronze.

Wakefield Reversible Direct and Indirect Fixtures.

The increasing popularity of indirect lighting has created a demand for a fixture of this type, which, while of neat design, good construction and efficiency, shall also be made of durable material aud moderate cost, so as to adapt it for many commercial and industrial establishments where artistic embellishment is unnecessary but good lighting is required.

To meet such needs the F. W. Wakefield Brass Company, Vermilion, O., has placed on the market a line of fixtures called "Mellowlites." Fig. 1 shows one of these fixtures and gives a good idea of its simple but pleasing design. The reflector bowl is made of enameled steel to give good efficiency combined with indestructibility. By fastening the bowl by light rods with hooked ends, the bowl can be readily swung down or entirely removed for cleaning.

A unique feature of this outfit is its reversibility. The ring on the stem to which the upper ends of the three bowl-supporting rods are fastened can be adjusted along the stem. By making this adjustment, removing the knob shown at the bottom of the bowl in Fig. 1, and then reversing the bowl the fixture can be readily converted into a direct fixture, as shown in Fig. 2. Thus the same unit can be used to provide direct or indirect lighting, as the tenants or occupants of particular rooms prefer.

These fixtures are made with three diameters of bowls, 14 inches, 18 inches and 24 inches. The lengths run from 30 to 42 inches. These fixtures are particularly suitable for the larger sizes of tungsten lamps, say, 150 to 1,000 watts. The new 750 and 1,000-watt gas-filled lamps with the larger fixtures make an excellent combination.

Two sizes of semi-indirect Mellowlite fixtures, 14 and 18 inches, are also made by the Wakefield Company. These are very similar to Fig. 1, except that the bowl is made of an excellent opaline glass rectifier. Pleasing appearance, ease of cleaning and moderate cost also characterize the semi-indirect units.

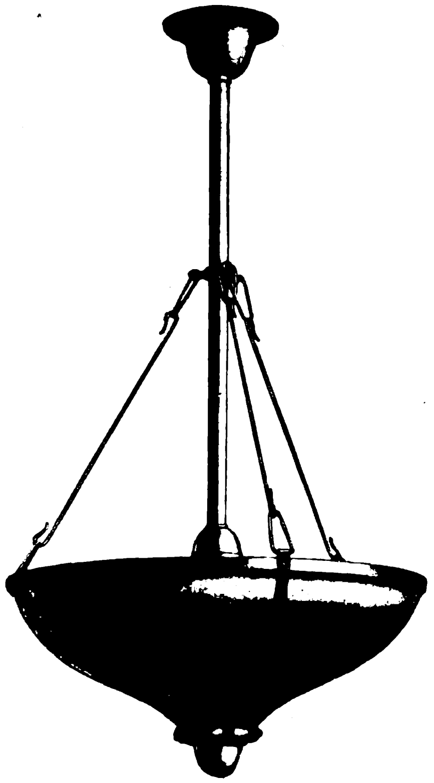


Fig. 1.—Wakefield Mellowlite Indirect Fixture.

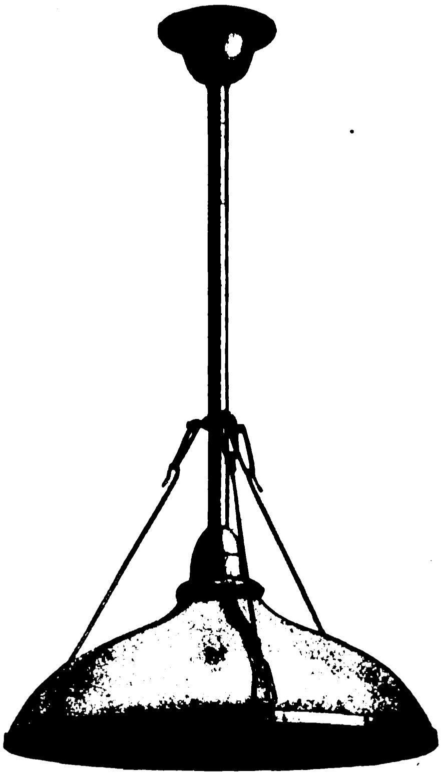


Fig. 2.—Fixture Adapted for Direct Lighting.

Extensive Traction Improvements for Philadelphia.

The Philadelphia Rapid Transit Company has entered into a tentative agreement with the city for the construction of a system of subways and elevated lines, involving an expenditure of about $63,000,000. The agreement provides for the city to build the necessary lines at an estimated cost of $45,600,000, the company to defray the cost of equipment to the extent of approximately $12,000,000, and operate the lines for a period of fifty years. At the end of such time the city is to receive all surplus earnings of the company in excess of six per cent on the par value of its stock. The proposed improvements include a subway under Broad Street, and elevated lines to Frankford and Darby, these to connect with the present Market Street subway and elevated lines. Provision has also been made in the agreement for the elimination of exchange tickets in 1920, and the substitution of universal transfers.

Current Electrical News

NORTH ATLANTIC STATES.

MANCHESTER, N. H.—The Manchester Light & Power Company will spend $25,000 a year for five years in putting its wires underground.

ATLANTIC CITY, N. J.—The Board of Public Utility Commissioners has approved the application of the Atlantic City Electric Company for the issuance of bonds for $103,000. The proceeds are to be used for fixed capital expenditures to plant and equipment. A.

MORRISTOWN, N. J.—The Morris & Somerset Electric Company will increase the capacity of its local power plant. Arrangements are being made for the installation of a new 1,500-kilowatt turbogenerator, and boiler equipment. A.

TRENTON, N. J.—The Public Service Electric Company will build a new substation in the Chambersburg section: the plant will be used for local distribution in this district. A.

EMPORIUM, PA.—This town has decided to purchase a 150-horsepower gas engine to operate with natural gas, direct connected to 2,200-volt generator, two-phase. Will also purchase switchboard and all necessary station equipment and will also be in the market for line equipment, including transformers, meters, etc. Address Charles Crandall, secretary, Borough Council, for further information.

SOUTH ATLANTIC STATES.

MILFORD, DEL.—Plans are being prepared for the power house of the L. D. Caulk Company, manufacturer of dental supplies. It is to be of brick and one story high. N.

CUMBERLAND, MD.—The Hagerstown & Frederick Railway Company is considering the erection of a power plant here.

PROSPERITY, S. C.—The city will install a $10,000 lighting system. Address the city clerk for particulars.

BALL GROUND, GA.—The town will obtain electric current from Amicacola Marble Company, Ball Ground, for a lighting system. Address the mayor for further information.

CHATSWORTH, GA.—The J. B. McCrary Company, Atlanta, Ga., is preparing plans for water works and lighting systems, to cost $25,000.

WINTER HAVEN, FLA.—Winter Haven Water, Ice & Light Company is contemplating additions to electric lines. W. F. Boyd is manager.

NORTH CENTRAL STATES.

CAMBRIDGE, O.—The new Midland Power & Traction Company will erect a substation here to handle the high-tension power lines from Coshocton. The lines will be completed in about 60 days. J.

CINCINNATI, O.—George Balch is preparing to erect a large garage for the Fischer Auto & Service Company, at a cost of about $50,000. Modern electrical equipment will be installed. L.

NEW CONCORD, O.—The town has sold a $2,500 issue of light bonds running for ten years, with five per cent interest, at a slight premium, and the proceeds will be devoted to the construction of a small lighting plant. Contracts will be let and material purchased shortly. L.

NORWOOD, O.—The City Hall Commissioners will re-advertise shortly for bids on the electric work involved in the new city hall, those first submitted having been rejected. L.

URBANA, O.—Two outside propositions have been received to install and maintain new arc lights here, one by a Boston syndicate, represented by E. W. Lothrop, at $62.50 per lamp per month, and one by the Ohio Electric Company at $55 per lamp per month. The local company's figure is $60 per lamp per month. J.

CHAMPAIN, ILL.—Eighteen thermostatic motors will be used in the heating apparatus for the new armory at the University of Illinois at Champaign. The heating system, which is to cost $18,000, will be installed in June. J. M. White is the supervising architect. Z.

EVANSTON, ILL.—It is stated that Northwestern University will install a private electric light plant.

BELDENVILLE, WIS.—H. O. Junkman is agitating the question of electric lights for this place. C.

FREDONIA, WIS.—L. H. Schmitz contemplates erecting an electric lighting plant in this village.

AURORA, MINN.—$20,000 will be expended for water and light improvements. Address the village recorder.

VILLARD, MINN.—Villard has voted in favor of building a $5,000 electric light plant.

ALBIA SPRINGS, IOWA.—The City Council is considering the proposition to furnish electric lights. Address the mayor for general information.

LINN GROVE, IOWA.—At a special election the Peterson Power & Light Company was granted a franchise for lighting the town.

BLUE SPRINGS, MO.—Nickols & Cannon have received a 20-year franchise for an electric-light plant and will begin work within the next 90 days. An ice-manufacturing plant also is to be established. M.

OAK GROVE, MO.—W. H. George has asked for a franchise for a light plant and the Council will vote on the requests at its June meeting. M.

TOWER CITY, N. D.—Aiken & Bartlett, of Fargo, are preparing plans for an electric light plant for this city. C.

DELL RAPIDS, S. D.—The Dell Rapids Light & Power Company has been incorporated with a capital of $20,000 by N. C. Draper, A. Powers, of Dell Rapids; and A. Powers, of Sioux Falls.

BARNES, KANS.—A $5,000 electric light plant is to be established at Barnes in the near future. M.

JETMORE, KANS.—$12,000 is to be spent for a municipal electric light plant. M.

KIRWIN, KANS.—$12,000 is to be spent for a municipal light plant.

VERMILLION, KANS.—The municipal authorities will spend $10,000 for an electric light plant shortly, a bond issue of that amount having carried at the election on May 26. M.

SOUTH CENTRAL STATES.

ASHLAND, KY.—Rufus Vinsant, of this city, and others, are reported to be interested in installing a waterworks and electric light plant.

LEITCHFIELD, KY.—Work is under way for the erection of buildings and the installation of machinery for an electric light plant here. The W. T. McCaskey Company, of Lansing, Mich., is doing the work, which will involve an expenditure of $10,000. W. N. Moss is the engineer. G.

LIVINGSTON, TENN.—The city is prepared to sell a franchise for the construction of an electric light and power plant. The Chamber of Commerce, E. C. Kight, secretary, has the project in hand. G.

HOT SPRINGS, ARK.—The Railroad Commission of Arkansas has granted a permit to the Ouachita Power Company of Arkansas to construct a hydroelectric power plant on the Ouachita River, about six miles southeast of this city. The company plans to develop 6,000 or 7,000 horsepower at its principal power dam. Power will be transmitted to Hot Springs, Benton, Malvern, Little Rock, and other points within 150 miles radius. They have also a permit to construct auxiliary and storage dams on the Ouachita River and its tributaries above their principal power dam.

HASKELL, OKLA.—Haskell Light & Power Company, has been incorporated with a capital of $10,000 by C. W. Marston, J. O. Dowdy, and E. B. Harris.

EL PASO, TEX.—A movement is on foot here for better street lighting, and to this end efforts are being made to secure contracts from property owners on San Francisco Street for the installation of a new system of lights on that street.

MEXIA, TEX.—W. W. Cook, Joseph Nussbaum and others have organized the Mexia Water, Light & Power Company, having a capital stock of $145,000. Waterworks, light and power plants will be built. D.

WESTERN STATES.

CARRIZOZO, N. M.—It is stated that J. H. Fulmen, of the Eagle Mining Company of Parsons, N. M., is planning to erect an electric power plant here to operate the mining property recently acquired by his company and to furnish current for a crushing and concentrating plant. D.

CLEARLAKE, IDAHO. — William C. Hazard, of Milwaukee, Wis., president of the Clearlake Power & Improvement Company, recently petitioned the Public Utilities Commission at Boise for a certificate of convenience and necessity for his company to construct and maintain an electric transmission and distribution lines in Twin Falls County, for the benefit of the cities and towns of that section. Clearlake is given as the principal place of business, and the company is capitalized at $750,000. O.

ELKS CITY, IDAHO. — Alfred Adams, of Atlantic City, N. J., and Hunter B. Supplee, here, well-known mining men of this section, have decided to install a commercial power plant, at this place, which will develop from 700 to 1,000 horsepower at the beginning. Water rights have been acquired on the Red River, and plans are being perfected for immediate construction of the plant that will serve the whole district with cheap power.

TUCSON, ARIZ.—The transmission line of the Tucson Gas, Electric Light & Power Company, which has just been extended to Sauharita Ranch, a distance of 10 miles, is to be further extended to Rillito Valley. Estimates for work on power plant and power plant machinery to be installed call for an expenditure of $90,000.

POMEROY, WASH.—William H. Galvani, engineer for the Pacific Power & Light Company, with headquarters in Portland, recently announced that improvements will be made to the local plant as soon as possible, including the connecting up of the plant with the Company's high-power line serving other towns in this region, and some needed extensions and improvements in the local territory. O.

SPOKANE, WASH.—Engineer J. C. Ralston has submitted estimates of the cost of a municipal light and power plant at $2,500,000.

BURNS, ORE.—The Harney Electric Company, was recently organized and incorporated with a capital stock of $250,000, by Harney County capitalists. The Company has named this city as principal place of business, and was organized for the purpose of taking over the J. Edwin Johnson holdings filed on the North Fork of the Malheur River, some 20 miles north of Drewsey. The power developed will be used for irrigation purposes, and furnishing heat, light and power for the Burns and Drewsey country.

GLENDALE, CAL.—A bond issue of $4,000 has been authorized to provide funds for the improvement of the municipal light and power plant.

NAPA, CAL.—The Calistoga Electric Company has been granted a franchise along certain streets in Napa County for the transmission of electricity for light, power and other purposes.

RIVERSIDE, CAL. — The City Council has started proceedings for the installation of an ornamental lighting system on Lime Street.

PROPOSALS.

MOTOR-DRIVEN MILLING MACHINE.—Sealed proposals will be received on June 10 by Chester Harding, commissioner, Washington, D. C., for furnishing and delivering one universal high-power milling machine, motor-driven, for use in the Fire Department.

ELECTRIC WIRING, ETC.—The members of the Board of Education of Macomb, Ill., are advertising for bids for the electric wiring in the new High School building. Bids will be opened on June 10. J. Ross Micket is president of the Board and J. H. Millsom is secretary. Z.

ELECTRIC PLANT.—Sealed proposals will be received at the office of the Lighthouse Inspector, New Orleans, La., until June 18 for furnishing and installing an electric plant for the completion of the tender Camellia. Blank proposals and particulars may be obtained by addressing the above.

CANAL CABLE.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until June 8 for furnishing 185 snubbing posts, complete, with anchor bolts and washers. For further information address F. C. Boggs, major, corps of engineers, U. S. Army, general purchasing officer, and refer to Cable 5-25.

ELECTRIC ELEVATOR. — Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until June 15 for the removal of the present elevator and the installation complete of an electric passenger elevator in the post office at Wichita, Kans., in accordance with drawings and specifications, copies of which may be obtained from the Supervising Architect.

INTERIOR LIGHTING FIXTURES. —Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 20 for furnishing the interior lighting fixtures of a two-story building for the post office at Bozeman, Mont., and until July 30 of a one-story building for the post office at Greeley, Col., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites or the Supervising Architect.

ELECTRICAL EQUIPMENT — Sealed proposals will be received by the Navy Department, Bureau of Supplies and Accounts, Washington, D. C., until June 16 for furnishing three electric furnaces, as per Schedule 6832, for delivery at the Navy Yard, Newport, R. I.; installing an underground telephone system at Narragansett Bay, as per Schedule 6835; on Type A induction motor, Class 1, 110 horsepower, 2,200-volt, three-phase, 60 cycles, as per Schedule 6839 for delivery at Navy Yard, Brooklyn, N. Y.; 30,000 feet lighting and power wire, rubber-insulated, single, solid, as per Schedule 6829, for delivery at the Navy Yard, Brooklyn, N. Y.; for 6,000 feet intercommunication cable, plain four and ten conductor; 148,000 feet plain, double flexible conductor for portables, insulated; 2,000 feet rubber-insulated cotton-covered wire for ignition circuits for combustion engines; 54,700 feet galvanized, soft-steel, leaded and armored, twin-conductor wire, all as per Schedule 6830, for delivery at the Navy Yard, Brooklyn, N. Y., and until June 30 for 10 two and five kilowatt radio sets for ship installation, as per Schedule 6811, for delivery at the Navy Yard, Brooklyn, N. Y.

NEW INCORPORATIONS.

ASHEVILLE, N. C.—The Ward Electric Company has been incorporated with a capital stock of $10,000 by M. C. Ward, C. W. Purefoy and others.

WAUSAU, WIS.—Marathon Electric Manufacturing Company has been incorporated with a capital stock of $25,000 by Neal Brown, D. E. Everest and E. M. Bischoff.

PERU, IND.—Miami Electrical Supply Company has been granted articles of incorporation, capitalized at $10,000. The directors are Ed. Trautmann, John Bethell and Samuel Fowden.

KINGSTON, WIS.—The Kingston Electric Company has been incorporated with a capital of $2,000 by L. A. Very, O. A. Oestreich, and Leora Westlake.

KANSAS CITY, MO.—The Kansas City Gas & Electric Fixture Company has been incorporated, the capitalization being placed at $15,000. James Butler, Henry W. Melenbacker and E. G. Breg are the incorporators. N.

KANSAS CITY, MO.—The Automatic Electric Light Company has been granted articles of incorporation, capitalized at $100,000. The incorporators are F. B. Willmont, W. H. Maloney and William F. Warner.

BUFFALO, N. Y.—Niagara Battery Corporation has been incorporated with a capital stock of $5,000 to manufacture electric batteries. The incorporators are George H. Woodward, H. B. Parry and E. C. Schlenker, all of this city.

BRONX, N. Y.—American Electric Sign Company, Incorporated, has been granted articles of incorporation, capitalized at $5,000. The incorporators are Philip Adelstein, Jacob Lieberman and Hattie Goldschmidt, New York.

CHICAGO, ILL.—Continental American Specialty Company has been incorporated with a capital stock of $100,000 to manufacture electrical supplies and novelties. The incorporators are K. W. Kemper, G. Cohn, A. J. Alsdorf, of this city.

NEW YORK, N. Y.—Majestic Electrical Appliance Company, Incorporated, has been granted articles of incorporation, capitalized at $10,000. The incorporators are Joseph P. Ryan and William Burrows, of New York City, and Arthur Rosenberg, of Jamaica.

NEW YORK, N. Y.—Reliable Gas Lamp Company, Inc., has been granted articles of incorporation to manufacture all kinds of gas and electric lamps, fixtures, etc. The capital stock is $6,000 and the incorporators are Sam Dubin, Louis Greenberg, of New York City, and David Guttenson, of Brooklyn.

JAMESVILLE, N. Y.—Zenith Wire Company, Incorporated, has been incorporated to manufacture and deal in electric coils and accessories used on automobiles, general plating, wooden novelties, copper wire, machinery and textiles. The capital stock is $100,000 and the incorporators are W. A. Beattie, H. V. Hulison, Syracuse; H. Hotaling, Jamesville.

ST. JOHNSBURY, VT.—The St. Johnsbury Wiring Company has filed articles of association, having a capital stock of $10,000. The incorporators are Elbert E. Gage, Robert W. McGillivray and Clarence A. Forrest, all of St. Johnsbury. The purpose of the company is to own and operate electric plants and deal at wholesale and retail in electrical appliances.

FINANCIAL NOTES.

The entire issue of $3,500,000 Northern Electric Company, Limited, first-mortgage sinking-fund five-per-cent bonds offered by Lee, Higginson & Company, at 95 and interest has been sold.

The Massachusetts Public Service Commission has approved the issue of $1,000,000 Boston Elevated 30-year bonds, to bear interest at a rate not exceeding five per cent per annum.

Holders of Cuyahoga Telephone Company stock have received notice that in exchange for their common and six-per-cent cumulative preferred shares they will receive common and seven-per-cent cumulative preferred of the Ohio State Telephone Company, par for par. Adjustment of fractions will be on the basis of $100 a share for Ohio State preferred, and $30 a share for Ohio State common. It is expected that holders of United States Telephone stock will receive par for par in the new company, plus fractional bonds of the Ohio State company.

Public announcement has been made of the new plan for Philadelphia transit development that is proposed following the recent conferences. The plan proposed provides for a total investment of approximately $63,000,000, of which, about $45,500,000 will be invested by the city in building the subway to elevated lines; about $12,000,000 will be provided by the Philadelphia Rapid Transit Company for equipment of city owned lines and about $6,000,000 will be provided for the Philadelphia Rapid Transit Company by outside interests in constructing a tube to Camden.

At a meeting of the board of directors of the Birmingham Railway, Light & Power Company, an operating subsidiary of the American Cities Company, J. S. Pevear, vice-president of the New Orleans Railway & Light Company, was elected president to succeed H. S. Ford, who resigned to become vice-president and general manager of the Cumberland County Power & Light Company. Mr. Pevear will continue in executive charge of the New Orleans company and J. H. DeWindt will be in charge of operations at Birmingham as general manager. The final contracts by which the Alabama Power Company, the operating subsidiary of the Alabama Traction, Light & Power Company, which will furnish current for operation of the Birmingham street railways and also for lighting and power from its hydroelectric development at lock 12 on the Coosa river, were signed. The Alabama Power Company will derive a gross revenue of about $350,000 from this contract and the Birmingham company will hold its steam stations in reserve.

Directors of the San Joaquin Light & Power Corporation have called a special meeting of stockholders for June 11 to authorize the issue of $3,500,000 cumulative prior-preference six-per-cent stock, changing the unissued $3,500,000 of present preferred stock into the new form. The prior-preference stock, if disposed of, will not only provide for the floating debt but will also provide a means by which the corporation will be able in the future to supplement the financing to be done through its first and refunding bonds. The Board also has called a special meeting of the stockholders for June 29 to vote upon the authorization of the issue of $2,000,000 bonds or debentures. In case the prior-preference stock is disposed of at a satisfactory price there will be no necessity for either authorizing or selling the bonds or debentures, the meeting for June 29 being called in order to save time in case the prior-preference stock is not authorized or cannot be disposed of at a fair price.

Interstate Electric Coroporation has contracted for the purchase of the Great Bend Water & Electric Company, Great Bend, Kans., and the Hoisington Electric & Ice Company, Hoisington, Kans., and will add these properties to the plants at San Angelo, Trenton, Corry and Laredo already controlled. An audit of earnings of the two new properties for the year ended December 31, 1913, shows a balance, after payment of all fixed charges, of $28,953.

A stockholders meeting for readjustment of the finances of the Columbus Railway, Power & Light Company has been called for June 29. Approval will be asked of a plan that has been formulated by the officers, one feature of which is an amendment to the charter providing for the issue of $3,145,000 of four-per-cent prior-preference stock, for the purpose of taking up and retiring the $3,145,000 present outstanding bonds of the Columbus Railway Company, known as the first-consolidated-mortgage 40-year four-per-cent gold bonds, dated October 2, 1899, and maturing October 1, 1939. It is also proposed to issue $450,000 six-per-cent series-A preferred stock for the purpose of retiring the $450,000 outstanding bonds of the Columbus Electric Company, known as first-mortgage six-per-cent 25-year gold bonds. In order to make possible the issue of these bonds the stockholders will be asked to authorize an increase in the capital stock of the company from $11,550,000 to $15,145,000. The contemplated blanket mortgage requires the authorization of $25,000,000 first and refunding sinking-fund-mortgage six-per-cent bonds, to be secured by a mortgage or deed of trust on the property of the company. These bonds are to be issued from time to time upon consent of the Public Utilities Commission when necessary for the acquisition of property, the construction, completion, extension or improvement of facilities, or for the discharge or refunding of the company's obligations. The conditions of the mortgage will impose suitable restrictions upon the issue of additional bonds. This plan is designed to fully provide the basis for the present and future financing of the Columbus Railway, Power & Light Company. Some such broad policy is declared to be necessary for the present welfare of the properties and to meet the growing demands upon the company's service. There has been practically no financing or development of these interests in a constructive way for several years.

Dividends.

	Term.	Rate.	Payable.
Ark. Val. R.,L.&P. pf..	Q	1.75	June 15
Brooklyn Rapid Tran...	Q	1.5	July 1
Chicago Tel............	Q	2.	June 30
Con. G., E. L. & P....	Q	1.5	July 1
Elec. Prop. Corp. pf....	Q	1.5	June 10
Mackay Cos. pf.........	Q	1.	July 1
Mackay Cos. com.......	Q	1.25	July 1
Mass. Elec. Cos. pf...	S-A	2.	July 1
Mont. Pow. pf.........	Q	1.75	July 1
Mont. Pow. com........	Q	0.5	July 1
Narragan. Elec. Lt.....	Q	2.	July 1
N. Y. Edison...........	Q	1.5	June 15
N. Ohio L. & P. pf...	S-A	3.	July 15
Roch. R. & L. pf.....	Q	1.25	June 1
Va. R. & P. pf.......	S-A	3.	July 10

Reports of Earnings.

VIRGINIA RAILWAY & POWER.

	1914	1913
April gross	$ 420,582	$ 398,302
Net	219,250	200,095
Surplus after charges.	90,509	81,122
Ten months' gross....	4,284,091	4,027,464
Net	2,151,783	2,015,336
Surplus after charges.	878,570	843,629

GREAT WESTERN POWER.

(and affiliated subsidiaries.)

	1914	1913
April gross.............	$ 220,858	$ 225,133
Net earnings..........	150,774	157,265
Gross income..........	169,350	170,196
Surplus after charges.	70,788	75,088
Balance after guaranteed dividends.......	58,288	62,588
Twelve months' gross.	2,718,882	2,447,752
Net earnings	1,726,420	1,427,298
Gross income...........	1,946,040	1,514,250
Surplus after charges.	772,607	423,435
Balance after guaranteed dividends.......	622,607	273,435

TEXAS POWER & LIGHT.

	1914	1913
April gross	$ 118,940	$ 82,573
Net after taxes	41,138	26,584
Surplus after charges.	18,249	11,749
Twelve months' gross..	1,313,564	1,054,622
Net after taxes........	469,047	414,648
Surplus after charges..	209,304	280,392
Balance after preferred dividends	99,054	208,467

PACIFIC POWER & LIGHT.

	1914	1913
April gross	$ 108,567	$ 99,494
Net after taxes........	58,041	37,262
Surplus after charges..	26,824	9,598
Twelve months' gross.	1,316,378	1,261,412
Net after taxes........	672,964	601,101
Surplus after charges..	311,995	300,359
Balance after preferred dividends	66,995	62,001

FORT WORTH POWER & LIGHT.

	1914	1913
April gross	$ 67,039	$ 44,473
Net after taxes...........	35,734	27,945
Surplus after charges.....	27,189	21,211
Twelve months' gross.....	751,351	545,487
Net after taxes...........	433,450	284,249
Surplus after charges.....	341,486	216,241
Balance after preferred dividends	284,445	172,841

MOUNT WHITNEY POWER & ELECTRIC.

	1914	1913
April gross................	$ 53,344	$ 42,513
Net after taxes...........	29,687	19,782
Surplus after charges.....	17,862	10,667
Twelve months' gross....	602,272	467,291
Net after taxes...........	329,846	247,459
Surplus after charges.....	187,946	137,959

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 1.	May 25
American Tel. & Tel. (New York)...........	122½	121¼
Commonwealth Edison (Chicago)...........	135	134
Edison Electric Illuminating (Boston)...........	252	252
Electric Storage Battery common (Philadelphia)...........	52	52
Electric Storage Battery preferred (Philadelphia)...........	52	52
General Electric (New York)...........	148¾	147
Kings County Electric (New York)...........	120	12[illegible]
Manhattan Transit (New York)...........	⅝	¾
Massachusetts Electric common (Boston)...........	11½	11
Massachusetts Electric preferred (Boston)...........	58	60
National Carbon common (Chicago)...........	110½	108
National Carbon preferred (Chicago)...........	117½	118
New England Telephone (Boston)...........	134½	134½
Philadelphia Electric (Philadelphia)...........	25½	25¾
Postal Telegraph and Cables common (New York)...........	82	82
Postal Telegraph and Cables preferred (New York)...........	68½	67½
Western Union (New York)...........	61⅞	66
Westinghouse common (New York)...........	77	72¾
Westinghouse preferred (New York)...........	123	114

PERSONAL MENTION.

MR. F. C. BEVANS has been appointed city manager at Mulberry, Kans., and will supervise the municipal light plant, as well as other municipal utilities.

MR. B. J. JONES, general manager of the Steubenville Traction & Light Company, Steubenville, O., has resigned. His successor has not yet been announced.

MR. W. CRIGHTON HARRIS has resigned from the engineering firm of Crighton Harris & Company to become chief engineer of the Titan Storage Battery Company, of Newark, N. J.

MR. D. W. ELLIS, a civil engineer, has been appointed to the newly created position of city manager of Osage City, Kans. Mr. Ellis will have charge, among other things, of the municipal electric light plant.

MR. S. B. IRELAND, who has been in charge of electric light and power properties at Fremont, Neb., has been appointed manager of the Bartlesville (Okla.) Interurban Railway Company, a subsidiary of Cities Service Company.

DR. GANO DUNN, president of the J. G. White Engineering Corporation, received the honorary degree of Master of Science at the celebration of the fiftieth anniversary of the founding of the School of Mines of Columbia University, New York City, on May 29.

MR. NEWTON W. BOLEN, general superintendent of the Public Service Electric Company, Newark, N. J., was the guest of honor at a recent dinner given at the Krueger Auditorium in that city. The occasion was the tenth anniversary of Mr. Bolen's connection with the company.

MR. A. H. FORD has resigned the presidency of the Birmingham (Ala.) Railway, Light & Power Company to become vice-president and general manager of the Cumberland Power & Light Company, effective June 1. Mr. Ford will have his headquarters at Portland, Me.

MISS MARIE J. RUSSELL, of the Kansas City Electric Light Company, will leave in July for a trip through the East, on which she will inspect the facilities and methods of other companies in new-business work. Miss Russell is in charge of the specialty or new-business department of the company.

MR. T. C. RINGGOLD, sales manager of the Central Electric Company, Chicago, Ill., was a speaker at the meeting of the Executive Club of Chicago on May 29. Mr. Ringgold gave many valuable suggestions relative to the conduction of a sales department of a large organization.

MR. C. W. GALLUP has recently been appointed to the territory north and south from North Dakota to Texas, and east and west from Kansas City to Pittsburgh by the Best Electric Company, Pittsburgh, Pa. Mr. Gallup was formerly with the General Electric Company.

MR. NELSON B. HAZELTINE, formerly Philadelphia district sales manager for the Adams-Bagnall Electric Company, has joined the sales organization of the Electric Storage Battery Company. Mr. Hazeltine will have headquarters at the New York office of the company.

MR. THOMAS E. MURRAY, vice-president of the New York Edison Company, and MR. PHILIP TORCHIO, electrical engineer of the company, are in Berlin, Germany, where they were entertained last week by Mr. Siegmund Bergmann, general manager of the Bergmann Elektrizitaets-Werke Aktien Gessellschaft.

MR. J. E. ERICKSON has recently accepted a position with the Western Conduit Company at Youngstown, O. Mr. Erickson previously had been connected with the Erner Electric Company, of Cleveland, and previous to that with the Thomas G. Grier Company of Chicago. Mr. Erickson has the supervision of the Cleveland territory and will continue his residence in that city.

MR. JAMES CLARK, JR., head of the James Clark, Jr., Electric Company, Louisville, Ky., caught his share of the 500 bass which were taken by the members of the Ananias Club, just back from a fishing trip to Middlebass Island, Lake Erie. The club is thirty-eight years old and seventeen of the twenty members were in the party this spring. Most of the members inherited their memberships in the club from their fathers, there being only about four or five of the charter members still living.

MR. E. K. JAMES, formerly with the Landers, Frary & Clark Company, of New Britain, Conn., has become associated with the Best Electric Company, of Pittsburgh, Pa., and will travel the territory north and south from Massachusetts to Georgia, and east and west from the Atlantic Coast to Pittsburgh. Mr. James made quite a success with the Landers, Frary & Clark Company and the Best Electric Company believes it has secured a valuable addition to its forces.

MR. B. C. EDGAR, assistant general superintendent of the Columbus Railway, Power & Light Company, has resigned to accept the position of general superintendent of the Nashville Railway & Light Company, of Nashville, Tenn. The latter property is operated by the Clark Management Corporation, which also controls the Columbus interests which Mr. Edgar is leaving. His successor is Mr. W. C. CAMPBELL, who has had extensive experience with railway and light properties in the Eastern States and on the Pacific Coast.

MR. GEORGE C. KEECH, district sales manager of the Cooper-Hewitt Electric Company, of Chicago, addressed the Detroit-Ann Arbor section meeting of the American Institute of Electrical Engineers on May 29. This was a joint meeting with the Industrial Electrical Engineering Society of Detroit. The address was illustrated with about a hundred lantern slides, and after discussing the special electrical and mechanical features of industrial lighting with mercury-vapor lamps, Mr. Keech described their application to illumination in foundries, round houses, printing establishments, plate-glass manufactories, drafting rooms, clothing manufactories, silk mills; in inspection work, such as razor blades, sugar, piano keys, and steel rails, and in motion picture and commercial and portrait photography.

MR. FREDERICK W. DOOLITTLE has been appointed director of the Bureau of Fare Research of the American Electric Railway Association, which bureau was organized on May 1, 1914. This bureau will make a detailed study of the factors affecting rates of passenger fares in street and interurban railways; it will also gather statistical information and various operating data now being received by the secretary of the Association, and assemble and compile financial operating results of member companies of the Association; from these data a study will be made of conditions influencing the rates of fare and operating expenses of electric railways. Mr. Doolittle is a native of Hopkington, Iowa, and a graduate of Lenox College. He has also received advanced degrees from Princeton University and the University of Colorado. He was connected for a time with the Boston Consolidated Mining Company, of Bingham, Utah, and the Consolidated Coal & Coke Company, of Dacoma, Colo.; he was instructor of mechanics and hydraulics at the University of Illinois for one year and for another year was in charge of structural engineering work at the University of Colorado; for nearly three years he was assistant professor of mechanics at the University of Wisconsin. At various times he has been closely associated with the engineering departments of various railroad companies, and for several years was special investigator for the Railroad Commission of Wisconsin. During the last few months he helped organize the staff of the Illinois Public Utilities Commission.

OBITUARY.

MR. CHARLES EVERETT PETTEE, for many years connected with the sales department of the Westinghouse Machine Company and since 1908 with the G. M. Herman Pneumatic Machine company, of Zelienople, Pa., died at his home in Pittsburgh, Pa., on May 21, after a long illness. He was 67 years of age.

MR. WILLIAM H. POVEY, superintendent of the lighting department of the Board of Public Works, of Newark, N. J., died of apoplexy at his home in that city on May 26. Mr. Povey was 54 years of age and had occupied the office of superintendent for 17 years. He is survived by a wife, two sons and a daughter.

MR. JOSEPH ADDISON SANDFORD, JR., electrical engineer for R. Thomas & Sons Company, East Liverpool, O., died in that city on May 21 of appendicitis. Mr. Sandford was well known as an expert on high-voltage insulators. He was born in Ware, Mass., October 17, 1879, and was a graduate of Worcester Polytechnic Institute. He leaves a widow and one son. Funeral services were held at his late residence in East Liverpool, after which the body was taken to Ware for burial.

SIR JOSEPH WILSON SWAN died in London, England, on May 27. He was born at Sunderland on October 31, 1828. He was early engaged in chemical work and the production of photographic plates. He produced the first rapid dry plates. He became interested in electrical phenomena and devoted a great many years to the perfection of the incandescent lamp, being credited with a number of inventions in this connection. In 1860 he produced an incandescent lamp having a filament made of carbon. This lamp did not prove at the time a commercial success, but in the year following Edison's exhibition of electric lighting at Menlo Park with carbonized bamboo filaments, Swan gave a public exhibition at Newcastle of incandescent lighting on a large scale, using carbonized filaments of cotton thread.

FOREIGN TRADE OPPORTUNITY.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Customhouse, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

NO. 13,094. ELECTRIC LAMPS.—A commission merchant in an important trade center of the Near East desires to receive catalogs and prices of electric lamps of all kinds. Prices must be quoted c. i. f. certain city, and correspondence should be in French. Terms, half cash with order, balance against documents.

NEW PUBLICATIONS.

IRON AND STEEL REPORT.—The Association of Iron and Steel Electrical Engineers has published a bound volume containing the proceedings of the 1913 convention which was held in New York City last September.

ELECTRIC POWER CLUB.—The Electric Power Club has issued the second edition of the booklet containing the standardization rules, constitution and list of members. The secretary is C. H. Roth, 1400 West Adams Street, Chicago, Ill.

DATES AHEAD.

Oregon Electrical Contractors' Association. Annual meeting, Portland, Ore., June 8-9. Secretary, F. C. Green, Portland, Ore.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Minnesota Electrical Contractors' Association. Annual convention, St. Paul, Minn., June 22. Secretary, G. M. Jones, 14 North Seventh Street, Minneapolis, Minn.

American Institute of Electrical Engineers. Thirty-first annaul convention, Cadillac Hotel, Detroit, Mich., June 23-26. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Canadian Electrical Association. Annual convention, Montreal, Canada, June 24-26. Secretary, H. G. Martin, Toronto, Ont.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 4. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 40 Martin Street, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Rome Wire Company, Rome, N. Y., has recently issued a very attractive calendar for June, 1914, the illustration being an excellent color-print of a summer girl.

Efficiency Sales Company, 42 Broadway, New York, is mailing a card illustrating and describing Mohawk fire-alarm switchboards which are designed to control fire-alarm systems from lighting circuits and to charge batteries.

Dossert & Company, New York, N. Y., were represented at the National Electric Light Association convention at Philadelphia last week, by H. B. Logan, president, with reception headquarters at the Bellevue-Stratford Hotel.

Munning-Loeb Company, Matawan, N. J., has recently issued bulletin No. 500, devoted to a description of brushes for use in electroplating, buffing, etc. This bulletin contains information on brush manufacture, selection and operating characteristics.

W. N. Matthews & Brother, St. Louis, Mo., are sending out new circular matter pointing out the advantageous features of the Matthews fuse switch. Among the features particularly emphasized are safety, economy and improved service.

Delta-Star Electric Company, Chicago, Ill., is distributing a 36-page bulletin devoted to a description of its new steel-tower type outdoor high-tension substations. The bulletin contains 36 illustrations and will be valuable to those interested in this line of work.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently sold an electric motor to General Villa, the Mexican Constitutional military leader who has for some months been arousing interest on both sides of the Rio Grande. The motor is to be used for driving a water works.

Rushmore Dynamo Works, Plainfield, N. J., has secured several large contracts abroad. S. W. Rushmore went to Italy, France and England a few months ago and closed contracts amounting to $150,000. He left again a week ago for Germany to close a $100,000 contract for equipment for a lighting plant.

Roller-Smith Company, 203 Broadway, New York City, has prepared bulletin sheet No. 85, which deals with the Hartmann & Braun vibrating-reed frequency meters. These instruments are made in several types for switchboard or portable use. Combined with some of them is an auxiliary frequency-variation alarm.

Newby Manufacturing Company, Youngstown, O., recently incorporated with a capital stock of $10,000 by William Newby, M. D. Kleinzahler, R. E. Brasher and Harry and A. B. Livingstone, is planning to erect plant for the manufacture of porcelain insulators, upon which it controls patents, and also a line of similar goods.

Standard Electric Company, Cincinnati, O., has issued two new bulletins. Of these, No. G-7 supersedes No. G-6 and describes and illustrates the latest types of Standard high-power, ball-bearing, portable electric grinders. Bulletin No. V-9 supersedes No. V-8 and is devoted to Standard universal, high-power, portable electric drills.

The Forbes Company, Philadelphia Pa., has recently issued bulletin No. 14-H illustrating and describing its electrically, gas and steam-heated water sterilizers. These heaters are designed to raise water to the boiling point and to quickly cool it. Numerous diagrams of these sterilizers are shown, as well as various systems of distribution and views and data on actual installations.

The Wells-Liddell Company, which was recently organized at Lomax, Ill., has begun installing machinery and apparatus in its factory building. This company is preparing to manufacture both wireless telegraph and telephone equipment. Its wireless telephone is said to embody original features which permit distinct and reliable conversation over considerable distances.

The Electric Controller & Manufacturing Company, Cleveland, O., has issued in a very attractively illustrated booklet form a reprint of an article by its Mr. H. F. Stratton that was published in the December, 1913, issue of the *Engineering Magazine.* It is entitled "Lifting the 130,000,000-Pound Quebec Bridge" and gives an excellent account of the electric hoisting and control equipment used on this important engineering structure.

United Ice Improvement Company, 50 Church Street, New York City, has prepared a well written booklet of 22 pages giving a practical talk on refrigeration by W. Everett Parsons in very simple language. A technical discussion of means for improving the efficiency and capacity of artificial-ice plants points out the value of the Parsons "Quick-Freeze" system. The company is prepared to send copies of this booklet to any one interested in the manufacture of ice.

Holtzer-Cabot Electric Company, Brookline, Mass., has begun the erection of a new factory building at Amory Street, Roxbury, Mass. This building will be a large structure, six stories high, and will be of modern construction and equipment throughout. Ground was broken on May 21 with impressive ceremonies, in which President Holtzer and other officials of the company participated. Mr. Holtzer made a brief address reviewing the development of his electrical business which he began in Brookline in 1875.

Apple Electric Company's plant at Dayton, O., was almost completely destroyed by fire on the morning of May 27, part of the buildings being saved only after the entire fire department of the city was called out to fight the blaze. The origin of the fire has not yet been discovered. Several other small buildings were destroyed, the total damage done by the fire amounting to nearly $100,000, according to careful estimates. The company manufactures electric automobile self-starters, storage batteries and similar electric goods. About 80 per cent of the loss is covered by insurance.

W. R. Ostrander & Company, 22 Dey Street, New York City, had an exhibit that attracted much favorable attention at the recent exhibition of fire-alarm apparatus and protective devices held in the Woldorf-Astoria Hotel, New York City, under the auspices of the National Association of Manufacturers. It was a complete demonstration of the system prescribed by the New York Fire Prevention Bureau and consisted of electromechanical gongs and manual type selective-ringing fire-alarm boxes. The energy was furnished from storage batteries automatically charged from a lighting circuit. This system has been favorably received by a large number of factory owners throughout the country.

George Cutter Company, South Bend, Ind., has published bulletin No. R-3,196, describing and illustrating the features of a new line of Cutter street-hoods for series and multiple circuits, adaptable for use with all sizes and types of incandescent lamps, including the new Type C or gas-filled Mazda lamp. This bulletin deals with the most modern systems of street illumination and in addition to the descriptive matter relating specifically to the new fixtures, contains considerable information of value to anyone interested in the use of the modern incandescents for street lighting or for multiple circuits. Copies of the bulletin will be furnished to those interested upon request.

Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a sales office at suite 524 University Block, Syracuse, N. Y. This office will be in charge of J. W. Bryant, who for some time has been identified with the sale of Wagner apparatus in that territory. The company has recently issued a miniature edition of its bulletin entitled "A Manual of Electrical Testing." This new edition is 5x3.75 inches and differs from the original bulletin only in size. As this manual is a well written, concise and valuable treatise on electrical testing, the miniature edition should prove of great convenience to anyone who desires to carry such a manual in his pocket.

The Babcock & Wilcox Company, New York City, has recently issued an 80-page cloth-bound book devoted to steam superheaters. The first part of this publication is devoted to a history of the use of superheated steam and to the properties and advantages of superheated steam. The remainder of the publication is devoted to a description of the company's superheaters and to the methods of applying them to different types of boilers. The book is well illustrated by excellent half-tone reproductions of views of numerous installations and of wash drawings of the various parts of the company's superheaters. The section devoted to the properties and advantages of superheated steam discusses the subject from both the theoretical and practical points of view, giving numerous formulas, tables and curves.

The Electric Storage Battery Company, Philadelphia, Pa., has published bulletin No. 146. This is a comprehensive publication dealing with the Ironclad-Exide battery for storage-battery locomotives. The requirements of a battery for this type of locomotive are set forth and comprehensive data are given of Ironclade-Exide batteries suitable for such service. The method of determining the size and capacity of battery to be used with any particular installation is given in detail with the aid of several examples. Characteristic curves for these batteries are given, as well as a table of boosting rates. Many important features to be taken into account in the selection and installation of batteries for this type of locomotive are made clear. The bulletin is well illustrated with numerous views of battery-driven locomotives, of complete batteries, etc.

The Westinghouse Machine Company, has recently issued bulletin Nos. 1054 to 1057 inclusive, dealing with the general subject of the application of the company's products to marine service. Bulletin No. 1054 is devoted to a discussion of bridge control and gives a description of the bridge control of the driving turbines installed on the collier "Neptune." This bulletin is well written, well illustrated and fully describes the method of bridge control of turbine units. Bulletins Nos. 1055 and 1056 are devoted to descriptions of the turbine installation and the reduction-gear propelling machinery of the same collier, respectively, while bulletin No. 1057 is devoted to a description of condensers and auxiliaries suitable for marine service. All of these bulletins are well illustrated and the subjects are treated in a very comprehensive yet simple manner. Bulletin No. 1058, issued by Westinghouse Gear & Dynamometer Company, is devoted to a description of Westinghouse gears and dynamometers for marine service. This bulletin is well illustrated and discusses in detail the need for a floating frame for gears in marine service.

Record of Electrical Patents.

Issued by the United States Patent Office, May 26, 1914.

1,097,636. System of Electrical Signaling. E. A. Hummel, St. Paul, Minn. An electric clock-control system.

1,097,640. Thermostatic Circuit Controller. W. L. Jacoby, assignor to The American District Telegraph Co. Thermostat short-circuits terminals.

1,097,651. Measuring Apparatus. M. E. Leeds, Philadelphia, Pa. A modified Wheastone bridge.

1,097,679 and 1,097,680. Electromagnetic Switch. W. M. Scott, Philadelphia, Pa. Control arrangement for electromagnetically operated switch.

1,097,699. Electric Alarm and Fire Escape. F. C. White, Jr., Denver, Colo., assignor of one-half to J. Thorman. A combined fire alarm and door-opening device.

1,097,736. Electrical-Receptacle Attaching Device. J. S. Stewart, assignor to A. Stewart, New York, N. Y. A sign receptacle with special terminal lamps. (See cut on next page.)

1,097,742. Double-Current Generator. F. H. Wade, Chicago, and W. E. Bauerle, Oak Park, Ill. A double-current generator having a single-phase ignition winding and a direct-current battery-charging winding.

1,097,760. Intercommunicating Telephone System. S. A. Koltonski, Boston, Mass. A key-operated intercommunicating telephone.

1,097,789. Typewriting Machine. T. Cahill, New York, N. Y. Movement of carriage obtained by electric motor.

1,097,801. Electrolytic Converter for the Transformation of Alternating Currents Into Continuous Currents. A. Heinz, Paris, France. A liquid converter having cellular aluminum and lead electrodes.

1,097,810. Driving Means for Electric Locomotives. G. Lundholm, Vesteras, Sweden. A double-crank drive.

1,097,823. Alternating-Current Motor. S. Sparrow, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. A series motor with special short-circuiting brushes for use when acting as a repulsion motor. (See cut, next page.)

1,097,826. Electrolytic Cell. C. P. Townsend and E. A. Sperry, assignors to Hooker Electrochemical Co., New York, N. Y. Has subdivisions formed by fibrous diaphragm and devices for compressing the diaphragm.

1,097,861. Toll Operating Circuits. E. E. Hinrichsen and J. F. Toomey, assignors to Western Electric Co., New York, N. Y. Covers details.

1,097,867. Selector Switch for Automatic Telephone-Exchanges. F. R. McBerty, assignor to Western Electric Co. Covers details.

1,097,868. Automatic Telephone-Exchange Selector. F. R. McBerty, assignor to Western Electric Co. A modification of 1,097,867.

1,097,871. Electric Flashing Device. T. J. Murphy, Rochester, N. Y., assignor of one-fourth to J. P. B. Duffy. A rotating arc device.

1,097,872. High-Tension Device. T. J. Murphy, Rochester, N. Y., assignor of one-fourth to J. P. B. Duffy, Rochester, N. Y. Electrodes for wireless-telegraph system mounted to rotate in a magnetic field.

1,097,873. Electric Oscillator. D. M. Palmer, Los Angeles, Cal. A magnetic vibrator.

1,097,883. Roller Contact for Electric Welding-Machine. K. Schmarje, assignor to Thomas Electric Welding Co., Lynn, Mass. A hollow roller contact for electric welding machine having water-cooling means.

1,097,884. Automatic Alarm Lock. M. Sherman, New York, N. Y. Covers details of contacts.

1,097,895. Spot Welding. E. Thomson, assignor to Thomson Electric Welding Co. Comprises a wheel having welding electrodes and seated on a current-supplying plate.

1,097,906. Lamp Cleaner. J. O. Beauchesne, Fall River, Mass. A pair of brushes is mounted at end of adjustable rod.

1,097,910. Electric Flash Light. W. Broad, Beaver Falls, Pa. Covers details of contact device and mechanical features of construction.

1,097,922. Advertising Device. F. H. Feraud, assignor to Edward S. Briggs, St. Louis, Mo. An electric lamp with no visible means of supplying current.

1,097,927. Automatic Telephone-System Selector. F. R. McBerty, assignor to Western Electric Co. A selector switch, the terminals of which are transversed by traveling brushes.

1,097,960. Telephone Repeating Device. D. H. Wilson, New York, N. Y. Covers details of circuits.

1,097,964. Fuse. W. C. Banks, New York, N. Y., assignor to Northwestern Construction Co., New York, N. Y. An inclosed fuse, the fuse member of which is bolted to terminals.

1,097,974. Receiver for Wireless Communication. W. Harrison, Brooklyn, N. Y. Includes a number of antennae of different oscillation constants, each antenna having its own detector.

1,098,015. Selective Switch System. F. E. Case, assignor to General Electric Co. Controls circuits of a railway motor having shunt and series windings.

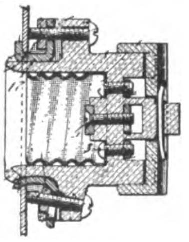
1,098,052. Magneto Machine. E. Podlesák, Tiffin, O. Covers details.

1,098,084. Automatic Transmitter for Telegraphic Signals. H. B. Croydon, assignor to Creed, Bille & Co., Ltd., Croydon, England. Employs a perforated tape.

1,098,085. Pistol Flashlight. J. Block, assignor to Interstate Electric Novelty Co., New York, N. Y. A trigger-operated pistol flash-light toy.

1,098,093. Spark-Plug. R. R. Brown, Belvidere, Ill., assignor of one-half to W. S. Brown. Covers details.

1,098,112. Signaling System for Electric Railways. A. D. Hughes and T. H. Hertzog, Washington, Pa. A trolley-operated signaling system having contact devices suspended above trolley wire.

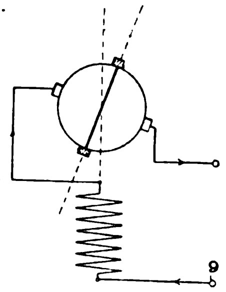


1,097,736.—Receptacle Attaching Device.

1,098,138. Pantograph Trolley. S. B. Stewart, Jr., assignor to General Electric Co. A spring-operated pantograph.

1,098,134. Motor Controller. F. T. Taylor, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. A combined shunt-motor starting rheostat and field controller.

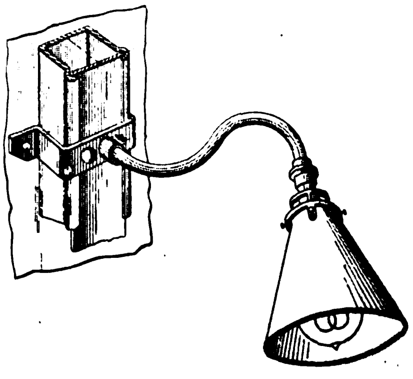
1,098,159. Means for Supporting Electric Devices. G. A. Lutz, New York, N. Y. Special lamp-fixture supporting means for use with metal molding. (See cut.)



1,097,823.—Alternating-Current Motor.

1,098,192. Electric Railbond. B. H. Thomson, North Adams, Mass., assignor of one-half to G. Wallace. Conducting pins inserted in longitudinal recesses of rails, the pins being under the compression of a spring.

1,098,204. Current-Distributing Network. G. Wolff, Hermsdorf, assignor to Bergmann-Elektricitäts-Werke, Aktiengesellschaft, Hermsdorf, Germany. A sectionalized cable having a neutral conductor in neutral point of section.



1,098,159.—Electric-Lamp Support.

1,098,211. Electric Sign. W. W. Arnold, Hamilton, O. Has a number of feeders at right angles and contact devices for each feeder.

1,098,214. Spark Plug with Priming Device. I. V. Beam, Elmira, N. Y., assignor of one-half to N. D. Doxey, Has a special valve in a longitudinal passage.

1,098,226. Magneto. W. Casey and I. Lesses, Kingston, Ontario, Canada, assignors of one-half to John J. Harty. Both magnet structure and armature rotate.

1,098,231. Electric-Accumulator Plate. G. O. Davies, Harrow, England. Plate mounted on wood frame.

1,098,242. Electric-Horn Switch. J. E. Foulks, Jr., New York, N. Y. Switch contacts mounted on steering wheel.

1,098,246. Housing for Electromagnets. E. Gengenbach, New York, N. Y. A metal housing with securing flanges.

1,098,291. Swivel Connector. G. W. Oakes, Kokomo, Ind. Has a pivoted joint in the conductor which is inclosed in insulating tube.

1,098,317. Incandescent Electric Headlight. C. W. Dake, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. Lamps are mounted near the edge of a parabolic reflector.

1,098,345. Generation of Polyphase Alternating Electric Currents of Varying Frequencies. W. P. Durtnall, Herne Bay, England. Involves the use of a motor-generator deriving current from constant frequency alternator.

1,098,357. Process of Treating Wood for Storage-Battery Separators. J. M. Skinner, assignor to Philadelphia Storage Battery Co., Philadelphia, Pa. Consists of immersion in sodium sulphide and washing.

1,098,361. Fly-Wheel Magneto for Explosive Engines. E. S. Huff, assignor to Henry Ford, Detroit, Mich. Permanent magnets mounted on fly wheel.

1,098,362. Burglar Alarm. T. H. Nelson, Chicago, Ill. A window contact device.

13,739. Portable Rheostat for Welding Apparatus. J. M. Yount, San Francisco, Cal., assignor of one-third to E. S. Brannaman and one-third to T. Finigin. Rheostats mounted on truck.

Patents Expired.

The following United States and electrical patents expired June 1, 1914.

583,452. Electric Switch. T. H. Brady, New Britain, Conn.

583,524. Underground Railway-Conduit. A. G. Wheeler, New York, N. Y.

583,575. Collector for Electric Railways. L. J. Hirt, Brookline, Mass.

583,586. Electric Igniter for Gas Engines. G. Westinghouse, Jr., and E. Ruud, Pittsburgh, Pa.

583,589. Electric Connector. F. E. Austin, Hanover, N. H.

583,618. Vacuum Electric-Arc Furnace. H. Eldridge, G. H. Wright and D. J. Clark, Galveston, Tex.

583,622. System of Electrical Distribution. P. M. Heldt, Chicago, Ill.

583,630. Electric Gas-Lighter. J. Y. Parke, Philadelphia, Pa.

583,644. Electric Burglar and Fire Alarm. J. R. Fraser, Jr., Chicago, Ill.

583,718. Electric Water-Filter. W. L. Teter, Philadelphia, Pa.

583,787. Electric Insulator. W. Christie, San Francisco, Cal.

583,810. Secretary Battery. J. H. May and F. King, London, England.

583,820. Fusible Socket for Electric Lamps. S. H. Russell, Watsonville, Cal.

583,880. Electric Brake. R. M. Hunter, Philadelphia, Pa.

Electric Vehicle Section

NEW ENGLAND ELECTRIC VEHICLE CONVENTION.

Boston, Mass., May 18-20.

A highly successful convention of central stations, electric-vehicle manufacturers and allied interests was held at Boston, Mass., May 18 to 20, with headquarters at the Engineers Club. The meetings were held under the auspices of the New England Section of the Electric Vehicle Association of America and the Electric Motor Car Club of Boston. Nine papers were presented and discussed during the regular sessions, with the addition of an open business forum in which the commercial side of the vehicle-exploitation problem was freely discussed. The convention closed with an outing at the Relay House, Bass Point, Mass., at which a shore dinner and informal outdoor sports were enjoyed by all who were able to be present.

The Problem of Terminal Freight Congestion and its Solution.

At the session on May 18, which was a regular meeting of the New England Section of the Electric Vehicle Association, Fred A. Hortter, car accountant of the Boston & Maine Railroad, Boston, Mass., discussed the general principles of freight handling on railroads at their city terminals, pointing out the evils of protracted delays in withdrawing shipments from stations and emphasizing the inefficiencies of modern trucking methods between business houses and the railroad receiving points. A week's observations in Boston at the North Station showed an average horse-vehicle load of but 0.36 ton in handling a total weekly traffic of 22,146 tons.

Electric-Vehicle Progress.

President Day Baker of the Electric Motor Car Club of Boston opened the meetings of May 19. He said that 1,000 electrics are now in use on the streets of Massachusetts and during the past year electric trucks have shown a larger percentage increase in registrations than gasoline machines. The express companies now have nearly 50 trucks in Boston service; Boston breweries are supplanting their gasoline machines with electrics and there are eight commercial-car manufacturers represented in Boston, with ten passenger-car agencies. People are realizing more and more the pleasure of driving an electric car.

Mr. Baker then announced that the following new members have been elected members of the Electric Motor Car Club of Boston. E. Y. Stimson, Anderson Electric Car Company; Louis R. Abell, consulting traction engineer, Boston; H. A. Fay, Service Recording Company, Boston; F. T. Moore, C. F. Goodrich Company, Boston.

Co-operation.

William H. Blood, Jr., of Stone & Webster, past-president of the Electric Vehicle Association of America, then addressed the convention. He stated that he knew of no association in which more real action takes place than in the E. V. A., and commended the co-operative spirit shown by manufacturers, central stations, accessory and tire houses, battery makers, garage men, owners of cars and trucks and the technical and trade press. The Boston Edison Company in particular has set the pace for New England, displacing practically all its horses by electric vehicles and making helpful rate reductions.

In the general discussion which followed, D. C. Tiffany, Ohio Electric Car Company, Boston, voiced the importance of reasonable rates for battery charging. He pointed out that because a small central station in Manchester, Mass., bills electricity to vehicle owners in that fashionable summer resort at 25 cents per kilowatt-hour, he was unable to close the sale of a passenger car. Col. E. W. M. Bailey, S. R. Bailey & Company, Amesbury, Mass., cited a parallel case in which a small central station refused to permit the installation of a rectifier outfit for a private garage, but finally after much persuasion, consented to supply energy to a motor-generator set furnished by the car owner, J. S. Codman, S. R. Bailey & Company, Boston, said that while the cost of energy is admittedly very high in Manchester, it is in part due to the fact that the company purchases electricity from another central station of moderate size, and also to the fact that the Manchester company is run chiefly to furnish lighting service for wealthy cottagers, and usually at a considerable yearly loss. He thought that there is a field for genuine co-operation in such cases, however.

Converse D. Marsh, Bates Advertising Company, New York, urged that the electric vehicle interests give special consideration to interesting consulting engineers in the development of the industry. The speaker's experience had been that in many cases electrical engineers practicing in other fields look upon the electric vehicle as a joke, and do not appreciate its capabilities. The idea is too prevalent that the designs of 10 or 15 years ago are more or less in vogue. He advocated carrying advertising in the pages of the American Institute of Electrical Engineers' publications, in which plain facts about the electric vehicle viewed from the technical standpoint would be set forth in a succinct and interesting manner for the benefit of the profession as a whole no less than the vehicle industry. Contrary to the opinion of many able engineers who have not kept up with electric-vehicle progress, the vehicle motor is anything but a toy; batteries are of larger capacity and more efficient than in the early days, and in point of speed and reliability, little is to be desired.

Mr. Baker referred to a recent drive with his eight-year old electric runabout as an instance of the machine's dependability. On May 17 he drove the machine 46 miles over hilly roads at an average speed of 13.2 miles per hour, having only 30 cells of battery. Few people as yet realize the value of the electric passenger car in suburban travel.

Charles B. Burleigh, General Electric Company, Boston, speaking from many years' experience as a sales engineer, said that the central station still fails to realize the benefits of electric-vehicle service and the profits of charging batteries in off-peak hours. The needs of the tourist must be considered, even though he is a future prospect. More attention to charging facilities should be given. The flat-compounded exciters now general in station service are not primarily adapted to battery charging and the attention of engineers designing stations should be given to the matter. Ninety-nine per cent of the time, battery charging can be done off the peak. There is a tendency for central stations to expect too much of the manufacturers, and a more alert attitude toward the electric vehicle will bring its own reward.

Colonel Bailey demurred at the last speaker's views, stating that on his tours with an electric vehicle he had found central stations universally cooperative, although in many cases makeshifts had to be resorted to for charging, and too often time was lost in waiting for someone in authority to push the work. In Ashtabula, O., the local central station went so far as to run a 1,200-kilowatt generator in order that an exciter might be operated for the battery-charging service. The colonel pointed out that in reality it is a very simple matter to get a charge where a high-rate boost is desired, as the instruments on the car can be used in place of any measuring devices in the station, and there is no real need of a recording wattmeter, since the service rendered rather than the actual input in kilowatt-hours, may be looked upon as the basis for a price.

Albert Weatherby, Boston, said that many central stations have invited him to send a demonstration car to their towns for a month, offering garaging and other facilities without cost. E. S. Mansfield, Boston Edison Company, cited the interest of the National Electric Light Association in electric vehicles, and outlined the co-operation of that organization with the Electric Vehicle Association of America. David W. Beaman, New Bedford Gas & Edison Light Company, described a new electric garage recently completed by his company, the building being 100 feet by 60 feet in plan, with a front of Indiana limestone to harmonize with the local office building. This plant will house about 30 cars in the near future, and the company now operates nine electric vehicles in its own service.

W. M. Thayer, Hartford, Conn., Electric Light Company, then described the local system of battery-exchange service. The Hartford company rents the battery service of commercial trucks, the purchaser owning the rest of the equipment, the charges being on a mileage basis and running from about $30 a month for a 750-pound wagon to about $100 a month for a five-ton outfit. Those prices include all battery service, charging and care, and 47 trucks are now in use today on this system, with nine more on order. The company also earns from $65 to $75 per week by the rental of ignition batteries for gasoline cars. Approximately $200 per week is earned by the company in its battery-service department and the present daily runs total about 1,600 miles. The maximum daily run thus far has been 85 miles. One 1,000-pound car has made 55 miles per day for the last six months and another makes from 50 to 68 miles daily, of course with the battery changed once. An old boiler house is used for the battery-charging station and the principal investment aside from the batteries was $200 for jacks used in handling the cells to and from the cars. No extra feeders were required as a substation is located on the same property.

S. Fred Smith, Salem Electric Lighting Company, said that a reduction from a 4.5-cent rate for battery charging to a 3 or 3.5-cent rate is under consideration. Mr. Burleigh suggested that much good could be accomplished by a tabulation of the investment required and the returns resulting from electric vehicle business in central stations. The outlay in money to handle this is small in proportion to the benefits. Answering a question, Mr. Thayer said that the labor item is the most variable factor in the battery-exchange system. As the number of cars cared for increases, the cost should diminish. In some cases, as in the ice-cream-delivery field, a car is released in the winter and its battery can be put in service elsewhere. The Hartford company carries 1.25 batteries per car at present, and in winter figures 1.5 batteries per car. This might be cut to 1.3 batteries if charging is done at night with the battery in the truck.

A. Jackson Marshall, executive secretary of the Electric Vehicle Association, New York, said that the membership has increased from 437 to 700 within the past few months, and that 1,000 members are probable by the October convention, which will be at Philadelphia. Cut-throat tactics are being eliminated in the commercial field. The Association is arranging for the listing of charging facilities in the Automobile Blue Book of America with data as to amperage and voltage and the distance to the next charging point. Sign rentals are being reduced for charging stations from $5 to $1 minimum per year. Intensive efforts are being made to win over the gasoline garage. The publicity work includes a specially useful program of releasing two or three times a week to some 100 newspapers in different sections of the country live items regarding the electric vehicle and what it is accomplishing, with frequent operating cost data and other information.

A committee was appointed by the chair, upon unanimous vote of the convention, to wait upon Governor David I. Walsh of Massachusetts, to urge him to use his influence to prevent the passage of the bill before the Legislature increasing the cost of commercial vehicle registration.

Electric Garages and Service.

J. C. Bartlett, of the Bartlett Garage, Philadelphia, pointed out that the first garage of his organization, caring for only a dozen machines, showed a profit of about $100 per month for the electric cars housed on the premises, so it was planned to build a 100-car garage and let the gasoline cars "pay the freight" while building up the business. The new garage is 70 feet wide by 100 feet deep. A head house 50 feet deep contains show and stock rooms, shops, etc. Double the skylight area usually recommended by architects is desirable. By locating the garage in the direct-current district, charging facilities were simplified, but the concern has learned that cheap rheostats are expensive. There are 33 charging circuits, of which 24 are rated at 35 amperes, six at 65 amperes, and three at 200 amperes. Sixty-five pleasure cars and a dozen trucks are cared for. The garage never had flat-rate service. The flat rate tends to produce sulphated batteries through skimped charging by careless garage men, and the life of plates is reduced if cars are charged every night. The unit rate, in which separate charges are made for storage, delivery and energy used, tends toward careful charges and considerate use. The absolute need of hourly attention to batteries to complete the bookkeeping records insures careful charging. With the large variety of batteries and differences in use among owners, it is practically impossible to arrive at any just charge on a flat-rate basis.

A strong hand should control the garages in any city to insure proper service, fair charges and to prevent destructive competition. By a system of rates encouraging the building up of district garages the central station can do most to help the electric vehicle salesman. The cars are usually left in charge of an ignorant washer at the very time when they most need skilled attention. If these one and two-car garages could be made impossible many evils would be eliminated. The salesman is often to blame for this situation, as he is liable to canvass a neighborhood to find a garage owner who will agree to allow a charging plant to be installed, and to take care of the car. When the garage owner finds that the car does not require repairs, takes up room and is somewhat of a nuisance to him, the car is bound to suffer.

Certain points are necessary to satisfy owners. Two competent battery men are on duty at the Bartlett Garage from 6 p. m. to 6 a. m., in addition to the floor men who wash, polish and move cars. A mechanic comes on duty at 6 a. m., to make minor repairs and such adjustments as have been reported by the night force. He inspects all cars before they are sent out. "Chasers" are employed to deliver the cars to owners and act as chauffeurs when desired. These men are young and are neatly uniformed. Before leaving the

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garage each car is blown out with compressed air, brushed off and a fresh paper napkin inserted in the card case, the flower vases being filled with fresh cut flowers on stated mornings of each week. In taking out a car the chaser fills out a delivery ticket which is time-stamped when he leaves and returns, the same procedure occurring at night. The car is carefully looked over on its return and the owner notified the next day of any damages sustained on the road. Any defects developing in its running are noted by the chaser to be cared for the next morning. The car is then blown out, washed, polished and charged. Once a month each car goes through a complete shop inspection for which no charge is made. Minor repairs are attended to and billed to the owner, but if more than trifling repairs are required, they are immediately brought to the owner's attention and no work is done until ordered. A complete log book is kept of all car movements, telephone calls, mileages, etc., to which the customers have access. The truck service is similar but much of the detail is omitted.

Utility of the Electric Vehicle.

A paper on the utility of the electric vehicle by E. J. Bartlett, Baker Motor Vehicle Company, Cleveland, O., was then presented. The author recapitulated various performances of pleasure cars in recent years, pointing out that a total run of 244.5 miles had been made on the streets of Cleveland on a single battery charge, and that a Baker torpedo machine had made a mile in 42 seconds. The Boston-Chicago run of Colonel Bailey was cited as a successful example of touring and the writer set forth the excellent average speed characteristics of electric passenger cars, stating that 22 miles per hour easily can be obtained by the passenger car of lighter design and 18 to 20 miles in the heavier types. Such speeds are ample for touring purposes. Seventy-five to 100 miles per charge can now be regularly obtained. The electric passenger car no longer appeals exclusively to women. The infrequency of troubles attracts the busy man and the cost of operation is about one-third less than that of the gasoline car, with one-tenth the bother.

Speeds of commercial electric vehicles range from 7 miles per hour with the five-ton truck to 13 miles per hour for the half-ton size. Gasoline speeds run 25 per cent higher for the same size, which means heavier maintenance and depreciation. The relative reliability of horse service is 75 per cent, gasoline 85 per cent, and electricity 98 per cent. Up to a daily service of 50 miles the electric vehicle is superior to gasoline in almost all cases. A life of at least 10 or 15 years can be counted upon. Records of a large installation taken last winter showed that for every 100 "truck-days" two troubles were reported for electric vehicles against six for the gasoline cars. Out of 4,900 truck-days, 3,400 were run by electric machines and 1,500 by gasoline outfits. The total number of troubles reported was 166, of which 92 applied to the gasoline machines despite their much lower combined mileage; 43 of the electric-vehicle trouble cases were due to exhausted batteries. The earliest hour of exhausted battery report was 5 p. m. Broken chains and loose tires were the chief remaining difficulties. Nearly all the trucks had been in service at least 18 months.

Mr. Burleigh, in opening the discussion, said that the difficulty encountered in bringing the electric vehicle to the attention of the smaller central station is due to the fact that 90 per cent of the men in such plants are technically rather than commercially educated. Mr. Marshall called attention to the courses on electric vehicles planned by the Electric Vehicle Association at such institutions as Case School of Applied Science, Cleveland, and Armour Institute, Chicago. Courses are also being considered for buyers, and plans are afoot for lectures, moving pictures, etc., in different parts of the country under the auspices of the Association.

At the close of the afternoon session those attending the convention were transported to the service buildings of the Boston Edison Company, where a thorough inspection was made of the company's immense garage under the guidance of Messrs. White and Smith of the Edison Transportation Department. A steak dinner was enjoyed in the company restaurant, all the viands being electrically cooked.

The Relative Fields of Electric, Gasoline and Horse Trucks.

H. F. Thomson, research assistant in the Department of Electrical Engineering, Massachusets Institute of Technology, opened the evening session with an illustrated address upon the work of the Institute in the past three years in the field of highway transportation, outlining the methods of observation and showing slides of field records and curves deduced from them. Inquiries have been received from practically every state regarding this work, and six foreign countries and 100 manufacturers have displayed interest in it. Several bulletins have already been published by the Institute upon this subject, and the speaker accorded much credit to the Boston Edison Company for its financial and technical interest in the work.

The results of the investigation to date will be published by the Institute in bulletin form during the present year. In general, these show that within a two-mile radius the service of the electric vehicle is equivalent to that of the horse in cost, but that beyond this limit, the electric furnishes the cheapest service possible for a given traffic out as far as the vehicle can be operated on a single battery charge. The annual repair expenses of a 2,000-pound truck are proportional to the mileage, and may be expected to run from $40 with a mileage of 2,000 to $200 with a 10,000-mile yearly service. The total cost of maintenance per mile in modern commercial motor vehicles appears to vary about five per cent between electrics and gasoline machines. The electric is about 95 per cent reliable as compared with, say, 75 per cent in the gasoline car. In transportation cost, the labor item is the most important. Small changes in the schedule produce large variations in cost. In parcel delivery the electric vehicle is superior between two and ten miles' radius, whereas in coal distribution a six-mile radius is about the economic limit. A five-ton coal truck can be counted upon for about 32 miles per day. The cost of electricity is only a minor item in the total analysis of truck service and in a typical instance in the coal field an increase in the kilowatt-hour cost of from two to four cents only increased the total expenses ten per cent.

In opening the discussion, R. B. Daggett, Commercial Truck Company of America, advanced the opinion that the cost of operating electric trucks on a scientific basis may be a good deal less than any average figures can show. He contended that the pasture is the real field of the horse and pointed to the successful use of industrial electric trucks over distances measured in yards as an indication of the possibilities in short-radius nstallations. The industry is as yet too young for teamsters to have learned to handle electrics most efficiently. In general, the speaker said that a one-ton electric truck can be operated 30 miles per day at a total cost of $7, compared with a $ cost for a one-horse outfit running 15 miles per day. By an extra battery the electric truck can be run 60 to 80 miles per day. The cost of doubling the mileage is about 40 per cent additional, or a total of $9.80 per day for a service of 60 miles compared with $16 per day for a similar service with four one-horse teams. The proper planning of street routes is of great importance. Mr. Marsh emphasized the advertising value of an up-to-date electric delivery service, and Mr. Abell concurred with Mr. Daggett as to the importance of correct routing. He had seen the cost of delivery rise from 4.5 to 19 cents per case on account of poor routing of trips. Day Baker, General Vehicle Company, Boston, said that an examination of the private cost sheets of a large meat packer recently showed

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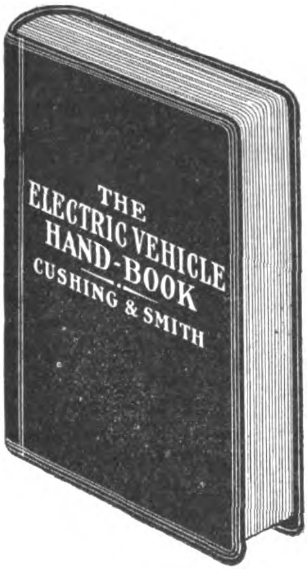

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that in an extended period of service the electric trucks showed a reliability record of 92.7 per cent, compared with 72.5 per cent for the gasoline outfits, taking all interruptions into account, and including layoffs for painting.

Touring by Electric Automobiles.

J. S. Codman, of S. R. Bailey & Company, Boston, presented a paper on electric automobile touring which aroused great interest. He pointed out that the day of touring is close at hand and that the obstacles are neither many nor great. The electric has sufficient speed for all reasonable requirements, and tours show that rough, muddy and hilly roads are not real obstactles. The runs of Colonel Bailey from Boston to Burlington, Vt., and from Boston to Chicago last fall were described at length. The latest remarkable trip in an electric automobile was made between Boston and New York by a Bailey car on May 14 and 15. New York was reached in less than 24 hours from the start, the actual time being 23 hours, 9 minutes and the distance, 247.8 miles. The total actual running time on the road was 10 hours, 52 minutes, and the schedule speed through the various sections ranged from 18.9 to 26 miles per hour. Five boosting charges were given the battery, the total boosting time being 10 hours, 23 minutes. The total ampere-hours for the trip was 753, or 3.04 ampere-hours per car-mile. All the experience of the author shows that road speeds of 20 miles per hour can be maintained without difficulty by the Bailey car and that the question of local charging facilities is the only real obstacle to very satisfactory touring. The Boston-Chicago tour of Colonel Bailey covered 1,305.2 miles and was made in 83 hours, 30 minutes running time, at an average road speed of 15.6 miles per hour, the local roads in the Middle West being heavy with rain and mud.

Although a battery cannot be filled as quickly as a gasoline tank, the delay is not great, if proper facilities can be obtained. Boosting a battery at high current rates is perfectly practicable today. The Edison battery is notable in this respect, and even the lead battery can be charged without injury at much higher rates than was formerly thought possible if only proper care is taken to reduce the rate before the gassing point is reached. Mr. Codman said that on one occasion he had himself boosted a battery at 200 amperes for one hour. This was a battery of Edison A-6 cells rated at 45 amperes normal current and it absorbed enough in that hour charge to run the machine 50 miles. On this occasion the cable was passed through the window of a central station and conected directly upon the exciter bus, with little loss of time. In touring, the ampere rate obtainable is generally low; public charging stations are few and far between, and when found are as a rule equipped with a hopelessly inadequate 30 or 40-ampere rectifier. On the other hand, the local central station is generally unprepared for charging service, and it is impracticable to spend an hour getting ready for a half-hour's boost. What is needed is apparatus all ready for use and someone about the station who knows what ought to be done. Even in Massachusetts only 53 towns out of over 300 supplied with central-station service are provided with charging stations and there are only 28 towns where more than 50 amperes can be obtained.

It would certainly seem that where there is a town with no public charging station capable of giving an adequate boost, at 100 amperes minimum, and 125 volts, the electric light company itself should have ready for service an equipment connected with the exciter and consisting of a switch, fuses, and terminals for connecting to the cable and charging plug which every motorist should himself carry. A cheap resistance coil for controlling the current is also desirable, but even this is needless when the Edison battery is used. The instruments on the car itself can be used for any necessary measurements. Such an outfit would be very inexpensive. The author closed with quotations from an editorial on touring by electric automobile which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 4, 1913, which emphasized the simplicity of the necessary co-operation from the central-station standpoint.

The discussion was opened by Mr. Abel, who advocated the co-operation of the National Electric Light Association in supplying central stations with charging connections at a lower cost than by single purchases. Mr. Marsh called attention to the possibilities of using photographs of the simple charging apparatus needed among central stations. S. Fred Smith urged the more general adherence of vehicle owners to the standard plug design of the E. V. A. Mr. Marshall said that the American Institute of Electrical Engineers has adopted the standard plug, and that the International Electrotechnical Commission now has it under consideration.

J. W. Cook, Electric Storage Battery Company, Boston, cited the possibilities of boosting lead batteries at high rates of charge. If a battery is exhausted, 50 per cent of its charge can be put in during the first hour, and in two hours two-thirds of the capacity can be put in. By charging on a constant-voltage basis, 90 per cent of the charge can be put in in three hours. P. E. Kelley, Philadelphia Storage Battery Company, Boston, concurred with Mr. Cook. F. B. Neely, Boston, said that in boosting a lead battery it is convenient to charge in amperes at the rate indicated by the reading on the ampere-hour meter: that is, if the meter shows 100 ampere-hours taken out of the battery, the cells can be charged at 100 amperes, reducing to 90 amperes when the meter shows 90 ampere-hours are out. Gassing and temperatures above 110 degrees Fahrenheit must be avoided. G. M. Goetting, Boston Edison Company, corroborated the foregoing speakers with particular reference to fairly empty batteries.

Mr. Daggett said that in a recent taxicab test in Philadelphia a service of 60 miles per day was increased to 120 miles by charging the cells when standing for five and ten-minute intervals which did not interfere with the service. W. G. Bee, Edison Storage Battery Company, Orange, N. J., called attention to the keeping of storage-battery street cars running 15 hours per day at Washington, D. C., by four to six-minute charges at the ends of certain trips. Other speakers were A. J. Marshall, E. Y. Stimson and Albert Weatherby.

Recognition of the Electric.

A paper by Hayden Eames, Standard Electric Company, Cleveland, O., was read in the author's absence by C. H Miles, Boston. The writer pointed out that there is no romance in electric-car operation, and that the public needs to be educated as to its practical service. The man who buys a gasoline car for $2,000 does not realize that the electric machine can be run at one-third less per mile. Broader methods of advertising, and particularly the encouragement of word-of-mouth recommendations from owners to prospects are needed. Nothing will advance the cause more than practical applications of electric vehicles and testimony by their users as to their convenience and economy.

Competition, Fair and Unfair.

A. Vere Shaw, of the Peerless Motor Car Company, Boston, opened the final session at the Engineer's Club on Wednesday morning with a paper on competition, J. A. Hunnewell, of Lowell Electric Light Corporation, presiding. He outlined the evils of an economic system which tempts men to acts of business immortality and set his face strongly against the boomerang policy of "knocking" competitors. Confidence is the mainspring of modern business and the buyer has a right to the truth. Distrust in a battery, created by an unscrupulous salesman, injures the entire battery business. All competition should be limited to offering society either a better article or a lower price. In place

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of the combination, coercion and secrecy of yesterday should stand the modern policy of service, subdivided into co-operation, competition and publicity.

P. E. Whiting, S. R. Bailey & Company, Boston, cited the improvement in the local electric-vehicle market resulting from the co-operative work of the Electric Motor Car Club of Boston in the past three years. Today there is hardly any "knocking" of competitors in the field. Mr. Mansfield said that older salesmen are much less prone toward tearing down their competitors' reputations, relying upon other and better ways of getting business. Colonel Bailey and Messrs. Marsh, Bee, Abel, and F. J. Stone of the Electric Storage Battery Company, Boston, offered cumulatice testimony along the above line.

Open Business Forum.

Converse D. Marsh, New York, analyzed the electric-vehicle sales problem diagrammatically, starting with the local agency. Business getting by salesmen was divided into the following records: Daily detailed report of prospects calling at salesroom; same on prospects called upon at home or office; demonstrations, reports and suggestions as to closing deal; and detailed reports as to calls on prospects. Advertising was skeletonized under the four heads of newspapers, follow-up literature, outdoor displays, and programs. Under the first were morning and afternoon issues. Under the second came form letters, printed matter and catalogs, with special letters from satisfied customers. The third head embraced billboards, painted and illuminated signs, and the fourth covered theaters, Boston Opera House programs and church and club publications. Mr. Marsh said he greatly doubted the value of advertising in programs of any kind. He dwelt upon the importance of a very large list of prospects, considering the small percentage of immediate customers. He discussed at some length the value of form letters of the highest class, and emphasized the importance of individuality in such compositions, actual signatures in ink, and even an occasional error in spelling (except in Boston!) as an insurance against stereotyped appearance. Of supreme importance is the making of a record of any word dropped by the prospect which throws light upon his point of view and enables the salesman to meet him on the same plane in all future relations.

Mr. Marshall opened the discussion. He said that too many people regard the electric vehicle as a "second" car, to be bought after the gasoline machine. Albert Weatherby, Detroit Electric car representative, Boston, said that he often follows the horse and places the electric vehicle in families, about 65 per cent of whom never owned an automobile. Colonel Bailey said that the easiest sales are made to existing car owners and Mr. Whiting said that about 50 per cent of the Bailey cars are now sold to men. There is room for more general advertising as to what the electric can do. Colonel Bailey said that the prospect rarely knows that the speed of the electric vehicle on the road, speaking from his own close observation, exceeds that of the gasoline car on the average.

Day Baker pointed out that the mechanically minded New Englander, with his heritage of early failures of the electric vehicle about 1901, needed to be educated as to the great improvements in recent products. He said that in running an electric daily between Brookline and Boston he observed an average speed of gasoline cars of about 15 to 17 miles per hour. Answering a question, Mr. Marsh said that if a local agency had $1,000 to expend in advertising in a year, he would recommend spending $250 on two or three press displays and putting the rest into mail and follow-up work. Newspaper advertising pays far better than program advertising because the reader buys the paper, and anything that costs real money means more than a publication which is free. Louis D. Gibbs, superintendent of advertising, Boston Edison Company, agreed emphatically with Mr. Marsh in regard to the uselessness of program displays, which he characterized as a "hold-up."

Weak Links in the Chain of Electric-Vehicle Salesmanship.

In a valuable paper upon this topic, F. Nelson Carle, publicity manager of the General Vehicle Company, Long Island City, N. Y., said that out of 100 average New England firms who look like good prospects at a given date, 8 may be eliminated as to immediate credit, 17 will have a straight gasoline truck proposition, 15 will have one or more gasoline trucks and will try them out before buying additional equipment, 12 will have local operating problems which the horses will best serve, 32 will either own no horses outright or be tied up with teaming or trucking contracts of various kinds, and 16 will be what might be called "gilt-edged" prospects for electric trucks. Of these 16 93.75 per cent will swear that they are not just now ready to buy. Assuming that the salesman converts 7 of these to the electric vehicle, he will lose at least two sales through competition, on price, delivery date or on differences in design. One sale will probably be forfeited because the man higher up changes his mind about buying trucks; another may go by the board because garaging and charging facilities are not immediately available. That leaves three firms to cash in on.

Some of the weak links in electric-truck salesmanship are as follows:

1. Lack of trade knowledge in opening up various lines of business.

2. Lack of more intelligent co-operation between the sales force and the smaller central station, accessory salesman and truck buyer.

3. The disposition on the part of some salesmen to accept an order for what the customer thinks he wants, rather than for what experience indicates he should have.

4. The tendency of some salesmen to let their engineering enthusiasm suggest a type of machine which pleases the customer but which is impractical to build and sell at the regular price.

5. Trade deals and concessions on the part of truck agents who place their commission before the good of the industry.

6. Inattention to really interested prospects in the smaller cities in a given sales territory.

7. Lack of more practical sales helps to the agent on the field by the manufacturer.

The industry must expect a certain amount of "giving in" to the customer for the reason that a man buying his first truck is apt to see everything through horse-wagon glasses. The business is needed, but if an initial truck falls down because of its departure from the standard, re-orders are automatically killed. No electric-truck manufacturer has half as large a sales organization as he would like, and as a result prospects in small places are sometimes unintentionally neglected. This situation works against the general success of the electric, and should be remedied as soon as possible in view of the activity of the gasoline-truck people. One of the first essentials to better results is an endless chain of data interchanging between salesmen in different parts of the country. The manufacturer is at fault in not giving the man on the ground greater assistance along this line, but it takes time and money to establish a clearing house of the kind needed. Some salesmen and agents do not save or assimilate the data sent them, and others "holler" for information but never turn in any to headquarters themselves.

At present, sales of standard machines are of prime importance. Electric trucks need to be made in great numbers to reduce costs and benefit the buyer. When the central station sides with the buyer in demanding a special design, or a battery man breaks into the situation and gets the specifications modified, neither are helping to increase sales in the broad sense because "specials" are fatal to quantity production.

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THE VALUE OF CORDIAL RELATIONS BETWEEN PUBLIC UTILITIES AND THE PUBLIC.

It is not so many years ago since the attitude of the managers of railroad systems and other utility properties toward the public was exactly the same as that of the greedy business man, now happily almost out of date, who wants to get all he can from the public and give as little as possible in return. These men felt that they were in the utility business by divine right and that if the public wished their service it could have it at rates which they thought proper; but that the public should have any remote right to be concerned in the conduct of the business or in the determination of the rates or nature of the service was absolutely beyond comprehension. The result of this attitude is the hostile feeling of the public toward nearly all utility companies, still prevalent in so many parts of the country.

It is pleasing to note that in the same state where the famous saying "The public be damned" originated, there was made a few weeks ago an address showing the modern attitude of utilities toward the public. We refer to the extemporaneous but splendid address made by Mr. R. M. Searle before the recent convention of the National District Heating Association, a brief abstract of which is given on another page of this issue. Mr. Searle is one of those thoroughly wide-awake managers of a large utility system who realize that the public will not treat a utility company unfairly if it is given fair treatment in turn. He believes in maintaining at all hazards the most friendly relations with the public, and has some excellent ideas as to how this may readily be done. For one thing he believes in letting the public know about the details of the business which affect the rates charged or the quality of the service. He believes that the patrons of a utility should always have the liberty to bring in complaints directly to the attention of the management. Such complaints, many of which are constructive, should receive immediate attention. If this is given, the cause for more serious disputes between the utility and the public is nearly always removed.

Mr. Searle has another excellent idea in that he does not believe in the old-time one-man idea of a large concern. In such an establishment, if everything must be referred to the head of the company, who of course has human limitations, many things are tied up indefinitely or receive improper consideration. A true manager will use such care in the selection of his heads of departments and his entire staff that he may repose complete confidence in them and let each man take responsibility upon himself.

Still another excellent thought Mr. Searle brought out in the address was that employees should be permitted to speak to newspaper representatives so long as they state the absolute truth. This is a feature that is highly desirable in many organizations where it is not now in evidence. In many such concerns a person desiring some information, which he is quite sure is not confidential, cannot obtain it without being referred from one person to another, until finally he is likely to lose patience and give up the attempt. Of course, with many of the aggressive newspaper representatives, this policy does not prevent them from publishing things about the company, even though they may not be obtained from reliable sources; frequently gross misstatements are made in the public press because persons who have been approached, and who had the information that was desired, were reluctant to give it out without the sanction of some superior officer.

Throughout Mr. Searle's address there can be noted a fine spirit of open and frank dealing, absolutely above board, which in the case of his company has resulted in the most cordial relations between the utility and the public. Not only does this practically eliminate the needless bickerings that are still manifested in many communities when utility matters come up for consideration, but it has raised the Rochester utility so much in the esteem of its public that the securities of the company are being freely purchased by its own customers and other local people. This alone has been a most highly desirable feature, because if many citizens in a community have a direct financial interest in the utility company which serves them, it is bound to promote that stability of friendly relations between the utility and the public which is to the mutual benefit of each. If more of our cities could boast of the good will of the Rochester company there would be very much less agitation for municipal ownership and drastic government regulation.

THE PITTSFIELD MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The Pittsfield meeting of the American Institute of Electrical Engineers, reported in this issue, was devoted principally to a discussion of the relative merits of delta and star connections for transformers. The discussion of this question makes it evident that there are a number of points connected therewith upon which there is no unanimity of opinion. Some of the speakers contended that there are important differences between ungrounded star and delta connections; whereas others maintained that the only important differences arose when the neutral of the star connection is grounded. There were contenders also for the superiority of both the isolated-delta and the grounded-star systems, especially when disturbances to telephone lines are taken into consideration. The trend of practice in this country upon high-voltage lines seems to be toward the use of the grounded-star system of connections and unquestionably this system has certain advantages under certain conditions. The only question seems to be whether there may be conditions under which these advantages disappear and where the isolated delta or isolated star is to be preferred. Regarding this point also there seems to be some difference of opinion. While the practice in Italy favors the ungrounded delta system, this appears to be mainly due to the fact that it was first used and has not developed enough serious trouble to lead to its abandonment.

It was hoped that this meeting would bring out sufficient evidence, with discussion from different standpoints, to make it possible to arrive at a definite answer to the problem, and although Mr. P. H. Thomas was on the ground to sum up the considerations brought out in the discussion, it can hardly be said that this point was accomplished. Certainly those who participated in the discussion did not come to any common ground in their attitude toward this question. The reader may, however, be better able from a consideration of all of the arguments brought out, to form a definite opinion upon the subject.

WHAT IS DISCRIMINATION?

A recent case before the Public Service Commission of the Commonwealth of Pennsylvania, in which a customer of the Bethlehem City Water Company complained of discrimination, brings up a point of much interest to all utility companies. The public utility law in most states provides that there shall be no discrimination shown in rates to customers receiving service under substantially similar conditions. The Pennsylvania Act of 1913, which established the Commission, provided that no greater or less compensation should be exacted from one customer than from any other "for a like and contemporaneous service under substantially similar circumstances and conditions."

In the case in question, the utility company had offered a special discount to consumers of water residing along streets where city water mains exist, the only reason for the distinction being the competition in supply to the latter class. The Commission decided that such competition constitued a difference in the conditions of service which warranted the discrimination in rates.

This decision sets a new precedent as to what constitutes discrimination and furnishes an interpretation of the law which was probably never intended by its framers. Heretofore "similar conditions of service" has been regarded as referring to the physical conditions involved, such as the quantity consumed, time at which consumed, etc. If business considerations alone furnish a sufficient warrant for discrimination, it is probable that any discrimination in rates whatever might be justified.

The Pennsylvania Commission in this case, however, has had in mind the best interests of the utility company which was made the respondent in this case, and has made the best of a difficult situation. The case arises on account of conditions which are not recognized in the theory which is at the basis of public-utility control. Where a utility company has a monopoly in the supply of its product in a particular territory, the conditions represented in West Bethlehem could not come about, and the law is framed in disregard of such a condition. The difficulty resides in the possibility of a municipality erecting a competing plant where a utility company is already furnishing service. The proper solution of the question is the prevention of such conditions by placing municipally owned and operated utilities under the same conditions that apply to privately organized utility companies, and in protecting established utilities from competition.

LANGLEY'S FLYING MACHINE.

Newspaper dispatches of May 28 stated that a successful flight had been made at Hammondsport, N. Y., by the well known aviator, Mr. Glenn Curtis, in the machine constructed by Langley in 1906.

It will be remembered by anyone interested in the subject of aviation that Secretary Samuel P. Langley, of the Smithsonian Institution, received a grant of funds from Congress for the purpose of carrying out his ideas in the construction of a machine heavier than air which would be capable of sustained flight. The machine was constructed, transported down the Potomac River, and the attempt at flight made by projecting the machine into the air over the river from its starting platform. Owing to an accident in starting, the machine did not acquire stability, but fell into the river and was damaged. Funds were not available for repairing the machine and making another trial, and Professor Langley was compelled to endure the disappointment of having his experiment regarded as a failure and being subjected to much ridicule.

After an interval of eight years, during which the death of the noted scientist has taken place, it has been demonstrated that his machine was constructed upon correct principles and was capable of sustaining itself in the air when given a proper start. While this vindicates the principles upon which Langley worked and is a consolation to the friends who had faith in his ability, it can never wipe out the disappointment which was his, due to his failure to continue the demonstration himself to the point of success. It will, nevertheless, help to establish his name as one of the pioneers who developed the subject of aviation and constructed a machine which was capable of flying through an atmosphere lighter than itself. It helps to demonstrate also that the proper application of scientific and mechanical principles to any problem will eventually achieve the recognition which is its due.

This incident presents the opportunity to emphasize once again the many directions in which the applications of electricity have benefited mankind and made possible achievements which could not otherwise be attained. Development of the aeroplane was dependent upon the application of the explosion engine, and this in its turn is wholly dependent for the ignition of its charge upon an electrical spark. It is well to bear in mind, consequently, in considering the wide application of electrical energy, that aviation and all other applications of the gasoline engine owe their achievements to an electrical method of controlling the energy upon which their success depends.

ELECTRIFY THE WEDDING GIFT.

The ancient worship of Juno, the goddess of matrimony, has left its traces to this day in the designation of June as the favorite month of brides and grooms. Thus June is the month of peak load for marriage-license clerks and ministers, as well as for the purveyors of things appropriate for wedding gifts.

Nearly every bride has a strong penchant for having everything connected with her wedding as attractive as possible and thoroughly up-to-date. This is natural because marriage is the climax of optimism, just as it is supposed to be the acme of happiness. It has been found that there is scarcely any line of wedding gifts that pleases a modern bride as much as an array of things electrical. They satisfy her desire to be right "up to the minute"; they are invariably attractive; they are always useful; they are the personification of convenience, and they conduce to the true happiness of the bride by making her realize that hers is not to be a life of drudgery and toil, but one in which leisure time will be left for culture and the higher things of life.

That June is a psychological time for pushing the sale of electrical appliances and utensils is being appreciated by a number of manufacturers and dealers in such devices. In this issue will be found a note of how the wide-awake management of the Louisville central-station company is actively carrying on a campaign of this nature through newspaper publicity and a special display.

Such a campaign carried on at this time should bring valuable returns. Electrical gifts at Christmas have become extremely popular and have furnished excellent revenue for electrical manufacturers, dealers and central stations. Just at this time, with the hot weather upon us, electrical cooking devices, fans and all other electrical appliances that will reduce the discomforts of the torrid season, make a peculiar appeal to the prospective as well as the mature housewife. Therefore, let us electrify the wedding gift.

Meeting of Chicago Jovian League.

Major Carl F. Hartman, chief signal officer, Central Department of the United States Signal Corps, was the speaker at the luncheon of the Chicago Jovian League on June 8. Major Hartman spoke on "Electricity in the Army in Time of War or Peace." Much of the work of the Signal Corps during times of peace is devoted to the establishment of advanced posts, such as those in Alaska. In this territory the government has erected over 36,000 miles of land lines for telegraphing and telephoning. Radio stations, however, are rapidly replacing these land lines as it is found that they are more satisfactory for that climate in all ways. The Panama Canal, he said, also was a large undertaking for the government in the way of electrical equipment, a complete 5,000-horsepower hydroelectric plant having been built. Considering the subject of harbor defense, he called attention to the fact that the large guns are fired without the gunners seeing the target, several observation points sending data to a plotting room from where the correct setting of the gun is telephoned to the gunners. During war, he said, telephone lines, buzzer lines, telegraph lines, and radio stations advance with the army. Some idea of the quickness with which this work is done, can be obtained from the fact that it requires only two minutes to unload a portable radio set and to place it in operation.

In the absence of President Homer E. Niesz, Vice-President F. W. Harvey, Jr., occupied the chair and Thomas G. Grier introduced the speaker. A large number of members of the Chicago Electric Club were present at the meeting by special invitation.

Lansing Jovians Have Rejuvenation.

A very successful meeting of Michigan Jovians was held in Lansing, Mich., recently, when 52 members gathered at the Hotel Wentworth. Members of the Lansing Jovian League, together with other Jovians from nearby cities, took part in the festivities, which included a banquet with several addresses; 13 candidates were initiated into the Order. This was the second rejuvenation held by the Lansing League, which now has 40 members.

Youngstown Jovians Working for Club Rooms.

Youngstown, O., Jovians and their friends gathered in force on a recent evening at the Park Theater, filling the house to overflowing. The attraction was not so much the excellence of the performance, although it was very good, but the fact that the Jovians had bought out the house for the evening and resold it, as a part of their campaign for funds with which to equip new club rooms. The fund is growing rapidly, and with the profits gained by the theater "stunt," and with other projects under way by which substantial sums are hoped for, indications are that very shortly there will be available a sufficient amount to furnish the organization's rooms in luxurious style.

Valuation of Cincinnati Utility Under Way.

The Union Gas & Electric Company, of Cincinnati, O., is actively at work on an inventory of its properties, which was requested some time ago by the Ohio Public Utilities Commission, and expects to have it completed well within the time limit set, which is October 1. At the same time, the City Council of Cincinnati has completed arrangements to have a physical valuation of the company's properties made under the supervision of A. C. King, deputy commissioner of electricity and gas, of Chicago, for the purpose of affording a basis for charges for current. There has been considerable criticism of the action of the Council, opponents of the plan pointing out that the methods used by the company for the Utilities Commission and those to be used by Mr. King on behalf of the city are said to be practically identical, and that the city, therefore, could have saved the expense, for which $8,000 has been appropriated, by awaiting the result of the company's inventory.

Placing of Wires Underground Deferred at Newport, Ky.

Protesting against the proposed action of the city commissioners of Newport, Ky., who are contemplating an ordinance by which public service corporations using overhead wires will be compelled to place them underground, Secretary Albert Silva of the Union Light, Heat & Power Company appeared before the commissioners last week on behalf of that company and set forth reasons why the company believes this action should not be taken. He said that the company has made very low rates, not only for street lighting, but for domestic consumers as well, on the understanding that the system now in use could be continued, and that the large expenditure necessary to place its wires underground would necessarily mean a readjustment of the rates, and, therefore, a hardship on the consumers and the city. The commissioners have taken the matter under advisement and no action will be taken for the present.

Exports of copper for the week ended June 4, totalled 8,690 tons, compared with 7,049 tons during the corresponding week last year.

Electric Club of Chicago Hears About Mexico.

A well attended luncheon meeting of the Electric Club of Chicago was held at the Hotel Sherman, Chicago, on June 4, with Vice-President W. C. Berry presiding. Announcement was made that as usual the weekly meetings will be discontinued for the summer after the June 18 luncheon, which will be a special get-together meeting and entertainment; weekly meetings will again be resumed on September 17. The invitation of the Chicago Jovian League to join its meeting of June 8 was unanimously accepted.

Mexico was the subject of the address by the speaker of the day, Robert J. Kerr, a Chicago lawyer who has made many trips to Mexico and who was civil governor of Vera Cruz in the interim between its recent seizure by our Navy and its occupation by the Army. He referred to the hydroelectric and other electrical developments in that country as worthy of arousing the interest of electrical men in its now unhappy condition.

Mr. Kerr touched on the characteristics of the Mexican people, pointing out that the extreme illiteracy (85 per cent of the inhabitants cannot read or write), as well as the slow development of the great mass of the Indian population, retarded the progress of the country and rendered its government on democratic lines well nigh impossible. He briefly traced the history of the nation, dwelling particularly on the upheavals of the last four years. Incidents were cited to show the gross ignorance of the average Mexican soldier and his contempt for the rules of modern warfare. Taking up recent developments at Vera Cruz, Mr. Kerr eulogized the behavior of the American troops and contrasted it with the conduct of their treacherous opponents.

Some features of our Government's Mexican policy were severely criticized by the speaker. The failure to secure protection for American citizens in Mexico was denounced, as was the advice that they leave their possessions, in most cases all they had, and depart from the country. The difficulties attendant on this were pathetically retold. The great bulk of American investments in Mexico were made not by powerful capitalists or trusts, said Mr. Kerr, but by people of moderate means, who were trying in a legitimate way to bring the blessings of civilization to a backward country by developing it and not by exploiting it. On account of proximity American manufacturers have a marked advantage in supplying Mexican wants and they should be encouraged, if our Government is really anxious to promote foreign trade.

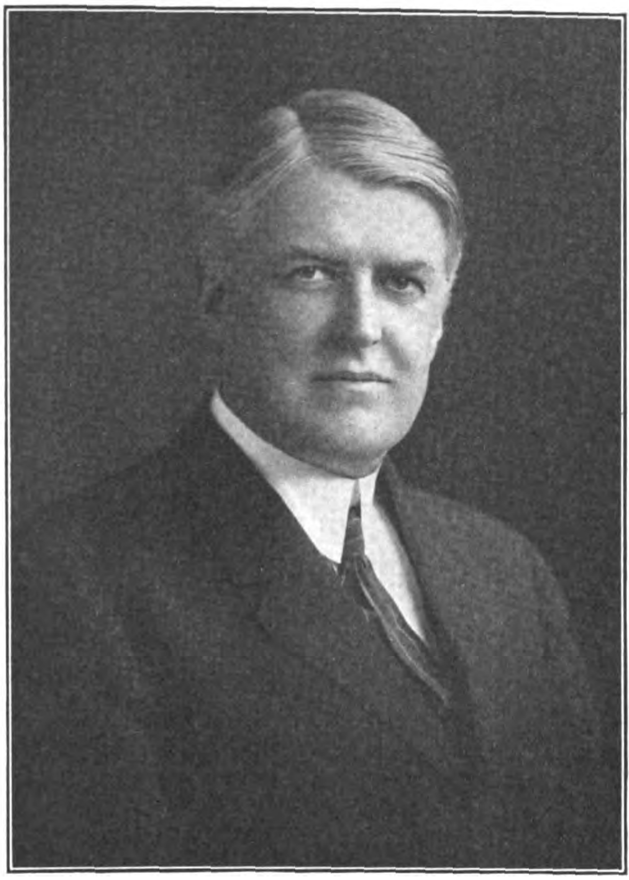
Morgan Brooks.

Morgan Brooks, practical electrician, inventor, engineer, scholar and instructor, has accomplished much for the electrical industry and contributed greatly to our modern conception of technical education and training of engineering students.

Morgan Brooks was born in Boston, the youngest son of Francis A. Brooks, a lawyer of marked individuality and personal force. Prepared at the famous Roxbury Latin School, he entered Brown University in 1877 with honors in mathematics. He was the youngest in his class until the advent in sophomore year of the now distinguished Justice Charles E. Hughes. Graduating from Brown in the scientific course and desiring further engineering training, he spent the two succeeding years at Stevens Institute of Technology and received the degree of Mechanical Engineer in 1883. His graduating thesis in colloboration with his classmate, J. E. Steward, upon "Tests of a 10-Horsepower Otto Gas Engine," was published in *Van Nostrand's Magazine*, and translated into French and German, owing to the tests covering the metering of the air as well as the gas consumed. Knowledge thus gained secured Mr. Brooks his first engineering position, with the Boston agents of the Otto engine. The following year he went into experimental work for the American Bell Telephone Company, establishing the first copper-wire specifications for that company, and testing telephonic inventions offered for purchase. In 1886 he followed Theodore N. Vail from the telephone to the storage-battery field, accepting a position with the Electrical Accumulator Company of Philadelphia in its Boston office. His work was the preparation of plans and specifications and the installing of storage batteries. It also included one of the earliest experiments in car lighting in America, that of the Fall River Boat train of the Old Colony Railroad, operating successfully in the winter of 1886-1887.

In 1887, on behalf of the St. Paul Gas Light Company, he investigated the then new transformer method of alternating-current lighting with 50-volt lamps promoted by the Westinghouse Electric & Manufacturing Company, and introduced it the following year at St. Paul in competition with the Edison three-wire direct system. Three years later he organized the Electrical Engineering Company of St. Paul-Minneapolis as contractors for the installing of light, power and telephone plants. The company grew into the foremost wholesale electrical supply house operating exclusively in the Northwest. During this period Mr. Brooks patented an intercommunicating telephone system for upwards of 100 subscribers, which was introduced at Northfield, Minn., and invented a successful device for eliminating "side-tone" in telephony.

In the summer of 1898 the chair of electrical engineering at the University of Nebraska was offered to him and accepted. He was for three years engaged in building up that department before accepting a similar call to the University of Illinois, where he is still teaching. At that time the number of students in electrical engineering was small, graduating classes numbering from 6 to 10 the first three years. Since then the growth has been rapid, graduates of 1909 exceeding 50. This increase Professor Brooks ascribes to the growing importance of electrical engineering, but those acquainted with his work think that his improvements in the course of study, his reputation as a teacher and the success of his graduates had much to do with the advance of his department. Professor Brooks feels that his engineering and business experience have been of great value to him in training students to meet the practical as well as theoretical demands of their work.



Morgan Brooks,
Professor of Electrical Engineering at the University of Illinois.

At Illinois, assisted by a graduate student, M. K. Akers, now professor of applied electricity at the State College of Washington, he developed the art of self-synchronizing of alternators. This required the use of reactances without iron cores, a type that has since been adopted generally in the protection of alternating apparatus. Study of inductances led also to the development of the first universal formula for the quick calculation of the inductance of coreless coils of any shape, published in a bulletin of the Engineering Experiment Station of the University of Illinois.

Professor Brooks has served as director and also as vice-president of the American Institute of Electrical Engineers, of which he is a life fellow. Several papers by him have been published in the *Transactions*. His most recent investigations have been in illumination, with particular reference to the lighting problem of large interiors and street lighting for small communities.

Moving Chicago Telephones.

Twenty-five thousand changes of telephone stations with practically no complaints and no demoralization of the service is the unparalleled record of the Chicago Telephone Company for the week ending May 2. It is four times greater than that of any previous year.

This record number of changes is but a part of the thousands made during the Chicago May-moving season. It is a striking evidence of preparedness-to-serve on the part of the Telephone Company to be able to meet the unusual demands upon it at the time when a large part of Chicago's population is indulging in its annual custom of migrating from place to place.

Owing to this custom, public-service companies are obliged to prepare for it weeks in advance. The Chicago Telephone Company, in addition to thoroughly organizing its forces to handle the business, endeavored to impress upon the people the importance of giving early notice where changes of residence were in contemplation. It did this through display advertisements in the daily newspapers and the periodicals. The company's success in dealing with the problem was due not only to thorough organization and persistent advertising campaigns, but also to the co-operation on the part of the subscribers.

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Illuminating Engineering Society Officers Elected.

The report of the Committee of Tellers of the Illuminating Engineering Society on the results of the recent annual election, presented to the Council of the Society on June 11, showed that the following national officers had been elected for the ensuing year: president, A. S. McAllister; vice-presidents for two years, F. A. Vaughn and C. A. B. Halvorson, Jr.; general secretary, Joseph D. Israel; treasurer, L. B. Marks; directors for three years, Ellice M. Alger, Harold Calvert, V. R. Lansingh.

Election of Section officers resulted as follows:

Chicago Section: chairman, W. A. Durgin; secretary, H. B. Wheeler; managers, Harry S. Gradle, M. G. Lloyd, F. A. Pinckney, Edward G. Pratt and Herman V. Willman.

New York Section; chairman, Norman Macbeth; secretary, Clarence L. Law; managers, George W. Cassidy, Norman D. Macdonald, H. B. McLean, Frank E. Wallis and Percy S. Young.

New England Section: chairman, Louis Bell; secretary, S. C. Rogers; managers, C. M. Coles, J. W. Cowles, Walter B. Lancaster, H. F. Wallace, R. C. Ware.

Pittsburgh Section: chairman, G. W. Roosa; secretary, S. G. Hibben; managers, W. A. Donkin, H. S. Hower, Harold Kirschberg, E. B. Rowe and R. H. Skinner.

Philadelphia Section: chairman, H. A. Hornor; secretary, L. B. Eichengreen; managers, James Barnes, Douglass Burnett, George S. Crampton, R. B. Ely and F. H. Gilpin.

The next annual convention will be held in Cleveland, O., during the week beginning September 20.

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A German inventor, Johannes Marschall, of Dresden, has recently patented an application of the well known principle of the thermopile to the practical production of electric light without the intervention of boiler, engine, or dynamo. The present invention consists of a furnace containing a series of thermopiles made of heat-resisting metals, and is said to deliver a practical lighting current for a somewhat less fuel cost than the best steam engines. The first cost of the plant should be very considerably less according to the claims of the inventor.

Electrical Decoration for Louisville Saengerfest.

Elaborate preparations are being made in the way of electrical illumination of the streets and public buildings of Louisville, Ky., for the meeting there June 24 to 27, inclusive, of the thirty-fourth Saengerfest of the North American Saengerbund, which is expected to bring thousands of visitors to the city. The contract for the street decoration and the decoration of the public buildings has just been let to the Rueff-Griffin Decorating Company, a Louisville concern.

The company will arrange the illumination as well as hang the bunting over some forty squares in the central part of the city. Its plans, submitted with its bid to the local committee on arrangements, are rather ambitious and will exceed anything ever undertaken previously in Louisville. A total of 18,000 incandescent lamps will be used, some fifteen miles of insulated wire and an indeterminable amount of bunting. The lights will display the colors of the Saengerbund, blue and white, while in addition the red, white and black of Germany will be displayed in textile decorations.

The lyre, emblem of the Saengerbund will appear, of wood and plaster construction and studded with white lights, at every street intersection, where it will be used in connection with the festoons that will be employed at each corner. The lyre will be made use of wherever opportunity offers and will be the only device.

It is estimated by J. T. Griffin that the work of putting up the illuminations will require a force of fifty men, the equivalent of three weeks of steady work. This work will consist for the most part in stringing the wires and connecting the receptacles and lamps, which the company carries in stock to a large extent, and setting up the wood and composition pillars which will be extensively employed on the downtown streets. Each of these pillars will be outlined by incandescent lights while the lyre that will top each will also be studded with lights.

Of the wire to be used in the festoons, some six miles will be in the way of feeder wires for the festoons, on the latter of which the white and the blue lights will alternate eighteen inches apart. Each street intersection will be marked by festoons draped from pillars at each corner to the center.

The lighting decorations will center at the Jefferson County Court House, an ancient structure of the Doric type. In front of this will be the "Court of Honor," an elaborate bit of work in which numerous festoons will be used, together with numbers of pillars and the architectural background, brilliantly lighted and composed of wood and plaster with the light-studded lyres everywhere in evidence. The pillars, to be defined by lights, stand nineteen feet high on bases five feet square, the whole surmounted with the lighted lyres. The platform for the guests of honor and the reviewing stand will be built around the base of the statue of Thomas Jefferson which stands in front of the Court House.

The other public buildings, the City Hall among them, and the Armory, where the principal sessions of the Saengerbund will be held, will get their share of the decorations. Altogether 4,000 lights will be used on the decorations of the public buildings, with another 4,000 in the "Court of Honor."

Many business houses have prepared for special lighting effects. Some of them, the *Courier-Journal* Building particularly, are equipped with permanent wiring for such occasions, when nothing is needed but the attaching of the lights and the turning on of the current. The *Anzeiger*, the German daily in Louisville, is also preparing something special in the way of electrical illumination.

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Production of Asbestos in the United States.

A report by J. S. Diller, of the United States Geological Survey, on the production of asbestos in 1913, now in press, shows that while the United States produces little raw asbestos, it is the largest producer of objects manufactured from asbestos. Canada is the heaviest producer of raw asbestos, and more than half the world's supply is brought into the United States from Canada and manufactured into various commercial products.

In 1913 the United States produced 1,100 short tons. There were two producers in Georgia, both furnishing asbestos of the amphibole type, and one in Arizona is just beginning to produce chrysotile.

A notable event of the year in the asbestos industry of the United States has been the opening of this new locality in Arizona, about 30 miles northeast of Globe, for the high-grade chrysotile such as occurs in the depths of the Grand Canyon. In occurrence, origin, quality, and quantity this deposit is essentially the same as that of the Grand Canyon district, but it is much more accessible, being in a canyon about 800 feet deep and within 30 miles by trail and wagon road from the railway. It is associated with limestone and in this respect is strongly contrasted with the asbestos of Canada which is found in serpentine rock, derived from peridotite.

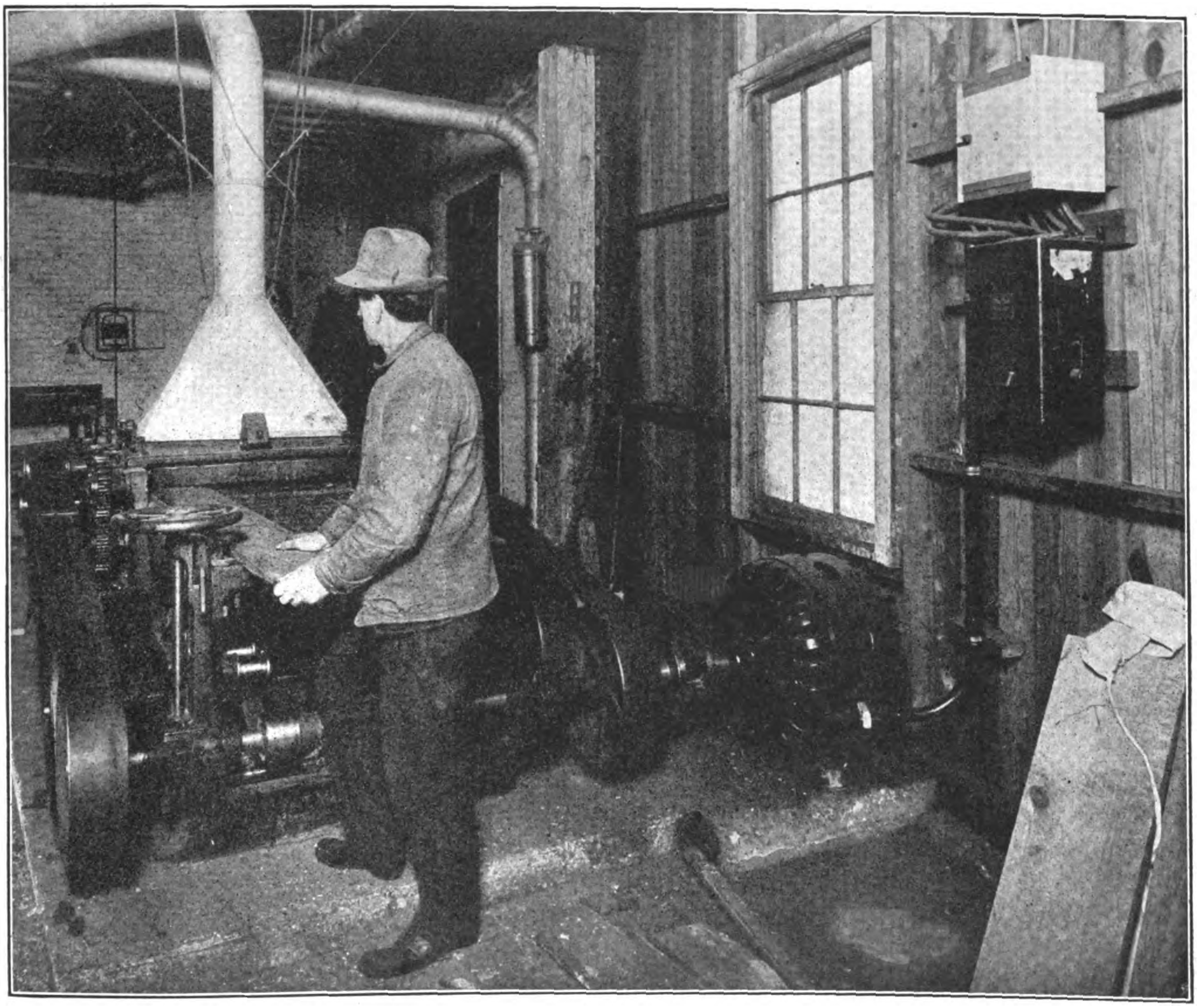
The remarkable fiber from Arizona when twisted to a yarn 0.03 of an inch in thickness will support an average weight of 15.5 pounds. Its content of iron is decidedly lower than that of the Canadian fiber, and for that reason it is better for insulating purposes.

Electricity in Woodworking Plants.

By E. G. Fox.

This article discusses the general advantages of motor drive for woodworking plants, with comment on the relative advantages of group and individual drive. Considerable data are also given on the horsepower required for various woodworking machines under operating conditions.

The tools of the early woodworker were, no doubt, a plane, an auger, a saw and a hammer. These were manipulated laboriously by hand to fashion the crude articles of daily use. With the arrival of sources of power generation new woodworking tools were devised essentially as a means for applying power to woodworking processes. Manual labor is now used only to control the tools and to feed the material. A horsepower-hour of human effort costs dollars where a horsepower-hour of mechanically generated power costs cents. It should be evident that the great advance in woodworking industries is directly due to the perfecting of methods of applying power to the work. With this in mind the importance of the subject of power application will be more fully appreciated. Power is not for driving machinery; it is for furthering productive processes.



20-Horsepower Motor Direct-Connected to 30-Inch Double Planer.

In the woodworking industry as in most others, line shaft and belt drive has long predominated as a means of power distribution and has gained a strong hold through usage. Motor drive must have real advantages to supplant existing methods. What advantages can be gained by motor drive and how can those advantages be best realized?

The application of power to woodworking processes by means of special tools has greatly increased production and lessened labor cost. Motor drive affords the greatest advantages of increased production due to the most effective application of power to the special tools. As the replacement of manual with mechanical power has advanced the industry, so will the more efficient application of power through motors have like effect.

Maximum output demands most effective cutting speeds constantly maintained, together with regular feeding of material. Motor drive shows a great advantage over shaft drive through speed maintenance. Woodworking machines commonly operate at high speeds and are driven by slow-speed prime movers. Necessarily there must be several intermediary shafts or else wide pulley ratios for a few. Either condition encourages fluctuation of speed with load. In practice it is found that shaft-driven machines vary in speed ten to twenty per cent from no load to full load. This has a very real effect upon output, particularly for power-fed machines. Not only does a machine slow down because of its own load but it is also affected by other machines in its group. In some cases machines have been found to run ten per cent slower at one time of day than another, depending upon the load in the department. By the use of motor drives most or all of the intermediate shafting and belting may be eliminated. Speeds are maintained through elimination of slippage and through independence of drives.

The importance of speed maintenance cannot be overestimated. Let us consider an actual case. A 26-inch planer was found to run 3,800 revolutions per minute without load and 3,250 revolutions per minute with load. The best cutting speed was about 3,500 revolutions per minute. This machine was turning out about 12,000 board feet per day. If the working speed were maintained at 3,500 revolutions per minute the output would be 13,000 board feet. The value of this process is about $1.00 per 1,000 board feet. Consequently in a year of 300 days the value of increased production is $300. This is materially more than the cost of installing an individual motor. As was previously stated, speed losses of ten to twenty per cent are very common with shaft and belt drives. The consequent shortage in production in plants having many machines is enormous.

Motor drives also affect the second consideration of securing maximum output, that of handling the material and feeding the machines. Motor drive permits the most advantageous placing of machines and leaves the space about them clear for passage. This is an important consideration in woodworking plants because of the bulkiness of the material handled.

Independence of drives also prevents production losses due to shutdowns. Woodworking plants generating their own power can usually secure breakdown service from local electric plants. Shutdowns in public service plants are now almost unknown, so that a manufacturing establishment purchasing power or having provision for breakdown service has the best of insurance covering this essential.

Secondary to increased production is the saving in power effected through motor drives. Most woodworking machines seldom operate at average loads anywhere near the maximum load. It is necessary, however, to provide power-transmission equipment suitable for the maximum load ever imposed. Line shafting or belting must be large enough to handle loads much heavier than are normally transmitted. This results not only in high first cost but also in increased friction losses, so that the power actually consumed at the tool itself is less than that consumed in friction in getting the power to the machine. Shafting and belt losses are almost entirely eliminated by using motor drive. Individual motor drive permits the delivery of the maximum percentage at the driven tool of the total power generated.

The minor advantages of motor drive are:

Lower maintenance costs. Belts in woodworking establishments must be kept very tight to prevent excessive slippage. Belt replacements average nearly 40 per cent. The cost of keeping belts tight and in order is considerable. Most woodworking plants are of mill construction and settle so that the shafting requires re-alinement from time to time to prevent excessive friction.

Motor drives are safer due to the elimination of belting and shafting.

Quality of work is improved through uniform speeds and better light.

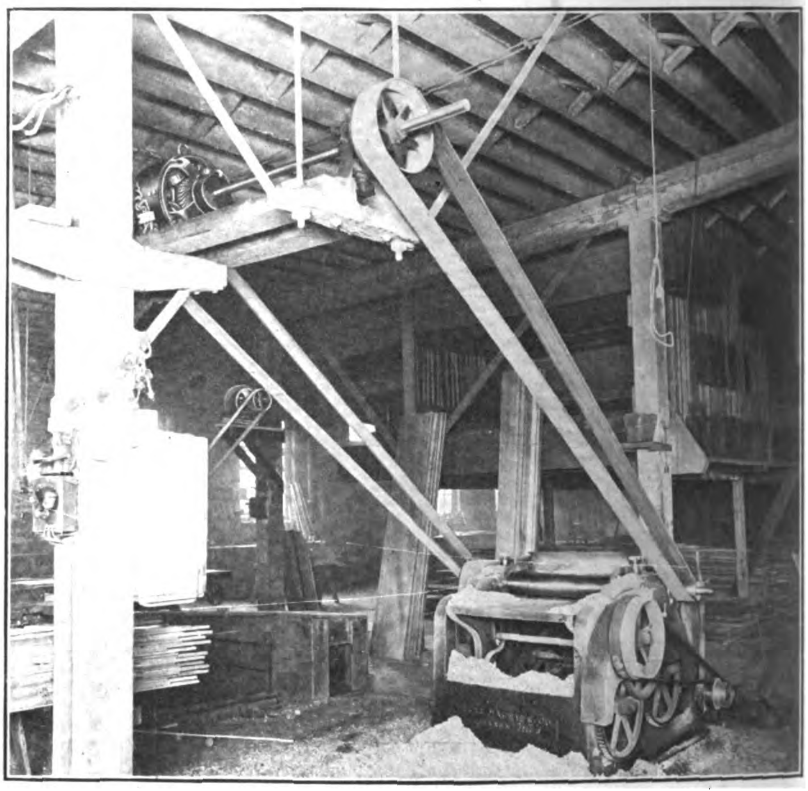
Lighter construction of buildings is allowable when there is no heavy shafting to be supported.

Fire risk may be decreased by placing the boiler room in a fireproof isolated building.

Fused motors provide a factor of safety protecting the machinery.

The first consideration in planning a system of motor drive for a woodworking plant lies in the degree of subdivision of power units advisable. Should the machines be grouped, or driven by individual motors? There are a number of advantages of individual drive but its universal use is not altogether warranted.

Direct connection of the motor to the driven shaft insures minimum speed losses. As most woodworking machines operate at high speeds they are equipped with small driven pulleys and there is sure to be considerable slippage with belt drives. The point has been made that the greatest advantage of motor drive is in speed maintenance to procure increased production. This point should not be lost sight of in making the application and the means should be designed to secure the maximum benefit.



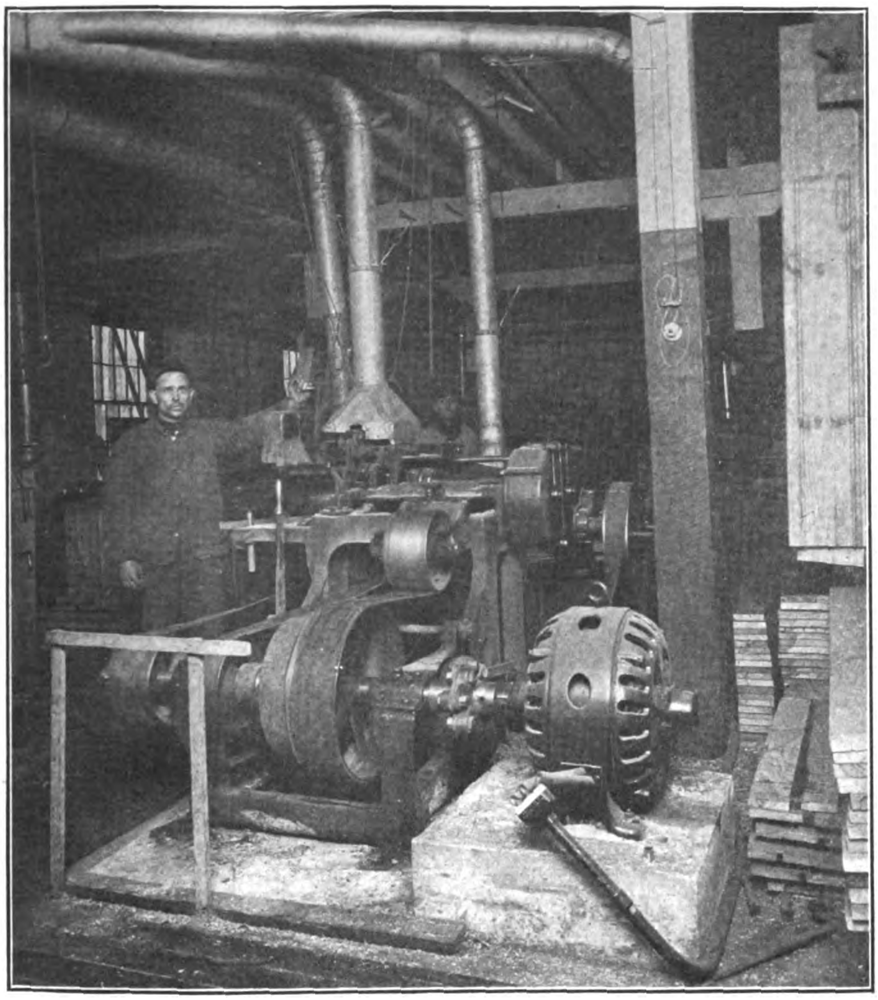
Showing Long Armature Shaft With Additional Outboard Bearing for Belting to Planer.

If each machine be supplied with an individual motor, this comprises a unit which can be located independently of all considerations of drive. Individual drive therefore allows the most advantageous arrangement of machines for maximum production due to the greater ease and rapidity of handling material. The tendency in woodworking plants as in metal working is to speed up tools and power-fed machines. Hence the output of a machine tends to become greater, requiring better methods of handling and better relative arrangement of tools to get the stock to and from them. Individual drive lends flexibility and ease of re-arrangement in future changes.

Individual drive permits maximum ease in handling the machines for stopping and starting. Independence of drive lessens losses from breakdowns. Where machines operate intermittently individual drive permits shutting down the machines not in operation. All transmission losses then stop. This reduces the cost of power. Decreased power consumption not only decreases power cost but allows the use of smaller generating equipment.

Group drive is generally cheaper in first cost. It can be advantageously employed for hand-feed machines where production is largely a matter of speed of the operator rather than speed of machine. It can well be used for small machines requiring little power and handling small stock. It is often best when old machines are retained which may ultimately be displaced or removed. It can be used for small machines continuously operated. It is sometimes advisable where machines require heavy starting torque, such that a larger motor would be required to start than to drive them. When such machines are grouped the larger motor is ample to handle the heavy starting torque of machines not starting simultaneously, the peak being relatively smaller compared to the capacity of the motor.

Alternating-current motors are the type best suited for woodworking plants. Woodworking machines almost without exception operate at constant speeds. The alternating-current squirrel-cage motor is unexcelled for this type of drive. Woodworking machinery runs at high speeds. Squirrel-cage alternating-current motors are at their best under this condition, whereas direct-current motors are less desirable for very high speeds. Sixty-cycle induction-motor speeds approximate closely the speeds of driven shafts of most woodworking machines so that direct connection of individual motors is possible.



15-Horsepower Motor Direct-Connected to 10-Inch Molding Machine.

Squirrel-cage motors are very simple and reliable and have no brushes to wear and give trouble. Large temporary overload capacity enables them to handle the peaks common to machines in this industry. Absence of sparking decreases the fire risk. In addition to these advantages the cost of an induction-motor installation is usually less than that of a direct-current motor installation.

Most woodworking machines may be divided, for purposes of power application, into two general classes, those which are hand fed and those which are power fed. In the former class, hand fed, the service is more or less intermittent, depending upon the rate at which the operator feeds the stock. Under this class are included: shapers, boring machines, hand-feed rip and cut-off saws, lathes, hand-feed joiners, belt and disk sanders, scroll saws and jig saws. With machines of this sort the maximum load exists for but a small portion of the time. The load of the machines is comparatively small and the inherent overload capacity of the motors, particularly if of the induction type, is sufficient to carry the machine over the peaks. Hence, smaller motors can be used than in the case of power-fed machines. The tendency of hand-fed machines to operate without load a portion of the time lends one disadvantage in the use of induction motors, due to the fact that small induction motors have a poor power-factor at partial loads. This is one point in favor of grouping a number of intermittently hand-fed machines upon one larger motor so that the diversity-factor will cause the larger motor to carry a load more continuously.

With power-fed machines the work is usually fed as fast as it can be machined. Hence the motor must be capable of carrying full load almost continuously. The inherent friction of power-fed machines is much greater than that of hand-fed machines and of the two machines running light, the power-fed machine requires the greater load. Hence the motor on a power-fed machine carries a more continuous load aside from the more regular feed. The power-fed machine will turn out much more work in most cases than the hand-fed machine, so that the power required per unit of output is less for the power-fed machine and the time required in the machine is often less. Power-fed machines are of the type enumerated in the following list, but a few of the total number being given: planers and matchers, molders, stickers, self-feed rip saws, scraping machines, resaws and tenoners.

The power required to drive woodworking machinery varies greatly under the different conditions of operation and the classes of work. Some of the main factors influencing the loads are: design of the machine itself; power-fed machines differ more than hand-fed machines in inherent friction load. Speed at which the work is done, comprising feed and depth of cut. Condition of the machine and cutters. Kind of material. Machines handling but one kind of material may be motored for their ordinary load, whereas machines used for diverse operations must be equipped for their heaviest service.

Some data are here given covering the motor sizes recommended for woodworking machines. The data are based upon numerous tests as well as the data given by manufacturers. As a guide they should be helpful. However, modifying conditions of individual cases must always be considered. Figures are for modern machines in normal condition handling medium woods. The figures are sufficiently liberal for most cases. Care should be taken to prevent overmotoring because of loss of efficiency and low power-factor affecting the generators.

Band Saws and Band Resaws.

All band saws possess considerable inertia and require motors with good starting torque. With resaws this condition is particularly true and motors should be capable of developing 1.5 times full-load torque at starting and should have good overload characteristics. With alternating-current squirrel-cage motors high-resistance end rings give the desired starting torque in a satisfactory manner. Wound-rotor motors must have their rings protected and are not strongly recommended, the high-resistance squirrel-cage motor being simpler and more satisfactory.

The speed of band saws depends upon the class of work, the kind of wood, width of blade, etc. Generally speaking, dimensions are standardized so that saws of a given wheel diameter use the same width of band, and operate at the same speed on similar work. Special attention should be given the saw-tension devices, as improper adjustments may result in excessive tension which imposes a heavy load upon the motor.

Resaws are apt to be called upon to work with the maximum stock for which they are designed so that liberal motor sizes should be adhered to, especially for hard woods.

Band Saws.

Diam. of Wheels, in inches.	R. P. M.	Max. depth of timber, inches.	Horse-power of Motor.
42	400-500	20	5
38	450	16	5
36	500	16	5
36	400	14	3
34	500	12	3
30	500	12	3

Belted motors are recommended for most installations because of slow speeds of driven shafts. Low-speed induction motors are costly and have poorer characteristics than high-speed motors of same type. If self-contained equipment is desired the motor can often be advantageously geared.

Band Resaws.

Diam. of Wheel in inches.	R.P.M.	Width of Saw blade, inches.	Max. depth timber, inches.	—Motor— Horse-power	R.P.M.
60	550	8	36	50	600
54	600	6	30	40	600
48	650	5	26	30	720
44	650	4	24	20	720
42	650	4	24	15	720
40	700	3	20	15	720
38	450	2	12	7.5	514

The above table represents average values taken from a number of manufacturers and modified by tests. Do not use smaller motors than suggested. Add for jointing attachment on 48-inch saw, 7.5 horsepower.

Band Rip Saws—Power Feed.

Diam. of Wheels, inches.	R.P.M.	Max. Size timber, inches..	—Motor— Horse-power.	R.P.M.
42	650	12	15	720
40	600	15	10	600

Add 2 horsepower for return rolls if used. Use high-resistance rotor preferably if alternating-current induction motor is used. For direct-current use compound-wound motors. Speeds given are for direct connection.

Scroll Saws—Hand Feed.

Two-horsepower motor required for ordinary saws of this type. If direct-connected a 900-revolutions-per-minute-motor is generally correct. Scroll saws operate with a reciprocating motion from a connecting rod, the saws being from 14 to 16 inches long.

Circular Saws.

Circular saws are not as much used for resawing as band saws, as they require more power, cannot run at as high speeds and waste more stock. They are cheaper, however. Splitting with circular saws requires from 15 to 20 per cent more power than cross cutting, whereas band saws require about the same power for both.

Max. Diam. Saw. inches.	R.P.M. of Saw.	—Capacity— Horizontal, inches.	Vertical, inches.	Horse-power.
42	900	17		25
36	1,000	14		25
32	1,225	11	8	20
30	1,200	10	6	20
24	1,225	8	6	20

Motors can usually be direct-connected to countershafts which run about 600 revolutions per minute in most cases.

Circular Rip Saws.

Max. Diam. Saw. inches.	Max. R.P.M.	Max. thickness. stock, inches.	Feed. Feet per minute.	Horse-power.
20	2,100	6	60-180	15
16	2,600	5	64-194	15
12	2,400	2	50-100	7.5

Motors can usually be direct-connected to countershaft under the machine which runs at about 900 revolutions per minute generally.

Hand-Feed Circular Rip Saws.

Max. Diam. Saw, inches.	Saw R. P. M.	Horsepower.
14	2,700	7.5
16	2,400	10
20	2,000	15
24	1,600	15
30	1,250	20
36	1,000	20

Where speed of saw shaft permits it is sometimes possible to connect the motor direct to this shaft. Otherwise belting is necessary. Direct-connected machines maintain speeds better than belted machines. Most rip saws of the above type have very intermittent loads. The above values are high enough for hard woods.

Power Feed Gang Ripping Machine.

No. of Saws.	Max. R.P.M.	Diam. Saws, inches.	Feed. Ft. per min.	Horse-power.
2	3,400	10	180	15
3	2,300	15	200	30
4	2,500	14	100 to 180	25
Power feed gang edger and ripper.				
8	2,500	14	90 to 200	35

Circular Cut-Off Saws.

Max. Diam. Saw, inches.	R. P. M. of Saw.	Horsepower.
14	2,700	5
16	2,600	7.5

Power feed cut-off saws are usually for heavy work in large amounts. They use 7.5 to 10-horsepower motor, depending upon the work.

Swing Cut-Off Saws.

This type of circular saw is used to cut equal lengths to square ends. The saw runs light the greater portion of the time while the stock is handled. The power required in the cut exceeds the figures given but the overload capacity of the motor will handle these intermittent peaks.

For very heavy work use....	20 hp. motor.
For heavy work.............	15 hp. motor.
For medium work...........	7.5 hp. motor.
For light work...............	5 hp. motor.

The third class is for ordinary work in most factories where stock 8 inches square is not exceeded.

The fourth class is for boards not thicker than 1.5 inches. Motors for this work must be belted, the motor being mounted upon the swinging bracket of the saw frame.

Double Cut-Off Saws.

Max. Diam. Saw, inches.	Max. thickness timber, inches.	—Motor— Horse-power.	Speed.
16	4	10	600 or 900

Motors can usually be direct-connected to the countershaft of the machines underneath, the motor speed being selected to suit.

Where work averages about 6.5 to 12 inches cross section of cut at one end, a 5-horsepower motor is ample. This is the condition met in many plants.

Inside Molders.

Max. capacity, inches.	Horsepower.
8 by 4	25
10 by 4	25
12 by 6	35
14 by 6	35

Outside Molders.

Max. capacity, inches.	Horsepower.
4 by 4	10
6 by 4	15
8 by 4	20
10 by 4	25
12 by 5	30
14 by 6	35

Stickers.

Max. Size timber, inches.	Horsepower.
16 by 4	5
18 by 4	7.5
20 by 4	10

Planers, Surfacers and Jointers.

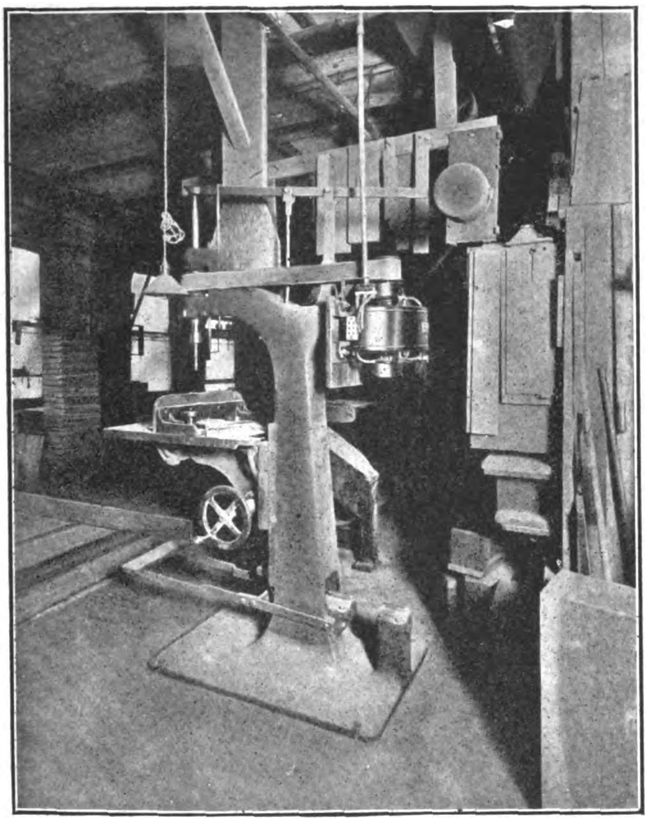
The depth of cut, width and kind of timber, rapidity of feed and condition of knives are factors influencing largely the power required by these machines.

Jointers.

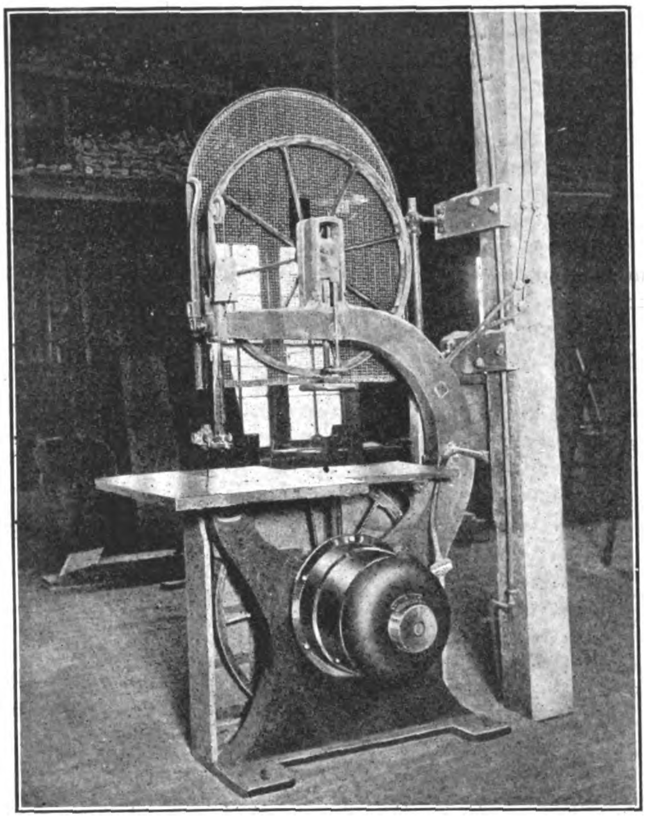
Max. Width Timber, inches.	Horsepower.
8	2
12	2
16	3
20	5
24	7.5
36	7.5

The speed of cutter heads depends upon the type used, whether there are three or four cutters. Where the head is to revolve at 3,400 revolutions per minute it is often possible and desirable to direct-connect the motor using perfectly flexible-flange couplings.

The above horsepower recommendations are based upon a maximum depth of cut of three-thirty-seconds inch. If this cut is to be exceeded it would be advisable to increase the motor size to correspond.



Vertical Ball-Bearing Motor Driving Boring Machine.



Slow-Speed Totally Inclosed Motor Direct-Connected to Band Saw.

Single Surfacers.

Values here given are for medium heavy work where cuts of not more than one-eighth inch are taken. For planing-mill duty involving heavy stock and deep cuts the motor sizes should be increased about 5 horsepower.

Max. Width Timber, inches.	Horsepower.
16	7.5
20	10
24	10
30	15
36	15

Double Surfacers.

Max. Width Timber, inches.	Medium Work. Horsepower.	Heavy Work. Horsepower.
26	20	35
30	25	35
36	30	

Timber Sizes.

For dressing timber to size, surfacing four sides simultaneously, the following figures are given. They apply to heavy service.

Max. Size Timber, inches.	Horsepower.
20 by 16	60
20 by 18	60-75
20 by 20	60-75
30 by 18	75
30 by 20	75

Drum Sanders.

In some classes of work, such as the manufacturing of doors, it is frequently required that articles must be sanded to size. This requires that considerable material must be removed by the sander in many cases and greater power is therefore required. In most factories this condition does not obtain. The figures given are for general sanding, not to size.

Where material is sanded to size and full width of sander is used with panels fed continuously, add 5 horsepower to the motor sizes given above.

No. of Drums.	Size Sander Max. Width stock, inches	Horsepower
1	30	10
1	36	15
1	42	15
2	30	20
2	36	20
2	42	20
2	48	25
3	30	20
3	36	25
3	42 & 48	30
3	54 to 66	35
3	72	40
3	78	40
3	84	50

Tenoners—Hand Feed.

Length of Tenon, inches.	Horsepower.	
7	7.5	Single
7	10	Double

Shapers.

For ordinary service on reversible single or two-spindle machines use a 5-horsepower motor. For extra heavy work such as in carriage factories, railroad shops, etc., use a 7.5-horsepower motor.

Scraping Machines.

Max. Width Stock, inches.	Horsepower.
12	2
26	3
30	3
42	5

Chisel Mortising Machines.

Max. No. Chisels.	Max. Size Chisel. Square.	Horsepower.
1	0.5	2
1	0.75	2
1	0.75	3
1	1.25	5
2	1	3
3	1	5
4	1	5
5	0.8125	5
6	0.8125	7.5
7	0.8125	7.5

Borers.

No. Bits.	Max. Diam. Bit. inches.	Horsepower.
1	1	3
1	2	5
2	0.75	3
3	0.75	5
4	0.5	5
8	0.5	10

Automatic Lathes.

Max. Diam. and Length of Stock, inches.	Horsepower.
2.75 by 52	10
3 by 50	15
3 by 50	20
5 by 50	20

Planers and Matchers.

For planing and matching timber at one operation.

Max. Size timber, inches.	Horsepower.
9 by 6	35
15 by 6	40
20 by 6	45
24 by 6	45
26 by 8	45

Box-board matchers are similar to the above except that the work is much lighter. Hand-feed box-board matchers usually require a 7.5-horsepower motor, while power-fed machines require a 10-horsepower motor.

Commercial Practice Management, Rates, New Business

Public Service Company of Oklahoma Holds Show.

With the assistance of the local electrical dealers and contractors, the commercial department of the Public Service Company of Oklahoma, under the management of J. L. Terry, recently put on the first electric show ever held in the State.

Oklahoma is dry, and that probably accounts for the Grill Room of Hotel Tulsa, the leading hotel, in being chosen as the place for holding the Show. It was a wise choice, for being located in the heart of the business section, and with banners strewn throughout the downtown district, inviting everyone to the scene of the display and demonstration and judging from the thousands of people who visited the show and pronounced it a huge success, there could have been no mistake either in the location or the manner of extending the invitations.

About three days before the beginning of the demonstration, printed invitations were mailed by the Public Service Company, to every one of its residential lighting customers and to all prospective customers. The invitation was neat and attractive, and it is believed that the majority of persons receiving them, attended the show. News articles appeared daily in the local newspapers, giving interesting accounts of the exhibits and demonstrations of the day before, and these served to stimulate the interest which was manifested during the entire week.

No special effort was made at taking orders for appliances, the principal idea being to educate the public to the many uses of heating, cooking and other household appliances. However, numerous sales were made directly at the show, and many prospects were listed which should soon materialize into sales.

The venture was a huge success both from the standpoint of the dealers who will profit by the sale of appliances, and to the central station whose day load will be greatly increased by the many new devices sold.

Free Fan Service for the Sick.

The Louisville Gas & Electric Company has advised the physicians of Louisville, Ky., that it will furnish their indigent patients with free electric-fan service this summer, when the fan would be advisable and when the patient is not able to pay for its installation. The company, through Robert Montgomery, manager of the commercial department, has stated that it will lend fans and, where that is necessary, will install temporary wire connections to supply the power. One formality is required and that is that the doctor must in writing ask that the installation be made.

Public Utilities Company Shows Increase.

The commercial showing of the subsidiaries of the American Public Utilities Company in 12 different cities for the week of May 16, 1914, when compared with a similar period of 1913, is remarkably satisfactory. The output of gas and electric current shows increases ranging from 5 to 40 per cent. The increase in the amount of gas used is natural and was to be expected, due to the growth of the communities in which the companies are located and to the fact that the modern method of cooking is being almost universally adopted.

The increase, however, in the amount of electric current manufactured and marketed is more significant and important for the reason that at all the plants where electricity is made there is more or less current used for power for manufacturing purposes. Taking into consideration the general conception of rather unsettled business conditions, the increase in output of electric current is very encouraging, showing a tendency toward the restoration of industrial activity.

Extension From Louisville System.

Electric service will be made available to a well populated territory east of Louisville, Ky., by the extension of the transmission lines of the Louisville Gas & Electric Company nine miles in that direction. Service is given now as far east as Anchorage; the extension will go to Crestwood in Oldham County. Some 240 contracts are waiting, sufficient to justify the extension. The region is highly favored as a location for the country homes of wealthy Louisville people, besides, several manufacturing enterprises will be within reach of the service.

Demonstration Building for Cincinnati Central Station.

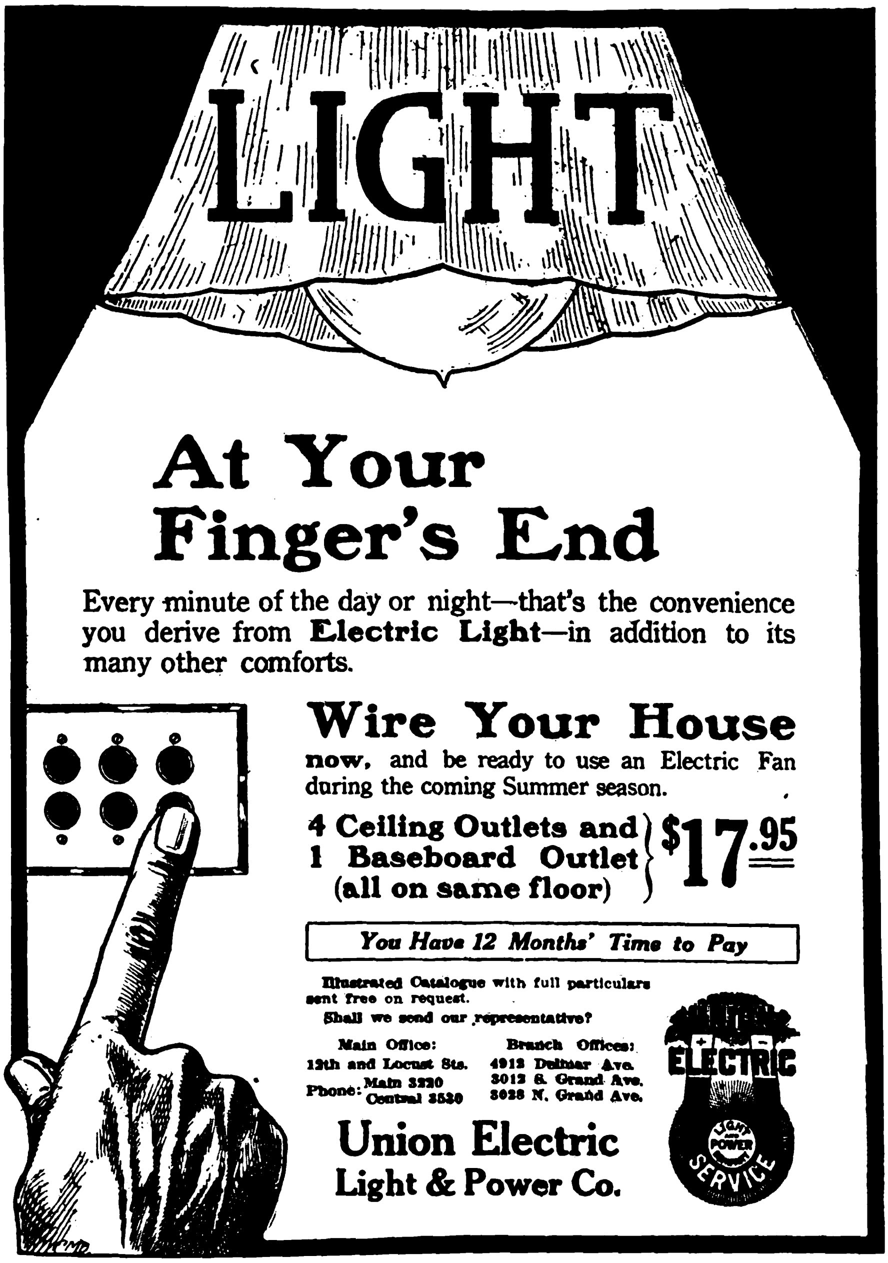
The Union Gas & Electric Company, operating the light and power system serving Cincinnati, O., has leased a three-story building at 405 Race Street, in the retail business section of the city, for the purpose of makng a continuous demonstration of the numerous uses to which electricity can be put in the household. The first floor is to be devoted to the various novelties using electric current, while in the basement and the two upper floors strictly practical goods will be shown and demonstrated. An up-to-date laundry will take up most of the basement space, the great convenience of electric current in this branch of household work being shown, while on the third floor a kitchen and dining-room, completely fitted up, will be used to demonstrate the various uses of electricity in cooking and serving, as well as in lighting. The second floor will be of especial interest to builders and prospective owners of homes, as it will be divided into booths representing the various rooms of a house, showing the proper distribution of electric fixtures, the various attachments and current-consuming devices which may be used, and so forth. On this floor also will be installed a restroom for women shoppers, which is expected to prove very attractive to patrons of the fair sex as it will contain electric curling-irons and massage machines. The lease calls for possession on June 20.

Socialist Administration Ready to Sell Municipal Electric Plant.

Preliminary plans are well under way for the sale of the municipal electric lighting plant of Martin's Ferry, O., by the present administration of that city. Bids have been submitted by two private corporations, the Sunnyside Electric Company and the Wheeling Traction Company. Although the present administration is a Socialist one and it is a known fact that municipal ownership is strongly advocated by the Socialists, the members of that party now in power at Martin's Ferry are favorable to the sale of the plant. The chief cause for selling the plant was the fact that it cost the city annually almost double the offer made by either company.

St. Louis House-Wiring Campaign.

From time to time we have recorded the progress that is being made in the campaign for house-wiring business conducted by the Union Electric Light & Power Company, of St. Louis, Mo. The accompanying illustration shows one of a series of newspaper advertisements that has been used and to which many profitable inquiries can be traced.



At Your Finger's End

Every minute of the day or night—that's the convenience you derive from **Electric Light**—in addition to its many other comforts.

Wire Your House

now, and be ready to use an Electric Fan during the coming Summer season.

4 Ceiling Outlets and 1 Baseboard Outlet (all on same floor) $17.95

You Have 12 Months' Time to Pay

Illustrated Catalogue with full particulars sent free on request.

Shall we send our representative?

Main Office:
12th and Locust Sts.
Phone: Main 3220
Central 3530

Branch Offices:
4912 Delmar Ave.
3012 S. Grand Ave.
3028 N. Grand Ave.

Union Electric Light & Power Co.

Advertisement of Union Electric Light & Power Company.

The wiring plan referred to provides for the wiring of four ceiling outlets and one baseboard, all on the same floor, for $17.95. This is the minimum rate, but many of the small houses and cottages have been secured on this basis. The customer is allowed 12 months in which to pay the account.

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Large Power Contracts at Omaha.

The contract department of the Omaha Electric Light & Power Company has closed a contract with the Cudahy Packing Company to supply all electrical power used in that company's plant at South Omaha. This aggregates 800 kilowatts, operating at about 60 per cent load-factor.

Another recent contract closed was for supplying about 250 kilowatts to the Burgess-Nash department store in Omaha. This store has previously had in turn its own steam, gas engine and gas-producer plants which are now being superceded by central-station service.

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New Electric Shop for Pittsburgh Central Station.

The Duquesne Light Company, of Pittsburgh, Pa., has opened a new electrical store in the Jenkins Arcade Building, at the Liberty Street entrance. Several new electrical appliances are being demonstrated at the store, among which is a new electric washing machine. A very novel means of advertising has been employed to advertise the machine. Soiled paper money taken into the Diamond National Bank is run through the washer and thoroughly cleansed; it is then electrically ironed until it becomes dry. In this way it is shown that the most fragile material can be washed and ironed by the machine without any ill effects. This remarkable exhibit draws crowds of people to the windows of the store every day.

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Co-operation Between State and Utility Companies.

A three-cornered contract has been entered into between the State of Utah, the Utah Power & Light Company, and the Utah Light & Railway Company for the transmission of electric power from the State's plant in Logan Canyon to all of the State institutions.

The State built a power plant in Logan Canyon three years ago, intending to supply all of its institutions from this plant, but until the present time a satisfactory arrangement for the transmission of this power has not been arrived at.

Under the terms of the present contract, the Utah Power & Light Company transmits the power from the State power plant in Logan Canyon to Salt Lake City, Ogden, and Provo over its high-tension transmission lines. At Salt Lake City and Ogden the current is turned over to the Utah Light & Railway Company, which transmits it over its distribution system to the State Capitol Building, University, Penitentiary, the Industrial School, and the School for the Deaf and Blind. At Provo, the Utah Power & Light Company transmits it over its secondary distribution to the State Mental Hospital.

The State power plant furnishes, in addition to the energy consumed by these various institutions, sufficient energy to compensate the transmitting companies for the loss in their system, and the State pays to them as compensation for this transmission service at the rate of 1.5 cents per kilowatt-hour for all energy delivered.

Governor Spry declares that the contract is a highly advantageous one to the State.

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New Business Campaign in Small Town.

The Fort Scott & Nevada Light, Heat, Water & Power Company, of Nevada, Mo., will give during the next thirty days a six-pound electric flatiron to each new residence service connected with the company's lines. The offer is a part of a campaign for new business, the local contractors agreeing to bear half of the cost of the irons, which are valued at $3.50 each The city's population in 1910 was 7,176.

Kansas City, Kans., Utility Controversy Settled.

The Standard Electric Light Company, which has operated in Kansas City, Kans., for some time past without a franchise, has reached an amicable agreement with the municipal authorities as to future operative methods. The city contended that the Standard company had no right to operate in Kansas City, Kans., and recently ordered the company to remove its wires. Under the new agreement, however, the light company may continue to sell its heavy power service. In return for this privilege, the company will discontinue its commercial light and light power service by March 1, 1915. It also will remove its poles by that time, except those needed for heavy power service, and will accept new customers only with the approval of the municipal authorities. A sum of $60,000 due from the city on old accounts, is to be diverted to the construction of a viaduct at Eighteenth Street and Muncie Boulevard. The city of Kansas City, Kans., on the other hand, will pay $60,000 annually to the Standard for arc lights at the rate of $55 each.

Campaign on Electrical Devices During Matrimonial Month.

The "June bride" season is cleverly taken advantage of by Robert Montgomery, commercial agent of the Louisville Gas & Electric Company, in the advertising being done by the company this month. Electrical utensils as wedding gifts are featured in all the papers in connection with the company's house-wiring campaign advertising. The company has put on also a special display of these utensils at its offices and every advertisement contains an invitation for wedding principals or prospective wedding guests to visit this display or "the showroom of any electrical merchandise store."

Fan Season Stimulates Wiring of Louisville Houses.

The signing last week of seventy contracts for the wiring of houses in Louisville, Ky., brought the number written since the campaign was begun in that city several months ago up to 915. These have been obtained by the solicitors of the Louisville Gas & Electric Company, while it is estimated that the solicitors for the independent contractors have got altogether as much again of this kind of business. In the hot weather which has prevailed in Louisville recently, the solicitors and the newspaper advertising of the company have emphasized the fact that wiring will permit the use of electric fans.

Damage Suit Resulting from Slipshod Accounting.

A prominent central-station company has just paid to a druggist in its city $5,000 as damages which resulted from misplaced records at the offices of the company. The druggist was one of the collectors for the company, that is, he was authorized to receive payment of the company's bills, an accommodation to the consumers in the neighborhood of his store. Between December 21, 1913, and January 2, 1914, he collected some $575 and turned it over to the company. In some way the record was confused and shortly the company began sending letters to the consumers in the druggist's district, reminding them that their bills were past due. These customers demanded explanations from the druggist and he, eventually, brought suit alleging that his reputation and business had been damaged. The company has lately admitted its error and the verdict for the plaintiff was peremptory, the jury fixing the damages at $5,000.

Sign and Window Lighting Campaign in New Bedford.

The New Bedford Gas & Edison Light Company has recently been conducting an electric lighting campaign, primarily to increase consumption through sign and store-window illumination. On a basis of a minimum of 150 kilowatt-hours per month, the company agrees to supply electric energy for exterior lighting, sign, and window lighting at a price of five cents per kilowatt-hour.

The agreement used provides that the current is to be furnished every night from dusk until 11 o'clock, and is to be turned on and off either by a time switch or similar device arranged by the company, or by a patrol maintained by it.

The number and size of lamps cannot be changed without the consent of the company, and all burned-out and broken lamps are to be replaced by the consumer at his own expense. The contracts are for a period of one year.

Not Required to Furnish Street-Lighting at a Loss.

Judge F. S. Deitrich has declared void the contract between the Idaho-Oregon Light & Power Company and Boise City, Idaho, under which the former was to furnish service for the new street-lighting system at a rate of $11.24 per light per year. This contract was made under severe competitive conditions prior to the appointment of a receiver for the Idaho-Oregon Company. The receiver objected to complying with the conditions of the contract on the ground that to continue to furnish the service at this price would result in a loss to the creditors of the company.

Louisville Municipal Ordinance Regulating Gas and Electric Utilities.

Methods for testing gas and electric meters, regulations for the conduct of gas and electric utilities and the appointment of a chief inspector and his assistants are provided in an ordinance which has just gone into effect in Louisville, Ky. The city officials had the benefit of consultation with several of the engineers connected with the government service in drawing up the ordinance, which is said to be similar to measures in effect in Philadelphia and other cities. In the way of regulations for the supplying of electricity, several testing stations are provided, it is required that the service shall be constantly up to the standard which the companies operating in the city shall stipulate, and detailed prescriptions are set forth for the management of the consumers' meters.

The only utility company operating in Louisville at the present time is the Louisville Gas & Electric Company, a Byllesby corporation, which is the result of the merger of three electric concerns and two gas companies.

The meter-inspection regulations require that every service meter shall be tested by the company immediately after installation and that it shall register correctly to within a one per cent variation. Periodical tests for various meters are prescribed. For instance, alternating-current meters rated above 150 amperes shall be tested once each year. Additional tests may be obtained by the consumer on the payment of a fee of 50 cents to the city inspector. If such meter shall be found to be more than four per cent fast, the company supplying the service must restore the fee to the consumer and credit him on the basis of his bills for the previous three months. If the test shows that the consumer has been favored, the company may charge him accordingly, while if the test shows that the meter is neither fast nor slow, within four per cent either way, the consumer does not recover his fee. Penalties are provided for the violation of the terms of the measure.

Hotel Changes to Central-Station Service.

The New Ferron Hotel recently bought by Russell Brothers, has been transferred to the list of subscribers of the Paducah, Ky., Light & Power Company. When built by John Ferron, it was equipped with its own electric light plant and was so lighted during the short period that Mr. Ferron conducted the hotel. The new owners, however, decided in favor of the city service and sold the hotel's isolated plant equipment to the Mitchell Machine & Electric Company.

Electric Sign Data

Spectacular Electric Sign in Pittsburgh.

Through the courtesy of Betts & Betts, of New York City, we are enabled to present, as the sketch idea for this week, data on a spectacular sign that has caused considerable favorable comment in Pittsburgh. The sign is the work of G. G. O'Brien, Pittsburgh's foremost out-door advertising man, and is installed on a roof facing the incline leading to the main entrance of the Pennsylvania Station, this being considered the best possible location for an electrical display in the Steel City.

The effect obtained is very clever and unique. As will be noted by reference to the two accompanying illustrations, the sign reproduces a modern American baseball game and the action and positions are so natural that one almost feels he is witnessing an actual game.

By means of a special Betts & Betts flasher the player representing the pitcher goes through all the antics of a typical professional "southpaw," finally throwing the ball, which is seen to go through the air towards the batter. The batter misses, after a realistic swing, and the ball is returned by the catcher. The same action is reproduced, the batter this time making a foul hit. The third time the pitcher throws the ball the batter makes a short hit, which the pitcher catches. The photographs reproduced here show the first and last stages of the operation. Suitable color effects are obtained by means of Betts & Betts color caps.

J. C. Young, of the Iowa Railway & Light Company, Cedar Rapids, Iowa, is a strong booster for electric slogan signs. In a recent communication he says:

"Our slogan sign in Cedar Rapids is 'Cedar Rapids Suits Me, It Will You,' located at our main railway station, and has been the occasion for a great deal of favorable comment to Cedar Rapids by the traveling public, which, of course, is the very best kind of advertising. If this sign had accomplished this only it would have well paid the company for operating it free of cost for Cedar Rapids, as we do.

"I can not help but feel that the citizens of Cedar Rapids, and particularly the business men, must feel that this sign has added very materially to the general boosting spirit which the City of Cedar Rapids is noted for. We are well satisfied that it has been an investment that paid us both in actual money value in instigating business of our own as well as of value which results from a general feeling of good will toward the company.

"We have experienced the same advantages in Marshalltown, Iowa, and at present are anticipating the same for several other cities in which we operate."

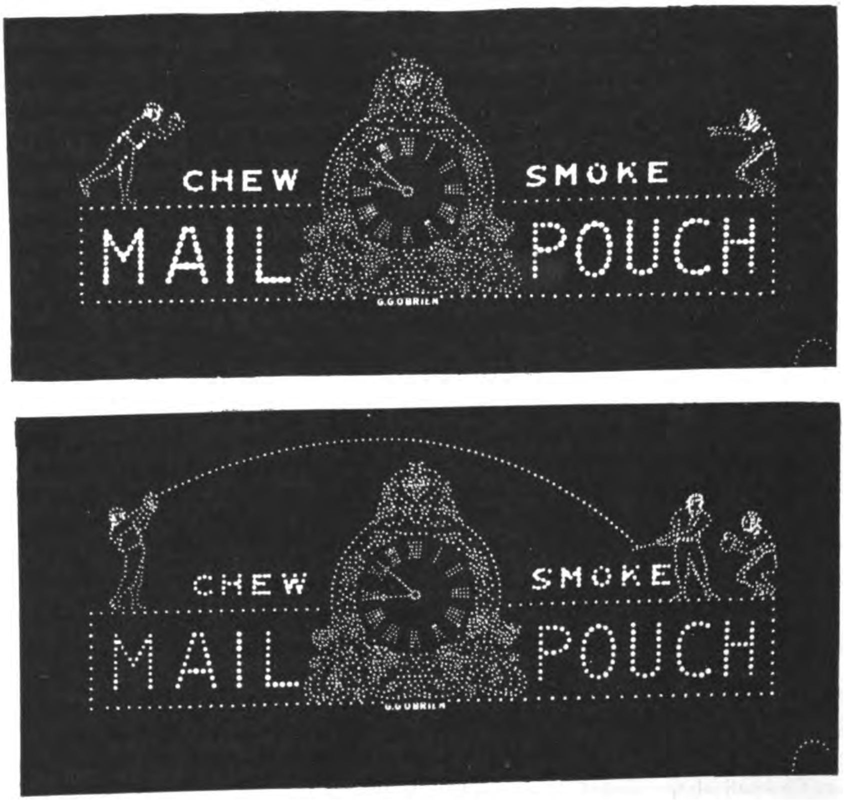
Just before the current was turned into the new slogan sign which the City Light & Traction Company presented to Sedalia, Mo., every light and sign in the downtown section of the city was turned off for thirty seconds, leaving only the moonshine for illumination. When all the lights and signs were turned on again the new "Do-it-Electrically" sign was among them.

The scheme demonstrated very forcibly the part that electricity plays in making a city attractive at night.

Proper ceremony accompanied the launching of the new sign. There were a band, and speeches and an immense crowd.

The Sedalia *Capital* says:

"Sedalia has found from experience in the last year or two that electricity has done a great deal towards the development of the city. In the way of advertising and stirring up business it has accomplished a great deal not only for individuals, but for the city as a whole. That Sedalia is coming to be known as one of the best lighted cities in Missouri is worth a great deal of money, and the big, new sign turned on last night by the City Light & Traction Company is a very valuable and beautiful addition to the city."



Photograph of spectacular sign installed in Pittsburgh, Pa., by G. G. O'Brien.

By means of Betts & Betts flasher a typical baseball game is reproduced, the first and last motions being indicated from the two illustrations above.

Betts & Betts color caps and electric "Klok" mechanism are used.

Electrical Construction

ELECTRICAL INSTALLATION IN A HOTEL USING CENTRAL-STATION POWER.

Fort Dearborn Hotel, Chicago, Ill.

The new Fort Dearborn Hotel, Chicago, Ill., is located in the business section of the city and obtains its power from the 220-volt three-wire mains of the Commonwealth Edison Company. The hotel is a 16-story building with an attic and two basements. Electric energy is used for illumination purposes and a number of power applications such as ventilating fans, laundry machinery, water pumps, vacuum-cleaning pumps, elevators, etc. The complete electrical equipment including wiring for light and power purposes, telephones, etc., was installed by A. S. Schulman, Chicago, Ill., Holabird and Roche, of the same city, being the architects.

Connection with the three-wire power mains of the Commonwealth Edison Company is made through a pull box in the basement from where four 1,000,000-circular-mil and one 1,500,000-circular-mil paper-insulated lead-covered cables are carried through four 2.5-inch conduits and one three-inch conduit to a pull box from where the cables lead to a switchboard in the sub-basement. This switchboard distributes the power by means of two wire shafts and a number of independent circuits, a three-wire 110-220-volt system being used for lighting circuits and a two-wire 220-volt system for power circuits.

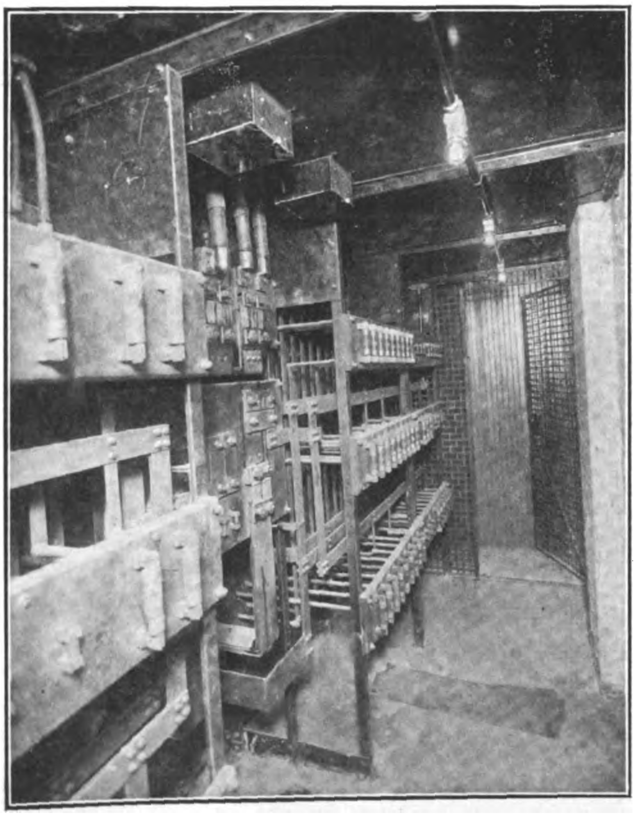


Fig. 1.—Construction Employed in Rear of Switchboard.

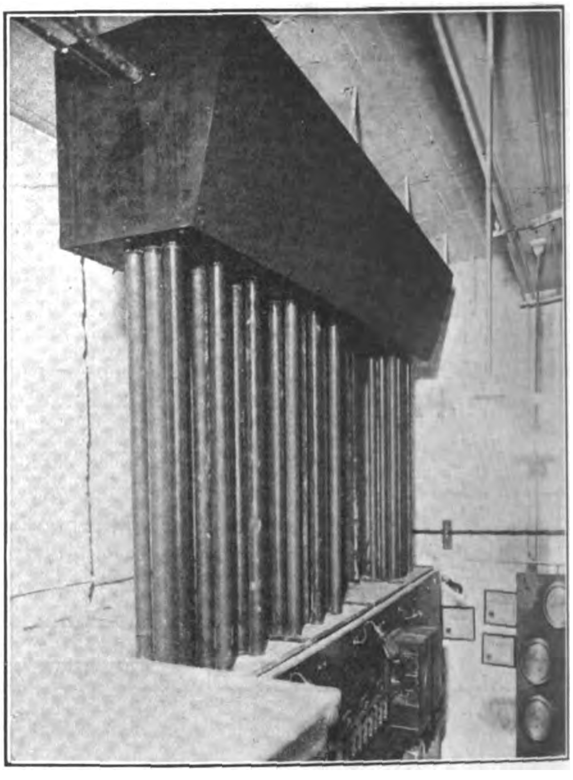


Fig. 2.—Switchboard Pull Box.

Fig. 1 shows the construction employed in the rear of the switchboard. Situated several feet from the back of the distributing panels of the switchboard, are slate slabs about one inch in thickness and about eight inches in width. These slabs are bolted to an angle-iron frame which also supports a steel plate approximately three-sixteenths of an inch in thickness extending from the top of the switchboard to a brick wall. The slate slabs are used to support N. E. C. standard inclosed fuses for the various circuits, the connections between the panel board, buses and fuses being made by round bare copper rods. Between these slate slabs and the panelboard are situated the various horizontal busbars. In the rear of the middle or service panel of the switchboard the slate slabs are mounted nearer the board than the other slate slabs. The slate slabs in the middle of the board are used to support the service buses and exposed copper service fuses. Fig. 1 clearly shows the result of employing this construction for the rear of the switchboard as the accessibility and neatness of the entire rear construction is apparent.

The steel plate extending from the top of the switchboard to the brick wall, is utilized as a means for supporting the conduits leading from the switchboard to the pull box hung from the ceiling above the board. For fastening the ends of these conduits to the steel plate, lock nuts are used on the top side of the plate and bushings at the under side. The passage in the rear of the switchboard is lighted by means of several incandescent lamps supplied by an exposed line of conduit with porcelain condulet receptacles.

The pull box which is situated above the switchboard is shown in Fig. 2. This box is constructed of No. 10-gauge steel plates riveted with three-eighths-inch rivets to a 1.25x1.25-inch angle-iron frame. The front side is inclined about 10 degrees from the vertical and is removable being fastened by cap screws. The top side of the box is provided with eight one-inch holes for the insertion of the hangers supporting it a few inches below the ceiling.

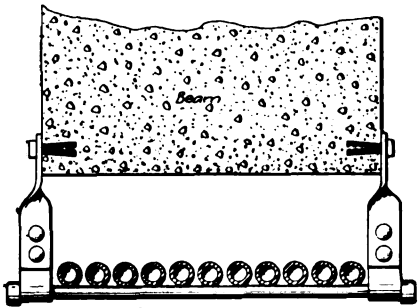


Fig. 3.—Conduit Hanger.

The service conduits and the feeding conduits all enter this pull box. Conduits are carried to two cableways for supplying the various floors, direct runs of conduit supplying the sub-basement with energy for power and lighting purposes. Throughout the building Sheraduct conduit is employed. In the basement, laundry, kitchen, etc., the conduit is exposed.

Fig. 3 shows the method of supporting several runs of small conduit in the basement. This hanger consists of a short length of iron pipe with pipe plugs at the ends supported from a beam by means of perforated iron strap the lower ends of the straps being bent around the pipe and fastened by a bolt and nut. Single runs of conduit are supported by U straps fastened to either the wall or wood blocks depending upon the weight of conduit to be supported. In the laundry and other places where large rectangular ventilating ducts are suspended from the ceiling the conduit is often fastened to these ducts by means of U Straps and cap screws.

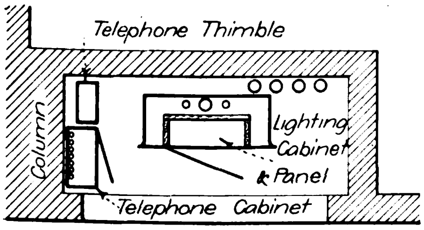

Telephone Thimble
Column
Lighting Cabinet & Panel
Telephone Cabinet

Fig. 4.—Layout of Lighting and Telephone Cabinets.

Fig. 8 shows how a run of conduit is led to a 5-horsepower motor driving a United Vacuum Cleaning Company's vacuum pump. It will be noticed that this conduit is bent to pass along the machine at a slight angle to the horizontal and is fastened to the iron frame of the machine by a U strap and cap screws. At the end of the conduit a porcelain bushing is employed, the wires between this bushing and the motor terminals being inserted in circular loom.

Fig. 5 shows the riser diagram. It will be noticed that two wire shafts are employed both of which are fed from the main switchboard through the pull box above the board. Both 220-volt 2-wire risers and 110-220-volt 3-wire lighting risers are carried in the shafts. It will be seen that the three risers shown to the left in shaft "A" each supply four floors, the fourth riser supplying the last two floors and attic. The fifth riser is run to a junction box in the attic and is used for sign lighting. The two feeders on the right in shaft "A" are power feeders supplying the elevator motors with 220-volt power. A similar arrangement is employed in shaft "B" with the exception that two risers (shown to the right) are used to supply the energency lamps on all floors.

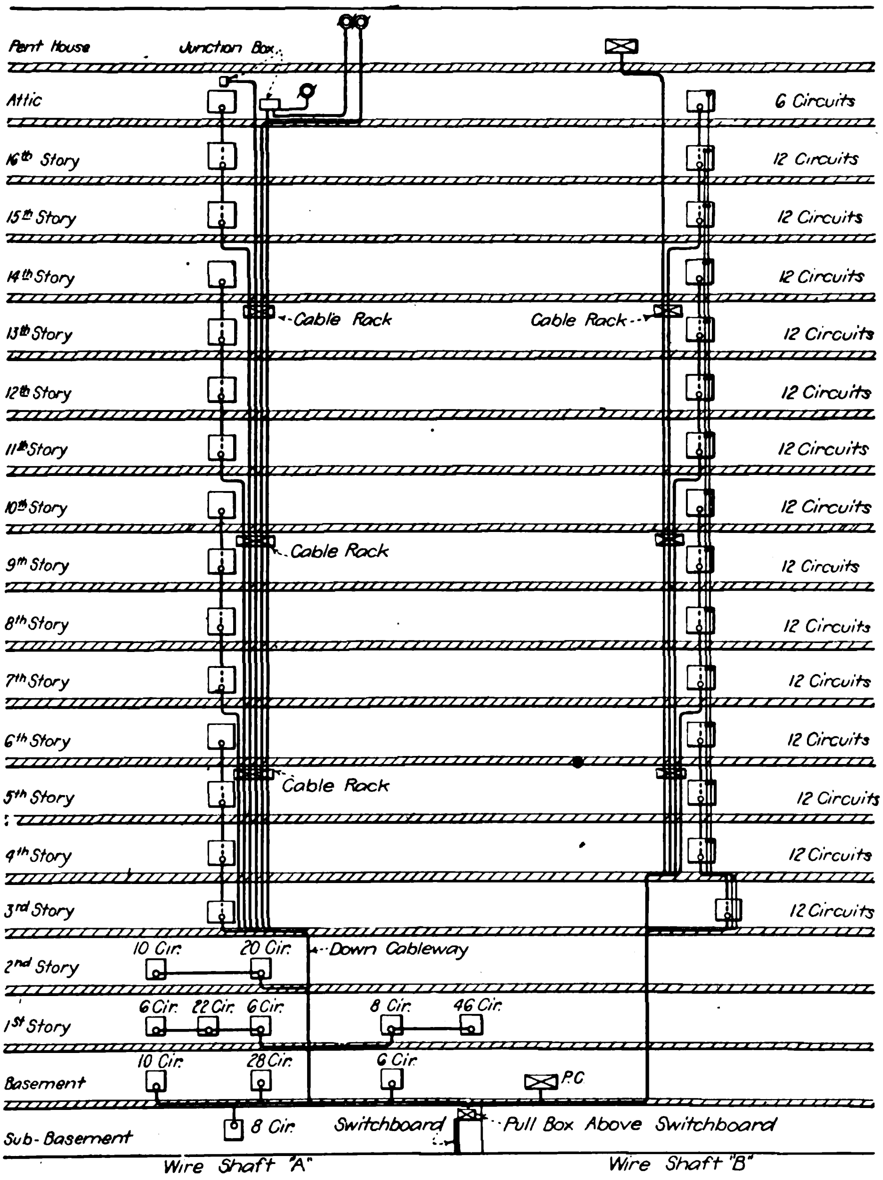

Pent House
Junction Box
Attic
6 Circuits
16th Story
12 Circuits
15th Story
12 Circuits
14th Story
12 Circuits
Cable Rack
Cable Rack
13th Story
12 Circuits
12th Story
12 Circuits
11th Story
12 Circuits
10th Story
12 Circuits
Cable Rack
9th Story
12 Circuits
8th Story
12 Circuits
7th Story
12 Circuits
6th Story
12 Circuits
Cable Rack
5th Story
12 Circuits
4th Story
12 Circuits
3rd Story
12 Circuits
10 Cir.
20 Cir.
Down Cableway
2nd Story
6 Cir.
22 Cir.
6 Cir.
8 Cir.
46 Cir.
1st Story
10 Cir.
28 Cir.
6 Cir.
Basement
P.C
8 Cir.
Switchboard
Pull Box Above Switchboard
Sub-Basement
Wire Shaft "A"
Wire Shaft "B"

Fig. 5.—Riser Diagram.

Three cable racks are employed in each shaft as shown. These cable racks consist of a steel plate to which the conduits are supported by U bolts, bushings being placed at the ends of the pipes. The wires are supported by means of porcelain cleats fastened to the same plate.

Figs. 4 and 7 show the layout and an actual view of the lighting cabinets employed throughout the main portions of the building. From Fig. 4 it is seen that the power and telephone cabinets are mounted in the same opening in a wall, the power cabinet being in the center of the space and the telephone cabinet to the side of the space. The cabinets are of sheet steel with plug fuses, the fuse receptacles being provided with porcelain mountings.

Closing these wall openings for the

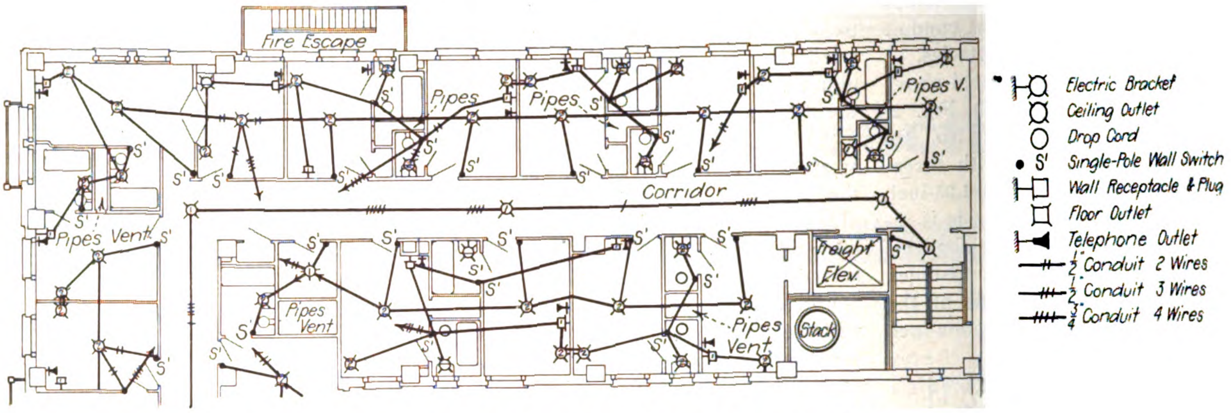

Fire Escape
Pipes
Pipes
Pipes V.
Corridor
Pipes Vent
Pipes Vent
Freight Elev.
Stack
Pipes Vent
S'
Electric Bracket
Ceiling Outlet
Drop Cord
S' Single-Pole Wall Switch
Wall Receptacle & Plug
Floor Outlet
Telephone Outlet
½" Conduit 2 Wires
½" Conduit 3 Wires
¾" Conduit 4 Wires

Fig. 6.—Wiring of Section of Typical Floor.

cabinets are wood doors of similar size and finish to those employed for closing the entrances to rooms. In this way the various cabinets can be located where desired, as they in no way interfere with the artistic effects, as would be the case if only small doors or exposed cabinets were employed.

Fig. 6 shows the typical layout for the wiring of a guest floor. It will be noticed that each guest room has a center ceiling fixture controlled from a push-button switch near the door, two bracket lamps, and a wall receptacle and plug for connection with a table lamp. The toilets are provided with two bracket lamps. One of the prominent features of this diagram is its simplicity, every effort being made to run the circuits in straight lines. Taking the upper half of the diagram it is seen that all the ceiling lamps are on one circuit, the conduit being carried from one end of the building to the other, each fixture being controlled by a switch near the door to the room. This one feature does much towards simplifying the wiring as if all the fixtures in one room were connected on one circuit the wiring would become more complicated. The bracket lamps and the wall receptacles are supplied in a somewhat different manner. The two rooms shown to the upper right in the diagram are supplied from one circuit, which also supplies a wall receptacle in the third room which is near the bracket fixtures in the second room. A study of the diagram will show that the same general method of wiring is employed throughout and that this system has the advantages of utilizing a minimum of wire and of simplifying the wiring circuits.

The same policy was employed for corridor lighting, all the fixtures being on one four-wire circuit which is carried around an entire floor.

Among the various lighting features, the illumination of the barber shop and the mezzanine floor are of interest. The barber shop is illuminated by means of a number of semi-indirect fixtures and a number of bracket fixtures over the mirrors. As the floor of the barber shop is of marble, and the walls of white sanitary glazed construction, the illumination of the barber shop is exceptionally well distributed.

The mezzanine-floor wiring is of interest because of the great number of base-board and floor receptacles that

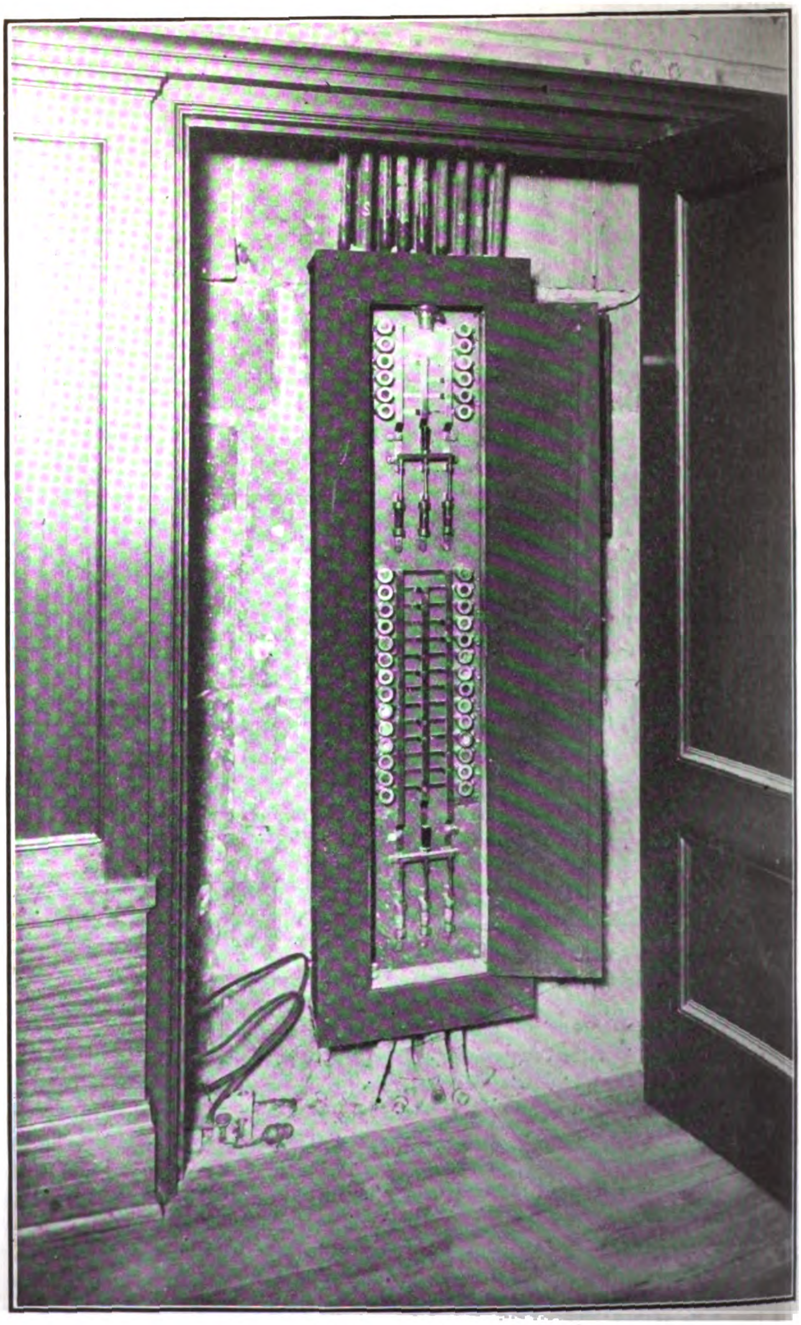


Fig. 7.—Lighting and Telephone Cabinets.

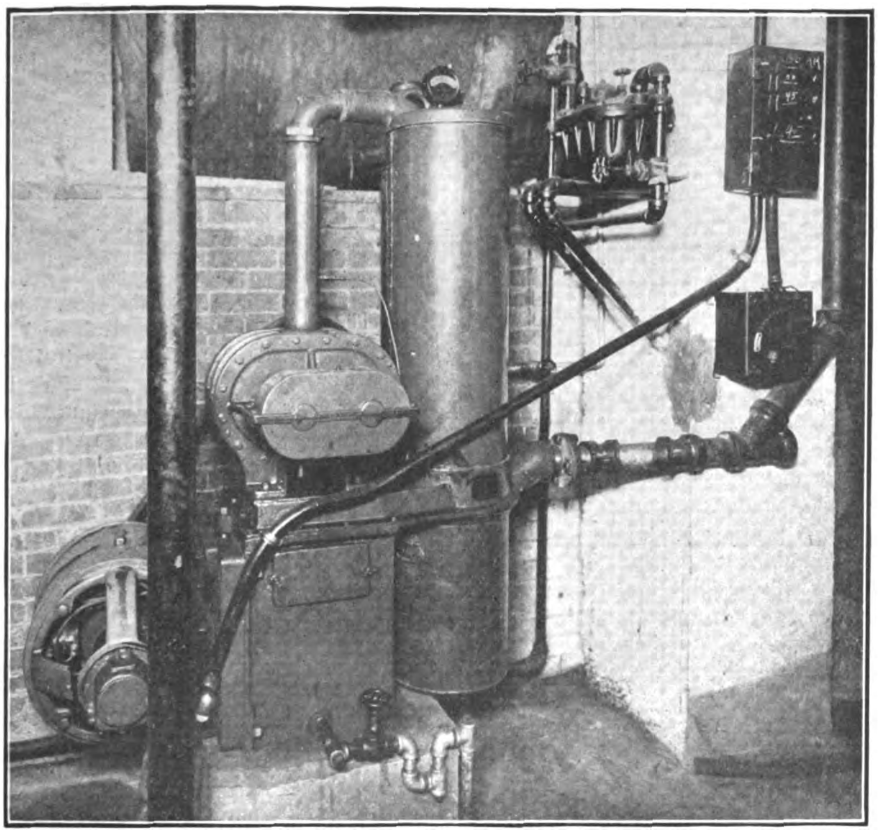


Fig. 8—Conduit Supplying Vacuum-Cleaner Motor.

are provided, making it possible to use numerous table lamps when desired without running long length of unsightly lamp cords.

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Proposed City Electrical Licensing Bureau for Newark, N. J.

The Master Electricians' Association has submitted an ordinance draft to the Common Council of Newark, N. J., covering the establishment of an electrical bureau. The proposed ordinance provides for the creation of a board of five examiners, empowered to examine all applicants desiring to engage in electrical installation work, including employees of companies as well as individuals who propose to operate independently. No certificate from a city department is to be granted for electrical wiring and other work unless the application is made by a licensed electrician.

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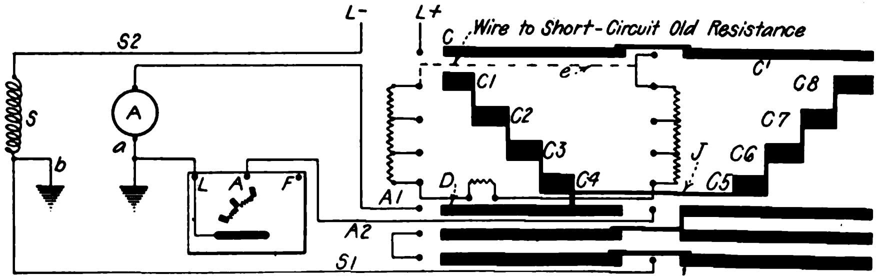
A Peculiar Case of Motor Trouble.

The writer was recently called out on a peculiar case of motor trouble. The motor was a two-and-a-half-horse-power series motor operated by a reversing drum controller, which controlled the motor speed through an iron resistance. This resistance had been burned out and the supply house, not having a duplicate set in stock, loaned the firm a starting box for a plain shunt motor, giving directions for connecting temporarily as in the accompanying sketch.

It will be observed that this makes the controller a simple reversing switch, and that the motor should operate satisfactorily upon moving the controller handle to one side or the other and moving the rheostat handle. But after the writer had made the necessary connections, it was discovered that the motor operated only when the controller handle was towards the left. In this position the motor operated at full speed without moving the rheostat handle.

Upon dismantling the motor, it was discovered that one brush holder was grounded at *a* and that the field was grounded near the terminal *b*. The result was that when the controller handle was in the left-hand position, the current took the path, *L* +, *c*, *c'*, *e*, *c*1-4, *d*, *A1*, *A*, *a*, *b*, *S*, *S2*, *L*-; thus cutting out the part of the circuit containing the rheostat. When the controller was reversed and the rheostat handle moved, the current took the path, *L* +, *c'*, *c*, *c*8-5, *d*, *A*2, rheostat, *a*, grounded, *b*, *S*, *S2*, to *L*-. This resulted in cutting the armature out of circuit, and blowing the fuse.



Motor and Controller Connections.

Upon removing these two grounds, the motor operated properly in both directions without changing any connections, and is still operating as well as could be expected under the circumstances.

W. R. Smith.

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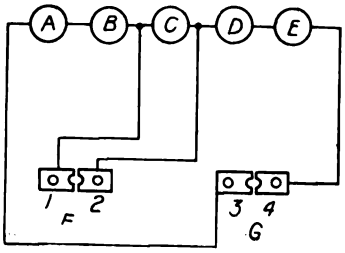
Bank of Lamps for Different Voltages.

In trouble shooting there are several voltages which one may encounter, and a bank of lamps connected as shown in the diagram will be very useful.

For use on a 500-volt circuit the line terminals are connected to the blocks 3 and 4, which puts lamps A, B, C, D and E in series. For 220 volts, plugs are inserted at F and G, and the line terminals connected at blocks 2 and 4. For 110 volts both plugs are out and the line terminals are connected at blocks 1 and 2. Lamp C will burn with this connection. All lamps are 110-volt lamps.



Lamp and Plug Connections.

A. B. Blatherwick.

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Illinois Contractors to Meet at Danville.

The Electrical Contractors' Association of the State of Illinois will hold a meeting at Danville on June 19 and 20. Assistant Secretary E. J. Burns is busy making arrangements for an attractive meeting.

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Wireless Plant to be Constructed In Philippines.

In its recent special session the Legislature of the Philippines granted a concession to the Marconi Wireless Telegraph Company of America for the establishing of a wireless plant for long-distance service, especially to Hongkong, Singapore, Shanghai, Japanese ports and other points. The concession runs for 50 years and gives the right to construct a plant for long-distance service only, the service not to be allowed within the islands without further authority.

LETTER TO THE EDITOR.

Indiana Contractors' Meeting.

the Editor:

I am very sorry to have been misquoted in my remarks before the Electrical Contractors' Association of Indiana in your issue of June 6. I am quoted as saying: "State associations should appoint supply committees whose object should be to forbid supply dealers and contractors from selling small quantities of wiring devices at almost wholesale prices." This is an error on your part because I certainly did not use the word "forbid." What I did say is that we should try to *persuade* supply dealers and others from selling small quantities at wholesale prices.

Ernest Freeman.

Chicago, Ill., June 8, 1914.

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Wire-Saving Arrangement for Annunciator.

An annunciator is often installed so as to be rung from a gang of push-buttons at one location. This may be in order that the manager of an office or other official can call any particular person by pressing the appropriate button on the gang switch. In one case an annunciator with 50 points under the word "In" and 50 points under the word "Out" was installed in a large office where a great many heads of departments were frequently coming and going.

On each of the "In" drops was printed a man's name and the list was duplicated on the "Out" drops. Near the entrance door of the office were installed the gang buttons, marked to correspond with the annunciator drops. As each man came in or went out he would push the button marked with his name.

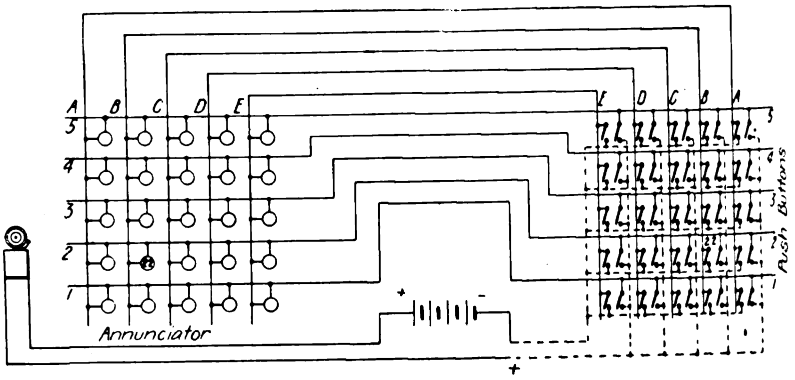
Then in case of a telephone call for any individual it was not necessary for the operator to connect up his private exchange instrument and wait to see if he would answer the ring, but she could simply look at the annunciator and tell at a glance whether he was in or out. Of course at regular intervals she would make a note of who was out and reset the annunciator.

The construction of the floor in the above case would not permit a two-inch conduit to be run from one side of the building to the other, and to save running five three-quarter-inch conduits, which would be necessary to carry the 102 wires as ordinarily connected, an arrangement was used whereby it was only necessary to run 22 wires, which could be accommodated in a single conduit. This resulted in a saving on both labor and material also; although it rendered necessary the use of more complicated and expensive push-button switches.

The arrangement used is indicated in the accompanying illustration, which gives a diagram of connections for a similar scheme using 25 instead of 100 annunciator drops.

The connections on this diagram may be traced as follows, each push-button making two connections: Supposing button No. 22 to be depressed, current will flow from the battery through the annunciator bell, along the positive dotted bus, through one side of the push-button switch to wire 2, through drop 22 on the annunciator to wire *B*, back through the other side of the push-button to the negative dotted bus and thence to the battery.

Any one of the 25 buttons indicated may be pushed and in the same manner will indicate upon the corresponding annunciator drop. In the case shown in the diagram 12 wires only are necessary to operate 25 drops. The advantage in number of necessary wires increases as the number of annunciator drops goes up, and in the case of the 100-drop installation referred to, only 22 wires were necessary. The batteries may be placed at either the annunciator or the push-button end of the line.



Wiring of Annunciator With Push Buttons and Annunciator Drops Concentrated at Two Points.

Any commercial annunciator can be changed over to fit this scheme. The buttons should be arranged with small busbars in the back, insulated from one another with fiber bushings, and each bar tapped for a 6-32 screw directly back of the buttons.

The front and back of the gang should be of solid brass plate and the front drilled to receive double-pole midget buttons. The back should be removable in order to permit the connecting up of the buttons. The frame of the gang may be of hardwood molding finished to match the furniture of the room.

Each button should first have four short wires connected to it. It is then pushed through one of the holes in the plate and is connected to the proper busbars from the rear.

B. H. Fisher.

Among the Contractors.

The Capitol Electric Company, of Des Moines, Iowa, has the contract for the wiring installation in the new Y. M. C. A. building in Marshalltown, and also for the new public school at Sheffield, Iowa.

The Inland Electric Company, which was recently established at 412 Hubbell Building, Des Moines, Iowa, has the contracts for the electrical work in the new addition to the North High School in Des Moines and for the Church of the Immaculate Conception at Cedar Rapids. This company is also completing the electrical work in the new Wenks & McCune Building in Des Moines.

Through Dawson & Holbrook, architects for Horace Chapman, Columbus, O., the Ryan Electric Company, of that city, has secured the wiring and conduit work in the remodeling of a six-story building into a power building. A feed wire carrying 300 horsepower will be introduced. The contract amounts to about $1,100. Bids for the motors and installation of same will be called for at a later date by the architects. The Ryan Electric Company has also secured an $800 contract for the wiring of the new high school at Pomeroy, O.

Paul H. Jaehnig, Newark, N. J., has been awarded the contract for electrical work in the new Lafayette Street School to be erected by the Board of Education of Newark. The Newark Gas & Electric Fixture Company has been awarded the contract for lighting fixtures.

The electrical work at the new Stivers School in Dayton, O., has been awarded to the William Hall Electric Company.

Walter Coleman, Jersey City, N. J., has been awarded the contract for electrical work in the new school building to be erected at St. Paul's Avenue and the Boulevard.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Western States Gas & Electric Company was authorized to issue two promissory notes, one for the sum of $108,900 and the other for $232,100.

The Calistoga Electric Company was granted a certificate of public convenience and necessity to operate under a franchise granted by Napa County.

ILLINOIS.

The Milford Telephone Company has applied to the Commission for a certificate of convenience and necessity to extend its telephone system into the territory now occupied and served by the Hickman Illinois Telephone Exchange.

KANSAS.

Berryton Telephone Company. In a decision rendered on May 22, the Commission has held that no public utility can have two different rates for the same class of service to different patrons. Relating to the Berryton Telephone Company, the opinion states that "It is very evident that this company, like many others, originally was organized nd intended to be operated as a purely mutual company. However, its experience is that the demand for service grew until it became a public utility operated for profit."

Northeast Kansas Mutual Telephone Company et al. The Commission has held that telephone companies must provide service for competing companies when it is shown that such service will accommodate the public. The Northeast Kansas Mutual Telephone Company, the Morrill Mutual Telephone Company and the Robinson Mutual Telephone Company were ordered to furnish service to a competitor, the Hiawatha Telephone Company, and the Commission stated that a company may be required to install a telephone in the office of a competing company at regular rates in order that patrons may be notified of calls over the other line.

MARYLAND.

United Railways & Electric Company. The Commission ordered the company to make an extension of its line from Overlea to Jerusalem. The company appealed and the Circuit Court No. 2 handed down a decision, June 2, holding that the demands of the Commission are unreasonable. The court sustained the company's contention that the service was not required in order to properly serve the public and that the expense would be considerable and that the extension would not pay for a number of years. An injunction was granted suspending the operation of the Commission's order. The opinion of the court cites the case of Laird vs. the B. & O. R. R., 121 Md. 187, as follows: "The discretion of a public service commission cannot override the discretion of the officers of the corporation in the management of its affairs, or the provisions of the statute in which securities are permitted to be issued."

NEW HAMPSHIRE.

Standards of Service. Rules prescribing standards for electric service, and providing for the testing of meters and otherwise regulating the service of electric utilities were adopted May 27th by the Public Service Commission. These rules are to apply to each electrical utility serving the public which in any one year shall have generated, transmitted or sold more than 25,000 kilowatt-hours or shall have more than 25 consumers. These rules are to go into effect July 1, 1914. It appears that it was the aim of the Commission to prescribe regulations adapted to the needs and the present state of development of the utilities to be affected. The Commission calls attention to the rule on voltage variation and states that the fluctuation in voltage permitted may appear to be excessive "but in view of the conditions existing in many parts of the state, a more exacting requirement at this time might work an undue hardship upon some of the utilities. A closer regulation may be expected to be practical in the future. It may be that some utilities cannot immediately meet the requirements of the rule as now made, since such requirements may involve the redesign and reconstruction of distribution systems, or the installation of regulating devices. In any such application may be made to the Commission for a temporary suspension, or a modification of the rule to meet the reasonable requirements of the particular situation, and in such case the Commission will make investigation and will take such action as may be in fact reasonably necessary."

NEW YORK.

New York Telephone Company. The Public Service Commission of the Second District has found it necessary to appoint a special counsel in connection with the investigation of the rates of the New York Telephone Company in New York City. D. B. Murphy, of Buffalo, has been engaged for this work on a month-to-month contract for not to exceed six months. It has been estimated that three hundred men could not complete the inventory and appraisal in much less than a year and effort is being made by the Commission to devise some plan which will shorten the time required and still provide a proper basis for rate making.

OHIO.

The Cleveland Telephone Company was granted authority to issue $4,000,000 of 5 per cent two-year notes. More than $3,000,000 of the proceeds will be used for refunding previous bond issues and the balance for improvements.

Uniform Accounts. Karl B. Nau, of Cleveland, has been employed by the Commission to prepare systems of accounting for utilities and submit them to the Commission for consideration. Representatives of the companies have been invited to confer with the Commission in this matter.

PENNSYLVANIA.

Discrimination Justified. The Commission dismissed the complaint alleging discrimination in the case of C. S. Goerlich et al. vs. Bethlehem City Water Company. In 1913 the borough of Bethlehem extended the mains of the municipal water plant to serve a certain district in West Bethlehem in competition with the respondent company. The latter, as a matter of self protection and in order to meet competition, made a discount of fifteen per cent for prompt payment to consumers along the streets occupied by its competitor. This discount provision was not extended to any of the company's consumers outside of this district. The contention was made by the complainants that this discount allowed to consumers in one street and not to those in a nearby street constituted a discrimination within the prohibition of the public service commission law. In passing upon the question as to what constitutes discrimination, the Commission says: "The question raised under the facts so found is whether or not the additional discount allowed to certain consumers and not to all is such a discrimination as the act of 1913 was intended to prevent. There is much of merit in the position of the respondent. It has invested large sums in its plant and has for thirty years at least supplied the people with a necessity of life without any return made to its stockholders. It now finds the territory it had occupied invaded and its rates presumed to be reasonable, in the absence of evidence to the contrary, assailed. It will be observed that the greater or lesser compensation forbidden by the act of 1913 is that of a charge 'for a like and contemporaneous service under substantially similar circumstances and conditions.' While it is manifestly the purpose of the act that public service companies should be supervised and controlled, and that everything in their conduct unreasonable or unfair should be prevented, there is nothing to indicate any intention to destroy or interfere with vested interests or to hamper the proper exercise of the powers conferred upon such companies.

"In the present case with respect to the streets to whose residents the greater discount was allowed by the respondent, there was competition of a serious character. To these residents another supply was offered at lower rates. The undisputed testimony is that it was necessary 'to meet their rates or lose the business entirely.' To lose the business would be to render valueless the investment in that part of the plant. The competition was the more threatening because of the fact that it had the strength and power of the municipality to support it. As to what constitutes such competition as will create a dissimilarity of circumstances and conditions must be determined from the facts of each case as it arises. After giving careful consideration to the ascertained facts and the situation as it exists in West Bethlehem, it is our conclusion that such dissimilarity between the conditions upon the streets named and the others exists as to make the prohibition of the statute inapplicable. It follows that the complaint should be dismissed and it will be so ordered."

The Economy Stock Telephone Company. The Commission has issued a decision ordering that the telephone company shall make no difference in the rates which it charges stockholders and non-stockholders and requiring that the practice of furnishing and maintaining free telephone service in hotels and railway stations be discontinued. The case arose upon the complaint of the Somerset Telephone Company, pointing out that discriminatory rates were charged by the Economy Company.

WISCONSIN.

Physical Connection of Telephone Lines. The Commission ordered that physical connection be made between the Wisconsin Telephone Company and the Rock County Telephone Company of Janesville for toll, local and rural service.

INTERSTATE COMMERCE COMMISSION.

The United States Supreme Court rendered a decision, June 8, upholding the order of the Interstate Commerce Commission in the Shreveport Rate case. The Louisiana Railroad Commission complained to the Interstate Commerce Commission that certain class rates applying from Shreveport to Texas points were unjustly discriminatory. Lower rates for similar shipments arising from Texas towns over the border were lower as prescribed in an order of the Texas Railroad Commission. The Interstate Commerce Commission ordered the railroad companies involved to eliminate the difference in these rates. In reviewing this order the court holds that Congress had power to control interstate charges of an interstate carrier to the extent necessary to prevent injurious discriminations against interstate traffic and that this power has been conferred by Congress upon the Interstate Commerce Commission. The court says: "It is of the essence of the power to regulate interstate commerce that where it exists, it dominates. The fact that carriers are instruments of intrastate commerce as well as of interstate commerce, does not derogate from the complete and paramount authority of Congress over the latter or preclude the federal power from being exerted to prevent the intrastate operations of such carriers from being made a means of injury to that which has been confided to federal care. Wherever the interstate and intrastate transactions of carriers are so related that the government of the one involves the control of the other, it is Congress and not that state that is entitled to prescribe the final and dominant rule, for otherwise Congress would be denied the exercise of its constitutional authority and the state, and not the nation, would be supreme within the national field."

BOOK REVIEWS.

"How to Build Up Furnace Efficiency." By Joseph W. Hays. Seventh edition, revised and enlarged. Chicago: Joseph W. Hays. Paper, 126 pages (4½x7¼ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This volume should be of interest to the plant owner, the manager and the fireman, and is written so that any one of these can understand what the author is driving at, as he has taken care not to make it too technical. The great waste of fuel under prevalent furnace practice, especially as it is found outside of the central stations, is strongly emphasized, and means indicated for rectifying inefficient conditions. While most of the information given is not new to the trained engineer, it should be very helpful to the classes of readers above mentioned, and if the author's directions are carried out in power plants which have heretofore paid little attention to fuel economy, the result should be very beneficial.

"The Practical Telephone Handbook and Guide to the Telephone Exchange." By J. Poole. Fifth edition, revised and enlarged. London: Whittaker & Company. Cloth, 624 pages (5x7½ inches), 535 illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $2.00.

The text of this book is a comprehensive popular handbook on the telephone and is evidently particularly written for telephone wiremen and others interested in the practical end of telephone construction and operation. It describes with considerable detail instruments and other apparatus used by subscribers, in exchanges, substations, power plants, lines. etc. The first few chapters are devoted to a popular explanation of electrical principles, while other chapters are devoted to electrical measurements and the testing of telephone systems. Submarine telephone cable systems and wireless telephony are briefly considered. Very little space is devoted to multiplex telephony and no attempt is made to discuss theoretically the many troubles associated with telephony. The book, however, should prove useful to the practical telephone man. The chapter on automatic telephony has been rewritten in this edition, and additions have been made to a number of other chapters.

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Gas-Filled Tungsten Street Lamps for Newark.

The Board of Works of Newark, N. J., has entered into a five-year street-lighting contract with the Public Service Electric Company. The agreement provides for the installation of 200 new nitrogen-filled tungsten lamps at once, and 500 additional such lamps within a year.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—Panama Canal Locomotives.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 223.—Street or Station Indicator.—Is there on the market an automatic device, usable inside of street cars, that will automatically, through electrically illuminated signs in each end or one end of the car, indicate intersecting streets bv name as and when the car approaches such intersecting streets, irrespective of the number of such streets, and is the same practicable? Where is such a device used and by whom manufactured?—W. H. W., Kansas City, Mo.

No. 224.—Alternating-Current Machines.—(A) In connecting a two-phase or three-phase alternating-current generator to a switchboard to which several other machines of the same kind are already connected, what methods may be used to insure getting the new machine in the proper phase relation to the busbars? (B) What is the purpose of the synchronizing resistance connected across the collector rings of a rotary converter while starting from the direct-current end?—P. M. B., Hudson, Ill.

No. 225.—Blame for Faulty Connection.—A certain building was wired and pronounced O. K. by the inspector. After meter was installed (it was a three-wire job) the lamps connected to the switches on the left side of the switchboard burned out. A test showed that the neutral wire had been connected to the right-hand pole of the entrance switch instead of to the center pole, thus giving 220 volts on the left and 110 on the right. The meter man supposed that the neutral was in the center and, as there was nothing to indicate the contrary, ran the two outside wires through the meter and onto the switchboard, as is customary. The entrance wires came in through conduit and could not be traced to the outside connections. The owners of the building blame the meter man; we contend that he was not at fault. Who is right?—J. S., New Knoxville, O.

No. 226.—Rewinding Motor.—How can I change a bipolar, 110-volt, direct-current, 250-revolutions-per-minute, series fan motor into a generator giving 10 to 20 volts and about 20 amperes? At present there is wound on each field one-half pound of No. 27 single cotton-covered wire; the armature has 12 slots and 12 bars and 120 turns of No. 30 double silk-covered magnet wire in each slot. I have two machines like this, exactly alike, and wish to make a motor-generator of them by changing one as indicated above.—H. J. G. J., New York City.

Answers.

No. 221.—Quartz Lamps on Alternating-Current Circuits—Why can the ordinary quartz-tube lamp not be used on alternating-current circuits? Are any such lamps available for these circuits?—B. W., Denver, Colo.

While it perhaps is feasible to build quartz lamps for alternating-current circuits, it is as yet considered to be commercially impracticable to do so, chiefly on account of likelihood of electrode trouble which is absent on direct current. Quartz lamps can, however, be operated from alternating-current supply circuits by using in connection therewith a mercury-arc rectifier. Many lamps have been installed in this manner, a rectifier serving from one to three quartz lamps in multiple.—K. L., Chicago.

No. 222.—Induction Motors.—1. With a given set of coils and a three-phase induction-motor stator, is there any rule by which the proper coil pitch can be determined other than approximating by placing the coil in the slots? 2. What effect on the power-factor, efficiency and speed will changing the coil pitch give on induction motors? 3. With a given winding in an induction-motor stator, what effect on power-factor and efficiency will changing the connections from Y to delta have and vice-versa?—A. C. H., Security, Md.

1. To determine the proper coil pitch for an induction motor, find out from the name plate the number of poles. If this is not given get the speed at which it operates and the frequency of the circuit to which it is to be connected, then from the formula $P = 120\ F/R.\ P.\ M.$, where P is the number of poles and F the frequency, the number of poles can be obtained. The coil pitch equals the number of slots divided by the number of poles. 2. In order to have a symmetrical winding in an induction motor it is necessary that the number of coils be a multiple of the number of poles and the number of phases. If the coil pitch is changed enough to make the above hold true, the speed will change according to the formula in the first part of the answer. If the speed increases the efficiency and power-factor will both increase, if proper change is made in the coil windings. If the speed decreases both will be lower. If the winding is not symmetrical it is not possible to give a general answer as to the performance.

3. If the winding of a given induction motor has been changed from star to delta and the voltage of the circuit on which it is operating is left the same, the condition is equivalent to operating the motor on a circuit the voltage of which is 1.73 times the original voltage of the motor. In addition there is likely to be heating due to the third harmonic which is likely to cause trouble in almost any delta-connected motor. If the change is made from delta to star, it is equivalent to operating on a voltage of 58 per cent of normal.—J. H. M., San Francisco, Cal.

Dayton Manufacturers Co-operate With Continuation School.

The Apple Electric Company, of Dayton, O., is one of a group of a dozen large manufacturers in that city, including the National Cash Register Company, which has entered into a plan under which, by co-operation with the Y. M. C. A., they have encouraged a continuation school for the benefit of their younger employees, conducted by the organization referred to. Boys employed in the plants of the manufacturers participating in the plan are permitted to attend the Association school for one-half a day each week without loss of pay. The course covers four years and instruction is included on the subjects of shop theory, mechanical drawing, and similar matters, which are calculated to be of practical benefit to the students. The second annual banquet of the school, marking the completion of its second school year in operation, was held recently, 130 persons being present, including representatives of the manufacturers, plant foremen and superintendents and the boys who are taking the course.

Central-Station Progress in Calcutta, India.

The electric supply company which operates in Calcutta, India, is progressing so rapidly that a further $2,500,000 capital has to be raised for new equipment to cope with the demand for light, fans and power. A large saving is being experienced consequent upon the installation of more economical plant, the closing down of the four old generating stations, and the concentration of all generation at the Cossipore new power station. The net revenue has nearly doubled in five years and a low-price demand from Calcutta's manufacturing industries is anticipated. The capital will now stand at $7,500,000. The dividend just paid has been nine per cent per annum, and as an incentive to co-operation and in order to keep down costs, a bonus system has been introduced under which one per cent of the net profits is divided among the staff in proportion to their salaries.

RELATIVE ADVANTAGES OF STAR AND DELTA CONNECTIONS.

Meeting of American Institute of Electrical Engineers at Pittsfield.

The 296th meeting of the American Institute of Electrical Engineers was held at Pittsfield, Mass., on May 28 and 29, under the auspices of the Pittsfield Section. Headquarters were at the Maplewood Hotel. The general subject for discussion was "Relative Advantages of Star and Delta Connections."

The first session was held on Thursday afternoon and was called to order by W. W. Lewis, vice-chairman of the Pittsfield Section. After extending a welcome to those present he called upon Past-President Dugald C. Jackson to preside. The first paper to be presented was one by D. W. Roper, of the Commonwealth Edison Company, Chicago, entitled "Experiences with Line Transformers."

Experiences With Line Transformers.

This paper present an analysis of the transformer troubles for one year on the system of the Commonwealth Edison Company, Chicago, which has nearly 15,000 transformers installed. About 50 per cent of the troubles due to the transformer can be eliminated without great expense by slight changes in construction details and methods of operation. The Bureau of Standards specification for transformers is taken to represent average American practice and is discussed with reference to improving some of the details in present practice. The name plate should be so placed that linemen can easily inspect it. Cases should be provided with handles so as to avoid the use of leads for this purpose. The leads should be provided with terminals just outside of the porcelain bushing. It would be preferable to buy cutouts and oil separately, and specifications for a cutout are given. Connection boards should be submerged, as 60 per cent of the troubles are due to lightning jumping across this board when it is above the oil. The records of four different makes of transformers are used as a basis for discussion of the value of continuity of service. It is shown that cost of repairs is a comparatively minor item and that a high value must be placed on continuity of service in order that the savings due to the most reliable transformer may offset the cost of its increased losses. Results of experiments with improved lightning protection are given, showing how the troubles were reduced to one-third. It is preferable to put lightning arresters on each pole carrying a transformer. Primary fuses should be used to protect the rest of the service from a defective transformer and not to protect the transformer itself from overloads. With proper attention to lightning arresters and other details of the transformers, cases of trouble due to lightning should be reduced to 10 or 20 per cent of those formerly experienced.

The discussion was opened by W. S. Moody, who, on behalf of the manufacturers, welcomed the information given by Mr. Roper as to the experience of the users of transformers. Co-operation between manufacturers and users is necessary to get the best results and to determine just how much expense is warranted in securing reliability. Pressure is brought to bear upon the manufacturer and the user to decrease the weight, size, cost, etc., to accede to which reduces the factor of safety, so that there is not much danger of transformers being made too reliable.

A. D. Fishel said that the distributing transformer is one of the most reliable as well as one of the most important things in a large distribution system. Transformers have been greatly improved in recent years and the reliability has been increased and more attention will be given in the future to their proper protection. The tables in Mr. Roper's paper apply to transformers that have been turned out in the past and not to the particular designs which are at present available. With present designs a connection board can be operated with perfect safety at the oil level. Larger clearances are allowed and syphoning of oil is avoided. This board is an advantage in giving support to the leads between the coil and the outlet bushing. For voltages of 6,600 or higher, the connection board should not be at the oil level. He advocated the standardization of voltages so that a connnection board would be unnecessary and taps could be eliminated. In that case the leads could be supported by porcelain spacers. Many transformers now have lifting lugs cast at the side of the case, avoiding the temptation to use the lead wires for that purpose. Nevertheless, with the rugged primary bushings which are now used and other changes it is hard to injure the transformer through the mishandling of the leads. More reliable fuse blocks are now available.

H. W. Hough, of Cleveland, O., said that his experience had been similar to that of Mr. Roper. Of 10,000 transformers in service, 400 had been damaged during the year. In most cases the terminal boards were damaged, except where they were submerged in oil.

Paul M. Lincoln questioned whether the evidence warranted the conclusion that the submergence of the connection board is a desirable thing. Burnouts are less frequent when a lightning arrester is on the same pole as the transformer. When a lightning arrester is not present the terminal board inside may serve the same purpose, as it is a relatively weak point. The records demonstrated that the connection board should have sufficient clearance to make it improbable that the lightning will jump across inside. This would remove any objection to the connection board. He agreed with Mr. Roper that transformer fuses should be installed for the purpose of interrupting short-circuits, etc., but not for protection against overload. The accelerated life test would be desirable, but so far no way has been devised to accomplish that result.

Joseph Franz, of Lenox, Mass., said that similar troubles had been experienced there as in Chicago. It is not always possible to obtain a good ground for a lightning arrester and when these are connected to the same ground as the secondaries, trouble has been caused by failure of the lightning arrester, which fused across the gap and sent primary current into buildings, which have been set on fire. He thought it would be an advantage for manufacturers to standardize the form of name-plate. He thought it preferable for the manufacturers to furnish oil with transformers.

M. O. Troy agreed with Mr. Fishel in urging standardization of primary and secondary voltages, so that the connection board could be entirely omitted. If the connection board is retained, he favored the submerged board.

E. E. F. Creighton said that deterioration due to successive strains has been determined by accelerated life tests. Such surges as are produced by lightning, with high frequency, high potential, steep wave fronts or sloping wave fronts can be used and it has been found that there is a deterioration from successive discharges. The number of discharges that the insulation of a transformer will stand is dependent upon the variety of the discharge, that is upon the voltage and the steepness of the wave front. Some of the salient points brought out are as follows. Doing away with exposed terminals reduces the troubles by one-half; placing arresters on the same pole with the transformers has further reduced the trouble to one-third; and improvements in protection again decreases the troubles to one-half. Combined they reduce the trouble to one-twelfth. Since the total trouble was originally small, this makes the effect of lightning quite negligible. This investigation has shown how to choose the elements in an arrester to give the highest degree of protection. Where a terminal board is arranged so as to allow a minimum discharge to take place through the case the transformer is not protected, but actually damaged. Mr. Roper's results show that one-third more transformers were damaged where the terminals were exposed than where they were not exposed. He summarized the situation relating to the practice for protection against lightning as follows: (1) Have no exposed terminal boards; (2) Place the arrester on the same pole with the transformer, but separate grounds should be used for the lightning arrester and the secondary circuit; (3) Use an arrester with good protective qualities; (4) Ground the transformer case to the ground terminal of the arrester, especially if the secondary is not grounded.

H. B. Alverson, Buffalo, N. Y., said it is very evident that the transformer ought not to be a lightning arrester. To put lightning arresters on the same pole with transformers is sometimes difficult in cities where there is joint use of poles. A number of lightning arresters on a circuit make it harder to locate trouble. A limited number of lightning arresters properly placed will do more good than a large number.

W. L. Granger, of Detroit, Mich., said that transformer connections were standardized in that city and terminal boards had been removed. It made little difference what the dimensions of the connection board were when it is at the oil level, because smoke, soot and moisture were breathed into the transformer and collected on the board. He agreed there should be a lightning arrester for each transformer. It was advisable to insert a fuse consisting of a piece of No. 18 copper wire inside of a glass tube on the line side of the lightning arrester. This prevented a breakdown in service in case the lightning arrester short-circuits. He uses these with all multi-gap arresters.

W. J. Wooldridge said three points should be considered in obtaining reliability of transformers: (1) design; (2) manufacture; (3) insulation and protection of installed apparatus. In designing insulation a certain margin of safety must be allowed for possible accidents and it is important that the material be properly handled by the workmen. The latter can best be secured by co-operation and teaching the workmen to understand the necessity of "safety first," both in their own shop and in the output which is to be turned over to others. He exhibited curves showing how the percentage of accidents had been reduced in the Pittsfield works of the General Electric Company. A monthly printed paper is distributed among the workmen giving information as to the value of perfect insulation, etc. He read an extract from one of these bulletins showing the connection between insulation and safety and winding up with the admonition: "Be careful with all insulation."

In closing the discussion, Mr. Roper admitted that conditions could be improved by better design of connection board, but it is preferable to remove the board altogether in the case of companies which operate at a single definite voltage. In Chicago all boards are removed from new transformers, and old transformers receive the same treatment when they come in for repairs. The use of joint poles is customary in Chicago, but lightning arresters are always installed on same pole with the transformer and grounded at that pole, and the secondary is grounded on a different pole. Where the telephone company already has a ground upon a pole which it is desired to use for mounting a transformer, the telephone company is paid for the cost of removing its ground to the next pole. Increasing the number of lightning arresters does not seem to increase the trouble as most types of arresters now in use give comparatively few interruptions to service. They are almost as reliable as the transformers themselves. He had tried the practice of grounding transformer cases and experience is being collected on this point. From 600 transformers so far no particlar difference has been noticed. An arrester on each transformer is not necessary but contributes to more reliable service.

The next two papers were discussed together. The first of these, by R. W. Sorenson and Walter L. Newton, entitled "Inherent Voltage Relations in Star and Delta Connections" was, in the absence of the authors, presented by H. W. Tobey. The second paper was by R. C. Clinker and was entitled "Harmonic Voltages and Currents in Star and Delta-Connected Transformers." It was presented by H. O. Stephens.

Inherent Voltage Relations in Star and Delta Connections.

The paper gives the results of experiments made with a miniature simple transmission system to demonstrate the inherent voltage relations with different combinations of star and delta connections. The experimental system consisted of a 7.5-kilowatt revolving-field generator, with coil terminals which could be connected either star or delta, and two banks of transformers each composed of three shell-type 3-kilowatt units. All inductive and capacity effects in the transmission line were eliminated. The tests were made under constant conditions, with non-inductive load. The authors give the results of four groups of tests, on four different systems of connections, pointing out the advantages and disadvantages of the several systems. In each case tests were made without load, with balanced load, and with load on one phase only, for various conditions of grounding. Typical voltage diagrams are given, to show what happens under various conditions of load. From these data the following conclusions for a star-connected transmission line are drawn. The generator should be star-connected. The neutral point should be well grounded at both ends to relieve electrostatic strains. There is, of course, the objection to a grounded neutral, that if a line becomes grounded also, one phase is short-circuited. The second point, which fortunately does not often arise in practise, is that all alternator frames, motor frames, and transformer cases should be thoroughly grounded, not only for the foregoing considerations, but also to protect the lives of operators and linemen. The disadvantages of star-connected transmission lines are the difficulty of obtaining a satisfactory ground on the neutral and overload or short-circuit of one phase by partial or complete grounding of a line. The authors discuss certain cases where the use of auto-transformers is advantageous, and the effects of different ways of connecting them.

Harmonic Voltages and Currents in Transformers.

This paper reviews the conditions under which triple-harmonic voltages and currents are produced in star and delta-connected transformers. These voltages are produced by hysteresis in the core. In a single-phase transformer, increase of series resistance tends to suppress the current harmonic and produce the voltage harmonic. In three-phase transformers, a star connection suppresses the current harmonic and allows the full flux and voltage harmonics to appear. Delta connection provides a closed path for the current harmonic, and suppresses the triple voltage. A case is cited where a star-connected autotransformer was used to step up from 6,600 to 12,000 volts at a substation. The neutral was not grounded, and trouble resulted due to partial resonance at triple frequency between line capacity and transformer reactance. The paper shows that, although not generally recognized, a triple component can exist in the line-to-line electromotive-force waves of a three-phase system. This is possible in a case where a two-to-three-phase transformation is used, and when the electromotive-force wave of the two-phase generator contains a triple harmonic. Vector diagrams and curves are given illustrating this possible effect.

Secretary G. W. Wade opened the discussion by reading two written contributions. The first was by Waldo V. Lyon and called attention to the fact that the writer had observed the possibility of the third harmonic referred to by Mr. Clinker, in connection with the Scott transformer connections. The second communication was from A. E. Kennelly and Harold Pender and told of the observation of a considerable voltage rise upon an artificial transmission line constructed at the Massachusetts Institute of Technology, which was equivalent to a 500,000-circular-mil three-phase conductor system 240 miles long.

Mr. Tobey, in presenting the paper, called attention to the fact that the apparatus used by the authors was comparatively small and that the results obtained might not be duplicated on a large high-voltage system.

F. W. Peek, Jr., discussed the conditions under which a third-harmonic may exist. If the third harmonic component of the magnetizing current is suppressed, as it may be when autotransformers are connected in star, the voltage wave will be peaked, hence in transmission work, especially where autotransformers are used, and in connections in which the third harmonic may be suppressed, care should be taken to avoid this. One of the simplest ways is to connect the neutrals of the transformer and generator together. It should be observed that instruments which measure effective values will not show the existence of such peaks.

Louis F. Blume pointed out that it is not only in Scott-connected transformers that the third harmonic may appear in a three-phase system, but that the generator itself might be connected in the same manner so as to make it prominent.

F. C. Green stated that he had been connected with the system referred to by Messrs. Sorenson and Newton, and told of some of the tests which have been made on that system. There is no excuse for having triple frequency in a system, because it is now known how to eliminate it.

C. L. Fortescue stated that the conclusions of Messrs. Sorenson and Newton were not warranted by the data given. He also disagreed with the statement that there was no manufacturing advantage in the star connection as compared with delta. The peculiarity of the Scott connection in bringing out the third harmonic, mentioned in Mr. Clinker's paper, had been noticed before and the same thing might occur in any connection which introduced dissymmetry of the phases.

Paul M. Lincoln stated that the same thing had been observed 19 years ago, when studying the wave forms of the Niagara Falls generators, which were of the two-phase type with flat waves. When they were connected up by the Scott method for three-phase operation, the wave form of one phase was unchanged; whereas, the other two were distorted in opposite directions.

J. M. Weed pointed out that Mr. Clinker had attributed the third harmonic to the effect of hysteresis, whereas it is really due to the variation of permeability.

Professor Jackson gave some particulars of the artificial transmission line used by Dr. Kennedy and Pender.

The session on Friday morning was called to order by President-elect Paul M. Lincoln. The first paper to be presented was one by Louis F. Blume, entitled "The Influence of Transformer Connections on Operation."

Influence of Transformer Connections of Operation.

In this paper the relative advantages and disadvantages in operation of the more important three-phase transformer connections are discussed. Three conditions of operation are given: (1) normal; (2) operation of a bank with one phase disabled; (3) effect of line grounds on operation. The paper is not complete, particularly in that high-frequency or switching phenomena are not discussed. Its major purpose is to give a fairly adequate presentation of insulation stresses at relatively low frequencies to which transformers are subject in either normal or abnormal conditions of operations. These frequencies include the fundamental or generated frequency and its harmonics and the natural frequency of the system. The behavior of three-phase autotransformers under the various conditions of operation given above is also analyzed. The following conclusions are reached. (1) Isolated systems are subject to greater insulation stresses than grounded systems and hence the latter have higher factor of safety. (2) A ground on an isolated system is more likely to be an arcing ground. (3) A ground on grounded system reduces potential of system, while on isolated system it increases potential. (4) Resistance in ground connection increases insulation stresses. (5) Neutrals must be grounded at both generator and end of line to limit potential to 57 per cent of line voltage. (6) With star-connected autotransformers, an isolated neutral is dangerous unless entire system is insulated, ratio of transformers is small, and triple-harmonic voltage is eliminated.

C. L. Fortescue then presented a paper entitled "A Study of Some Three-Phase Systems."

A Study of Some Three-Phase Systems.

The star-star, delta-delta, delta-star and star-delta connections are taken up in order and their individual peculiarities and characteristics, precautions that must be taken in operation to avoid trouble and where and when the system may be grounded with best results, are discussed. The question of delta-delta versus delta-star is considered. (1) For moderate voltages the delta-delta system has the advantage on account of its greater flexibility. (2) Above 44,000 volts the delta-star connection is preferable, chiefly on account of its greater strength and lower cost. There is a probability that a delta-star bank of transformers will cause less disturbance in switching than one that is delta-delta connected. (3) There are much greater possibilities of development in transformers designed for delta-star connection than for any other. (4) Past and present practice upholds the use of the delta-star connection in preference to the delta-delta for high-voltage transmission.

These two papers were discussed in conjunction with a third one by J. P. Jollyman, P. M. Downing and F. G. Baum, entitled "Experience of the Pacific Gas & Electric Company with the Grounded Neutral." In the absence of the authors this paper was presented by V. M. Montsinger.

Experience of the Pacific Gas and Electric Company With the Grounded Neutral.

The paper gives an outline of the distributing system of the Pacific Gas and Electric Company, which operates at 60 kilovolts, the transformers being star-connected, with the neutrals solidly grounded. The company considers the grounded-neutral system has a number of important advantages with regard to the transformers, the transmission lines, and operation. The fewer turns of larger capacity of the star-connected transformers and the fixed lower average voltage to ground greatly increases their reliability. The maximum voltage on the line insulators with the grounded neutral is never more than 57.7 per cent of the line voltage, and it is possible to maintain polyphase service at a substation on a branch line with only two wires in case one wire should be cut out. This cannot be done on a delta system unless one phase of the system be grounded, which is very undesirable. With a grounded neutral, a wire down is instantly detected and power must be shut off. In a delta-connected system an arcing ground is often followed by surges which break down the insulation at other points, the cause of this disturbance being the oscillatory character of the arc. In the grounded-star system no such disturbances occur, as the frequency of an arc to ground is the same as that of the system and any damage is confined to the point of failure. It is also believed that operation with the grounded neutral causes less disturbance in telephone and telegraph lines than would be the case in delta-connected lines.

F. F. Brand opened the discussion by reading a communication from Guido Semenza, Milan, Italy. Italy, with an area about double that of the state of New York, has more than 2,400 hydroelectric power plants, nearly all of which are connected with transmission and distribution lines. The output varies from a few thousand up to 40,000 kilowatts, and the transmission voltages range from 6,000 to 88,000 for overhead lines, and up to 25,000 volts for underground lines. Most of the systems are delta connected and insulated from the ground. A few have horn-gap arresters between the neutral point and ground. A few have the neutral point grounded through a resistance. There are two which have the neutral point grounded without resistance. None of the underground lines has a grounded neutral. On the low-tension distribution circuits all of the usual arrangements are to be found. The isolated-delta connection was the first to be used in Italy, and as its operation has usually been satisfactory there has been little tendency to change. In some of the later installations, however, upon which there were disturbances, the neutral was grounded as an experiment both in the power house and at some extreme point of the distribution system. In some cases this practice proved to be good, and the disturbances were eliminated, while in other instances there was a contrary effect. Very serious disturbances were caused upon some telephone and telegraph circuits. In one case of telephone disturbance it was found that the principal cause was a third harmonic due to an oversaturated transformer. The Milan city plant, operating at 60,000 volts, has the neutral grounded through a water-jet discharger. Operation is fairly good, but interruptions of service are more frequent than on plants using the delta connection. The latter is usually favored, the grounded neutral having the following disadvantages: (1) With good circuit-breakers a ground on the line will always result in an interruption. (2) Grounding through a resistance presents the disadvantages of both insulated and grounded systems. The disadvantage of the insulated system is that the full delta tension is put on an insulator when a line is grounded, but when the neutral is grounded through a resistance, an accidental ground through a low resistance can give such a drop on the neutral connection that the tension on the insulation may rise quite near to the full delta tension. (3) A ground connection is never very certain and it is effective only locally. Hence, one ground on a large system is not considered sufficient. (4) If neutrals are grounded without resistance they are likely to disturb telephone and telegraph circuits. (5) In Italy lines are overinsulated. There would be no advantage from grounding in the direction of reducing the cost of the line. (6) The grounded neutral does not obviate the disturbances on long lines due to traveling surges caused by atmospheric influences. (7) The accumulation of static charges which is prevented by a grounded neutral can also be obviated by using water-jet dischargers.

W. W. Lewis referred to statistics of 35 transmission systems using voltages of 70,000 or over, of which about 50 per cent use a grounded neutral. Most of these installations have been put in during the last seven years and it is natural that practice has not yet become settled with respect to either method. He selected six typical systems, three of which use the insulated delta connection and three the grounded star, and discussed their operating experience. The three former are the Great Western Power Company, the Colorado Power Company and the Au Sable Electric Company. Lightning is severe on all of these; the first has little trouble from it, however, although short-circuits and arcing grounds do cause some trouble. The principal trouble on the Colorado line is due to short-circuits from wires swinging together during wind storms, and arcing grounds due to swinging against towers or ground wire. Both of these usually cause shutdowns. It has been found impossible to operate the long Shoshone-Denver line with one conductor dead grounded on account of the increase in corona loss and charging current. On the Au Sable system lightning causes the insulators to spill over on two or three lines at once, causing short-circuits. The Sierra and San Francisco Power Company, the Yadkin River Power Company and the Pennsylvania Water & Power Company use a grounded-star connection. The first experiences short-circuits about once a month. These are taken care of by separating the lines on the low-tension side and cutting out the affected line. Grounds and short-circuits are frequent on the Yadkin lines. Trouble from short-circuits has been reduced by means of a device consisting of a relay in the neutral which, when operated by a ground current, throws a large resistance in series with the field of the generator exciter, thus momentarily reducing the voltage and allowing the short to die out. The Pennsylvania system has frequent short-circuits due to insulators flashing over during lightning storms. Interruptions have been greatly reduced by a device which short-circuits the line at the station through a fuse, thus allowing the arc at the insulator to become extinguished. This is supplemented by another device consisting of series line relays which act on the generator field, opening it and closing it momentarily, the whole action taking place so rapidly that synchronous apparatus does not get out of step. With the assistance of these devices operation is satisfactory. Mr. Lewis concluded that neither insulated-delta nor grounded-star systems are free from trouble, and the amount of trouble is governed largely by local conditions. Two arguments frequently used in favor of the insulated-delta system have been shown to be fallacious: (1) that only voltage troubles need be expected, since phase short-circuits are numerous on the Colorado and Au Sable systems. (2) That a delta system can operate continuously in case of a dead ground on one line. This is only true for very short lines, as on long lines the charging current and corona losses become excessive. The telephone system is also invariably disturbed. On the other hand, short-circuit troubles on a grounded-star system are very severe and auxiliary devices are essential to satisfactory operation.

V. M. Montsinger described the experiments which he and Mr. Blume had carried out in investigating the effect of electrostatic capacity and reactance upon third harmonics in star-connected autotransformers. Curves were shown illustrating the results, and an apparatus consisting of three five-kilowatt transformers, excited by a three-kilowatt generator was set up in the back of the hall to demonstrate the method. Some interesting results were obtained with respect to the voltage of the third harmonic, which depended upon the density of the magnetic flux in the core. Tests were also made on a three-phase transformer, and it was shown how a current of triple frequency could be obtained with appropriate connections. Lantern slides were exhibited showing oscillograms taken in the course of this work.

President C. O. Mailloux appeared at this session and was called upon for a few remarks.

H. S. Osborne discussed the subject of inductive interference on telephone and telegraph circuits. The present disturbances from the transmission lines of the Pacific Gas & Electric Company are very serious—more so than for the other power companies in California. This is no argument against the grounded-neutral system, however, because many of the other companies also use this system. The experience of the telephone companies, however, does not lead them to agree with the conclusions of the authors of the paper. Mr. Osborne presented a tabulated comparison of the two systems with reference to telephone interference. Interference would be similar from the two if they were both perfectly balanced. The differences arise when the system is thrown out of balance. The comparison indicated that with either type of connection under abnormal conditions of operation, that is, with one wire grounded or one wire open-circuited, the disturbance in circuits which are exposed to the power line are likely to be so considerable as to put them out of service and destroy the protective apparatus. Currents of high frequency are more objectionable than the fundamental frequency. The experience of telephone and telegraph companies is in favor of the delta connection as against the star connection. In answer to a question he stated that electromagnetic disturbances are of more importance than electrostatic, although the latter occur in some cases. Electrostatic disturbances, however, seldom affect a line more than 200 or 300 feet away from the disturbing circuit. With electromagnetic induction, however, the effects are very widespread.

C. O. Mailloux and E. E. F. Creighton also stated that electromagnetic effects are a greater menace to the telephone line than electrostatic.

John B. Taylor said that the question of star or delta connections could not be settled by argument since both arrangements have advantages and the conditions of use are variable, so that one system may be more advantageous for one company and the other for another. Confusion is introduced into the discussion by assuming that the star connection involves a grounded neutral, whereas it may be used as an isolated system. He disagreed with Mr. Blume as to the necessity of grounding neutrals at both receiving and generating ends of transmission lines. The usual objections to the grounded neutral result from grounding at more than one point, when so many of the advantages are secured with a single ground. The trouble on one of the lines referred to by Mr. Semenza in Italy is due to grounding at more than one point, causing a considerable current of triple frequency to return through the earth with accompanying induction in neighboring telephone and telegraph lines. The evidence produced by Mr. Lewis shows that the star connection is on the increase.

F. C. Green distinguished troubles affecting the transmission line and those affecting the transformers. Practically no troubles have been experienced with transformers on account of high phase voltage. They are all due to high frequency generated by troubles on the line. Triple-frequency effects do not need to be considered, as they can be entirely eliminated. The grounded star-delta has been shown to give lower voltage stresses than the delta-delta. All connections should be eliminated from the discussion of the star connection except where only one side of the transformer is connected in star and the neutral grounded without any resistance. With the insulated delta, a grounded line always means an arcing ground and the voltage stresses produced are greater and are accompanied by high frequencies. This is the most vital feature of the whole question. With the neutral grounded, the arc is very liable to be steady, since it is maintained by normal voltage. He did not agree that the insulated delta system is better up to 33,000 volts, since the abnormal voltage and frequency caused by a breakdown is just as likely to break down the transformer or other points of the line as on a high-voltage system. He considered the grounded star system safer for both line and transformers at all voltages. He thought the advantage in cost of construction on the grounded star system would be taken advantage of in the near future. He pointed out that the location of a fault is much easier with the grounded star system. The argument for the delta system that one line wire can be grounded without interrupting operation applies only to short lines or low voltages.

P. M. Lincoln stated that the question of the grounded neutral was one that could be settled only by the experience of operating companies and not by designing engineers.

D. W. Roper called attention to a statement of Mr. Fortescue that in four-wire three-phase systems where three-phase power is supplied through star-delta step-down transformers, the neutral point connected to the neutral wire serves as balancer for loads taken off between neutral wire and lines. While this statement is true, it gives a very bad operating condition. The blowing of the fuse on one transformer does not interrupt the service but overloads the other transformers and may result in a burnout. The system was tried in Chicago but abandoned. Arcing grounds have occurred on this system and while not serious, they are quite possible.

F. W. Peek, Jr., did not consider the question of transformer connections very important, since most transmission troubles arise on the line. The insulation of the line is the most important point and there are many inconsistencies in the way this is carried out. Lightning troubles are usually greater on low-voltage lines than on high-voltage lines, because the latter have better insulation. Whether a delta or a star system is used will depend upon the operating experience of the engineer and will be decided from the standpoint of cost. In his experience many of the points brought out in favor of the delta system or the star system had worked in just the reverse way.

J. R. Werth inquired whether any systems are grounded through a reactance, as no reference is made to such a connection in the paper by Mr. Fortescue.

Louis F. Blume stated that a star connection without the neutral grounded did not give much different results than delta connection and consequently the whole discussion rested between the delta-star system and the delta-delta system. The important question is as to operation with a grounded neutral or an insulated system. He agreed with Mr. Taylor that grounding at one point is sufficient with a simple transmission line, but where there are groups of step-down transformers of small capacity over a scattered territory it is not sufficient to ground at one point. Interference due to third-harmonic currents should not be considered an objection to the grounded star system because under proper conditions such currents can be eliminated. He suggested that the trouble referred to by Mr. Osborne was due to the fact that some of the load is between one line and the neutral. A load connected in this manner requires a return circuit through the ground, which is in the nature of an unbalanced load. With the ordinary delta-star transmission system with grounded neutral the loads can be perfectly balanced and this will not occur.

C. L. Fortescue stated that the delta-star connection can be operated just as well without the grounded neutral and has some other decided advantages, one of which is the insulation of transformer windings for the lower voltages required. It is also fully as good as the delta connection from the point of view of electromagnetic stresses. Whether one has current troubles or voltage troubles with either of the connections depends upon the amount of capacity and the amount of energy in the system. As for telephone troubles, the delta-star step-up transformer almost entirely eliminates the third harmonic. He agreed with Mr. Blume that telephone troubles with star-connected systems have been due largely to star-star connections in which the neutral of the star is connected with the neutral of the generator and to the prevalent practice in the West of loading between one wire and the ground. He did not consider that sufficient regard had been taken of the advantages of the star system ungrounded, as compared with the delta system. The higher the voltage the greater the advantage it has. Above 44,000 volts the star connection has the greater advantages whether grounded or ungrounded. He referred to a case where the neutral point was grounded through reactance causing a disturbance on telephone circuits, which was removed with a dead ground.

Mr. Montsinger closed the discussion by reading a communication from Mr. Downing, in which he stated that grounds on delta systems are usually arcing grounds and he considered the delta system detrimental to the system of nearby telephone lines.

President Mailloux occupied the chair at the evening session. The first paper to be presented was by T. S. Eden, entitled "Relative Merits of Star and Delta Connection for Alternators."

Relative Merits of Star and Delta Connection for Alternators.

The main advantages obtained with the star connection are as follows: (1) It is possible to bring out a lead from the neutral point of the winding, which is useful for various purposes. (2) The cost is less than with the delta connection, requiring approximately 58 per cent of the turns. (3) It is not possible for circulating currents of triple frequency to flow in the windings. (4) In general, for the average alternator, the electromotive force wave of the star-connected winding is nearer a true sine than that of the delta-connected generator. (5) The use of the grounded neutral reduces the potential strain on the insulation of the windings, permitting reduced thickness of insulation. The delta connection does not appear to have any advantages except as a convenience in design for certain voltages. When used, proper precautions must be exercised in the design to eliminate excessive circulating currents.

Cassius M. Davis then presented a paper entitled "Delta and Star Connections for Railway Transmission and Distribution."

Delta and Star Connections for Railway Transmission and Distribution.

Transformer connections are discussed under three conditions, according as the railway (1) purchases power; (2) builds and operates the generating and tranmission systems; (3) purchases power and in addition builds and operates a secondary transmission system. The choice between delta and star connection is frequently determined by purely economic considerations. However, it is common practice to use the delta connection on both the high and low-tension sides of transformers, except in the case of six-phase synchronous converters, where the diametrical connection on the low-tension side is the rule. Synchronous-converter substations employing two machines in series for high-voltage direct-current railways are frequently operated from single banks of transformers, which have double windings on the low-tension sides. Methods of starting have little effect upon transformer connections except in the case of six-phase converters. Transformer connections are seldom important electrically in single-phase and three-phase railway systems. A secondary distribution system may at first be delta-connected and later changed over to star connection to obtain better voltage regulation.

The discussion of these papers was opened by John B. Taylor, who stated that the star connection of generators seemed to be acknowledged to be the best construction. The star-diametral connection has been used for a number of years and there does not seem to be any objection to it. However, there are unbalanced voltages when the transformers are excited and before the load is connected, and the result may be voltages larger than the ratio of transformation would warrant. He cited a case in Waterbury, Conn., 10 years ago, where this increased voltage due to the third harmonic had caused considerable apprehension.

C. J. Fechheimer pointed out the advantages that sometimes are found in delta connection for alternators, but which are of limited application. With delta connections half voltage can be secured very simply, by tapping each side of the delta at the middle point. This is often convenient where 120 volts is desired for lighting and 240 volts for power. Another advantage is in the case of large machines wound for low voltage. Thus a generator for 240 volts and 2,000 kilovolt-amperes would be difficult to construct with star connections. A third advantage is frequently found in the use of existing parts where the connections can be simplified by using delta rather than star connections. He then referred to curious results sometimes obtained with circulating current in the delta of an alternator. This current can be eliminated by using 2/3 pitch winding, as Mr. Eden had stated, and also by inserting reactance at the corners of the delta and tapping this reactance at the middle point. The use of magnetic wedges, which increases the reactance, will also have the same effect. The circulating current can also be reduced by properly designing the shapes of the pole shoes. He pointed out that the circulating current varies with the load and with the power-factor and that a circulating current which is negligible at no load may become of importance at full load. Grounding the neutral of an alternator at one end of the line and the neutral of another at the other end of the line or at a bank of transformers may cause considerable circulating current between the machines, the third harmonic appearing between the neutral and the terminal of the machine, even when it does not appear between terminals. This applies also to two machines in the same station. The effect of circulating current upon efficiency is not so important as upon the heating of the machine, as it may cause the temperature to rise above the safe limit. Owing to the change of circulating current with load, an accurate temperature run can only be made at full load.

E. G. Merrick referred to the reduction of harmonics by a proper proportioning of the pole face. This usually works out with a minimum gap about half the maximum gap. The modern turbo-alternator has a smooth cylindrical rotor and the result must be obtained in some other way. This can be accomplished by a proper proportion between the wound and unwound portions of the periphery, the proper proportion being about one-third unwound to two-thirds wound. He disagreed with Mr. Fechheimer regarding the dependence of the third harmonic upon the load.

R. E. Doherty thought that the difference in the results obtained by Mr. Fechheimer and Mr. Merrick might be due to the different proportion of minimum and maximum air gap in the different machines.

Cassius M. Davis thought it might be due to the fact that at full load the load current obscured the third harmonic of the exciting current owing to the reactance drop in the windings.

John B. Taylor told of a case where the third harmonic had varied with load in a star-connected machine. He thought the matter could be very easily settled by inserting proper measuring instruments in the circuit.

Mr. Eden then closed the discussion and President Mailloux called upon Percy H. Thomas to summarize the results which had been presented at the meeting.

Mr. Thomas referred to papers which had been read before the Institute at previous meetings, indicating that this is an old subject, and while it had been dealt with at length in the past, no definite conclusions were reached. Substantially all of the merits and demerits of each system of connection had been discussed previously, with the exception of third harmonic. This may be reduced if the transformer is star-connected and the neutral points connected together, either directly or through the ground. In the latter case the currents penetrate to considerable distances in the earth. Danger may then be encountered in connection with telephone and telegraph lines, in that these will act as secondary circuits and have current induced within them, which, in turn, will produce disturbances in other systems.

He also referred to similar phenomena in delta-connected alternators or in star-connected alternators, with their neutral points connected together. Whereas in the transformers the third-harmonic current is due directly to the variation in permeability and resultant necessity of forcing the iron through the hysteresis cycle, in the alternator the third-harmonic currents are induced, being caused by the wave form being other than that of a sine, and having in it harmonics of the third degree.

Mr. Thomas also referred to the dangerous potentials which may be induced in secondaries of the step-up transformers on a three-phase system, if they be connected star on primary and secondary, and one of the transformer primaries should become short-circuited, thus raising the potential between neutral and terminal to that potential which should be embraced between terminals. The secondary voltages of these step-up transformers, as well as the transmission-line potentials and distributing potentials on the secondary sides of the step-down transformers would then be increased 73 per cent and may lead to disastrous results.

He further called attention to dangerous conditions which may result with high-potential autotransformers in connection with transmission lines, which may be due to any of the several transient phenomena tending to produce surges, or even to the triple-frequency current, or to line-charging current. Possibly one of the most dangerous sources of surges is that of the arcing ground. Mr. Thomas explained somewhat at length why the arcing ground is generally more serious than that of an ordinary arc.

An Interesting Underground Mining Substation Supplied with Central-Station Current.

The Silver King Coalition Mines Company, with headquarters in Salt Lake City, whose mines are located at Park City, Utah, placed in operation recently what is perhaps the largest and most unique underground hoisting and compressor station in the world. This station, which is located 1,670 feet below the surface, has been made possible only through the fact that its entire equipment is electrically operated.

This underground station has been installed to provide hoisting and compressed-air service for a new shaft on the Silver King mine, from which shaft some of the ore bodies of this company's property can be worked more advantageously.

The station contains three rooms or chambers, occupying a floor space of approximately 3,600 square feet. The walls and roof are of heavily reinforced concrete finished in smooth white cement plaster. The air for the shaft and construction of the station has been supplied by three large compressors from the surface. A motor-driven compressor of the

Sullivan compound type has been installed in the new station which supplies air for the station and shaft and serves as a booster on the main pipe line, this compressor having a capacity of 900 cubic feet of free air per minute.

The motor-driven hoist for operating the cages in this shaft is located in one of the three rooms of the station and is operated by 600-volt direct current from a 250-kilovolt-ampere synchronous motor-generator set also located in the underground substation, which obtains its power from the surface transmission lines through a 2,200-volt cable.

The engineers in designing this plant have arranged it so that the air compressor which is used as a booster to the main air lines utilizes the electric current during the intervals when the hoist is not running, thus eliminating the peak loads which would be occasioned by the superimposition of the demands of the two machines, and which would materially increase the price paid for electric power.

To accomplish this the compressor unloader is connected with the hoist in such a way that, when the current is thrown into the motor of the latter, it automatically unloads the compressor and places all of the power of the motor-generator set, except the friction load of the compressor, available for operating the hoist. When the hoisting current is off the compressor automatically picks up the load, thus providing a high load-factor for the motor-generator set, as well as a nearly constant demand from the supply company's mains.

Current for this installation is purchased from the Utah Power & Light Company.

A party of prominent Salt Lake business men were piloted through the mine by Ex-Senator Thomas Kearns, its general manager, and witnessed the inauguration of service in this interesting new underground station.

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Hydroelectric Development in Norway.

The greatest single factor in the industrial development of Norway lies undoubtedly in its cheap and abundant hydroelectric power. The country having practically no coal resources, the Norwegian industries are coming to depend more and more upon the utilization of waterfalls as a primary motive-power source. Water-power rights could formerly be purchased very cheaply, and private individuals foreseeing the possibilities of the future secured title to many of the best sites. Municipalities have also in recent years awakened to the possible advantages of acquiring such rights for future municipal uses. The small mountain streams and lakes not being navigable, their titles are vested in private hands, and can be transferred as any other form of real estate. A few years ago it was an easy matter for foreign interests to acquire such rights, but the deeding of water property to other than Norwegian citizens is becoming restricted. Opinions are even expressed that in a few years it will be difficult for citizens of other countries to lease electric current in connection with industrial enterprises, chiefly because of the efforts being made to have waterfalls developed for the benefit of home industries.

It is claimed that Norway has the cheapest hydroelectric power in the world; the cost of the development is said to average between $40 and $50 per horsepower and in some projects even less. The cost in other countries is said to exceed greatly these figures. The comparatively small cost of the Norwegian power is due chiefly to the proximity of the waterfalls to natural deep-water harbors and almost worthless land at good heights where the clear rock-bottom water is found.

The Stavanger district is one of the richest waterfall sections of Norway, being estimated to contain not less than 500,000 available horsepower, comparatively little of which has been developed. The harnessing of the waters about the Saude Falls is the largest project now on foot. It anticipates the development of some 70,000 horsepower, involving a total expenditure of about 10,000,000 crowns ($2,680,000). The waters about Saude are located at good heights near the head of a narrow arm of the Ryfylke Fjord, where there are excellent harbor facilities and sites for factories. It is planned to make Saude an industrial center rivaling Odda and Aura. Chemical, electrothermic, carbide of calcium, sulphate of ammonia, and cyanamide industries will likely be located here, and possibly other plants for the manufacture of artificial nitrates, aluminum, etc.

The Saude Falls when developed, according to present plans, will have three power stations. The largest is to be provided with four turbines of 10,000 horsepower each and is calculated to cost about $500,000. The actual heights of the water pressure will vary between 650 and 1,000 feet and will be communicated through tunnels to the respective power plants. The largest of these tunnels will have its intake at a height of 795 feet and convey the water 5.25 miles; its dimensions will be 13.12 by 9.84 feet, and its cost is calculated at $350,000. A second tunnel will be 4,920 feet in length and is estimated to cost $60,000; its water will operate six turbines of 5,000 horsepower each. Although the plans for this project are well under way and its construction is assured, actual work will not likely begin before next summer. There are also several smaller projects in the district awaiting development.

Automatic Installation for Galvanizing Tubes.

The following description of an automatic galvanizing installation now in use in Germany is taken from recent numbers of *Electrochemische Zeitschrift.*

The tubes, bars or other objects of similar shape are placed upon endless-chain supports, composed of a series of articulated elements cut in the shape of an incomplete circle, as shown in Fig. 1. These chains are moved by the rotation of the upper supporting wheel, which is connected to the motive power. The shape of the bottom of the galvanizing vat must be such that the tubes will be carried over and caught on the other side. The chain is run slowly enough so that the workman will have time to pick off the finished tubes and replace them. The apparatus for cleaning and polishing is shown in Fig. 2.

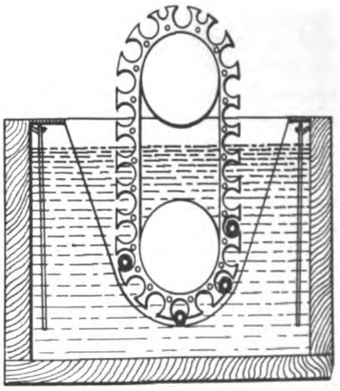

Fig. 1.

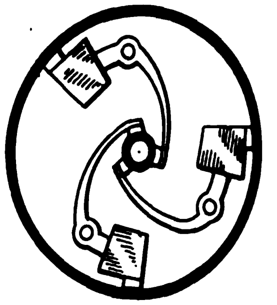

Fig. 2.

It consists of a perforated disk on which are three axes supporting bent levers having at one end a brush, and at the other end a counterweight. When the disk is rotated at high speed the weights will be thrown outwards, thus pressing the brushes against the tubes to be polished. If it is required to clean the inside of a tube of large diameter, the brushes are fixed on the outer surface of the weights.

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The Christmas Hotel, Bryan, O., recently installed the only electric dishwasher in that city. The apparatus is giving complete satisfaction and has attracted the interested attention of practically all the housewives in town.

NATIONAL DISTRICT HEATING ASSOCIATION.

Annual Convention, Rochester, N. Y., May 26-29.

The sixth annual convention of the National District Heating Association was held at the Seneca Hotel, Rochester, N. Y., May 26 to 29. The first session was called to order by President S. Morgan Bushnell, Chicago, Ill., at 2 o'clock Tuesday afternoon. In the absence of the mayor, the convention was cordially welcomed to Rochester by Commissioner of Public Safety Charles S. Owens. His address was appropriately responded to by F. B. Orr, of the Illinois Maintenance Company, Chicago.

New members were elected as follows: Class A, 26; class B, 34; class C, 16; associate members, 16.

President's Address.

Mr. Bushnell then delivered his presidential address, in which he briefly sketched the rise and growth of the Association. Commenting on the fact that central-station heating was at first regarded as a rather unwelcome visitor, managers were inclined to avoid the heating problem. Not until the past few years has there been an organized effort to collect and systematize information on steam and hot-water heating, so as to place them on an advanced scientific basis. Mr. Bushnell gave figures to prove that it is highly improbable that steam and hot-water systems of heating will be soon displaced by electrical heating, inasmuch as over eleven times as much heat can be secured from steam for one cent as can be secured from one cent's worth of electricity. Referring to gas competition, he thought this was negligible except in those especially favored districts supplied by natural gas. He then compared the relative advantages of steam or hot-water heating when supplied from a central-station source and when supplied from isolated plants. He showed that the central-station source was the better, tabulating the various advantages. He contended that the claims made to the contrary by advocates of isolated plants had been disproved in practice, and that the installation of isolated plants had been sometimes made under advice colored by self interest on the part of the engineer. The central-station production of electricity for power which at first seemed small and unimportant, has grown until it is on the point of surpassing the production of electricity for lighting; and in view of the rapid changes made in so short a period, who shall say what shall be the limit to central-station production of heating in the more scientifically planned city of the future? Mr. Bushnell referred to the co-operative work being done by the National Electric Light Association and National District Heating Association, not only along engineering lines but on lines of utilizing engineering and business talent to insure practical business success. In 1912 the Association and the American Society of Heating and Ventilating Engineers appointed members of a joint committee to take up certain engineering problems so that the two societies could work along side by side on matters of common interest. The work of this committee, which is called the Educational Committee, during the first year consisted largely in outlining the scope of the work to be attempted, while the committee during the past year has taken up the actual work of determining a code of rules and specifications to be used in connection with district heating. The capital invested in central-station heating stations now runs well up into the millions, and the number of companies engaged has been estimated at from 300 to 400.

Secretary-Treasurer D. L. Gaskill, Greenville, O., presented his annual report showing the Association to be in good financial condition, and reporting 85 active and 15 associate members received during the year, the total net membership at the close of the year being 230 active and 70 associate members. Mr. Gaskill congratulated the members on the fact that they stand today the most active and progressive that the Association has ever had. He especially thanked President Bushnell for his valuable assistance in increasing the membership during the year, and predicted a further increase during the coming year.

Secretary Gaskill made a motion, with the approval of the Executive Committee, for the election to honorary membership of James D. Hoffman, past-president of the American Society of Heating and Ventilating Engineers, and now professor of mechanical engineering, University of Nebraska. This motion was unanimously carried. The Membership Committee, A. C. Rogers, chairman, submitted a report of its labors during the year, and ascribed the bulk of the credit for the additions to the membership during the year to President Bushnell. A nominating committee, composed of W. A. Wolls, A. D. Spencer and J. L. Heck, was appointed to make report at the evening session.

Underground Construction.

The report of the Committee on Underground Construction was presented by its chairman, H. A. Woodworth, Indianapolis, Ind. This made a plea for good construction of underground mains. An analysis of such construction as carried out during the past 35 years shows that more than 15 methods of insulating pipes and various devices to provide for expansion and anchorage have been used. This analysis also shows that the present practice is tending towards standardization. The report dealt further with many types of pipe-line construction and included data on actual construction costs. There was also given a discussion of line losses, depreciation, preservation, etc. Both steam and hot-water systems were dealt with in the report.

Before opening the discussion, John F. Hale, president of the American Society of Heating and Ventilating Engineers, spoke of the value of comprehensive reports such as the Committee had presented. The report was discussed by A. C. Rogers, D. S. Boyden, Henry Meyer, Thomas Donohue, H. A. Ruth, H. A. Austin, R. C. Holley, R. C. Marsh, W. R. Owen and Mr. Woodworth. A number of speakers emphasized the importance of having good underdrainage for the system.

At the evening session the report of the Nominating Committee was received and deferred for action until the following day, in accordance with the requirements of the constitution.

D. R. Mason, of the National Tube Company, Pittsburgh, Pa., delivered an address on "Manufacture of Welded Iron and Steel Pipe," illustrated by moving pictures showing the progress of manufacture. There was a good attendance from the engineering and technical societies of the city as well as the convention proper.

Public Policy of Utilities.

On Wednesday morning the session opened with an extemporaneous address on the "Public Policy of Utilities," by R. M. Searle, vice-president of the Rochester Railway & Light Company. Mr. Searle's address was a frank statement of his opinions on this matter derived chiefly from his experiences in Rochester. The utility company there, as well as other companies of which Mr. Searle is an officer, finds that the attitude of the public toward it is very pleasant. Criticisms occasionally arise but on analyzing them it is found that some four-fifths thereof are constructive, that is, by meeting the difficulties complained of, a complainant is converted into a friend. It is important to respect courteously the rights of all patrons of the company. As an example of how this may be done, Mr. Searle cited a conference he had had with some citizens in a small village located on an interurban trolley line. Their grievances had been converted into an attack on the rate of fare. On carefully investigating each important complaint, however, and rectifying the difficulty, it was found that they appreciated that the fare was not unfair and they stated that they had been pleased to be accorded courteous attention by an official of the company.

It is important to maintain good relations with the newspapers and in Rochester all of the utility employees, some 6,000, are authorized to speak to any newspaper man for publication if they will tell the truth. Mr. Searle's previous experience with five large utility organizations convinced him that if he ever became an executive he would not handicap a subordinate by making him feel that he could not talk for fear of saying something without authority. No utility should fear any statement by any of its employees, if it is the truth. If it is not the truth, then it is time to find this out because a man who will not tell the truth in public is not likely to tell the truth in his regular routine business relations and a successful utility cannot be built up if any individuals in its organization are willing to tell untruths. As a result of this policy the Rochester utility is held in high esteem.

Mr. Searle narrated a number of incidents showing how his subordinates are authorized to deal directly with prospects and customers of the company. None of these relations are philanthropic. The community is told that the company is clean in its methods, is anxious to give good and efficient service and is ready at all times to treat the public with consideration. The utility should be ready to do little favors for societies and for the citizens in general, because it will develop good will thereby; in order to do this, however, its revenues must not be hampered too much.

Mr. Searle told how the company undertook not long ago to practically clear the streets of its overhead wires. The company had an agreement with the city for doing a certain amount of this each year. It actually had placed underground a great deal more than had been required. However, when the municipal authorities brought up the matter the company explained that to place all of the circuits underground immediately would necessitate an increase in rates to provide the necessary revenue. Since there are no alleys in Rochester, the expedient was hit upon of placing the overhead distribution circuits along the rear lines of the lots and for this purpose pole easements had to be obtained. The matter was explained to the property owners and relatively little difficulty was experienced in taking down the lines along the street and placing them on the rear lot line.

The big man in every utility company must know his people and be perfectly frank and fair with them in order to get their good will. He must leave his office wide open without any reception room and let everybody know that they can come in at any time. The good will developed by this plan has resulted in the sale during recent years of a large part of the Rochester utility's securities. The attitude of the employee to the public is the greatest asset of a public utility. He must understand the policy of the management and deal with the prospects and customers frankly and directly. He should have authority to settle matters on the spot without referring time and again to his superiors. The president of a utility company must be big enough and broad enough to understand his staff and to have enough confidence in them so that when they favorably report to him on any matter to which they have given individual and collective study, to immediately give it serious consideration.

The report of the Meter Committee was presented by A. D. Spencer, Deroit Mich., chairman. This report consisted principally of further descriptions of some new meters and included data on the performance of steam-flow meters and condensation meters. The committee felt it would be premature to draw up any exact specifications defining acceptable meters and stating limits for allowable accuracy. The report discussed the advantages of flat rates for steam heating combined with regulation by thermostats, as compared with metered service, and the conclusion was reached that thermostatic regulation cannot supplant the metering of steam service. The committee's report was discussed by G. D. Bly, John F. Hale and Mr. Spencer.

Election of Officers.

The report of the Nominating Committee was again read, and by unanimous action the nominees were elected as officers for the ensuing year as follows:

President, H. R. Wetherell, Central Illinois Light Company, Peoria, Ill.

First vice-president, D. S. Boyden, Edison Electric Illuminating Company of Boston, Mass.

Second vice-president, B. T. Gifford, American Public Utilities Company, Grand Rapids, Mich.

Third vice-president, George W. Martin, New York Service Company, New York, N. Y.

Secretary and treasurer, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

Executive Committee: S. Morgan Bushnell, Chicago, Ill.; H. Almert, Chicago, Ill.; C. F. Oehlmann, Denver, Colo.

President-elect Wetherell was then called upon to say a few words; he gratefully expressed his appreciation of the honor conferred upon him.

A communication was presented from Mr. Bascome, of Coshocton, O., requesting information on municipal or other requirements limiting the temperature of water discharged into sewers. This matter was discussed by D. L Gaskill, A. C. Rogers, D. S. Boyden, F B. Orr and H. R. Wetherell.

The report of the Station Record Committee was read by A. P. Biggs, Detroit, Mich., chairman. Accompanying the report the committee presented in book form about 250 record forms used by 39 heating companies. The report itself strongly emphasized the value of keeping comprehensive operating records in such systematized form that they constituted complete reports of the station's operation.

This report was discussed by H. W. Whitten, J. P. Hecht, D. S. Boyden and Mr. Biggs.

A. C. Rogers, Toledo, O., then opened a discussion of the relative advantages of operating centrifugal pumps and double-acting pumps. He pointed out that the former type has made wonderful strides in the last five years. However, neither class of pumps can be indiscriminately condemned. The difficulties arising with each type of pump are due frequently to improper design, capacity, or operation of the pump. In Toledo seven centrifugal pumps are used for circulating the water in the hot-water heating system. They have worked very satisfactorily, have eliminated pulsation in the system, and occupied but small floor space.

The discussion was continued by D. S. Boyden, J. P. Hecht, W. A. Wolls, H. A. Woodworth and Mr. Rogers. Mr. Hecht, of the Public Service Company of Northern Illinois, said that experience has shown the centrifugal pump to be much more economical as to maintenance than the reciprocating pump. Although the latter pump may show better initial steam economy than the centrifugal pump, in the long run it is impossible to maintain the reciprocating pump in such condition that its economy will remain better than that of a turbine-driven centrifugal.

The session on Wednesday afternoon opened with a discussion on "Hot-Water Heating Under Forced Circulation," by Thomas Donohue, Lafayette, Ind. He explained that the hot water must be pumped because gravity circulation is impracticable except on the customers' premises. About six pounds of water per square foot of radiation should be supplied per hour to give the standard drop of 30 degrees Fahrenheit in the water; this amount is often found to reach as high as 50 pounds, however, in poorly piped houses. The pumpage can usually be decreased in a well built system. He believed that the possibilities of hot-water heating have not been fully worked out; it has greater flexibility, higher efficiency throughout the system and greater ease of control than steam, which makes it more popular in residences. The subject was further discussed by W. A. Wolls and A. C. Rogers.

A discussion on "Effect of Superheated Steam on Heating Systems" was opened by D. S. Boyden, Boston Edison Company. He explained the advantages and disadvantages of superheat for this purpose. Among the former are increased economy in boiler plant, smaller allowable pipe sizes, slightly reduced heating surface, lower initial installation cost, and elimination of condensation noise or water hammer in the system. Disadvantages that offset these considerations are increase of distribution losses, danger of severe burns and scalds from the heated ends of radiators and leaks, trouble with pipe fittings, slightly increased cost of maintenance, etc. Considering economy alone, however, the advantages seem to be slightly with superheated steam. This matter was further discussed by Charles R. Bishop, A. D. Spencer, E. L. Wilder, F. B. Orr, W. H. Wells, L. S. Shaw and Mr. Boyden.

Some Effects of Utility Regulation as Affecting District Heating.

Secretary D. L. Gaskill then opened a discussion of this subject in which he stated that the period of regulation is at hand and the only question is whether utility companies shall be regulated wisely and well, or whether they shall be in a continual fight with the body that regulates them. If the public is protected as to rates and service that is all that it can ask. Mr. Gaskill said that as a result of an experience extending over 19 years in the utility business he has become convinced that nearly all of the troubles of a utility are of its own making. If it is managed on the basis outlined by Mr. Searle in the preceding session, so that the business is conducted in a manner that gives the public confidence in the utility, the latter need never fear the effect of regulation by some governing body.

The effect of utility regulation on heating companies will probably be not very much different from its effects on electric lighting and other utility companies. In the heating business there are not as many details as in the electric business, nor is there as much likelihood for people becoming dissatisfied. The chief differences which have arisen between heating companies and their customers have had largely to do with rates. Much of this is due to the fact that the public has not been properly educated as to heating rates.

In practically all states where utility regulation is in vogue, when a complaint is filed as to rates the case comes before the public utility commission. In this connection Mr. Gaskill strongly emphasized the need of each company knowing just what are its costs. It is unlikely a utility company will lose its case if it can show by competent evidence what its costs are. Only those utilities have lost out that have had no record of what they were doing. The laws are construed and frequently specifically provide that a utility shall not be compelled to give service at a rate which will not permit it to meet all its costs and also to pay a reasonable profit upon its investment. Mr. Gaskill cited a recent case of an Ohio company that had kept no record of costs or of investment, and was, therefore, in danger of losing its case until the Ohio Electric Light Association came to its rescue and secured an expert valuation on its property. He also cited another Ohio case which by contrast was won because the company had complete data available, even though politicians had to be fought in working out the case.

Replying to a question by Thomas Donohue, of Lafayette, Ind., Mr. Gaskill said that the situation in Ohio as to utility valuations is a peculiar one. The Ohio Commission, in order No. 176, had recently ordered every utility to file with the Commission before August 1, a complete inventory and valuation of its property. The utility companies knew that this would be a difficult thing to secure in such a limited time. Therefore, the state associations representing the different classes of utilities took the matter in hand. The Ohio Electric Light Association ordered an assessment levied. A committee of five, known as the Appraisal Committee. was appointed with authority to call to its aid the service of the leading utility and valuation experts in the United States. These are preparing forms. The Committee has opened an office in Columbus, O., and will maintain its headquarters there for some two years. Each company has been urged to ask the Public Utilities Commission to grant an extension of time. This has been done by the Commission. The forms prepared by the experts are to be sent out to the companies with explicit directions just how to make their appraisal. These forms are then to be returned to the committee, which will look over the matters, make suggestions regarding their completion and, if necessary, will send an engineer to the utility to assist in completing the appraisal. This procedure was determined upon not with the idea of thwarting the Commission's orders, but on the contrary to enable every utility represented by the state association to file a proper appraisal so that its overhead expenses and intangible valuations may receive proper recognition. Mr. Gaskill expressed the opinion that probably not 10 per cent of the utilities in the country know anything definite about their overhead or intangible values, and have no record thereof. The physical property is easily appraised, and if this is all that appears on the appraisal, the rates based on this valuation will very likely be so low as to put the company in distress.

The matter was further discussed by J. C. Hornung, H. O. Pond, Messrs. Donohue, Rogers and Gaskill.

District Heating For Small Towns.

A paper was then presented entitled "District Heating for Towns and Cities of Ten Thousand Population and Under." This paper was presented by L. T. Mason, of Hornell, N. Y. Mr. Mason opened his paper by the statement that this matter is determined very largely by the local conditions. If the plant is so located and the buildings to be heated are so scattered that the interest and depreciation on the investment required would be more than the business would warrant, it could not be considered a desirable proposition. However, the majority of small electric plants are so located that by adding steam heating, constructed on modern lines, and by selling their exhaust steam by meter, they could be made to pay good dividends on their total investment. Early opinion held that steam heating is an unprofitable business. This has been shown to be due to faulty line-construction methods and to flat-rate methods of charging. There has been a great revolution in methods of district heating in the last 25 years. In undertaking a system of this kind the best materials and the most modern methods must be used in order to get satisfactory results. With improper operating conditions eliminated and the rates for heating based on the assumption that all steam sold is generated expressly for heating, there is no question of making a profit. In many communities there is a demand for central-station heat distribution. The question therefore arises, will the existing electric light plant meet this demand or will it allow heating companies to be formed?

The discussion was opened by Secretary D. L. Gaskill, who referred to the difficulty experienced in Ohio in obtaining information of this nature from small operating companies, who seem to fear that anything given out may be used in raising the valuation of the property for taxation. On account of the peculiar taxing methods in vogue in Ohio, which Mr. Gaskill explained at some length, it is easy to see why utilities are cautious. H. R. Wetherell and Mr. Mason also discussed the paper briefly.

A discussion on the subject "Which is More Profitable—To Shut Off Steam at Night or To Keep It On Continuously?" was then opened by E. L. Wilder, Rochester, N. Y. He showed that there are a number of considerations involved in this question. He discussed what happens in a room which has been heated to a considerable temperature and then has its supply of heat stopped. In some buildings it is not allowable to let the temperature drop below a certain point, but in many factory buildings it has been found that a saving of 10 to 30 per cent may be effected by intermittent heating.

Others who discussed the subject were D. S. Boyden, Boston, Mass.; H. R. Wetherell, Peoria, Ill.; C. H. Spiehler, Dayton, O.; E. B. Tyler, Pittsburgh, Pa.; G. D. Bly, Toronto, Canada; R. C. March, Chicago, Ill.; F. M. Noecker, Renovo, Pa., and H. W. Whitten, Boston, Mass. Some difference of opinion was expressed by the speakers as to which was the better practice, this evidently being due to different conditions and requirements in buildings used for different purposes.

A paper presented by J. Byers Holbrook, New York City, entitled "Heat Loss from Buildings of Latest Construction," was then read by Secretary Gaskill in the absence of the author. This paper gave formulas for determining heat losses in which was involved a prior determination of the radiating surface.

District Heating Versus Isolated Heating.

The next subject taken up was a general discussion of the economic advantages to consumres of central-station heating service over individual heating plants. This discussion was opened by A. C. Rogers, Toledo, O., who said that in Toledo about 99 per cent of the hot-water heating system is in the residence districts. In taking up the advisability of central-station heating with prospects it is necessary that they be asked to consider the actual total cost of operating their own heating plant; included in this must be the investment in boilers, rental value of the space taken up for boilers and fuel, and the entire cost of operation and of depreciation of the private plant. The heating rates used in Toledo make the cost of heating from the central station 10 to 20 per cent less than the cost of heating by the old individual plants. Where difficulty is experienced in convincing prospects of the value of the service it is due to the fact that they are prone to consider only the fuel bills of their plant without considering all other elements of cost and convenience. Among the latter features are the elimination of dirt and dust and the damage these produce on the interior furnishings of the building. The fire risk is also reduced when the private plant is eliminated. The customers who have been served by the heating system have found that their fear that the service would be a luxury has been entirely groundless and instead of being a luxury it has turned out to be a necessity.

H. R. Wetherell, Peoria, Ill., said that his experience had been that it was by no means always possible for a district-heating company to heat a man's building cheaper than the owner can do so himself. He usually tells his prospects that if they sign a contract on the flat-rate basis their bill will possibly be twice their former fuel bill. However, by using the meter system and operating a plant intelligently it may be possible to secure the service at less cost than from the individual plant. It is usually found that when a customer realizes the advantages of 24-hour service he makes more liberal use thereof and will heat his building more months in the year than he would operate his own plant.

G. D. Bly, Toronto, Canada, mentioned a case of a customer who had regarded his bills as being excessive, therefore he operated his own plant for one year. Now he is again taking central-station heating. While he was operating his plant heat was shut off from four in the afternoon until eight in the morning, whereas, with the central-station heating was supplied from five in the morning until ten at night. If the customer will ask only the same service that he would supply himself he can almost invariably be served more cheaply from a central station.

W. A. Wolls, Columbus, O., told of a superintendent of a state institution who had enthusiastically recommended the renewal of the central-station steam-heating service, although the board of control had considered installing an independent plant. It had been found that while central-station service was provided it had practically eliminated pneumonia among the inmates of the institution, who were children under two years of age.

L. T. Mason, Hornell, N. Y., said that the installation of a meter practically compels the customer to put his equipment into first-class condition. Thomas Donohue, Lafayette, Ind., said that every central-station heating company should freely give advice and information to its customers on how to get the best results from the service.

Charles R. Bishop, American District Heating Company, North Tonawanda, N. Y., cited a case where a twenty-story office building with about 400 offices, will probably be piped so as to have a meter for each suite of offices. It is believed that this will increase the heating revenue very materially and at the same time avoid arguments between tenants and owners of the building. H. R. Wetherell said that his company insists on providing only one type of service to each building, and cited a case where the use of two different systems had resulted in inequitable bills to two customers in the same building.

On Thursday morning the session was opened with a discussion on the subject of "Customers' Steam Heating Systems." H. R. Wetherell, Peoria, Ill., presented a written discussion on this matter in which he described various types of equipment in use on the premises of central-station heating customers. He pointed out some of the advantages and difficulties connected with each of the systems described. This matter was discussed further by H. A. Woodworth, Indianapolis, Ind., R. P. Bolton, New York City, R. C. March, Chicago, Ill., and A. C. Rogers, Toledo, O.

George W. Martin, vice-president of the New York Service Company, then presented a paper entitled "Commercial Steam Heating in New York City." This paper dealt almost exclusively with the practice of the New York Service Company, which operates a number of individual plants for supplying steam for heating and for industrial uses other than for power. This company has been operating for about two years with excellent success. He described the nature of the agreements made with various owners of buildings, the forms of contracts, log sheets and records, and gave data on the heating service for five different buildings.

The discussion of this paper was opened by R. P. Bolton, New York City, who emphasized that one of the most important features on which the success of such a company depends is the careful supervision of the firing and purchasing of appropriate fuel. He discussed at length the relative economy obtained in various buildings, dwelling particularly on the manner in which the coal is fired and the number of firemen employed for buildings of almost identically the same character. Considerable difference in labor cost was noted. Mr. Bolton also referred to the cost of maintaining steam in summer, which in most private plants he has found to be very excessive.

D. S. Boyden, Boston, Mass., Fred B. Orr, Chicago, Ill., Charles R. Bishop, North Tonawanda, N. Y., and Mr. Martin continued the discussion.

Heating Rates.

E. L. Wilder, chairman of the Rate Committee, then presented the report of this committee. Included in this were diagrams showing steam rates in use in seven states. Also one showing the average steam meter rates of these different states. It is now being recognized by heating companies that the radiating surface installed in a customer's premises bears little relation to the amount of steam used. In the case of steam-heating companies the charge may be divided into two parts —one being a charge proportional to the steam demand and the other proportional to the amount of steam actually consumed. Since there is no inexpensive instrument for determining the maximum demand, this is usually based on the square feet of radiation installed, but this value must be modified by a factor depending upon the nature of the building, its exposed window and wall area, thickness and material of outer walls, cubical contents, forced ventilation and general exposure. The quantity of steam actually used is now almost invariably determined by a meter. This permits a two-rate charge, which has been found very satisfactory in actually making the charge correspond to the cost of giving the service. For hot-water systems the flat-rate system is the method ordinarily employed, which is really a demand charge based on the calculated heating requirements. In the case of customers whose demands are essentially off-peak, the charge may very appropriately be decreased.

The discussion was opened by A. C. Rogers, Toledo, O., who stated that the Ohio Public Utilities Commission has given authority for charging customers on the demand or readiness-to-serve basis even though they do not take heat for a full season. A. D. Spencer, Detroit, Mich., W. G. Carleton, New York City, Henry Meyer, Terre Haute, Ind., R. C. Holley and Charles R. Bishop, North Tonawanda, N. Y., Thomas Donohue, Lafayette, Ind., R. P. Bolton, New York City, F. M. Noecker, Renovo, Pa., and Mr. Wilder continued the discussion.

Station Operation.

The final session of the convention assembled on Thursday afternoon. The report of the Station Operating Committee, of which Byron T. Gifford, Grand Rapids, Mich., is chairman, was presented; in the absence of the chairman the report was read by Secretary Gaskill. This report was prepared by a number of men prominent in the district-heating business and touched on two main topics, namely, boilers and general operating conditions. Under the former there was discussed the rating and capacity of boilers, the relation of capacity to efficiency, the relation of CO_2 to efficiency, water purification. Under general operating conditions there was a discussion of conditions relative to a steam-heating plant and of those relating to a hot-water heating plant. Contributing to the committee's report were E. C. Fisher, of the Wickes Boiler Company, D. S. Jacobus, of the Babcock & Wilcox Boiler Company, Joseph Harrington, and Frank Vatter, of the Power Plant Specialty Company.

The report was discussed by George W. Martin, New York City, who emphasized the need of close attention to boiler-room economy. R. P. Bolton, New York City, discussed the operation and design of boilers, pointing out particularly the trend toward the vertical boiler. He predicted that in the near future we may see boilers with a rating of 5,000 horsepower. J. P. Hecht, Chicago, Ill., stated that he also had found it common for engineers to pay much more attention to the engines than to the operation of the boilers.

C. N. Green, of the Public Service Commission of the First District, New York, then made a brief address calling attention to the book published by Delos Wilcox, formerly of that commission, which deals with franchises for various utilities. He suggested that this be referred to in collecting forms of franchises.

D. S. Boyden, Boston, Mass., chairman of the Educational Committee, then presented the report of this committee, which has been gathering much data, information and references of value to the district-heating business. The Association's committee has co-operated with a similar committee of the American Society of Heating and Ventilating Engineers. The co-operation of other organizations in the work was urged. In appendices to the report were given: (A) recommended pipe sizes and radiation for heating systems, suggestions regarding steam meters, proposed new standard for flanges and flanged fittings, effect of weather stripping on air leakage and radiation of buildings; (B) rules for prevention of accidents, regulations for employees, first aid to injured, resuscitation from electric shock, etc.; (C) tests of low-pressure steam vegetable cooker, analysis of effect of weather conditions on heat output of a district-heating plant, further pipe data, etc.

On motion it was decided to carry out the recommendations of the committee asking the American Society of Mechanical Engineers and other organizations to appoint representatives to a joint committee. The matter was discussed further by Mr. Boyden, H. W. Whitten, Boston, Mass., and Henry B. Smith, Jr., Bay City, Mich. The convention then adjourned.

Entertainment.

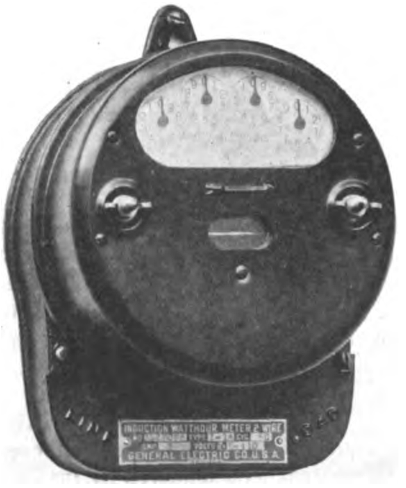
Although the convention program was well filled with technical and business matters, time was reserved for some enjoyable entertainment features. The ladies were entertained during the sessions by automobile rides, card parties, lake trips and shopping tours. On Wednesday evening a theater party was given for all in attendance. Thursday afternoon the men visited the works of the Taylor Instrument Company in Rochester.

On Friday the entire convention was the guest of the American District Steam Company, of North Tonawanda, N. Y. A special train composed of five Pullmans and a club car left at 9:30 a. m. The first stop was made at Lockport, N. Y., the home of the original central heating plant. The entire party was conveyed through the principal residential and business districts of the city, including a visit to the heating plant on Elm Street, by large motor sight-seeing trucks. After returning to the train, the next event was the luncheon tendered by the company at its works in North Tonawanda. Then followed an inspection of the large plant devoted exclusively to the manufacture of materials for use in the construction of central heating plants and of "Adsco" specialties. Subsequently the trip was continued to Niagara Falls, where all enjoyed a ride in special cars around the scenic gorge route, thence to the Clifton House on the Canadian side for dinner which was served about 7:30 p. m. At the close of dinner Secretary Gaskill expressed the appreciation of those present for the hospitality displayed by the company and remarked concerning the very able manner which had attended the conducting of every part of the schedule. Mr. Wells, president of the company, responded very graciously. The return trip to Rochester was made via Buffalo.

New Electrical and Mechanical Appliances

New Single-Phase Watt-Hour Meter.

A new single-phase watt-hour meter, representing what is believed to be a distinct advancement in the design of meters operating on the induction principle, has recently been placed on the market by the General Electric Company, Schenectady, N. Y. The salient features embodied are high initial and maintained accuracy, micrometer adjustments, solid structure assuring permanent alinement of working parts, very legible register, easy access for inspection and repairs, simple construction, compact design and neat appearance. The meters are offered self-contained in capacities of 5 to 300 amperes, 110 or 220 volts, two-wire, and 5 to 150 amperes, 220 volts, three-wire, 25 to 133 cycles.



New Single-Phase Meter.

The mechanical design of the meter is a marked departure from that heretofore used. The base, or central iron casting, supports the complete motor element on the inside, and the damping magnets, bearings and registering mechanism on the outer or front side. An extension at the bottom forms the terminal box. The fact that all working parts are rigidly attached to this single integral casting assures accurate alinement during operation, while being transported, or also when it becomes necessary to take apart and reassemble the meter.

There is the usual key-holed support in the top at the back of the base casting. The two holes for the lower supporting screws are inside the terminal box and, when the meter is connected in circuit and sealed, these screws are sealed also. The leads enter the bottom of the box, the brass terminals being permanently molded into place in a noncombustible insulating compound.

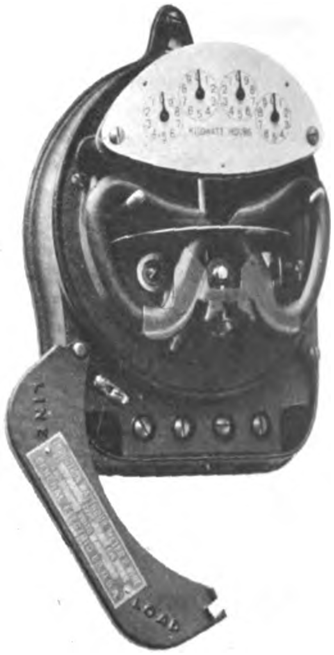
The iron back plate is secured by screws entering from the front side of the base casting, which are accessible only when the front cover is removed. The cover is stamped from sheet zinc and has the two usual glass-covered openings for observing the register and the rotation of the disk. The cover and plate joints are packed with felt gaskets to render them dustproof. Two seal pins and wing nuts in front hold the cover in place and provide for sealing in the usual manner. Meters with all-glass covers can be furnished, if desired.

The rotating element consists of an aluminum disk mounted on a vertical shaft with a worm cut in the upper end, which transmits motion to the wormwheel at the back of the register. The lower shaft bearing is a sapphire mounted in a brass screw, which is readily accessible and can be removed and replaced in its original position without adjustment. A brass cap is screwed on over the end of the jewel screw and acts as a guide, preventing the pivot from jumping out of the cup in the event of some disturbance in the circuit. The top bearing consists of a flexible steel wire mounted in a removable brass plug supported by the main casting, and extends down into a washer mounted in the top of the shaft.

The magnetic circuit is in two sections rigidly fastened together by two punched iron reinforcing plates. There are two current poles and one potential pole. Three screws hold the entire element in position inside the base. The permanent magnet, by means of which the speed of the disk is regulated, has two individual magnets astatically arranged and mounted in a brass shoe. It is supported by a shelf on the main casting and provided with micrometer adjustment. Turning the screw clockwise draws the magnet out, decreasing the speed of the disk, and vice versa.

A slotted and knurled thumbscrew gives micrometer adjustment for light load by moving a metal punching laterally under the potential pole in the path of the potential flux. Two brass studs project from the molded compound in the terminal box, joined by a small brass connection strap, by means of which the potential circuit may be opened and any number of meters tested in series.

In the 100 to 300-ampere capacity meters the current-coil laminations are of slightly different dimensions to accommodate the larger winding, which is of strip copper terminating in cast lugs molded into a terminal block of insulating compound. This block is fastened to the base by three screws entering from the rear. A set of two or more lugs or terminals is furnished with each of these meters.



Meter with Cover Removed.

Two holes punched diametrically opposite in the disk prevent creeping or turning on potential alone. The meters are practically unaffected by variations in voltage 10 per cent above or below standard ratings. Ordinary variations in temperature, small changes in frequency met with in lighting circuits, or variations of wave-form of generators for such service also do not affect their accuracy appreciably.

A lagging device, consisting of a rectangular copper punching in the form of a short-circuited loop and attached to the light-load plate, compensates the meter for inductive loads. It is tested and adjusted at 0.5 power-factor. The iron case surrounding the electrical element protects it from the effects of ordinary external stray fields. The astatic arrangement of the permanent magnet tends to eliminate any influence on the damping system. The central iron casting shields the magnets from the effects of short-circuits that create a heavy field within the meter itself. The accuracy of the meter is thus practically unaffected by stray fields.

◆

New Pass & Seymour Fittings.

The firm of Pass & Seymour, Incorporated, Solvay, N. Y., has added two more new fittings to its well known line. The one shown in Fig. 1 is a porcelain rosette designed for use on outlet boxes only. It is made in two sizes, for the 4-inch and the 3.25-inch boxes. The hole in the cap of the rosette is arranged to receive so-called fixture loops, thus permitting its use with chain fixtures and making a very inexpensive and yet presentable fixture. The line terminal screws are conveniently placed so as to be readily accessible; these screws are long and upset to prevent dropping out.

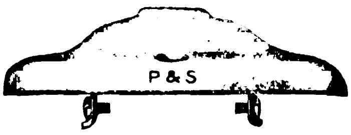


Fig. 1.

A new sign receptacle is shown in Fig. 2, which gives a good idea of the parts of the device. This receptacle was designed to meet the latest desire of certain underwriting interests with regard to a receptacle that it is not possible to turn after it is once placed in position. The receptacle has five notches. When installing it, it is necessary to cut only one projection in the metal face. This projection when bent down into any of the notches gives practically any desired position of the receptacle and prevents its subsequent turning.

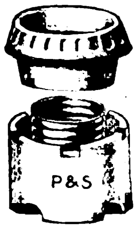


Fig. 2.

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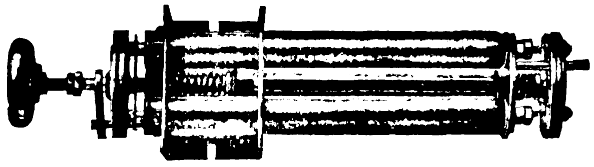
Allen-Bradley Speed Regulators for Slip-Ring Induction Motors.

The Allen-Bradley Company, Milwaukee, Wis., has recently developed a speed regulator for slip-ring motors which is claimed to have decided advantages over the ordinary wire-wound or grid-type resistance regulators on the market. The latter are generally rated to give a maximum speed reduction of the motor at full load of 50 per cent; that is, on the first contact on the face plate of the regulator, the speed of the motor is cut down one-half. Now, assuming that the operating lever was left on the first contact and the load on the motor reduced to one-half of what it formerly was, it would then only be possible to reduce the speed of the motor 25 per cent, since the speed variation of a slip-ring motor is entirely dependent upon the load of the same and the limited number of contacts would not permit of a greater speed reduction.

It is believed that the apparent shortcomings of the old form of regulator have been entirely overcome by the Allen-Bradley carbon compression-type speed-regulating devices. This is made possible by the fact that a resistance range of 100 to 1 can be obtained by means of the carbon-compression resistor and therefore the regulator can always be adjusted by turning the handwheel to give the desired speed reductions. Of course, this could also be accomplished with the wire-wound or grid-type resistance regulator, if the number of contacts and corresponding speed steps were greatly increased; however the complexity, bulkiness and cost of such a device makes the same prohibitive for general use. With the new type of regulator the speed variation obtainable is entirely independent of the load.

The illustration herewith clearly shows the simplicity and compactness of the Allen-Bradley regulator. The resistance and corresponding speed variation is obtained by turning the handwheel which gradually compresses the carbon disks contained in the steel tubes, which are thoroughly insulated from the same. One of such resistance units is supplied for each phase. The applied pressure is absolutely equalized by means of proper mechanism so that the phases are never unbalanced. Another point of advantage over the old wire-wound or grid-type resistance is the fact that the resistor employed is practically indestructible. It cannot burn out, nor is it affected by the action of moisture or corrosive fumes.



Speed Regulator for Slip-Ring Motors.

Instead of obtaining only as many speed variations as there are contacts on the face plate of the regulator, it is possible to obtain an infinite number of steps with the carbon-pile resistance, which is a feature of great importance. Any slight turn of the handwheel effects a change in the speed of the motor, so that the same may be adjusted exactly to operating conditions and held at that point. This method of control also does away with button contacts or renewable segments and consequently all arcing in moving the operating lever from one contact to another is entirely eliminated.

This speed regulator is very compact in design and light in weight, although it has a very large overload capacity. For 50-per cent speed reduction, it is made in sizes up to 10 horsepower for fan and similar duty, while up to the present time 5 horsepower is as high as these regulators are rated for machine duty. The Allen-Bradley Company, which manufactures this device, can build the same of larger capacities, however, if a smaller percentage of speed reduction is desired.

◆

Electrical Portrait of Mr. Edison.

One of the electrical decorative features at last week's covention of the National Electric Light Association in Philadelphia, was an electrical portrait of Thomas A. Edison made from his recent photograph.

This feature brought out Mr. Edison's face in a most realistic way, the various colors being faithfully portrayed, such as flesh, hair, collar, tie and coat. The whole had an appearance of being a well illuminated oil painting, although carried out in somewhat of a poster effect.

At the close of the convention, T. C. Martin presented the portrait to Mr. Edison with the compliments of the electrical men of the country. The picture was made by the Greenwood Advertising Company, under the Tucker-Leach patents pending, and is an ingenious piece of work, the high lights and shadows being reproduced by reflections and re-reflections. The entire display is made of metal, and surrounded with a frame.

◆

Electrical Curing of Lumber.

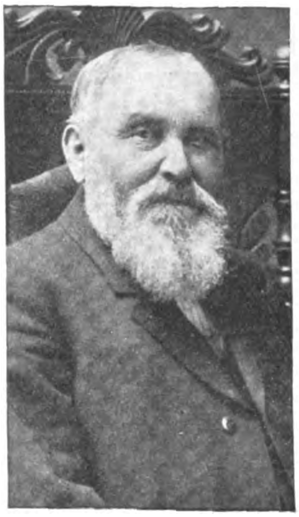
An electrical device for the curing of logs and lumber in such a way as to prevent sap stains is in actual and successful operation at the mills of W. W. Gary, at Inverness, Miss., and of Monroe McChord, of the same place. The device is the invention of J. P. Sullivan, of Memphis, Tenn., who is exhibiting letters from the two Inverness men to the effect that his device is doing all he claims for it and proving more than practical.

The New Plant of Mathias Klein & Sons.

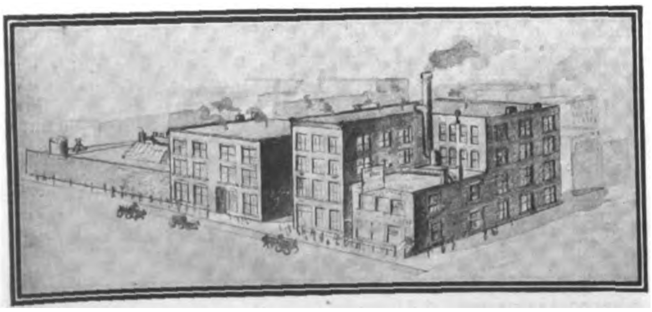
Mathias Klein & Sons, Chicago, Ill., manufacturers of telegraph, telephone and other linemen's tools, have recently removed to a much enlarged plant at Belmont and Kedzie Avenues.

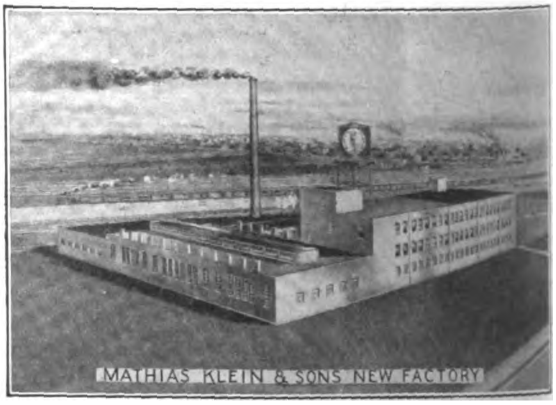
The growth and history of this company, whose products are regarded as standard by linemen, is of much interest. Mathias Klein, now 88 years of age, but still able to take an active part in the management of the plant, putting in the usual working day of from 7:00 a. m. to 5:30 p. m., was first employed in Philadelphia, Pa., as a blacksmith at $6.00 per week. In 1855 he came to Chicago, Ill., and in 1857 opened a blacksmith's shop. At about this time, much telegraph work was being carried on throughout the country. Linemen of what was then known as the Illinois & Mississippi Telegraph Company, finding that ordinary pliers and other tools were not suited to their work, began to come to the shop of Mathias Klein for the purpose of having tools made that more nearly fulfilled their needs.

John M. Klein.


Mathias Klein, Founder of the Firm.

Joseph A. Klein.


Factory Occupied Till Last Year.


MATHIAS KLEIN & SONS NEW FACTORY
New Factory Completed Last Fall.

Mr. Klein not only tried to make the tools as requested, but he sought to give the men stronger tools and tools that more than merely fulfilled their needs than those that they specified. As a result it was not very long before the Illinois & Mississippi Telegraph Company, as well as numerous similar companies, became interested in his shop and began to order their standard lineman's tools from him.

The business grew steadily and the shop had to be moved a number of times to get increased space. When the great fire of 1871 occurred, the shop was located on Dearborn Street where the Great Northern Hotel is now situated, the conflagration wiped it out of existence, but it was immediately rebuilt and continued at that location until 1881. In that year a two-story and basement building was erected on Van Buren Street, two blocks west of the river; its ground area was 25 by 50 feet and Mr. Klein thought that the climax of the business had been reached. However, additions had to be made several times and the shop was rebuilt in 1891 and further added to later so as to have over eight times the floor area that it had in 1881. Even this proved inadequate and in 1906 a large additional factory was built on Clybourn Avenue near North Avenue.

This had been considerably enlarged when in 1913 the firm decided to build its present three-story plant at Belmont and Kedzie Avenues. Throughout this period of development, Mr. Klein sought to make better tools than specified and to make constant improvements in them, thus bringing his tools into the favor of all linemen. Mr. Klein has succeeded in obtaining the personal respect and good will of his employees, some of whom have been in his employ as long as 42 years.

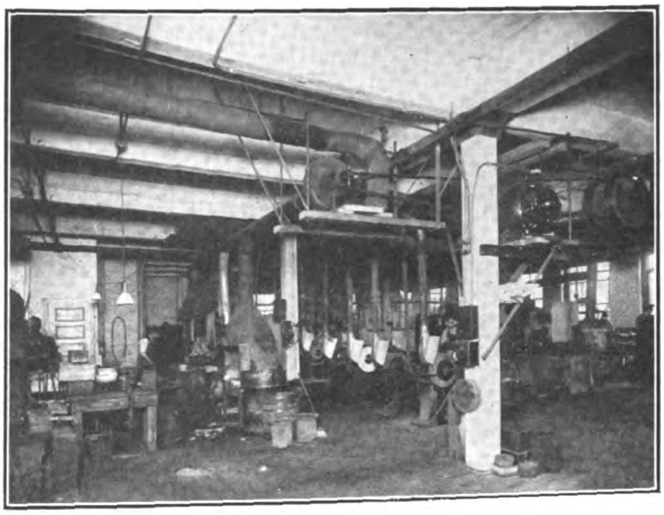
The company's new plant is situated in a 65-acre plat of land, so as to provide for future expansion. The factory building may be considered as being built in three sections. One of these sections has a ground area of about 15,300 square feet and is three stories in height. At right angles to this section is a one-story section having a ground area of about 13,350 square feet. To one side of this section is located a 55x100-foot building which is utilized as a power house, gas-producer plant, boiler house, etc. The total floor space of the factory is hence about 64,750 square feet.

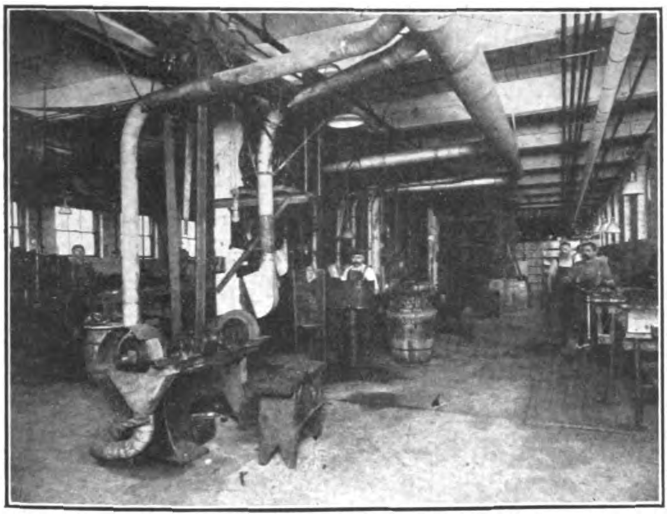
The company's new plant is modern in all ways, every effort being made to make the plant a pleasant and a sanitary place in which to work. Numerous windows and a complete ventilating equipment have done much to remove the gloom, dust and foul air of the average forge shop, grinding rooms, finishing rooms, etc.

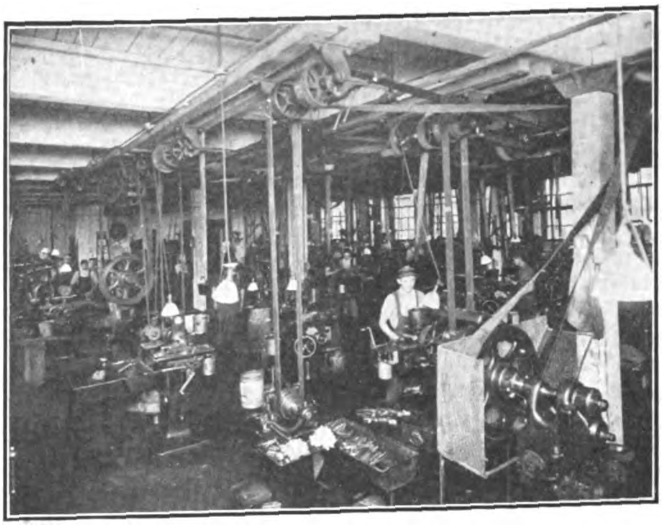
In the power house are situated a 100-kilowatt, Corliss-engine-driven Western Electric three-wire generator for supplying light and power. Here are also located the various water heaters, steam pumps, and the equipment for heating the building. Apparatus for the pneumatic sprinkling system as manufactured by the Rockwood Sprinkler Company, of Chicago, is used for fire protection throughout.

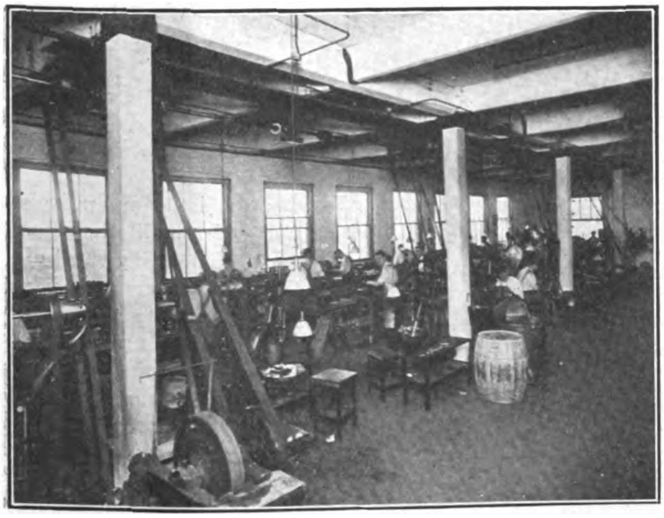
On the same floor is situated a Flinn and Dreffein gas producer which is used to furnish gas to the various furnaces on the different floors for forging and tempering. This gas producer furnishes from 1,300 to 1,400 cubic feet of gas per hour, using for this purpose about one ton of pea coal per day and about fourteen gallons of water per minute.

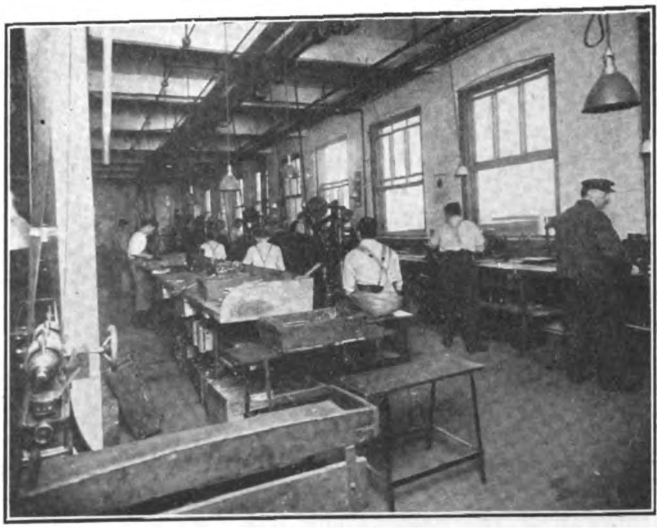
Plier Forge Shop.


Plier Finishing, Tempering and Inspection Department.


Climber Finishing Department.


Milling and Drilling Department.


Plier Assembling Department.


Plier-Connector Assembly Department.

On this floor are also located stock and shipping rooms as well as a forge shop. The raw material for pliers is taken to the forge shop where it is heated in the small producer-gas furnaces and drop forged to shape by means of various types of drop hammers driven by belts from two overhead lines of motor-driven line shafting extending the length of the room on each side.

After being forged the parts of the pliers are taken to the second floor where they are milled to correct shape on milling machines equipped with special tools. From the milling department pliers are taken to the assembly room on the third floor where they are assembled. After being inspected, pliers are taken to the tempering department where they are heated in gas furnaces, the temperature of which is always kept at a known constant value by means of Hoskins electric pyrometers connected to each furnace. Having been heated to the desired temperature, pliers are withdrawn from the furnaces and oil-tempered by means of tempering process found to be the best for the purpose by the manufacturers.

When tempered, pliers are sent to the finishing and grinding departments where they assume their final form. In order to protect the man in the grinding department from the harmful dust prevalent in such shops, each grind stone is provided with a special suction hood which carries the dust and particles resulting from the grinding operation to the outer air.

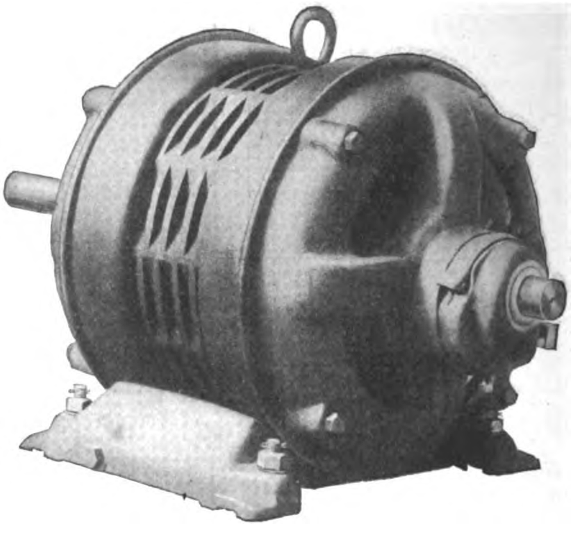
After being finished pliers are subjected to rigid inspection, and placed in packages for shipping.

In addition to manufacturing the well known "Goehst" wire-cutting and other pliers, this company also manufactures poleman's climbers, wire-reels, pole construction tools, etc.

At the present time about 133 men are employed in the new plant, but in spite of enlarging its facilities and even doubling its plier force since last October, the company cannot keep pace with its orders. Last year about 85,000 pairs of pliers were sold, an increase of about 20,000 over the previous year's sales. Orders for climbers run as high as 3,000 to 4,000 dozen pairs, yet Mr. Klein recalls the time when an order for a dozen climbers was considered a large order.

In addition to the various metal-working processes carried on in the plant, a complete woodworking shop is also provided for making the wood parts of pole tools, wire reels, carts, etc. A complete stock of raw material is constantly kept on hand, so that the factory need at no time be hampered by the lack of raw material. In order to improve the general efficiency of the plant each machine is located beneath an incandescent drop lamp with metallic shades, and an eight-station Western Electric intercommunicating telephone system is employed to permit the entire plant being within call of the office.

Mathias Klein maintains that the growth of his business and his wide reputation as a tool maker, are the result of his efforts to produce tools of greater strength and greater convenience than those which meet the minimum specifications for such tools. Mathias Klein is still a true lover of his trade and in place of occupying a desk in his office at 652 Van Buren Street, Chicago, Ill., he prefers to remain at the factory where he can constantly keep in touch with its various operations and have the company of his friends of long standing.


Westinghouse Squirrel-Cage Elevator Motor.

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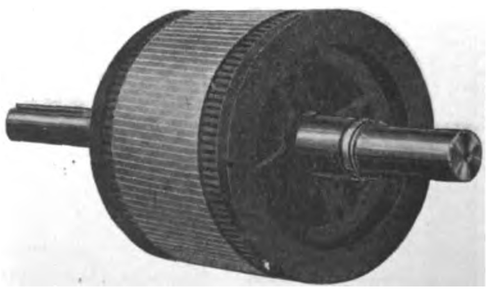
A New Westinghouse Elevator Motor.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just announced that it is placing on the market an alternating-current squirrel-cage elevator motor of new design. The special features of this motor are great mechanical strength, quiet operation, extreme reliability, and excellent performance characteristics.


Rotor of Elevator Motor.

It requires only a simple switch without resistance and is started by being thrown directly on the line. It starts with high torque, so that the car is quickly but smoothly accelerated, but only a moderate starting current is drawn from the line.

The frame is built up of steel laminations, securely mounted between rolled-steel end shields and supported by a rolled-steel foot. This construction provides very great strength with great compactness, so that the motor is readily mounted on the elevator machine.

The shaft and bearings are very large, the bearings are protected from dust, and the stator coils are moisture-proof and can withstand a high degree of temperature.

The rotor is practically indestructible. The end rings are cast solid on the bars, and the insulation is inorganic and will withstand a high degree of heat, moisture and mechanical stress. No solder, screws or bolts are used. There is, therefore, nothing to burn out, deteriorate under heat, or work loose.

Stator for Elevator Motor.

The rotor is comparatively long and of small diameter, which gives a small flywheel effect. This, together with perfect balance and the rigid construction, makes this rotor especially adapted for the frequent starting, stopping and reversing required of motors in elevator service.

These motors are made in sizes of from 3 to 20 horsepower for two and three-phase, 25 and 60-cycle circuits of 220, 440 and 550 volts.

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The aluminum output was 72,330,000 pounds last year in the United States. In 1883 only 83 pounds were produced.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—NePage, McKinney & Company, Armour Building, Seattle, Wash.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each cabinet.

Approved April 29, 1914.

BUZZER.—General Electric Company, Schenectady, N. Y.

"G. E." buzzer, alternating current, 2 amperes, 125 volts. Sub-base for combination switch and buzzer catalog No. GE511. For use in series with incandescent lamps to indicate when lamps are left with the current on.

Approved April 30, 1914.

GROUND CLAMPS.—Ideal Clamp Manufacturing Company, 77 Jamaica Avenue, Brooklyn, N. Y.

"Ideal" ground clamp. A two-piece clamp of brass having the ends secured by a single bolt and provided with lug for soldered connection to the ground wire. Made for all sizes of pipe and conduit up to three inches in diameter.

Approved April 20, 1914.

LAMP GUARD.—Harvey Hubbell, Inc., Bridgeport, Conn.

Tinned steel-wire lamp guards.

Non-locking.

For standard sockets, catalog Nos. 5573, 5578, 5591-92, 5623-24 including 5766.

For porcelain sockets, catalog Nos. 5731, 5765, 5820.

Locking guards.

For composition sockets, catalog Nos. 5810, 5818.

For standard sockets, catalog Nos. 5762, 5764.

Approved April 30, 1914.

RECEPTACLES, For Attachment Plugs.—The Cutter Company, Philadelphia, Pa.

"Cutter" flush receptacle and face plate, for use with approved Edison screw-shell attachment plugs.

Approved April 30, 1914.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Brass-shell wall sockets.

Key, catalog Nos. 20, 40, 45.

Keyless, catalog Nos. 21, 41, 46.

Pull, catalog Nos. 23, 32, 37, 42, 47, 168, 174, 175, 177-79 inclusive.

Approved May 5, 1914.

RECEPTACLES, Standard. —Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass shell, closed or slotted bases.

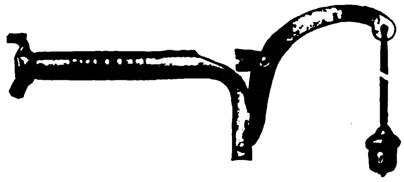
Keyless, 660-watt, 250-volt. For use on metal ceilings, catalog Nos. 1, 44.

Approved April 15, 1914.

ROSETTES, Link Fuse.—Trumbull Electric Manufacturing Company, Plainville, Conn.

"Circle," 2 amperes, 125 volts. Cleat; catalog No. 765.

Approved April 18, 1914.



Economy Extender—Harvey Hubbell, Incorporated.

ROSETTES, Fuseless.—E. H. Freeman Electric Company, Trenton, N. J.

One-piece rosettes, 3-ampere, 250-volt.

Cleat type, catalog No. 318.

Combination cleat and concealed type, catalog No. 319.

Two-piece rosettes, 3-ampere, 250-volt.

Concealed type, catalog No. 335.

Approved April 18, 1914.

Economy Extender Attached to Fixture—Harvey Hubbell, Incorporated.

ROSETTES, Inclosed Fuse.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Ceiling pull switch rosettes, catalog Nos. 5902, 5903; with "Economy" extender, catalog Nos. 5922, 5923. (See cuts.)

Approved April 18, 1914.

SOCKETS, Weatherproof.—E. H. Freeman Electric Company, Trenton, N. J.

"Freeman," 660 watts, 600 volts.

Two-piece porcelain socket enclosed in a two-piece aluminum shell, catalog No. 186.

"Freeman," 660 watts, 250 volts.

One-piece porcelain socket, catalog 120.

Approved April 30, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell sockets.

Pull, catalog No. 482. Also with shadeholder attached, with composition or insulated metal key, with or without extension keys and pull sockets with extension chain guide or insulating link in chain.

Approved May 1, 1914.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

"P. & S." brass-shell electrolier sockets.

Pull, 250 watts, 250 volts; catalog Nos. 438, 478.

Keyless, 660 watts, 250 volts; catalog Nos. 470, 479, 484.

Approved April 30, 1914, for fixture use only.

SOCKETS, Weatherproof. — General Electric Company, Schenectady, N. Y.

Porcelain shell, catalog No. 9496.

Approved April 8, 1914.

SWITCHES, Push-Button Flush.—Keil & Sons, Francis, 401-425 East 163rd Street, New York, N. Y.

Push button flush switches shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined and tested at factories and passed by Underwriters' Laboratories, have labels attached to each device.

Approved April 20, 1914.

SWITCHES, Push Button Flush.—Keil & Son, Francis, 401-425 East 163rd Street, New York, N. Y.

Single-pole, 5-ampere, 250-volt, 10-ampere, 125-volt; catalog No. 32501.

Double-pole, 10-ampere, 250-volt; catalog No. 32502.

Three-way, 10-ampere, 250-volt; catalog No. 32503.

Approved April 21, 1914.

WIRES, Slowburning. — Northern Electric Company, Limited, Montreal, Canada.

Tag on coil to read: "National Electrical Code Standard."

Marker: Yellow thread woven in braid, or, one blue, green or black thread in a red braid.

Approved April 18, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

BINGHAMTON, N. Y.—Taxpayers of Binghamton at a special election voted in favor of issuing $148,200 bonds for the erection of a municipal street lighting plant.

CAMDEN, N. J.—The Keystone Leather Company is planning for the erection of a new boiler and engine plant on Stevens Street. A.

JERSEY CITY, N. J.—The Merchants' City Centre Association is negotiating with the Board of City Commissioners for the installation of an ornamental street lighting system on Newark Avenue, in the vicinity of the "Five Corners." A.

TRENTON, N. J.—The American District Telegraph & Messenger Company has made application to the Board of City Commissioners for the operation of a local fire alarm, signal and messenger system, lines of existing companies to be used where possible.

MILESBURG, PA.—The State Centre Electric Company will move its power plant from Bellefonte, Pa., to Milesburg, where waterpower will be used instead of steam for generating electricity. S.

SOUTH ATLANTIC STATES.

CUMBERLAND, MD.—It is reported that the Hagerstown & Frederick Railway Company has arranged to purchase the Frostburg Illuminating & Manufacturing Company, which supplies electricity to Frostburg and vicinity. It is also negotiating for a water power development of 50,000 horsepower capacity near Cumberland. The company is still undecided whether to buy this development or to build a large power plant at Cumberland and furnish the current through transmission lines to its customers in Allegany County. With the consummation of these deals, on which the counsel for the company is now at work, the company will occupy the public service field in the whole of the Western Maryland counties.

MENDOTA, VA.—This city is figuring on installing an electric lighting system. J. C. Payne is mayor. G.

WASHINGTON, N. C.—June 17 bids will be received for improving the electric light plant. $150,000 in bonds has been authorized. Address Frank C. Kugler, mayor.

BATESBURG, S. C.—The J. B. McCrary Company, Atlanta, Ga., is preparing plans for an electric light plant.

REYNOLDS, GA.—The City is planning to establish an electric light plant. Address G. L. Cooper, secretary, for further information.

NORTH CENTRAL STATES.

ATHENS, O.—July 18 has been set by the local council body as the date for an election to decide upon the proposed issuing of $118,000 in bonds for a new light plant and water works. Of this amount $45,000 will be for the light plant. J.

BELLEFONTAINE, O.—A franchise has been granted to George Lehrer for an electric lighting plant at Rushsylvania. Work on the plant it is stated will begin at an early date. H.

DAYTON, O.—The Carrmonte Improvement Association, of the village of Carrmonte, near here, is in charge of the project of securing electric lights for the village, and it is reported that the installation will be made within the next month or so. L.

GREENVILLE, O.—The Greenville Electric Light & Power Company has taken the preliminary steps for a $28,000 common stock increase, the proceeds to be used in building and equipping an addition to its power station here. J.

MASON, O.—$14,000 will be expended for municipal lighting. Address the village clerk.

YOUNGSTOWN, O.—H. W. Jones, lighting expert of Cleveland, has been employed to make preliminary plans for a municipal lighting plant for the city of Youngstown and also to devise and draw up plans for a new lighting system for the city. H.

HAVANA, ILL.—The Commercial Club is planning ways and means to establish ornamental lighting. Address the secretary.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company will spend $2,000,000 in Minneapolis in the coming year in general improvement work and extension of service. The work will consist of laying of new ducts and conduits to connect the Main Street, S. E., and Fifth Street Stations; replacing of Fifth Street station machinery and enlargement of capacity.

PINE RIVER, MINN.—The Pine River Electric Company will build a transmission line to Backus.

SPRINGFIELD, MINN.—George P. Foster was chosen chairman of a committee to look up the matter of a "White Way" lighting system.

PRIMGHAR, IOWA.—Electric lights will be installed here. Address the city clerk for particulars.

WELLMAN, IOWA.—The Council has granted a franchise to a private company to establish a lighting plant. Address the village clerk.

BRUNSWICK, MO.—J. A. Nickell & Sons, operating the Brunswick electric light plant and waterworks, will spend about $5,000 for new equipment. A new 75-horsepower Murray engine of the Corliss type already has been ordered. The installation of new machinery will make possible a 24-hour service for both light and power. M.

CASSVILLE, MO. — Farmers of Barry County will establish a telephone system with headquarters at Cassville, as the result of a disagreement with the Mitchell, Kans., Telephone & Electric Company. M.

ARMOUR, S. D.—Interstate Power Company will locate a central plant here with J. F. Cameron as manager. C.

DE SMET, S. D.—Lake Preston Milling Company will erect a plant here and supply the town with electricity. C.

KANSAS CITY, KANS.—The municipal authorities will manufacture ice at the municipal light plant. About $200,000 will be spent for equipment. L. H. Chapman is commissioner of water and lights. M.

MANHATTAN, KANS.—The City Commissioners have begun negotiations with the view of purchasing the electric light plant of the Manhattan Ice, Light & Power Company. M.

ROBINSON, KANS.—The Council at a recent meeting decided to abandon the idea of installing a municipal electric light plant, and the project has been taken up by H. J. Stockings, who has asked the city for a franchise.

SOUTH CENTRAL STATES.

CADIZ, KY.—The city's second electric light franchise was sold here to George L. Smith, who will erect a plant. A previous franchise was sold to Alexander Brothers & Comapny, and that concern has contracted for the lighting of a number of residences. G.

MUNFORDVILLE, KY.—A new electrical concern is the New Munfordville Electric Light & Power Company, incorporated here with a capital of $2,800. F. W. Wheeler, J. W. Payton, J. M. Craddock and Richard Lobb are the incorporators. G.

BRISTOL, TENN.—Abingdon, Va., has contracted with the Bristol Gas & Electric Company for street lighting and power. The electricity will come from the Watauga power plant. G.

CHATTANOOGA, TENN.—Bids for a five-year contract for lighting the city's streets have been advertised for, according to approved specifications. The contract with the Chattanooga Railway & Light Company will expire in December. G.

NASHVILLE, TENN.—Lyle Andrews, commissioner of lights, has under consideration a petition from the property owners along Eighth Avenue between Church and Broadway, for the placing of cluster-globe-lighting standards along that part of the street as has been done already in other sections of the down town streets of Nashville. It is reported that he and the property owners have virtually reached an understanding as to the apportionment of the expense.

BROWNSVILLE, TEX.—Albert A. Browne and associates, who have just purchased the Rio Grande Railroad that runs from Brownsville to Point Isabel, 22 miles, and the local street railway system, will construct an electric power plant for the purpose of providing energy for operating the combined system.

WESTERN STATES.

LIVINGSTON, MONT.—Work will begin in the immediate future on the installation of automatic electric block system on the Northern Pacific Railroad, between this city and Toston, also on the reconstruction of all telegraph and telephone lines between this city and Missoula. The block-signal installation extends over 195 miles of roadway. O.

POTTER, WYO.—C. C. Carlisle, of Cheyenne, has prepared plans for a municipal lighting plant. Address the city clerk.

BOISE, IDAHO.—The receiver of Idaho-Oregon Light & Power Company has secured permission from the Federal Court to continue construction of the 5,000 horsepower Oxbow Plant on the Snake River, near here. He will spend $220,000 in completing the plant. Over $1,000,000 has already been spent on this project, and it is planned at a later date to construct a dam and develop 32,000 horsepower.

SAFFORD, ARIZ.—The plant of the Gila Valley Light, Power & Water Company, only recently completed, has been destroyed by fire.

TUCSON, ARIZ.—Monte Mansfield, of Tucson, and Spiro S. Proto, of Nogales, have been granted an electric light franchise for Nogales.

EVERETT, WASH.—D. A. Barnes, manager of the Everett Railway, Light & Water Company, has petitioned the County Commissioners for a franchise to construct and operate electric transmission lines from the interurban road to Beverly Park, where the Florida Land Company has announced its intentions of installing an electric lighting system. O.

MONROE, WASH.—The Monroe Water & Light Company is negotiating with Seattle capitalists for the sale of the local plant, who, it is understood, will invest a large sum of money in improvements. O.

PORTLAND, ORE.—Preparatory to the establishment of a municipal lighting plant in this city, to furnish light and power for all the city streets, buildings, shops, and parks, and possibly to enter into the sale of current for commercial purposes, City Commissioner Daly has asked the City Council to uphold him in the appointment of an electrical engineer to make a detailed investigation of the cost and feasibility of such a plant on one of two power sites, which the Council has under consideration and which belong to the city. Under budget appropriation, the city has $5,000 available for the investigation Each of the sites has a capacity, under proper development, of 30,000 horsepower.

TILLAMOOK, ORE.—The City Council has granted a 25-year franchise to the Tillamook Light & Fuel Company, which contemplates numerous improvements.

BANNING, CAL.—The Board of City Trustees has sold a blanket franchise to Ghreist & Son of Newport Beach, Cal., who will proceed to install an electric light and power system in Banning. Electricity will be supplied by the Southern Sierra Power Company. The same company is planning to operate lighting plants in Victorville and other neighboring towns with Banning as headquarters.

LOS ANGELES, CAL.—It is announced that the City will purchase a sufficient amount of the $6,500,00 issue of power bonds voted on May 8 to permit work to be resumed as soon as possible. Plans for more than doubling the amount of water saved by the aqueduct have been announced by Councilman Betkouski, chairman of the public service committee after a trip of inspection, by means of constructing a large dam across the mouth of the Owens River gorge where it opens into Long Valley. The dam is estimated to cost $200,000, and it is to be built by the water department.

NORDHOFF, CAL.—The Ojai Power Company has applied to the Railroad Commission for authority to issue 192 shares of its capital stock at the par value of $19,200. The funds are to be used for the installation of an additional unit for the distribution of power for lighting purposes in this vicinity.

SAN BERNARDINO, CAL.—The Southern California Edison Company has been granted a franchise to construct transmission lines along certain highways in San Bernardino County.

VALDEZ, ALASKA.—Amended articles of incorporation for the Alaska Water, Light & Power Company, of this city, have been filed with Secretary of the Territory, Charles E. Davidson. Amended articles show that the capital stock has been increased from $100,000 to $250,000. S. A. Hemple, of Valdez, is the head of the company, and is authority for the statement that considerable work of improvement and extensions will be made during the coming summer. O.

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C. until July 10 for the lighting fixtures for the post office at Idaho Falls, Idaho. Drawings and specifications may be obtained from the custodian of the site or the office of the Supervising Architect.

ELECTRIC ELEVATORS. — Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until June 26 for two electric passenger elevators for the post office at Dayton, O., in accordance with drawings and specifications, copies of which may be obtained from the office of the Supervising Architect.

ELECTRIC WORK. — Sealed proposals will be received until June 18 by the Board of School Directors, Ben Avon, Pa., for the general contract on electric work. Plans and specifications for the work and all necessary information upon which the bids are to be based, may be obtained at the office of R. M. Trimble, architect, 705 Ferguson Building, Pittsburgh, Pa. S.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 23 for furnishing 20 panels, for delivery at the Navy Yards, Boston, Brooklyn, Norfolk and Charleston; and 20,000 feet of leaded and armored steel twin-conductor wire, for delivery at the Navy Yard, Brooklyn, N. Y., both as per Schedule 6886.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 16 for furnishing four hot-wire ammeters; 4,500 feet armored double-conductor wire; miscellaneous magnet wire, as per Schedule 6856, for delivery at the Navy Yard, Brooklyn, N. Y.; and 16,000 feet of rubber-covered wire, as per Schedule 6855, for delivery at the Navy Yard, Brooklyn, N. Y The Bureau will also receive bids on the following until June 30: Two 200-kilowatt generating sets, as per Schedule 6878, for delivery at the Navy Yard, Philadelphia, Pa.; miscellaneous three-conductor potheads; miscellaneous switches and panels; 470 feet three-conductor wire; 880 pounds bare copper wire, as per Schedule 6861, for delivery at the Navy Yard, Philadelphia, Pa., and until July 14 for miscellaneous generating sets and spare parts, as per Schedule 6851, for delivery at the Navy Yard, Mare Island, Cal.

FOREIGN TRADE OPPORTUNITIES.

[*Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Customhouse, New York, 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Customhouse, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.*]

NO. 13,110. ELECTRIC CRANES. —The American consulate at Madrid, Spain, reports that the acquisition of two electric cranes for use in the port of Huelva, Spain, is authorized. Proposals must be submitted through a local representative before June 27.

NO. 13,113. ELECTRIC MASSAGE VIBRATORS.—The manager of an important barber shop in a European capital informs an American consular officer that he desires to receive catalogues from American manufacturers of electric massage vibrators. Correspondence may be in English.

NO. 13,129. NOVELTIES AND ELECTRIC HOUSEHOLD UTILITIES.—An American consul reports that a resident of a European city desires to import American novelties of all kinds, including electric household utilities. Correspondence should be in German.

NO. 13,164. ELECTRIC CRANES. —The American consulate at Madrid, Spain, reports that proposals are requested by the Junta de las Obras del Puerto de Valencia, Valencia, Spain, for supplying and installing in the port of Valencia, four electric cranes. The estimated cost of the cranes is not stated. Proposals must be submitted through a local representative before July 19.

NO. 13,166. FIRE-ALARM SYSTEM.—An American consular officer reports that the municipal authorities in a city of his district are considering the installation of a fire-alarm system for the city. Advertising literature, full particulars, and prices should be sent to a list of persons named in the report by the consul.

NO. 13,178. ELECTRIC CRANE.—A report from an American consul states that in about two months some harbor improvements in his district will be completed and the Government proposes to erect an electric crane for handling cargoes. No details are available, but the installation will probably be made by the contractors in charge of the improvements. Interested American manufacturers should lose no time in placing illustrated circulars in their hands, and prices should be quoted c. i. f. certain city. Letters and advertising matter should be in the Italian language.

FINANCIAL NOTES.

At the annual meeting of the Mexican Telegraph Company retiring directors were re-elected.

At the annual meeting of the Central & South American Telegraph Company, retiring directors were re-elcted.

The Philadelphia Company has elected George S. Davidson to the Board of Directors, succeeding Patrick Calhoun.

The Consumers Power Company, of Minnesota, is offering, through H. M. Byllesby & Company, $64,000 of three and one-half-year six-per-cent collateral notes, dated November 1, 1913, at 98 and interest.

Hambleton & Company, of Baltimore, are offering the unsold portion of $1,000,000 consolidated four-per-cent bonds of the Washington Railway & Electric Company, due 1951, at 83.5 to yield about five per cent.

Bondholders of the Rochester Telephone Company have ratified the plan to surrender interest on their holdings for two years in order to raise $200,000 for new equipment and extensions.

The California Railroad Commission has extended to December 31, 1914, the time in which the Great Western Power Company may issue and dispose of the $3,971,731 first-mortgage five-per-cent sinking-fund bonds, authorized by the commission some time ago. The time originally fixed called for the issue to be made prior to March 1, 1914.

At the special meeting of the American Gas & Electric Company, stockholders voted to increase the capital stock of the company by authorizing $500,000 additional common stock, with par value of $50. All common stock authorized by the previous increase in capital has been allotted to stockholders and the new stock will remain as treasury stock until such time as the board of directors approve its distribution to common shareholders.

The Federal Light & Traction Company will complete in the current year a comprehensive program of improvements calling for a total expenditure of $741,000. Since its organization in 1910 the company has expended directly and through its subsidiaries upward of $10,000,000 in the purchase and development of public utility properties.

The Pacific Gas & Electric Company, in a letter to stockholders, requests approval of a charter amendment to reclassify capital stock into $100,000,000 common, $50,000,000 first preferred and $10,000,000 present preferred, making a total of $160,000,000. Offers to stockholders of an issue of $12,500,000 new preferred at $82.50 permits holders of old $10,000,000 preferred to exchange for new preferred after July 1, 1916, at the rate of ten and one-quarter shares new for ten shares of old. Dividends of four per cent on the common stock will be resumed in 1915.

The Twin City Rapid Transit Company will offer to its preferred and common shareholders of record June 15, the right to subscribe pro rata up to July 15, to $1,900,000 par value of the unissued capital stock of the company at par. This gives both the preferred and common shareholders the right to take one share of new common stock for each twelve shares of the present holdings. The stock will be payable 20 per cent at the time of the subscription on or before July 15. The balance is payable in installments of 20 per cent each sixty days thereafter. Interest at six per cent will be allowed on all payments made and the right to prepay in full is granted. Interest and dividends will be adjusted at the time of any prepayment.

The Western States Gas & Electric Company is offering, through H. M. Byllesby & Company, $50,000 first and refunding five-per-cent bonds at 89 and interest or on a 5.80-per-cent basis. There are now $4,392,000 of these bonds outstanding in addition to $418,000 American River Electric five-per-cent first-mortgage bonds. Earnings of the company for the year ended March 31 last were $1,082,457 gross, $476,665 net and $256,613 balance after fixed charges, including interest on the additional issue. The American River Electric bonds cover a hydroelectric plant on the American river.

The Columbus Railway, Power **&** Light Company has called a special meeting of stockholders for June 29, at Columbus, Ohio, to authorize the issue of $3,145,000 four-per-cent prior-preference stock. The new stock is to be issued solely for the purpose of taking up and retiring in whole or in part, with the consent of the bondholders, the $3,145,000 outstanding first-consolidated-mortgage 40-year four-per-cent bonds of the Columbus Railway Company, dated October 2, 1899, and due October 1, 1939. The approval also will be asked of an issue of $450,000 Series A six-per-cent preferred stock, to take up and retire the $450,000 six-per-cent first-mortgage 25-year bonds of the Columbus Electric Company, dated November 1, 1897. The stockholders will be asked to approve an increase in the capital stock of Columbus Railway, Light & Power Company from $11,550,000 to $15,145,000, including the above issue of prior-preference four-per-cent stock and six-per-cent Series A preferred stock. The stockholders also will be asked to approve an issue of first and refunding sinking-fund five-per-cent bonds of an authorized amount not to exceed $25,000,000, such bonds to be issued from time to time upon the consent of the Ohio Public Utilities Commission for the acquisition of properties, the construction, completion, extension or improvement of its facilities, for refunding outstanding bonds or for other corporate requirements. On account of the special meeting the transfer books of the company will be closed from June 14 to June 29. The issue of the new stocks and creation of the new mortgage is for the purpose of enabling the company to simplify its capitalization and also to formulate a plan for the raising of additional capital.

Dividends.

	Term.	Rate.	Payable.
Brazil Tr., Lt.&Pwr.pf.	Q	1.5	July 1
Cent. States Elec. pf.	Q	1.75	July 1
Col. Elec. pf.	Q	3.	July 1
Duluth-Supr. Tr. pf.	Q	1.	July 1
Duluth-Spr. Tr. com.	Q	1.	July 1
East. Pow. & Lt.	Q	1.5	June 15
El Paso Elec. pf.	S-A	3.	July 13
Indianapolis St. Ry.	S-A	3.	July 1
Interborough R. T.	Q	2.5	July 1
Louisville Trac. com.	Q	1.	July 1
Manila El. R. R. & L.	Q	1.75	July 1
Niagara Falls Pow.	Q	$2.	July 15
N. Y. State Rys. pf.	Q	1.25	July 1
N. Y. State Rys. com.	Q	1.5	July 1
Penn. Wat. & Pow.	Q	1.	July 15
Phila. Co.	Q	1.75	Aug. 1
Phila. Co. pf.	S-A	2.5	Sept. 1
Un. Tr. & Elec. N. J.	Q	1.25	July 1
Union Tr. Phila.	S-A	3.	July 1
Western Elec.	Q	2.	June 30

Reports of Earnings.

AMERICAN POWER & LIGHT.

(Combined earnings of subsidiary companies.)

	1914.	1913.
April gross	$ 524,627	$ 459,310
Expenses and taxes	279,315	266,906
Net earnings	245,312	192,404
Twelve months' gross	6,112,059	5,458,356
Expenses and taxes	3,274,683	3,048,024
Net earnings	2,837,376	2,410,332

NORTHERN OHIO TRACTION & LIGHT.

	1914.	1913.
April gross	$ 287,719	$238,546
Net	114,397	83,926
Surplus after charges	64,066	38,712
Four months' gross	1,080,884	925,727
Net	412,582	343,321
Surplus after charges	212,427	163,025

MONTREAL LIGHT, HEAT & POWER COMPANY.

The Montreal Light, Heat & Power Company has issued its report for the year ended April 30, 1914. The income account compares as follows:

	1914.	1913.
Gross	$6,245,697	$5,509,557
Expenses	2,778,451	2,328,440
Net	3,467,246	3,181,116
Interest	467,977	463,979
†Surplus	2,999,269	2,717,137
Dividends	1,700,000	1,530,000
Surplus	1,299,269	1,187,137
*Deductions	610,000	560,000
Surplus	689,269	627,157

*Depreciation and pension fund.

†Equal to 16.74 per cent on $17,910,662 capital stock, as against 15.98 per cent on $17,000,000 previous year.

SOUTHERN CALIFORNIA EDISON.

	1914	1913
April gross	$ 376,337	$ 369,971
Net earnings	166,651	187,952
Gross income	177,156	187,893
Surplus after charges	98,248	119,840
Balance after depreciation	73,248	54,840
Four months gross	1,522,984	1,478,909
Net earnings	692,051	705,264
Gross income	704,175	704,452
Surplus after charges	402,947	431,600
Balance after depreciation	302,947	216,600

INTERBOROUGH RAPID TRANSIT.

	1914	1913
April gross	$3,020,204	$2,850,646
Net after taxes	1,774,879	1,559,088
Other income	37,239	55,027
Total income	1,812,118	1,614,115
Surplus after charges	904,740	672,007
Passengers carried	58,845,286	55,729,197
Ten months gross	27,851,791	27,049,525
Net after taxes	15,379,515	14,274,287
Other income	501,473	371,942
Total income	15,880,988	14,646,228
Surplus after charges	6,581,146	5,429,309
Nine months dividends	2,625,000	2,265,000
Surplus	3,956,146	2,804,309
Passengers carried	542,994,769	527,933,490

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 8	June 1
American Tel. & Tel. (New York)	123¼	122½
Commonwealth Edison (Chicago)	135½	135
Edison Electric Illuminating (Boston)	250	252
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	148	148¾
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	11½	11¼
Massachusetts Electric preferred (Boston)	58⅝	58
National Carbon common (Chicago)	110½	110¼
National Carbon preferred (Chicago)	118	117¼
New England Telephone (Boston)	134	134¼
Philadelphia Electric (Philadelphia)	25⅝	35¼
Postal Telegraph and Cables common (New York)	81¾	82
Postal Telegraph and Cables preferred (New York)	68½	68¼
Western Union (New York)	61¾	61⅞
Westinghouse common (New York)	76½	77
Westinghouse preferred (New York)	124	123

PERSONAL MENTION.

MR. W. H. CLARKE has been appointed manager of the Bond Department of H. M. Byllesby & Company, Chicago.

PROF. COMFORT A. ADAMS, of Harvard University, has been made Abbott and James Lawrence professor of engineering.

MR. HARLEY ROBINSON, electrical engineer at the American gypsum plant, Gypsum, O., had his right leg broken and his right arm badly bruised last week when he was knocked from his bicycle by a motorcycle.

MR. FRED A. POOR, Chicago, representative of The Rail Joint Company, resigned on June 1 to become president of the P. & M. Company, whose general offices are in the Railway Exchange Building, Chicago.

MR. RICHARD HAWKEY, of Pittsburgh, Pa., who has been assistant to the vice-president of the Eastern Group of the Bell Telephone Company, has been appointed vice-president and general manager of the Pittsburgh & Allegheny Telephone Company.

MR. FRANK C. HULING, of Columbus, O., has been made treasurer of the Pittsburgh & Allegheny Telephone Company, which has just emerged from the hands of a receivership of three years' standing. Mr. Huling fills the vacancy caused by the death of Mr. J. W. Vance, of Wheeling, W. Va.

MR. ARTHUR PURDON has been engaged as assistant in the sales department of the Moloney Electric Company, St. Louis, Mo. He was formerly with the Westinghouse Electric & Manufacturing Company, serving in the transformer department and the consulting division of the engineering department at East Pittsburgh, and later in the St. Louis office of the company.

MR. HAROLD ALMERT, consulting engineer, Chicago, Ill., has been retained as technical counsel by the Washington Railway & Electric Company and the Potomac Electric Power Company, of Washington, D. C. The appraisal division of Mr. Almert's staff will make a detailed inventory and valuation of the property of these companies in preparation for a hearing before the Public Utilities Commission, which Commission appeared before the District Committee of Congress, on June 2, and declared itself in favor of public ownership of the utilities.

MR. L. R. POMEROY has been appointed manager of the New York sales office of The United States Light and Heating Company. Mr. Pomeroy has long been engaged in work in the railway and electrical fields, and enjoys the reputation of being an authority along several lines in each industry. He was born at Port Byron, N. Y., in 1857, and attended high school at Milwaukee, Wis., and the Irving Institute at Tarrytown, N. Y. From 1874 to 1880 he was engaged in commercial business, bookkeeping, special auditing, drafting and designing of cars and locomotives. From 1880 to 1886 he was secretary and treasurer of the Suburban Rapid Transit Company of New York. For four years following this he was a special representative of the Carnegie Steel Company, introducing basic boiler steel for locomotives and special forgings for railways. For nine years he was engaged in the same work with the Cambria Steel Company and the Latrobe Steel Company, jointly. From 1899 to 1902 he was assistant general manager of the Schenectady Locomotive Works. For six years following this he was a special representative in the railway field for the General Electric Company, this work covering the electrification of steam roads, railway shops, and the general application of electricity for all railway purposes. Following this he was for two years assistant to the president of the Safety Car Heating & Lighting Company, during which period he devoted a portion of his time to consulting work in the special field of railway shops and machine-tool operation. From there he went to J. G. White & Company as chief engineer of the railway and industrial division. Recently he has had an office in New York City as consulting engineer.

L. R. Pomeroy.

MR. W. A. THOMAS, who for several years has been commercial engineer in charge of all sales of mining apparatus for the Westinghouse Electric & Manufacturing Company, resigned his position with this company on June 1, and has taken up the practice of consulting engineering in Pittsburgh, with offices in the Second National Bank Building. He will specialize on mining. Mr. Thomas graduated from Pennsylvania State College in 1898 and was connected with the General Electric Company at Schenectady, going through the Testing Department and being afterwards connected for several years with the Power and Mining Engineering Department. For two years he was in charge of the power equipment of the Pennsylvania Coal and Coke Company at Cresson, Pa., resigning his position with this company to take charge of the mining work of the Westinghouse Electric Company. Mr. Thomas is also president of the Rocky Ridge Coal Company, of Robertsdale, Pa., which is an important bituminous coal-mining company.

W. A. Thomas.

OBITUARY.

MR. WILLIAM R. BELKNAP, chairman of the Board of Directors, formerly president and one of the founders of the Belknap Hardware & Manufacturing Company in Louisville, died at his home there on May 31. He was 65 years of age and was at the head of one of the largest concerns distributing electrical supplies in the country.

MR. EDWARD BRILL, a member of the firm of J. G. Brill Company, street-car builders of Philadelphia, Pa., died at his summer home near Atlantic City, N. J., on June 8, at the age of 64. Mr. Brill was the son of one of the founders of the company and had held every official position in the company except that of president.

MR. ALEXANDER E. ORR, for many years president of the Board of Rapid Transit Railroad Commissioners, in New York City, died on June 3, at his home in Brooklyn, at the age of 83 years. The Public Service Commission for the First District adopted a minute in appreciation of the work of Mr. Orr in connection with the rapid-transit subway facilities of New York City.

MR. JACOB FURTH, president of the Puget Sound Traction, Light & Power Company, died in Seattle, Wash., recently. Mr. Furth was born November 14, 1840, in Austria. He came to this country in 1858, going first to California. He afterwards settled in Seattle and became interested in a number of business enterprises in that city. At the time of his death he was interested in several banks, holding large interests in real estate and other lines of business. When the Seattle Electric Company was formed he was made president.

NEW INCORPORATIONS.

EAST LIVERPOOL, O.—The E. J. Bett Lighting Company has been organized with a capital stock of $10,000, to deal in light fixtures. The incorporators are E. J. Bett, G. A. Hughes, K. J. J. Hughes, and others. L.

TRENTON, N. J.—MacLewee Electrical Company has been incorporated to deal in electrical supplies. The capital stock of the company is $100,000 and the incorporators are W. MacLewee, H. M. Hartman and F. R. Brace, of this city.

BINGHAMTON, N. Y. — Mason-Bouck Electric Company, Incorporated, has been granted articles of incorporation, capitalized at $5,000, to engage in the business of electrical work, electrical fixtures, etc. The incorporators are Elizabeth Mason, Fred J. Mason and William C. Bouck, all of this city.

CHICAGO, ILL.—Becker Brothers, of Chicago, have been granted a license to incorporate. The capital stock is given as $25,000 and the incorporators are Oliver E. Becker, Charles J. Becker and William F. Becker. The company is to manufacture and deal in motors, dynamos, electrical apparatus, etc. Z.

DATES AHEAD.

American Society of Mechanical Engineers. Spring meeting, St. Paul, Minn., June 16-19. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Sixth semi-annual meeting, Troy, N. Y., June 17-20. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

Electrical Contractors' Association of the State of Illinois. Annual meeting, Danville, Ill., June 19-20. Secretary M. N. Blumenthal, 179 West Washington Street, Chicago, Ill.

Minnesotal Electrical Contractors' Association. Annual convention, St. Paul, Minn., June 22. Secretary, G. M. Jones, 14 North Seventh Street, Minneapolis, Minn.

American Institute of Electrical Engineers. Thirty-first annual convention, Cadillac Hotel, Detroit, Mich., June 23-26. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Canadian Electrical Association. Annual convention, Montreal, Canada, June 24-26. Secretary, H. G. Martin, Toronto, Ont.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 4. Secretary, Edgar Marburg, University of Pennsylvania, West Philadelphia, Pa.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, Albert Jackson Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Gleason-Tiebout Glass Company, New York City, has issued a card calling attention to its line of Onyx lighting glassware.

General Insulate Company, 1008 Atlantic Avenue, Brooklyn, N. Y., announces that Frederick Steinberger has been appointed sales manager for its middle west territory, with an office at 9 South Clinton Street, Chicago, Ill.

General Chemical Company has begun work on its new plant at Newell, Pa. The building will be used for the manufacture of muriatic acid. It will cost $250,000, bringing the total valuation of the company's holdings at Newell up to $2,000,000. F. W. Lovejoy is superintendent.

The Thompson Electric Company, Cleveland, O., has recently issued a pamphlet describing Thompson cut-out hangers for incandescent and arc lamps. These hangers are designed to permit the ready and safe cleaning of lamps and reflectors by rendering the lowering and the disconnecting of a lamp an easy matter.

The Ohio Brass Company, Mansfield, O., has issued its 1914 catalog of appliances used in the construction, maintenance, and operation of electric-railway systems, mine-haulage systems and transmission lines. This catalog contains 600 pages and includes numerous cuts of the various devices described.

The F. W. Wakefield Brass Company, Vermillion, O., has issued its 1914 catalog of lighting fixtures. This catalog covers numerous types of plain and ornate direct, semi-indirect and indirect fixtures. Numerous cuts and full descriptions add to the value of the catalog. In addition to describing numerous types of lighting fixtures, fixture parts and devices are included.

H. W. Johns-Manville Company has moved its Duluth, Minn., office to larger quarters at 327 West First Street, in order to take care of its increased business. The new office is on the ground floor, with windows for the display of J-M asbestos roofing, pipe coverings, packings, sanitary specialties, automobile accessories and other products of this company's well known and varied lines.

Mesta Machine Company, Pittsburgh, Pa., has ready for distribution Bulletin O which deals with Mesta rope drives. This publication points out some of the advantages of rope drives and shows numerous typical installations thereof. The factors on which the success of a rope drive depend are clearly set forth and valuable diagrams and formulas are given for determining the life of Manila transmission rope.

De La Vergne Machine Company, New York City, has issued a folder entitled, "One Cubic Inch of Oil With 6,000 Square Inches of Surface," calling attention to the principles and advantages of De La Vergne oil engines.

Harrison Safety Boiler Works, Philadelphia, Pa., has recently issued a booklet on "Precision in the Measurement of Water," which describes various types of instruments for use in steam power plants.

Ft. Wayne Electric Works, of General Electric Company, Fort Wayne, Ind., has issued bulletin No. 46,203, which describes and illustrates its new type-K5 single-phase watt-hour-meters. These meters are of exceptionally simple construction, compact size and light weight, but maintain the standard for accuracy and reliability characteristic of the meters built by this establishment. The bulletin is well illustrated with general and detail views and diagrams.

The H. A. Strauss Data-Card Service, Harris Trust Building, Chicago, Ill., has begun the fortnightly publication of a continued series of engineering data cards. These will cover the entire field of engineering and related technical subjects. The cards are 5 by 8 inches in size, conveniently arranged for filing, and are etchings of specially prepared data sheets and diagrams, all neatly lettered. They are live and of high engineering value. A simple system of indexing has been adopted. Eight or more cards are to be issued each month.

Babcock & Wilcox Company, New York City, has published a sixty-three page book entitled "Chain-Grate Stokers." This publication is fully up to the standard set by this company in the completeness and excellence of the illustrations. The stokers are described in detail with the aid of numerous diagrams. Sectional views are shown of the use of the stokers with various types of boilers. There are a large number of illustrations of complete installations. The book contains much valuable information, including tests relating to stoker equipments, etc.

International Electric Tool Company, Fourth and Windlake Avenues, Milwaukee, Wis., announces that its secretary and treasurer, William H. Gaulke, has withdrawn entirely from his former connection with the Independent Electric Manufacturing Company, of which he was treasurer. Mr. Gaulke will now devote himself entirely to the interests of the International Company, developing a complete line of electric hammers, riveters and chippers for stone and iron. Recently, he developed a set of electric vibrators for use in foundries.

C. C. Bohn Electric Company, 780 Sixth Avenue, New York City, has been appointed exclusive sales agent for the sale of the Santo electric vacuum cleaners for the territory of Greater New York and vicinity, by the **Santo Manufacturing Company,** of Philadelphia, Pa., The Bohn company has also acquired the business of the **Santo Electric Appliance Company,** formerly at 168 Madison Avenue, New York City. The acquisition of the Santo line, together with the steady growth of its supply and contracting business has caused the Bohn company to secure a long lease of the building at 820 Sixth Avenue, New York City, where extensive alterations are being made. The company will probably move into its enlarged quarters on or about August 1, 1914.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued "Textile Quarterly No. 7," which deals with the equipment of power plants for textile mills. Construction and operation of steam turbines are thoroughly explained and illustrated, and the advantages of that method of drive for industrial plants are clearly set forth. Several tables are devoted to figures showing the comparative cost of installation of reciprocating engines, low-pressure and high-pressure turbines, and high-pressure turbine with bleeder. Porcelain and glass insulators are described and illustrated in catalog section No. DS845, just issued by the company. The booklet gives a large number of sectional drawings with the voltage ratings. The different kinds of insulators such as the pin type for poles, pin-type strain insulators, transformer bushings, roof-entrance bushings, outdoor-type transformer bushings, floor and wall tubes and knobs are all covered.

General Electric Company, Schenectady, N. Y., has received the following among a large number of recent orders for power equipment: Empire District Electric Company, Joplin, Mo., two 300-kilowatt synchronous converters, one 210-kilovolt-ampere frequency-changer set, three 500-kilovolt-ampere water-cooled transformers, six 110-kilowatt and three 75-kilowatt transformers, switchboards and accessories. Eastern Michigan Power Company, Jackson, Mich., three 900-kilowatt transformers. Roque River Public Service Corporation, Grant's Pass, Ore., has purchased a 750-kilowatt alternating-current generator. Aluminum Company of America, Massena, N. Y., eighteen 2,500-kilowatt rotary converters and nine 5,000-kilowatt water-cooled transformers. Cyclops Iron Works, San Francisco, Cal., has two 15, four 30 and four 37-horsepower induction motors. Crucible Steel Company, Milwaukee, Wis., one 500-kilovolt-ampere and three 10-kilovolt-ampere transformers. John A. Roebling's Sons Co., Trenton, N. J., fifteen 20-horsepower motors and starters. Riter-Conley Manufacturing Company, Pittsburgh, Pa., seven small motors, six motors of 10 horsepower and ten of 25 horsepower capacity. Oldbury Electric Chemical Company, Niagara Falls, N. Y., a 500-kilowatt rotary converter, three 175-kilovolt-ampere transformers and a switchboard. Lakeland Phosphate Company, Lakeland, Fla., a 937-kilovolt-ampere generator with 35-kilowatt turbo-exciter and 35-kilowatt motor-generator exciter set, switchboard and accessories. Portland Flouring Mills Company. Tacoma, Wash., a 500-horsepower induction motor with starting compensator panel, and two 100-kilovolt-ampere transformers. Standard Portland Cement Company, Leeds, Ala., four 75-horsepower induction motors. Spencer Kellogg & Sons, Buffalo, N. Y., a 1,000-horsepower induction motor and switchboard. Western Glass Company, Streator, Ill., two 200-horsepower induction motors and controllers. Newport Mill Company, Newport, Tenn., 25-horsepower, 35-horsepower and 75-horsepower induction motors. Bordens Condensed Milk Company, Elgin, Ill., a 150-kilowatt alternating-current generator, eight five-horsepower motors, switchboard and accessories. J. C. Hubinger Bros., Keokuk, Ia., a 1,270-horsepower synchronous motor with 18-kilowatt exciter; one 50, two 100 and one 150-horsepower induction motors, and switchboard and control apparatus. Western Brick Company, Danville, Ill., will install 7.5, 35 and 150-horsepower induction motors with compensators.

Record of Electrical Patents.

Issued by the United States Patent Office, June 2, 1914.

1,098,372. Telephone Apparatus. A. H. Dyson, assignor to Western Electric Co., Chicago, Ill. A battery signaling system.

1,098,379. System of Selective Control. J. H. Hammond, Jr., Gloucester, Mass. An electromagnet controlling apparatus operated by light waves.

1,098,380. Automatic Ticker Receiver. J. H. Hammond, Jr. Oscillation period of antenna varied by magnet-operated condenser.

1,098,387. Time Switch. V. G. Jensen, Chicago, Ill. A clock-operated knife switch.

1,098,431. Magneto-Electric Generator. R. H. Cunningham, assignor to Splitdorf Electrical Co., Newark, N. J. Special field and armature construction designed to deliver varying voltage.

1,098,436. Electric Heating System. W. S. Hadaway, Jr., New York, N. Y. Heating current supplied to reinforcing members of concrete building.

1,098,437. Electric Heating Device. W. S. Hadaway, Jr. Soldering iron with heating coil.

1,098,447. Calling Device. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Covers details of calling device for automatic telephones.

1,098,452. Inductor-Magneto Alternator. L. J. Le Pontois, New Rochelle, N. Y., assignor to H. W. Johns. Has permanent and electromagnetic field poles.

1,098,472. Indicating and Recording Hygrometer. W. H. Bristol, assignor to The Bristol Company, Waterbury, Conn. Has thermo-electric couples and voltmeter.

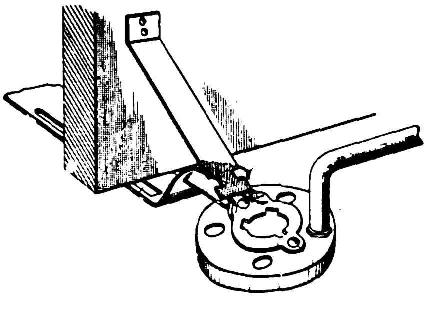
1,098,478. Attachment Plug for Electric Circuits. F. H. Chapman and O. E. Kenney, Toledo, O. A key plug.

1,098,490. Thermostatically Operated Circuit-Breaker. T. R. Fagan, Huntington, W. Va. Thermostat operates switch.

1,098,501. Electric-Wire Connection. H. H. Holdaway and A. C. Candland, assignors to M. E. Holdaway, Salt Lake City, Utah. A swivel connection.

1,098,528. Telephony and Telegraphy for Mining Cages. J. H. Reineke, assignor to Studiengesellschaft für drahtlose Grubentelefonie, Cologne-Lindenthal, Germany. A battery system.

1,098,529. Multiple Brush Selector. J. N. Reynolds, assignor to Western Electric Co. An automatic switch.



1,098,581.—Outlet-Box Support.

1,098,539. Internal-Combustion Engine. J. A. Williams, assignor to The K. W. Ignition Co., Cleveland, O. Special ignition means for two-cycle engine.

1,098,545. Retractor for Printing-Telegraphs. A. H. Adams, assignor to Western Electric Co. A magnet-operated rotating shaft.

1,098,549. Transformer. T. E. Barnum, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. One winding is movable longitudinally.

1,098,550. Electric Welding Machine. F. E. Beam, assignor to The Electric Welding Co., Toledo, O. Covers details.

1,098,557. Rotary Converter. S. M. Burk, Philadelphia, Pa., assignor of one-half to G. W. Hosfeld. Armature composed of disks.

1,098,581. Support for Conduit Outlet Boxes. B. P. McKinley, assignor to Metal Specialties Co., Kansas City, Mo. For attachment to girder. (See cut.)

1,098,592. Illuminating Device. E. O. Schweitzer, assignor to Associated Engineers Co., Chicago, Ill. A cut-out for series lamps.

1,098,606. Electric Battery. E. Achenbach, Hamburg, Germany. Contains depolarizing mixture of graphite, manganese dioxide and mercuric oxide.

1,098,612. Elevation-Controlled Firing Apparatus for Guns. E. Bourdelles, Paris, France, assignor of one-half to Compagnie des Forges et Aciéries de la Marine et d'Homécourt, Paris, France. Electric firing means.

1,098,617. Electrical Apparatus for Transmitting and Receiving Signals. A. T. Dawson and G. T. Buckingham, assignors to Vickers, Ltd., Westminster, England. Automatic telegraph receiving and sending apparatus.

1,098,628. Pistol Flash Light. H. Hyman, assignor to Interstate Electric Novelty Co., New York., N. Y. A flash-light toy.

1,098,637. Spark Plug. E. C. Rauch, Coeur d'Alene, Idaho. Has a carbon electrode.

1,098,649. Constant-Current Regulator. A. A. Tirrill, assignor to General Electric Co. An exciter regulator.

1,098,656. Alternating-Current Motor Control. E. F. W. Alexanderson, assignor to General Electric Co. Synchronous motor starts as single-phase commutator motor.

1,098,664. Instrument Transformer.

M. D. Dobrowolsky, assignor to General Electric Co. A bus-bar transformer.

1,098,666. Electric Brush. J. Graves, assignor to T. W. Lacey, Minneapolis, Minn. A wire brush connected to electric battery.

1,098,692. Temperature-Controlling Device for Storage Batteries. G. H. Stahl, assignor to The Stawil Co., Quincy, Ill. A thermometer-operated electromagnetic switch.

1,098,698. Electric-Railway Trolley. J. A. Walsh, Rochester, N. Y. A protecting device consisting of an auxiliary wheel.

1,098,705. Spark Plug. A. G. Bergstrom and A. J. Bergstrom, Rockford, Ill. Covers details.

1,098,717. Overhead-Trolley Construction. G. Gibbs, New York, N. Y. A pantograph.

1,098,718. Rheostat. A. I. Grabham, Wellington, New Zealand. A rheostat with special resistance block of manganese oxide, zinc oxide, soda silicate, and brass filings. (See cut.)

1,098,738. Lightning Rod. S. D. Krentzer, St. Louis, Mo. Covers details.

1,098,741. Electric-Lamp Push Socket. L. F. Lindstrom, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Covers details.

1,098,753. Electric Generator for Ignition Systems. E. Podlesák, Tiffin, O. Covers details of permanent magnet structure.

1,098,754. Inductor Alternator. E. Podlesák, Tiffin, O. Covers details of pole-fastening means.

1,098,761. Optical-Illusion Amusement Apparatus. C. T. Rehlin, Pittsburgh, Pa. A series of magnetically controlled figures.

1,098,772. Signal or Alarm Device. W. M. Waite, and J. H. Wheelock, assignors to American Model & Instrument Co. A clock-operated signal.

1,098,775. Bushing for Electric Tubular Insulation. C. M. Wheelock, assignor to The T.-W. Mfg. Co. A bushing for securing flexible tubing.

1,098,778. Circuit-Controller. H. P. Ball and G. Wright, assignors to General Electric Co. An electromagnetic switch.

1,098,779. Concealed-Wire Supporting Chain. W. H. Blake, assignor to F. S. Alden, Boston, Mass. Wires concealed in hollow chain.

1,098,780. Motor-Starting Device. P. Caldwell, assignor to General Electric Co. Includes electromagnetic contactors.

1,098,809. Railway Switch-Throwing Mechanism. H. C. Kinsel, Altoona, Pa. Electromagnetically operated.

1,098,822. Telephone Attachment. F. E. Miller, Fond du Lac, Wis. A special receiver support.

1,098,834. Electric Bell. S. Oliver, Chicago, Ill. An alternating-current bell.

1,098,842. Electric Sign. R. T. Savage, assignor to Savage Novelty Co., Inc. A transparent sign.

1,098,845. Elevator. M. C. Schwab, Chicago, Ill. Counterweight of safety device prevents motor rotation.

1,098,849. Switch. E. E. Smart and G. H. Hart, assignors to The Hart Mfg. Co., Hartford, Conn. A knob-operated switch. (See cut.)

1,098,852. Electric Permutation-Lock Switch. G. Stupar, Chicago, Ill. A special locking arrangement.

1,098,893. Electrically Operated Vibrator. J. L. Dinsmoor, New York, N. Y. A solenoid-operated vibrator.

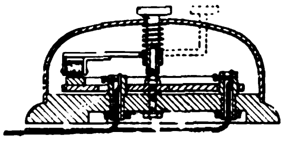
1,098,959. Telegraph Transmitter. L. I. Moore, Leggett, Tex. Has a number of levers controlling main contact.

1,098,867. Process of Making Insulating Material. C. F. Peterson, assignor to General Electric Co. Process of making mica sheet.

1,098,973. Electric-Lamp Socket. M. Reich, New York, N. Y. Covers details.

1,098,983. Electrical Musical Instrument. M. L. Severy, and G. B. Sinclair, assignors to Choralcelo Mfg. Co. Electromagnetically controlled.

1,099,022. Trolley Wheel. T. Cavanaugh, Pittsburgh, Pa. Designed to retain wheel on trolley wire.



1,098,718.—Rheostat.

1,099,061. Lamp Fixture. W. E. Lane, Kansas City, Mo. An adapter.

1,099,062. Electric Scalp Appliance. P. P. Laposkey, Cherokee, Iowa. A wire comb with battery attachment.

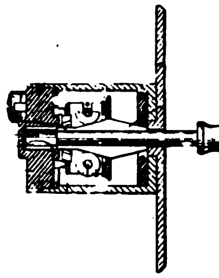
1,099,071. Rheostat. J. A. McCoy, Jr., assignor to Davis Electric Co., Parkersburg, W. Va. Covers details.

1,099,087. Lamp. E. A. Hawthorne, Bridgeport, Conn. Covers details of supports.

1,099,090. Terminal Device. W. G. Houskeeper, assignor to Westinghouse Lamp Co. A mercury contact.

1,099,091. Electrical Terminal Device. W. G. Houskeeper, assignor to Westinghouse Lamp Co. A modification of 1,099,090.

1,099,093. Electric Contact Device. A. A. Kent, Philadelphia, Pa. A ratchet and pawl contact device.



1,098,849.—Switch.

1,099,095. Process of Preparing Conducting-Filaments. H. D. Madden and W. G. Houskeeper, assignors to Westinghouse Lamp Co. Consists of applying electric currents of different values to portions of filaments.

1,099,138. Solid Titanium-Carbid Stick-Electrode. W. G. Abbott, Jr., assignor to General Electric Co. An electrode consisting of titanium carbid particles cemented together by titanium sub-oxid.

Re-issue 13,742. Original No. 920,350. Automatic Telephone-Exchange System. J. W. Lattig, and C. L. Goodrum, assignors to Western Electric Co. Covers details.

Patents Expired.

The following United States electrical patents expired June 8, 1914.

583,900. Electric Meter. J. Harris, Lynn, Mass.

583,912. Secondary or Storage Battery. A. S. Krotz, Springfield, O.

583,916. Searchlight Mount. F. T. Marchand and G. E. Marchand, Annapolis, Md.

583,926. Conduit. J. T. McRoy, Chicago, Ill.

583,933. Electric Motor. E. S. Pillsbury, St. Louis, Mo.

583,934. Shunt Ammeter. W. B. Potter, Schenectady, N. Y.

583,935. Series-Parallel Controller. W. B. Potter, and F. E. Case, Schenectady, N. Y.

583,936. Electric Furnace. E. F. Price, Niagara Falls, N. Y.

583,938. Pneumatic Controller. E. D. Priest, Schenectady, N. Y.

583,939. Pneumatically Actuated Controller. E. D. Priest and F. A. Merrick, Schenectady, N. Y.

583,944. Rotary Converter. E. W. Rice, Jr., Schenectady, N. Y.

583,945. Electric Light for Vehicles. A. M. Rodriguez, Brooklyn, N. Y.

583,950. Three-Phase Induction Meter. C. P. Steinmetz, Schenectady, N. Y.

583,951. Motor Meter. C. P. Steinmetz.

583,953. Apparatus for Producing Currents of High Frequency. N. Tesla, New York, N. Y.

583,955. Carbon Holder for Arc Lamps. E. Thomson, Swampscott, Mass.

583,956. Producing Sterioscopic Pictures by Roentgen Rays. E. Thomson.

583,957. Electrostatic Influence Machine. E. Thomson.

583,959. Safety Lamp. W. Waegel, Philadelphia, Pa.

583,963. Electric Switch. G. Winckler, Schenectady, N. Y.

583,987. Lightning Arrester. A. Ekstrom, Schenectady, N. Y.

583,991. Binding Band for Armatures. H. Geisenhoner, Schenectady, N. Y.

583,997. Turntable for Surface-Contact Electric Railways. E. M. Hewlett, Schenectady, N. Y.

584,013. Rail Bond. W. B. Potter, Schenectady, N. Y.

584,029. System of Electrical Distribution. J. L. Woodbridge, Brooklyn, N. Y.

584,056. Igniting Device. B. Jolles, Vienna, Austria-Hungary.

584,062. Synchronizing Mechanism. H. F. Parshall, London, England.

584,149. Automatic Electric Time Switch, L. H. Watters, Media, Pa.

584,155. Electric Regulator. C. C. Gartland, Buffalo, N. Y.

584,173. Hotel Electric Call Apparatus. A. B. Chance, Centralia, Mo.

584,184. Electric Arc Lamp. G. L. Moyer, Hartford, Conn.

584,185. Cutout Switch, G. L. Moyer.

584,186. Electric Arc Lamp. G. L. Moyer.

584,202. Burglar-Alarm System. W. T. Arnold, Chicago, Ill.

584,235. Insulator for Telegraph or Other Electric Wires. C. C. Nesmith and G. F. Arnett, Manchester, Ala.

584,249. Thermostat. H. Van Hoevenbergh, New York, N. Y.

584,258. Prepayment Mechanism for Electrical or Other Meters. C. O. Bastian and H. C. Hodges, London, England.

584,297. Noninterfering Signal Box. J. T. Stack, Chicago, Ill.

584,299. Connection for Electrical Conductors. B. F. Weldon, Pittsburgh, Pa.

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STANDARDIZATION OF THE MOTOR DRIVE.

During the past few years considerable progress has been made in the standardization of certain machine parts, with results advantageous both to the machine manufacturer and to the machine user. For a long time it has been seen to be desirable, at least on the part of a number of tool builders, that something be done toward standardizing certain motor dimensions, speeds, etc., for machine-tool drive. At the recent spring convention of the National Machine Tool Builders' Association, a paper upon this subject was presented by Mr. Charles L. Fair, of Schenectady, N. Y., and the author's comments upon possible lines of progress in the direction of standardization deserve consideration.

The writer pointed out that it could not be expected that the electrical manufacturers would change existing standards of motor dimensions or speeds, nor is such a course desirable; but he saw no reason why, if the motor manufacturer in conjunction with the tool builder would co-operate, the former could not incorporate, at least in part, some agreed dimensions and speeds when bringing out new lines of motors. Obviously, it would be just as impossible for the various builders of motors to design their products to a single set of dimensions as for machine builders to follow such uniform practice. Notwithstanding this, much can be done to improve the situation.

An almost endless number of combinations of speeds is available, but from this great variety certain speeds should become the logical ones for the majority of drives. The direct-current shunt-motor speed, for instance, might be that of the alternating-current, 60-cycle motor. Alternating-current and direct-current motor speed should be given in terms of full load or possibly in terms of both no load and full load, bearing in mind the fact that the frequency fixes the alternating-current motor speeds, except as modified by slip. Adjustable-speed motors would naturally be higher in speed on the highest speed than a constant-speed motor, on the theory that the former would run only a percentage of the time on high speed. Adjustable-speed motors are more generally geared, and their speeds should be governed by a proper gear ratio.

Little difficulty should be encountered in arriving at a proper shaft diameter and key for a given horsepower, shaft length and speed of motor. Under the frame, uniformity of dimensions is clearly impossible, but much can be done to reduce the existing large variety of dimensions to perhaps two or three sizes per frame. In one case mentioned by the author, eight different frame sizes were used by a single manufacturer in a single size of motor. There appears to be no reason why there should not be a uniform drilling of feet per frame.

Uniformity of marking motor terminals, standardization of wiring diagrams and the protection of live parts are all beneficial practices. The machine user, no less than the manufacturer, will derive considerable benefit from the elimination of needless variations in dimensions, patterns, shapes and weights, and it is probable that within the next few years real progress will be made in the direction of a more general motor standardization for machine-tool propulsion.

CONSTRUCTION FEATURES OF THE HOTEL GIBSON.

The modern hotel houses a multiplicity of electrical applications, the number and diversity of which can hardly be equalled except in those buildings devoted to industrial purposes. Not only must proper and elaborate illumination be provided, but efforts must be made to meet the exacting demands of the traveling public, which is always seeking to obtain the maximum number of conveniences. The hotel of today houses a complete motor-driven laundry, an extensive refrigerating plant including ice-making machinery and an extensive ice-water system, a complete telephone exchange, numerous signalling systems, a vacuum-cleaning system, motor-driven kitchen machinery and a great number of miscellaneous power applications.

The wiring of a modern hotel is hence a task of no mean proportions, as not only must provision be made to supply electric energy for power and light applications, but every effort must be made to make the control of these applications convenient without detracting from the beauty of the architectural layout of the guest and public portions. The Hotel Gibson, at Cincinnati, O., a description of the electrical installation of which begins in this issue, may be considered as a typical modern hotel.

The power plant of this hotel presents several interesting features. In place of three-wire generators, two-wire generators and balancer sets are employed, the balancer sets not only serving to maintain the voltage of the middle wire of the three-wire system when private-plant power is used, but also when the emergency two-wire central-station energy is used. The switchboard in this plant is an acme of convenience. All connections on the rear of the board are made in straight lines or at right angles, the feeder connections being made by means of copper rods and buses occupying a space over two feet in width, thus rendering repairs and inspection an easy matter when compared with the labor required to perform the same operations on a compact and often confusing switchboard where connections have to be traced first with extreme care.

In line with the convenience of the switchboard construction is that of the cable supports and anchors in the wire shafts. The cable racks are models of simplicity, being constructed of sheet steel and supporting the cables by means of porcelain cleats, and the conduits by means of U-bolts. By means of the doors of the steel boxes inclosing these racks, ready inspection is rendered possible, and additions to the present cable system can be easily made if ever deemed advisable. The similar accessibility of the cable anchors permits of taking up slack in the cables due to expansion from temperature or other causes at any time.

In spite of the accessibility of the cable supports and anchors, no unsightly effects are produced, as in the public and guest portions of the hotel all steel cabinets and boxes are hidden from view by doors conforming with the woodwork of the building.

The use of angle-iron frames as temporary supports for conduits until the panelboard cabinets became available is a feature which should appeal to every contractor. Building operations must proceed in spite of a contractor's inability to always have proper cabinets available at the time the conduits are laid, and the necessity for secure and accurate supports for conduits as a means for preventing dislocation is apparent.

ELECTRIC STERILIZATION OF MILK.

The sterilization of water by electric means was shown to be practical a number of years ago and installations for applying ultra-violet rays generated by electric lamps to this purpose have been applied on a large scale, particularly in Europe. The necessity for the sterilization of milk is quite as urgent as for water and this method was at once applied to the latter form of beverage, but without success. The opacity of the milk presented one obstacle and undesired effects made the process unsuitable.

More recently a process has been developed in Liverpool which accomplishes the desired sterilization by electrical means and seems to produce no objectionable results so far as the taste of the milk or other practical considerations are concerned. This has now been put into use upon a commercial scale and is described elsewhere in this issue. The method is based upon the use of a high-potential alternating current, which is passed through the milk as it traverses a thin tube. Tests show that the bacterial content is reduced almost to zero, the most objectionable species being entirely destroyed. Thus while the milk may not be made absolutely sterile it is rendered innocuous so far as the presence of disease-producing bacteria is concerned, such as those causing tuberculosis, typhoid fever, etc., frequently found in raw milk.

An application of electric current to this purpose has been much sought after in the United States and if the new method satisfactorily meets the tests to which it will be subjected, it will undoubtedly receive wide application in this country, and become an important competitor of sterilization by heat.

TRANSFORMER DESIGN AND OPERATION.

The paper presented by Mr. D. W. Roper at the Pittsfield meeting of the American Institute of Electrical Engineers, and abstracted in our last issue, gave results of some very valuable experience in the operation of distributing transformers and pointed out how the trouble arising from transformer failures can be materially cut down. While the number of failures of this class is already exceedingly small when the number of transformers in use is considered, showing that the transformer of today is a very dependable and rugged piece of apparatus, it is, nevertheless, very desirable both from the standpoint of costs of repairs and continuity of service to reduce the failures to the lowest possible minimum.

To achieve the desired result requires of course the co-operation of manufacturers and users. Manufacturers need to know the results of the experience in operation and this is dependent upon the accumulation of such facts as Mr. Roper presented in his paper. Moreover, the determination of transformer design and the formulation of specifications which transformers are to meet depends also upon such co-operation. While any buyer may, of course, draw up his own specifications, he will find that if these are different from the requirements of other users and consequently from the stock production of the factory, he will have to pay perhaps dearly for his departures from general practice. .

It is consequently desirable to have general specifications drawn up which will be satisfactory to nearly all users and will enable the manufacturers to meet all demands by one line of product. There will be many items upon which all cannot agree, since the requirements of small and large operating companies may be conflicting. This statement applies for instance to the furnishing of oil. On the other hand many points of the criticism of present designs brought out by Mr. Roper are of general application and manufacturing practice might well be revised in accordance with them.

Many troubles which arise in practice are more dependent upon operating methods than upon the construction of the transformer. The difference in failures noted as dependent upon whether a lightning arrester is placed upon the same pole as a transformer is an important one and it is for each operating company to determine whether such increases in expense as are entailed by supplying a lightning arrester for each transformer are warranted in attaining greater continuity of service and less frequent accidents to the transformers.

The question of using a connection board is another point requiring careful consideration. The manufacturers seem to think that they have eliminated the trouble from this source.

Such papers as that of Mr. Roper and the discussions which are brought out by them represent a class of the most valuable material which can be brought forward at such conventions.

ADVERTISING VALUE OF GOOD STREET-CAR LIGHTING.

Good lighting as a business stimulator for the central-station company has no equal. Much to the profit of all concerned, electric companies are rapidly realizing this and it cannot be long before efficient lighting installations will be the rule rather than the exception.

It seems, though, that a very excellent method of educating the public to a realization of what scientific illumination really means is being consistently neglected in the campaign for better lighting. It is needless to comment on the extensive work that has been undertaken by electric utility companies in improving lighting in the home, office and public institutions. Commercial departments more recently, perhaps, have also been putting forth every effort to extend and improve street lighting, show-window lighting, sign lighting and display lighting of all varieties, yet the street car, which is used daily by a large percentage of the entire population of the city, is in many cases abominably lighted, and seldom represents the best practice.

Aside from the results which would be obtained by providing good lighting in street cars from the railway operator's standpoint, it would appear that no advertisement would receive more consideration or have a greater effect on such a large number of people; demonstrating to the public just what pleasing results can be obtained when the lighting equipment is properly selected and properly installed. It seems almost ridiculous for a utility company to strive to have its city known as a well lighted one and entirely neglect the street car. Yet this is the case in many localities.

Some time ago the Toledo Railways & Light Company, Toledo, O., equipped all of its cars with modern lighting units in accordance with the best engineering practice. The change from the old equipment was quickly observed by all passengers, but the company emphasized the change by inserting in the daily newspapers advertisements calling particular attention to the new installation and commenting on the effects that result from the use of proper lighting equipment. It is said that remarkable results have been obtained from this campaign. When both the railway and electric utilities are controlled by one organization it would seem from the experiences of the Toledo Company that much good can be accomplished in this direction. There is also a field for co-operation when separate companies are in control. In a good many instances the railway company is a customer of the central station and in this capacity should be accorded the same treatment as is given the ordinary lighting customer. Undoubtedly it can be shown in many cases that energy consumption can be reduced by a substitution of proper lamps and glassware, and a co-operative campaign can be conducted along these lines, with benefits to both utilities.

Meeting of Pittsburgh Section.

The annual election of officers of the Pittsburgh Section of the American Institute of Electrical Engineers was held on June 9, with the following results:

Chairman, J. W. Welsh; secretary and treasurer, Chas. R. Riker; board of directors, G. M. Eaton, B. Wiley, B. C. Dennison, E. R. Spencer, T. H. Schoepf, Ray Dudley.

Papers were read by R. L. Snyder on "Some Recent Improvements in Telephone Practice" and by J. Gordon on "Spinners of Speech." Mr. Snyder said in brief that in spite of the remarkable inventions which have brought the telephone to its present stage of usefulness, improvements are being constantly introduced. The ordinary receiver is so sensitive that the energy consumed in lighting an ordinary electric lamp would be sufficient to produce an audible sound in every receiver in the United States, and improvements are still being made. The amount of improvement in telephone apparatus is spoken of in terms of its effect on transmission, the unit being a transmission-mile.

The standard circuit for making comparisons consists of subscriber's set, an artificial line and a receiver set. The volume of transmission over this standard circuit is increased or decreased by increasing or decreasing the length of cable pair included in the circuit. Comparison is made by cutting line in or out until the transmission is the same as with the apparatus on test substituted for the cable pair. Conversation can be carried on with comparative ease over a line of 30-mile transmission equivalent. All circuits between subscribers in what is known as the Pittsburgh Metropolitan area are designed to give a 19-mile transmission equivalent or better. Toll line transmission between cities varies from a 20 to a 30-mile equivalent. On toll lines the potential used is double that for local connections.

A phantom circuit which consists of a third telephone circuit superimposed upon two physical circuits by placing balanced repeating coils at each end of the physical circuits, must be transposed the same as the side circuits. This was impossible until the duplex or quadded cable in which the twisted pairs of wires are again twisted around each other, was designed. The phantom circuit has twice the conductivity of the side circuits and hence gives better transmission making long-distance toll calls a success. The introduction of loading coils and inequality repeating coils also had much to do with this improvement in transmission.

Among the improvements which have helped to cheapen construction is the 900-pair cable, which gives a 50-per cent increase in capacity over that of the 600-pair cable, with the same outside diameter.

The switchboard is gradually undergoing changes which lessen the work of the operator. With machine ringing, for instance, the operator can handle 27 to 40 per cent more calls than with the old manual ringing system.

Mr. Gordon gave a description of the actual operation of the switchboard and of the methods of line construction illustrated fully with stereopticon and motion-picture views.

The discussion which followed brought out that the phantom circuits are not used for local work, primarily on account of signalling difficulties and that phantom circuits may be superimposed although not in common use on the Bell lines. In conclusion, Mr. Snyder emphasized the importance of a high standard of line work on the part of power companies when crossing or running parallel with telephone lines.

The Institute of Radio Engineers.

At a meeting of the Institute of Radio Engineers, held at New York City on June 3, Melville Eastham, of Boston, Mass., presented a paper on the methods of radio transmission, involving high group frequency and sending apparatus. He described a number of types of apparatus, using rotary quenching spark gaps and operating on both direct and alternating-current source of supply. A characteristic feature of the method used is that ordinarily a low-frequency alternating current or a direct current is used to produce sparks recurring at a rate above the upper limit of audibility, and the very rapid groups of electromagnetic waves thus erected are further subdivided into trains at audible frequencies. In this way it is said to be possible to secure higher over-all efficiency than by the common methods of conversion involving motor-generators.

Society for Electrical Development Offers Prizes.

The Society for Electrical Development, Incorporated, announces eight prizes for the best stories, articles or reports on any subject pertaining to commercial electricity. The competition is open to employees of members of the Society. There will be one prize of $250, one of $150, one of $50 and five of $10 each. The competition closes on September 1, 1914. Full particulars may be obtained by writing to the Competition Editor, Society for Electrical Development, Incorporated, 29 West Thirty-ninth Street, New York City.

Canadian Association to Meet.

The twenty-fourth annual convention of the Canadian Electrical Association will be held in Montreal, June 24-27, with headquarters at the Ritz-Carlton Hotel.

Local committees have been appointed and consist of the following: General Committee: Major Hutcheson and J. S. Norris, joint chairmen, and L. D. McFarlane, E. F. Sise, G. H. Olney, R. S. Kelch, R. J. Jones, J. M. Robertson, L. Herdt; Ways and Means Committee: J. C. Smith, chairman, and K. B. Thornton, J. A. Shaw, R. H. Balfour, W. F. Graves, R. F. Morkill; Entertainment Committee: L. Grant, Chairman, and A. Boyd, P. Sise, R. G. Harris, W. C. Lancaster, W. H. Winter, H. C. Post, R. Roper, Powell and R. M. Wilson; Publicity Committee: S. W. Smith, chairman, and W. J. Doherty, L. J. Belnap; Finance Committee: J. W. Pilcher, chairman, and C. F. Medbury, F. W. Smith, R. M. Wilson, L. B. Belnay. P. T Davies is honorable secretary.

A special programme has been prepared by the Entertainment Committee which is sure to appeal to all vistors. Special souvenirs have been provided for the ladies.

Municipal Electricians to Convene.

The nineteenth annual convention of the International Association of Municipal Electricians will be held in Atlantic City, N. J., September 15 to 18, with headquarters at the Hotel Isleworth. An excellent program of papers and addresses is in preparation. As usual, a fine array of exhibits will be displayed and new products demonstrated. Arrangements already made and others in hand indicate that this will be the banner convention of the Association. Special care will be given the ladies; the piers will be at their disposal with roller chairs waiting at all times. The secretary of the Association is Clarence R. George, Houston, Texas.

Memphis Electrical Exposition.

The Jovian League of Memphis, Tenn., is this week conducting an Electrical Exposition in that city, to which admission is free. The exhibit hall is 75 by 150 feet, in addition to which there is a lecture and demonstration hall 30 by 60 feet. Both interior and exterior of building are brilliantly lighted and decorated. Electrical appliances to the value of $750 are being given away as prizes.

Among interesting features of the Exposition are an electrical fountain, an electrical refrigeration plant, a wireless telegraph station, the manufacture of tungsten lamps, a street-railway demonstration, high-potential apparatus, automatic telephone system, etc.

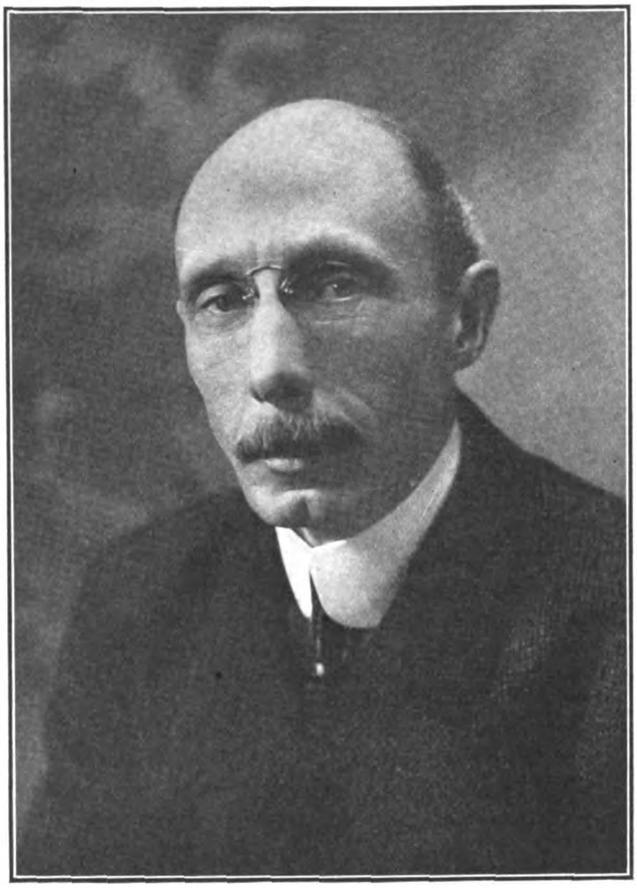
Charles Blizard.

The development of the electric storage battery is so intimately related with the development of the electrical industry as a whole, that being a part of the former development indicates an experience and contact with practically all that can be said today with respect to the commercial applications of electrical energy.

A prominent figure at every convention of electrical men where things of importance are being done, vigorous, sturdy and still a young man, Charles Blizard, the subject of this sketch, was in it when the electric storage battery first became a thing of utility and usefulness.

Mr. Blizard was born at Stevens Point, Wis., at that time a lumbering town 25 miles from any railroad. Going east he received his education at the Newburgh Institute, Newburgh, N. Y., and at the Brooklyn Collegiate and Polytechnic Institute, of Brooklyn, N. Y. His early business experience was in a financial way, and he was employed in Wall Street for about 10 years. He took charge of the affairs of the Franklin Accumulator Company in New York, in which concern a considerable amount of money had been invested in an attempt to develop an alleged new form of Planté battery. Mr. Blizard's job was to determine whether the money could be saved and if not to wind up the affairs of the concern. For two years he sold these batteries, returned to the shop and made them, installed them, and then sometimes collected the money for them. The battery was successful in line work and was adopted by the Western Union Telegraph Company to displace primary cells under certain conditions. The company spent a great deal of money and Blizard spent a great deal of time in endeavoring to successfully apply the battery to street-car propulsion, and it was used in experiments upon the P Street line in Washington, D. C. In special applications the battery was a success, but for general storage-battery use it was a failure. The company paid its debts in full and closed up shop.

Just about that time, 1893, the Electric Storage Battery Company put the chloride accumulator on the market, and Mr. Blizard became manager of its New York office. He remained in that position until 1900, when he went to Philadelphia as manager of the sales department, and was later elected third vice-president in charge of sales, the position he now holds.



Charles Blizard,
Third Vice-President of the Electric Storage Battery Company.

Strike at Westinghouse Works.

For the past two weeks the works of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, Pa., have been partly shut down on account of a strike by the employees. Prior to the strike a committee of workmen presented a petition asking the company to deal with a committee for the adjustment of all grievances arising in the plant, and stating the following as grievances already existing: (1) the reinstatement of men laid off in place of hiring new men; (2) the elimination of bonus, premium and piecework systems; (3) rotation of lay off during slack season for all employees whose temporary lay off would not hamper operations.

Vice-president Davis talked with the men but declined to grant the petition.

A newly formed labor union, known as the Allegheny Congenial Industrial Union, is conducting the strike.

With the exception of arrangements for the protection of the shops from fire and violence, the company has made no effort to push the resumption of operations, although the gates have been open every day as usual and several hundred employees have succeeded in coming in and working.

The spirit of optimism seems to prevail among the officers in regard to the strike situation, and there is a feeling that in a short time there will be a general movement to return to work on the part of a majority of their men.

On Friday of last week a number of employees of the Union Switch & Signal Company walked out at noon without presenting any reasons for so doing. The Company promptly announced that the works would be shut down until Monday, at which time the employees would be expected to return. Practically the full quota of men has now returned, and this, coupled with the unsuccessful attempt of the strikers to call out the men at the Westinghouse foundries at Trafford City, has given their cause a serious setback.

When asked as to the effect of the strike on the business of the companies, one of the officers stated that owing to the policy adopted several months ago of manufacturing goods for stock in order to provide work for its employees during the dull period, a large amount of goods, sufficient in many lines for several months' requirements, had been made and distributed to the company's warehouses in various parts of the country, from which orders have been filled daily without delay.

Utah Trade Excursion

Mention was made in our issue of June 6 of the trade excursion undertaken by the Commercial Club of Salt Lake City, Utah, into northern Utah and southern Idaho. That the electrical industry had eight representatives out of a total of seventy business men on the excursion is an indication of the importancee which the electrical industry has assumed in the business community.

The excursionists report that the electrical industry generally in Idaho is in a flourishing condition. In one of two places where competition has been particularly keen during the past several months, the companies have been brought to a standstill by the somewhat dull times, and little progress can be made until some kind of a reorganization and readjustment is effected.

The early crop prospects this year are better than they have been for several seasons, and business should open up splendidly in the rural communities as soon as the crops are assured.

Philadelphia Vehicle Association Meeting.

The regular monthly meeting of the Philadelphia Section of the Electric Vehicle Association of America was held on June 10, at The Philadelphia Electric Company's rooms, 226 South Eleventh Street, Philadelphia, Pa., Chairman R. L. Lloyd presiding. After the regular routine business was disposed of the speaker of the evening Lieutenant W. B. Mills, of the Philadelphia Traffic Squad was introduced. The subject of Lieutenant Mills' paper was "Traffic Regulations."

In growing dense populations, the question of transportation and congestion of traffic in the ever narrowing, by comparison, highways of the larger cities becomes a serious problem. Speed is ever uppermost in the minds of the people, said Lieutenant Mills, but the speed must take second place under consideration of the three points of safety of pedestrians, safety of the driver of the vehicle, and the expeditious handling of merchandise in loading and unloading.

Unidirectional traffic on narrow streets and on one side only of the broader streets has been largely adopted to great advantage, but Lieutenant Mills expects to see in the not distant future an arrangement of city streets whereby the street crossings will be on different levels so that the traffic can proceed uninterruptedly in a given direction. The parking of cars is becoming a serious problem, he said, when it is considered that office buildings now house several hundred people, many of whom use automobiles which are left outside in a convenient spot while they are in their offices. The question is now being considered whether all parking in public streets will have to be abolished.

Touching on statistics, Lieutenant Mills said that this year, so far, there have been but four accidents in Philadelphia, where formerly there were 600 during the same period. This good record is due to the improved conditions under the present regulations. As far back as Lieutenant Mills had an opportunity to look in his records there had been no accidents in which an electric vehicle took part, and he ascribed this to the facility with which the electric vehicle can be started and stopped, in case of emergency. The following gentlemen entered into the discussion: Messrs. Browning, Eaton, Metcalf, Cordner, Fredericks, Hancock, and Bartlett.

Sixty members and guests were present and everyone expressed himself as being benefited by the paper and discussion. The chairman announced that this would be the last meeting until the fall. He called particular attention to the national convention which will be held in the Bellevue-Stratford, Philadelphia, on October 19-21. Two new members have been secured since the last meeting, making the total 56 to date.

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Chicago Vehicle Association Meeting.

The June meeting of the Chicago Section, Electric Vehicle Association of America, was held in Kuntz-Remmler's Green Room on June 10. Plans were discussed for the joint picnic of the members of the Garage Owner's Association of Chicago, and the local section of the Electric Vehicle Association, on August 12. Upon the recommendation of the Executive Committee, it was decided to cast a mail ballot on the motion to change the Constitution and Rules of Procedure so as to conform with those recommended by the National Association.

G. H. Jones, Homer E. Neisz and C. F. Frayer delivered short talks on the National Electric Light Association's last convention. Mr. Jones called attention to the prominence that was given the electric vehicle at this convention, papers having been delivered on the subject by C. P. Steinmetz and W. P. Kennedy, and electric-vehicle problems and data being included in the Electrical Salesman's Handbook and the report of the committee on Non-Peak and High-Load-Factor Business.

H. Salvat called attention to some of the fine electric-vehicle records made in Chicago, quoting one case where 109 miles was made on one charge.

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Columbus Jovians Have Outing.

Columbus, O., Jovians held their third annual picnic at Buckeye Lake, about twenty miles east of the city and the favorite outdoor resort of central Ohio, on Thursday, June 11. There were 120 local electricians in attendance, and this number augmented by friends and members of families made up a large picnic crowd. The main party left at noon over the Toledo & Ohio Central Railway.

There was no formal program, but as Buckeye Lake has street-car park attractions, several hundred motor boats and an amusement pier, besides affording excellent fishing, the opportunities for having a good time were legion. An indoor ball game was played between two picked nines of Jovians. A chicken and fish dinner was served at the Sunset Club. The committee of arrangements, consisted of W. A. Hopkins, of the Erner-Hopkins Company, L. A. Sackett, of the Sackett Mill & Mine Supply Company, and A. E. Loeb, of the Avery-Loeb Electric Company.

Louisville Jovian League Organized.

At their regular June meeting a few days ago the Louisville, Ky., Jovians effected the formal organization of the Louisville Jovian League, with R. E. Brian, manager of the local office of the Federal Sign System (Electric), as president. Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company was elected vice-president, and Carl A. Klemm, manager of the local branch of the Westinghouse Electric & Manufacturing Company, secretary. The members of the Board of Directors include James Clark, Jr., statesman of the Order and president of the James Clark, Jr., Electric Company, and Capt. Walter O. Smith, superintendent of construction of the Louisville Gas & Electric Company.

The next meeting of the League will be an open air meeting to be held in July at Senning's Park, a local resort. The wives and sweethearts of the members will be in attendance and several entertainment features will be provided. The regular meetings of the League are to be held monthly at the Tyler Hotel The committee in charge of that phase of the League's activities is working on the organization of a baseball team.

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Philadelphia Jovians to Have Big Outing.

The annual outing of the Philadelphia Jovian League will be held on Saturday afternoon, June 27, at Kuglers' Roost on the Delaware (Morris Station, N. J.). The arrangements are being made by the Sports and Entertainment Committee, of which Frank P. Groves is chairman. All indications are that a fine program of baseball and other sports, together with music and dancing, and an abundance of food and liquid refreshments will be provided.

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Chicago Jovian League.

A get-together meeting of the Chicago Jovian League was held on June 15, this being the last meeting of the League until September 14. It was voted to hold a picnic some time during the summer and a committee was appointed to make the necessary arrangements. Remarks were made by Perry Boole, George C. Richards and Thomas G. Grier.

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Pennsylvania State Convention.

The next annual convention of the Pennsylvania Electric Association, which is a section of the National Electric Light Association, will be held at Eagles Mere, Pa., September 8, 9, 10 and 11. S. E. Pohe, of Bloomsburg, Pa., is secretary.

Electricity in Grain Elevators.

By H. E. Young.

This article, prepared by the sales manager of the Minneapolis General Electric Company, discusses the general advantages of motor drive for grain elevators, presenting detailed data on several noteworthy installations purchasing power from the company. Considerable valuable data are also given on the power requirements of the various machines employed in the industry.

The application of the electric motor to the handling and cleaning of grain dates back to the time when electricity first began to force itself into industrial applications, due to the wonderful economies effected by its use. It would be folly indeed to try to estimate, even roughly, the number of bushels of grain that are today handled by the electric motor, that were in the past handled by the isolated steam plant.

As far as we are aware, there has been a lack of technical data published, relative to the application of electricity in grain elevators, and the object of this article is to describe actual installations, the data from which should be of value to the power engineer whose efforts may be required in this direction. In recommending the adoption of central-station service for grain elevators, the power engineer should be amply provided with facts and figures, relative to the economy, reliability and advantages of motor drive in elevators, as only by a thorough knowledge of existing practice, combined with present tendencies in the direction of economy, can the best results be obtained.

The application of electric power is first of all an engineering problem, and especially is this true in connection with grain elevators, as each individual elevator must be considered as an entirely separate proposition, and must be handled according to its particular class of business, with consideration as to its general lay-out. In a tour of a large number of elevators in the city of Minneapolis, the grain center of the country, the similarity of drives and motor applications was conspicuous by its absence. In no case would it have been good engineering practice to consider, any more than in a general way, the individual application of any one motor and try to apply the data secured to any one particular case. In other words, each elevator must be considered as an absolutely separate problem and must be handled as such, if all the advantages and economies due to the use of electricity are to be obtained.

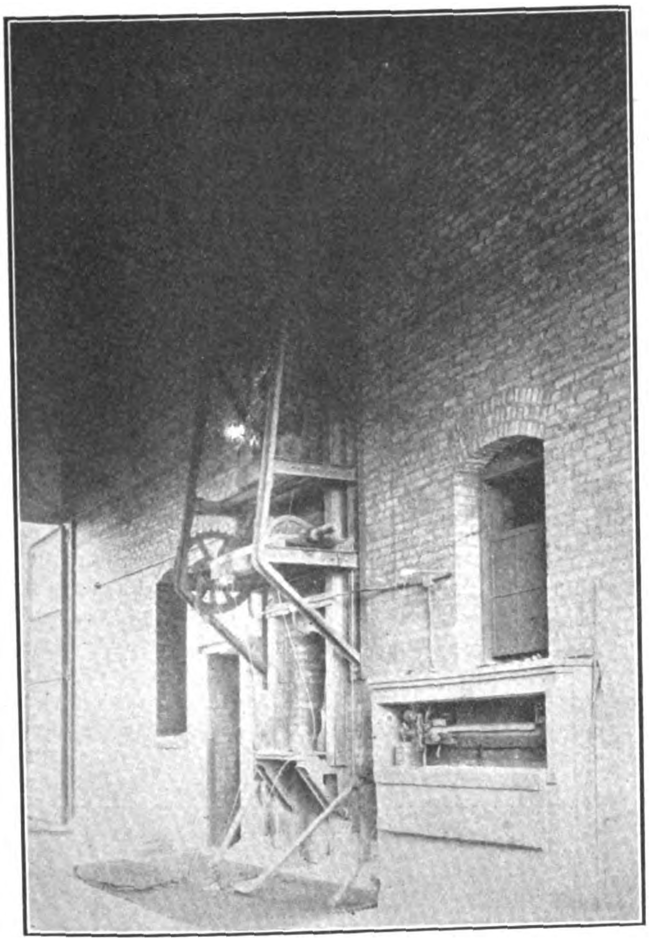

Fig. 1.—Unloading Shovel Driven by 15-Horsepower Motor.

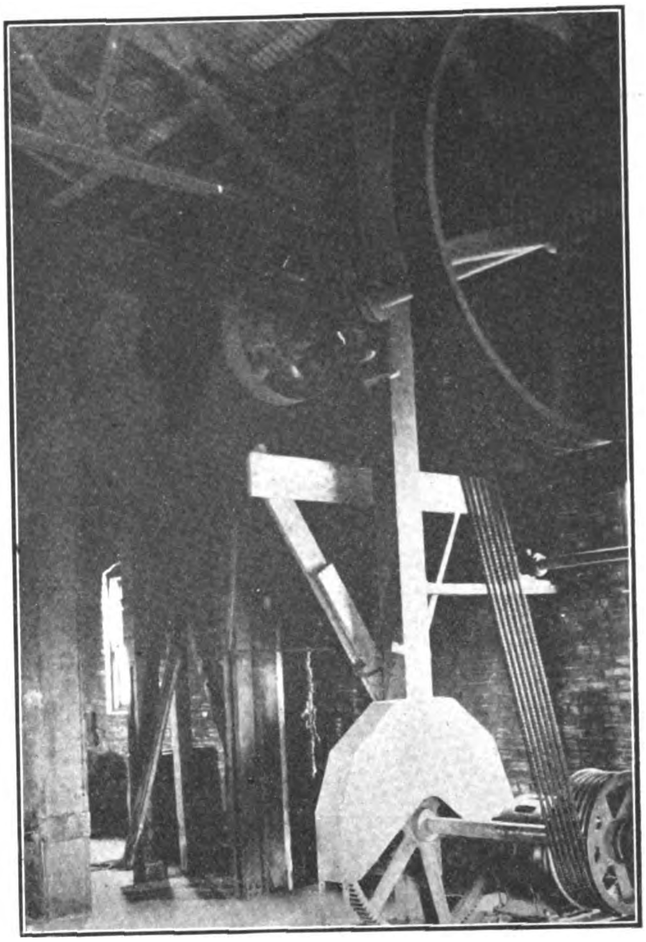

Fig. 2.—20-Horsepower Motor Driving Two Barley Cleaner Legs.

In this connection it should be mentioned that due to the difference in the condition of the various grains, when received, the lay-out of the house and the varying amounts of time devoted to cleaning and handling, it is found that the storage capacity of an elevator has no relation to the power demand, and for these reasons, it is unreliable to estimate the consumption of a given elevator, using as a basis another elevator handling a similar amount of grain.

As an example of one of the most modern elevators in the Middle West which is using central-station service exclusively, the following description, together with the accompanying views are especially interesting.

The Gould Elevator Company is an excellent example of individual drive as applied to a modern elevator, and for this particular installation, the individual drive has proved to be the most efficient.

In order to get a clear understanding as to the functions performed by the various motors used in an elevator, we shall endeavor to follow the grain from the time of its arrival to the time of its departure.

The duties of a grain elevator are to receive wheat, oats, corn, barley, etc., from cars, and to hold same in storage until required for shipment. A large percentage of elevators are equipped for the cleaning and weighing of the grain and these processes are incidental to storage.

It is well to make note at this point that many elevators operate in connection with their cleaning department, a department known as a purifying mill. This consists of the treatment of the grain with steam and sulphur fumes in order to put it in a better marketable condition. The fact that steam is needed for this process is a great aid in changing elevators from engine to motor drive, as it is not necessary to "scrap" the boiler equipment. These units being necessary for the generation of steam for the above process are still retained as a necessary part of the equipment of the plant, and also furnish steam for heating during the winter months, providing it can be done more economically than by small isolated heating units. In changing of the plants in the Minneapolis territory, the central station finds this is a very easy solution of the prejudice which naturally exists against "scraping" first-class equipment, though it is frequently necessary when the mills have not been operating purifying processes, to show that the installation of this additional machinery , necessary to put in a purifying mill is a money maker, insomuch as the main investment is represented by boilers, which has already been made.

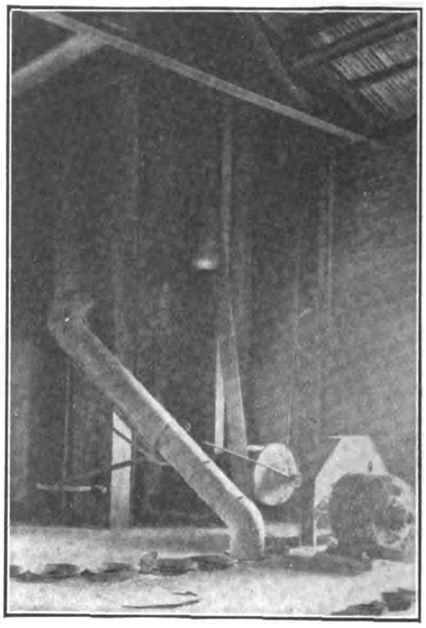

Fig. 3.—Showing Spouts by Which a Leg Can Be Made to Discharge Into Any Bin Desired.

The grain is brought to the elevator in carload lots, left in the elevator-company's siding, from whence it is pulled by means of a car puller and located directly over, the receiving hopper which is at the side of the track, level with the floor, and covered with a heaving iron grating. The boards covering the door of the car are then removed and the grain allowed to fall by gravity into the receiving hopper. Power-driven shovels are then used to clear the car of the balance of the grain that will not run out of its own accord. The shovels are usually arranged so that when pulled to the farthest corner of the car a clutch is engaged,—thus winding up the cable to which the shovel is attached—the attendant simply having to manipulate the shovel and thus clear the car.

From the receiving hoppers, the grain is raised by an endless belt, to which are attached buckets of size depending on the amount of grain to be handled. These bucket conveyors are known as elevator legs, and are used to elevate the grain to the top of the building, and there deposit it in large storage bins, by means of a conveyor belt.

The shipping of the grain is accomplished by drawing it off from the storage bins, by means of conveyor belts and screw conveyors, into the ground-floor hoppers, raising it to the top of the building by the elevator legs, and then allowing it to flow, by gravity, into the scale bins, where it is weighed. It then falls into shipping cars by the aid of spouts.

As stated above, cleaning is one of the functions incidental to the operation of an elevator. Cleaners and separators are usually located on the ground floor of the elevator proper, and here it is that such foreign matter as bits of wood, chaff, dirt and stones are removed from the grain.

A very important consideration in the handling of grain in all large elevators is the maintaining of a predetermined safe temperature, in order to prevent spoilage, due to high temperature effects. This is accomplished by keeping the grain in motion by means of the conveyor belts and elevator legs.

The squirrel-cage induction motor has proved itself to be the most suitable for elevator work. This is readily appreciated when we consider that all the machinery in a grain elevator runs at practically constant speed, and the atmosphere is constantly saturated with highly inflammable dust. The

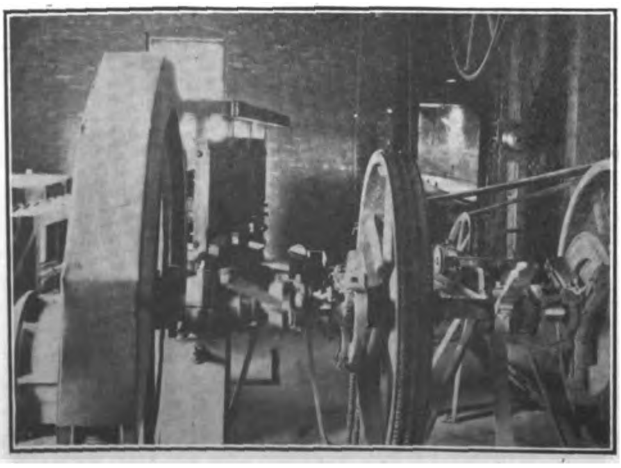

Fig. 4.—Drive for 30-Inch Conveyor Belt on Distributing Floor.

Fig. 5.—35-Horsepower Motor Driving Leg.

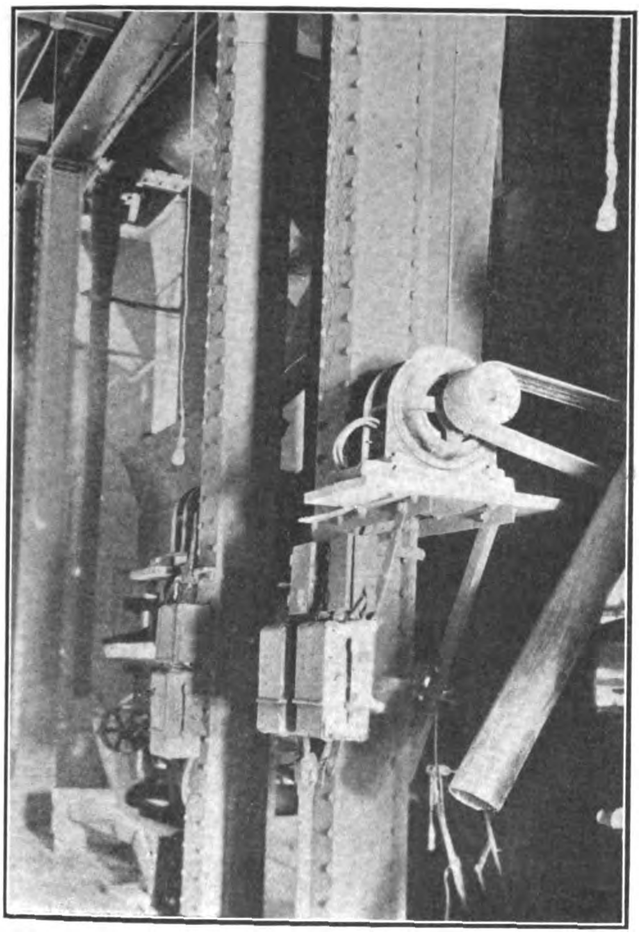

Fig. 6.—Five-Horsepower Motor Driving Barley and Wheat Separator.

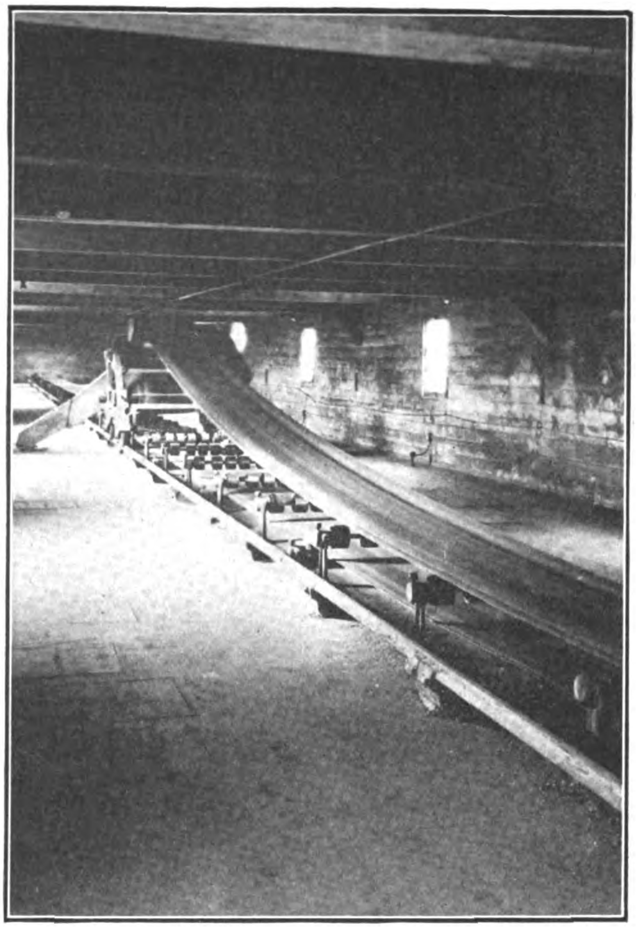

Fig. 7.—Conveyor Belt and Unloading Machine on Distributing Floor.

squirrel-cage induction motor being entirely free of any sliding contacts, eliminates all possibilities of fire, and at once commends itself for this work.

If the only power available is direct current, the motors should be of the totally inclosed type.

In the application of the electric motor to elevator machinery, the transmission is to a large extent accomplished by rope drive, due to the fact of its flexibility and its ability to transmit power in dusty locations, and without excessive slip in vertical runs.

For moving the grain from one part of the building to another, a conveyor belt is used. It is customary in all large elevators to have a conveyor belt on the top or distributing floor, by means of which the grain is transferred from the elevator workhouse to the storage tanks. This conveyor belt is so arranged that by means of a movable unloading machine the grain can be allowed to fall into any of the large storage tanks, so familiarly seen in such structures. A conveyor belt is also used for drawing off the grain from the storage tanks, when it is required for shipment, or for any other purpose. The size of the belts used ranges from twenty to forty inches in width; the speeds ranging from very low speed up to twelve hundred feet per minute. The carrying capacity is, of course, dependent upon the speed of the belt and in this connection it should be mentioned that, in order to obtain the maximum carrying capacity from belts, idle pulleys are arranged every few feet, along both sides of the belt, thus troughing the belt and allowing a much larger quantity of grain to be carried without leakage. The horsepower required to drive conveyor belts varies according to the speed, the length of run and the quantity of grain to be carried.

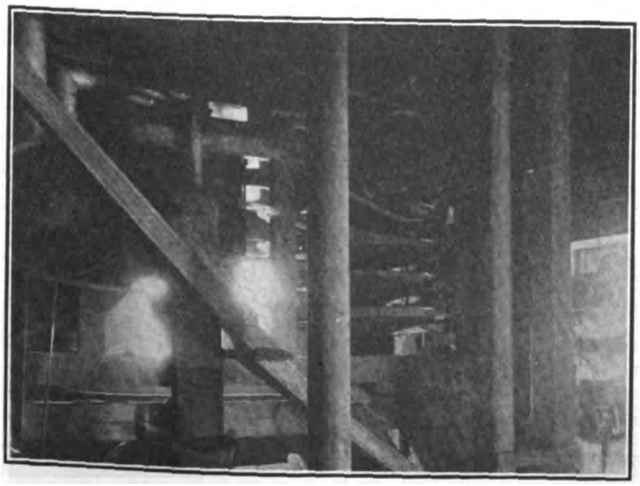

Fig. 8.—Three-Horsepower Motor Driving Mustard Machine.

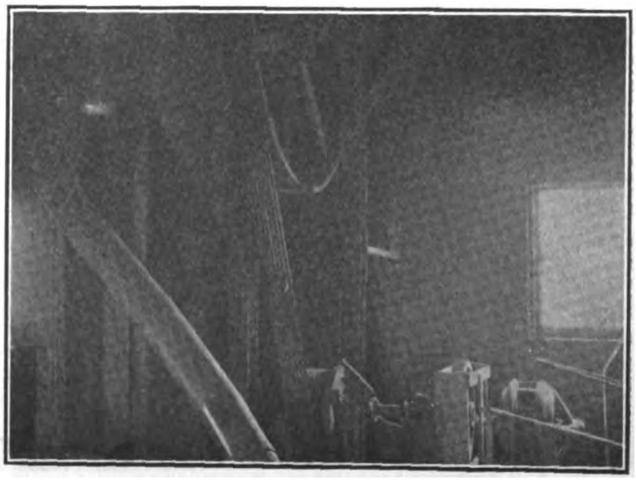

Fig. 9.—35-Horsepower Motor Driving Unloading Leg.

Grain Elevator Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Gould Elevator Company, Minneapolis. General storage and cleaning business. Storage capacity, 18 tanks, 30,000 bushels each, and 8 small tanks, 12,000 bushels each. Grain handled is mostly barley.

This plant runs cleaning apparatus 24 hours a day and load and unload for 10 hours a day. This plant handles on the average 80 cars, in and out.

Total connected horsepower, 332.5. Total number of motors installed, 19. Average kilowatt-hours per month, 7,545.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
February	5,360	June	5,800	October	7,520
March	6,400	July	6,680	November	7,960
April	4,760	August	7,360	December	11,900
May	5,600	September	8,280	January	13,100

Load-factor, 28 per cent.

MOTOR INSTALLATION.

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts. Transformed on premises to 220 volts, three-phase, by three 50-kilowatt transformers.

No.	Horsepower	R. P. M.	Application.
1	3	1,700	Driving mustard machine.
1	15	1,200	Driving barley cleaner.
1	5	1,150	Driving four screening cleaners.
1	5	1,800	Driving barley and wheat separator.
1	25	1,200	Driving transfer leg, having capacity of 8,000 to 10,000 bushels per hour.
1	15	1,200	Operating shovel on south side of building.
1	10	1,200	Operating shovel on north side of building.
1	25	1,200	Running 30-inch conveyor belt in basement, 200-foot centers.
1	5	1,800	Driving twin leg having capacity of 2,000 bushels per hour.
1	7.5	1,200	Driving short leg for barley cleaner.
1	35	690	Driving leg on north side of building. This leg has a capacity of 10,000 bushels per hour. 22-inch buckets.
1	20	860	Driving two barley-cleaner legs, each leg having capacity of 5,000 bushels per hour.
1	35	690	Driving unloading leg having capacity of 10,000 bushels per hour. 22-inch buckets.
1	35	1,200	Driving shipping leg having capacity of 10,000 bushels per hour. 22-inch buckets.
1	25	1,200	Operating 30-inch conveyor belt on distributing floor, having capacity of 10,000 bushels per hour. 200-foot centers.
1	3	1,800	Humphrey cleaner.
1	20	1,200	Operating car puller.
1	15	1,200	Operating barley cleaner having a capacity of 5,000 bushels per hour

Banner Grain Company, Minneapolis. General cleaning and storage business. Number of men employed, 4. Plant operates 10 hours per day. Storage capacity, 12 tanks, 25,000 bushels each, 75 feet high; and 5 tanks, 10,000 bushels each, 75 feet high. Grain handled is mostly wheat.

This plant handles on the average 300 cars per month, in and out.

Total connected horsepower, 85. Total number of motors, one.

Average kilowatt-hours per month, 6,258.

Kilowatt-hour consumption for following months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
April	5,180	August	5,320	December	8,960
May	980	September	8,540	January, 1914.....	8,680
June	1,400	October	10,640		
July	3,780	November	9,100		

Load-factor, 18 per cent; operating-time load-factor, 43 per cent.

MOTOR INSTALLATION

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts.

No.	Horsepower.	Speed R. P. M.	Application.
1	85	720	Belted to 40-foot shaft by 14-inch belt, driving shaft at 250 revolutions per minute. From this countershaft are driven the following: Two elevator legs, each having capacity of 5,000 bushels of wheat per hour. One 30-inch belt conveyor on distributing floor. 150-foot centers. One 26-inch conveyor belt in basement. 150-foot centers. One Monitor compound separator. One flax cleaner. One car puller. One automatic shovel. One main lift.

Grain Elevator Data—Sheet No. 2.

Merchants' Elevator Company, Minneapolis. General storage and cleaning. Mostly barley is handled. Number of men employed, 10. Storage capacity, 20 large tanks, 20,000 bushels each, and 6 small tanks, 7,000 bushels each.

Total connected horsepower, 275. Total number of motors, 8. Average kilowatt-hours per month, 32,790.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	34,320	May	16,080	September	42,000
February	34,800	June	28,320	October	48,000
March	27,360	July	30,240	November	38,758
April	15,360	August	37,440	December	40,800

Load-factor, 43 per cent.

MOTOR INSTALLATION

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,200 volts, transformed on premises to 220 volts, three-phase.

No.	Horse-power.	Speed R. P. M.	Application.
1	40	900	Drives line shaft to which is connected one 6-inch screw conveyor; one 12-inch screw conveyor; one 14-inch screw conveyor; one car puller; one automatic shovel; one sulphur pump. Belted motor.
1	50	900	Driving three legs, one 1,500 bushels per hour, one 2,000 bushels per hour and one 4,000 bushels per hour. Rope drive. Back-geared.
1	50	900	Driving three legs, one 1,500 bushels per hour, one 2,000 bushels per hour and one 4,000 bushels per hour; also one screening cleaner.
1	15	1,120	Driving No. 10 Invincible cleaner. Belted. Back-geared. Rope drive.
1	15	1,120	Driving large size Invincible cleaner. Belted.
1	30	1,120	Driving blower fan. Direct-connected.
1	20	1,120	Driving 36-inch conveyor belt; 300-foot centers. Back-geared.

Quinn, Sheperdson Company, Minneapolis. Elevator D. Business, general cleaning in transit. Number of men employed, six. Storage capacity, one tank, 50,000 bushels. Grain handled is mostly corn. Plant operates 24 hours per day. Average of 400 cars per month, in and out.

Total connected horsepower, 75. Total number of motors, 2. Average kilowatt-hours per month, 4544.

Kilowatt-hour consumption for following months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
May	3,500	August	2,000	November	5,100
June	3,600	September	3,660	December	7,380
July	3,420	October	4,460	January	7,120

Load-factor, 32 per cent.

MOTOR INSTALLATION.

The following is a list of the motors with their respective drives. The supply source is three-phase, 60 cycles, 2,300 volts. Transformed on premises to three-phase, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	50	850	Drives line shaft to which is connected one car puller; one shovel rigging; three cleaning machines; one No. 9 oat separator; one No. 8 flax cleaner; one 36-inch Richardson machine; one 30-inch conveyor belt. 75-foot centers.
1	25	900	Driving three legs. One having capacity of 5,000 bushels per hour and having 20 7-inch buckets. The other two each having a capacity of 1,200 bushels per hour, and having 10-by-16-inch buckets. Gear and rope drive.

TABLE I.—GIVING APPROXIMATE HORSEPOWER REQUIRED TO DRIVE WORM, CONVEYOR FOR GRAIN AND OTHER LIGHT MATERIAL.

Tons per hour	——Length of Conveyor in Feet——									
	10	20	30	40	50	60	70	80	90	100
5	0.19	0.38	0.57	0.76	0.95	1.14	1.33	1.52	1.71	1.90
10	0.38	0.76	1.14	1.52	1.90	2.28	2.66	3.04	3.42	3.80
15	0.57	1.14	1.71	2.28	2.85	3.42	3.99	4.56	5.13	5.70
20	0.76	1.52	2.28	3.04	3.80	4.56	5.32	6.08	6.84	7.60
25	0.95	1.90	2.85	3.80	4.75	5.70	6.65	7.60	8.55	9.50
30	1.14	2.28	3.42	4.56	5.70	6.84	7.98	9.12	10.26	11.40
35	1.33	2.66	3.99	5.32	6.65	7.98	9.31	10.64	11.97	13.30
40	1.52	3.04	4.56	6.08	7.60	9.12	10.64	12.16	13.68	15.20
45	1.71	3.42	5.13	6.84	8.55	10.26	11.97	13.68	15.39	17.10
50	1.90	3.80	5.70	7.60	9.50	11.40	13.30	15.20	17.10	19.00

Grain Elevator Data—Sheet No. 3.

TABLE II.—CARRYING CAPACITY OF THE STEEL GRAIN BUCKET.

Size.	12 in. apart. Speed 200 ft. per min. Bushels per hour.	12 in. apart. Speed 300 ft. per min. Bushels per hour.	12 in. apart. Speed 500 ft. per min. Bushels per hour.
5x4	250	371	625
6x4	275	412	687
7x4.5	500	637	1,062
8x5	600	900	1,500
9x5	650	1,012	1,687
10x5.5	850	1,275	2,125
11x6	1,105	1,725	2,875
12x6	1,300	1,950	3,250
14x6	1,600	2,400	4,000
20x6	2,275	3,412	5,687

TABLE III.—NUMBER OF CUBIC FEET OF MATERIAL DELIVERED IN AN HOUR BY DIFFERENT WIDTHS OF TROUGHED CONVEYING BELTS TRAVELING AT THE SPEED OF 100 FEET PER MINUTE.

750 feet per minute is not an extraordinary speed for grain-carrying belts.

Width of belt.	Capacity in cubic feet.	Capacity in bushels.	Width of belt.	Capacity in cubic feet.	Capacity in bushels.
12 in.	187	150	26 in.	880	707
14 in.	255	200	28 in.	1,020	820
16 in.	333	265	30 in.	1,170	940
18 in.	413	332	32 in.	1,333	1,117
20 in.	521	418	34 in.	1,505	1,210
22 in.	630	506	36 in.	1,687	1,355
24 in.	750	602			

TABLE IV.—SPEED OF ELEVATOR BELTS

Elevators carrying grain will discharge well if run at the speed given in table below, if the elevator head is properly constructed.

Diameter of head pulley, inches.	Revolutions per minute.	Speed of belt in feet.	Diameter of head pulley, inches.	Revolutions per minute.	Speed of belt in feet.
24	37 to 42	232 to 263	48	31 to 36	389 to 452
30	35 to 40	275 to 314	54	30 to 35	424 to 494
36	33 to 38	311 to 358	60	29 to 34	455 to 534
42	32 to 37	351 to 406	72	28 to 33	527 to 622

TABLE V.—APPROXIMATE HORSEPOWER REQUIRED TO DRIVE WORM CONVEYOR, FOR HEAVY MATERIAL.

Tons per hour.	——Length of Conveyor in Feet——									
	10	20	30	40	50	60	70	80	90	100
5	0.33	0.66	0.99	1.32	1.65	1.98	2.31	2.64	2.97	3.30
10	0.66	1.32	1.98	2.64	3.30	3.96	4.62	5.28	5.94	6.60
15	0.99	1.98	2.97	3.96	4.95	5.94	6.93	7.92	8.91	9.90
20	1.32	2.64	3.96	5.28	6.60	7.92	9.24	10.56	11.88	13.20
25	1.65	3.30	4.95	6.60	8.25	9.90	11.55	12.40	14.85	16.50
30	1.98	3.96	5.94	7.92	9.90	12.28	13.86	15.84	17.82	19.80
35	2.31	4.62	6.93	9.24	11.55	13.86	16.17	18.48	20.79	23.10
40	2.64	5.28	7.92	10.56	13.20	15.84	18.48	21.12	23.76	26.40
45	2.97	5.64	9.81	11.88	14.85	17.82	20.79	23.76	26.73	29.70
50	3.30	6.60	9.90	13.20	16.50	19.80	23.10	26.40	29.70	33.00

TABLE VI.—HORSEPOWER AND CAPACITY OF INVINCIBLE OAT CLIPPER.

Size No.	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	60	90	120	160	200	400	600	800	1,200	1,500
Est. h. p.	6	7	9	9	10	12	15	25	40	48

TABLE VII.—HORSEPOWER AND CAPACITY OF DUSTLESS DOUBLE RECEIVING SEPARATOR.

Size No.	0	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	50	100	200	300	500	750	1,000	1,250	1,500	1,750	2,000
Est, h. p.	2	2.5	3	4	5	6	7	8	10	12	15

TABLE VIII.—HORSEPOWER AND CAPACITY OF COMPOUND SHAKE DUSTLESS DOUBLE RECEIVING SEPARATOR.

Size No.	0	1	2	3	4	5	6	7	8	9	10
Bu. per hr.	50	100	200	300	500	750	1,000	1,250	1,500	1,750	2,000
Est. h. p.	2	3	4	5	6	7	8	10	12	15	18

An approximate formula that can be used for obtaining the power required for conveyor belts, when fully loaded is as follows: Figure 0.6 horsepower for each 100 feet run, per 1,000 bushels of wheat per hour. To this, add from 15 to 25 per cent for friction, depending on the length and speed of the belt. This figure is for horizontal runs, and proper additions must be made in the event of inclined runs.

The following formula may be used to obtain the power required by a screw conveyor: 1.5 horsepower per 100 feet of conveyor belt, per 1,000 bushels per hour. Add 25 per cent for friction losses.

Elevator legs, as mentioned above, consist of an endless belt, to which are attached buckets, the size of which depends on the amount of grain to be handled. Their function is to carry the grain from the receiving hoppers to the top of the building, from which point they can be placed in any of the storage bins, by means of movable spouts. The speeds commonly used in connection with elevator legs vary from 200 to 500 feet per minute, with the capacity ranging from 250 to 6,000 bushels per hour, depending on the spacing of the buckets, and the speed of the belt. Elevator legs are also used for supplying the various cleaners and separators, the only difference being that they are much smaller than the large legs used in unloading and shipping. Table No. 6 shows the size of head pulleys in common use on elevator head shafts, together with the revolutions per minute of head shafts, and the corresponding belt speeds in feet per minute.

It is very important that the elevator operator have some way of knowing the true condition of the grain stored, and this without useless turnings. In this connection, mention should be made of the Zeleny thermometer system, which is used in no less than a dozen elevators in the city of Minneapolis, and a large number of other elevators throughout the country. The principle employed in the Zeleny thermometer system is the thermoelectric couple, wherein an electromotive force is produced whenever two dissimilar metals are in contact, and this electromotive force changes in strength with the change in temperature.

From this, it is readily seen that, as these thermoelectric couples are placed every 5 or 10 feet throughout the various storage tanks, the elevator operator knows at all times the exact condition of the grain stored in each bin, for if there is any heating, or the least variation in temperature, it is detected instantly by simply noting the reading instrument, thus eliminating any chances of his allowing it to spoil, as well as saving the cost of turning the grain when it is not necessary.

Referring now to the accompanying views of the Gould Elevator in Minneapolis, we are presented with an excellent example of a modern elevator and the application of electric drive.

Fig. 1 shows the receiving hopper, covered with a heavy iron grating and a 15-horsepower motor for operating a pair of unloading shovels, as described in a previous paragraph. The scales are also shown in this picture for weighing all cars both in and out.

Fig. 2 shows the gear and rope drive for an elevator leg, which has proved to be the most suitable arrangement for this class of work. Fig. 2 also shows this common method of drive and shows clearly how the grain is deposited into the desired bin by means of a movable spout.

In Fig. 6 we see a good construction for mounting a motor, driving cleaning apparatus, when same is not driven from a line shaft. The starter is seen located immediately below the motor.

Fig. 7 shows the 30-inch conveyor belt, together with the unloading apparatus for placing the grain in the different tanks. As shown, this machine runs on rails and can be placed in any position desired. Fig. 4 shows the method of drive for this belt, and the 25-horsepower motor used.

It might be well to mention that the power engineer should always keep in mind the wisdom of co-operation between the manufacturer and the central station, before deciding upon a definite piece of apparatus, for there is no doubt the manufacturer being in touch with changing conditions and operating requirements of similar applications can be of valuable assistance in arriving at the most satisfactory and efficient arrangement for all concerned. In spite of the fact that electricity has brought about a new power era, it often happens that the prospective user is entirely unfamiliar with the apparatus and engineering features involved, as well as the advantages and economies which will result from its introduction. This is where co-operation will produce the greatest benefits, not only in increased commercial prosperity of the central station, but also in a betterment of the general welfare of the community.

No. of elevator	Grain handled	Bushels handled per year	Class of business	Bushels per K. W. H.
1.	Mostly barley	6,100,000	Cleaning and storage	15.5
2.	Mostly barley	3,000,000	Cleaning and storage	33
3.	Mostly wheat	1,000,000	Cleaning and storage	45
4.	Mostly corn	1,250,000	Cleaning and storage	47
5.	Mostly corn	2,500,000	Cleaning and storage	41
6.	Mostly wheat	886,000	Cleaning and storage	50

The foregoing table contains data on the operation of six elevators located at Minneapolis, purchasing power from the local central station.

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Electric Club of Chicago.

At the meeting of the Electric Club of Chicago held on June 11, Arthur H. Ford, professor of electrical engineering at the University of Iowa, made an address on "The Supply of Power to Constant-Current Circuits." He first explained the characteristics of series circuits and showed how their simplicity and economy of wiring and ease of control made them practically universal in American street-lighting practice. Since these circuits are almost invariably of the constant-current type, they must include not only an automatic cutout at each lamp to maintain continuity of the circuit but they must have provision for variable voltage at the source to accommodate variation in number of lamps burning.

At first the supply of power to series lighting circuits was obtained from direct-current arc machines, but the operating troubles of these have caused their almost complete substitution by alternating-current generating equipment. Since the latter is invariably of the constant-potential type, some form of transformer is usually employed to obtain constant-current regulation. At first series transformers to whose secondaries the lighting circuits were connected, were used; these are suitable only for incandescent lighting. Constant-current transformers for either arc or incandescent circuits give the best possible regulation from full load to short-circuit, but are rather expensive in first cost. Transformers with large leakage paths give approximately constant current over a limited range and are serviceable for incandescent lighting; their power-factor is not very good, however. The fourth type is the leakage transformer with a number of potential taps. This has the advantage over the preceding type in an adjustible range of regulation and improved power-factor. It is much cheaper than the constant-current transformer and on incandescent circuits gives all the regulation usually needed. Since series arc lamps are more and more giving way to series incandescent lamps, especially tungsten lamps, the constant-current transformer will gradually be retired also, in Professor Ford's opinion, because its additional expense will seldom be warranted.

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The production of coal in Alabama in 1913 was 17,678,522 short tons, valued at the mines at $23,083,724.

Commercial Practice Management, Rates, New Business

Important Rhode Island Power Contract.

The Rhode Island Power Transmission Company, a subsidiary of the New England Power Company, has closed a contract with the Blackstone Valley Gas & Electric Company, by which the latter will purchase a large amount of hydroelectric power from the former.

The Blackstone Valley company will distribute the hydroelectric current throughout the territory which it serves in Rhode Island, the current being generated at the New England Power Company's plants on the Deerfield River and the Connecticut River Power Company's plants on the Connecticut River. The contract is similar to that made by New England Power Company with the Narragansett Power Company but with some changes due to difference in conditions in the territories of the two distributing corporations.

Except in times of low water in the rivers, when additional power may be required, the steam plants of the Blackstone Valley company will be held in reserve, but the contracts provide for an interchange of power, by which the steam plants may be used to help out the hydroelectric plants when necessary. The hydroelectric power will soon be available.

Chattanooga Sign.

The Tennessee Power Company is donating current to illuminate a large civic sign recently painted under the auspices of the Chattanooga Chamber of Commerce on a conspicuous wall in the business district of that city. The sign is 35 by 100 feet in size, and is lighted at night with a 2,000-candlepower nitrogen-filled Mazda lamp, mounted in a concentrating reflector. The reflector is installed on the roof of an adjacent building and the entire surface of the sign is brilliantly illuminated. The sign is believed to be the first of its kind ever established to advertise a city. Several concerns donated work or material so that although the completed project represents about $500, it did not cost the Chamber of Commerce anything. Proprietors of "The Electric Shop" did the wiring and electric installation. The following Chattanooga Jovians participated in the project: F. W. Hoover, L. J. Wilhoite, P. J. Kruesi and P. W. Curtis, of "The Electric Shop."

Residence-Service Campaign of the Commercial Section, N. E. L. A.

The residence-service advertising campaign, prepared by the Commercial Section of the National Electric Light Association for distribution among members, is now ready for the use of member companies. It seems that this residence-service advertising campaign fills a field that has hitherto been somewhat neglected.

The Commercial Section was organized four years ago, and has grown from a membership of less than 200 to a membership which will probably exceed 2,000 before the end of the current month. The object of the Section, as stated in its Constitution, is "To aid in every way possible the development of the central-station sale of electricity for light, heat, power and other uses." The constructive and valuable publicity work created by the Section in pursuit of this object is directly responsible for its present position as one of the most aggressive, important and powerful sections in the Association. One has only to glance over the report of the Merchandising and Advertising Committee, the Electrical Salesman's Hand Book and the new Residence Service Campaign, in order to realize how thoroughly the Commercial Section is living up to the promises implied in its Constitution.

Many central-station managers who realize today what splendid opportunities are lying neglected in the disproportionately large amount of unconnected business in their territories are pondering these three troublesome questions:

(1) "How shall I increase the efficiency of my salesmen?" (2) "What are the best advertising methods for increasing the sale of current-consuming appliances?" (3) "How shall I get my unconnected 'prospects' down to the irreducible minimum?"

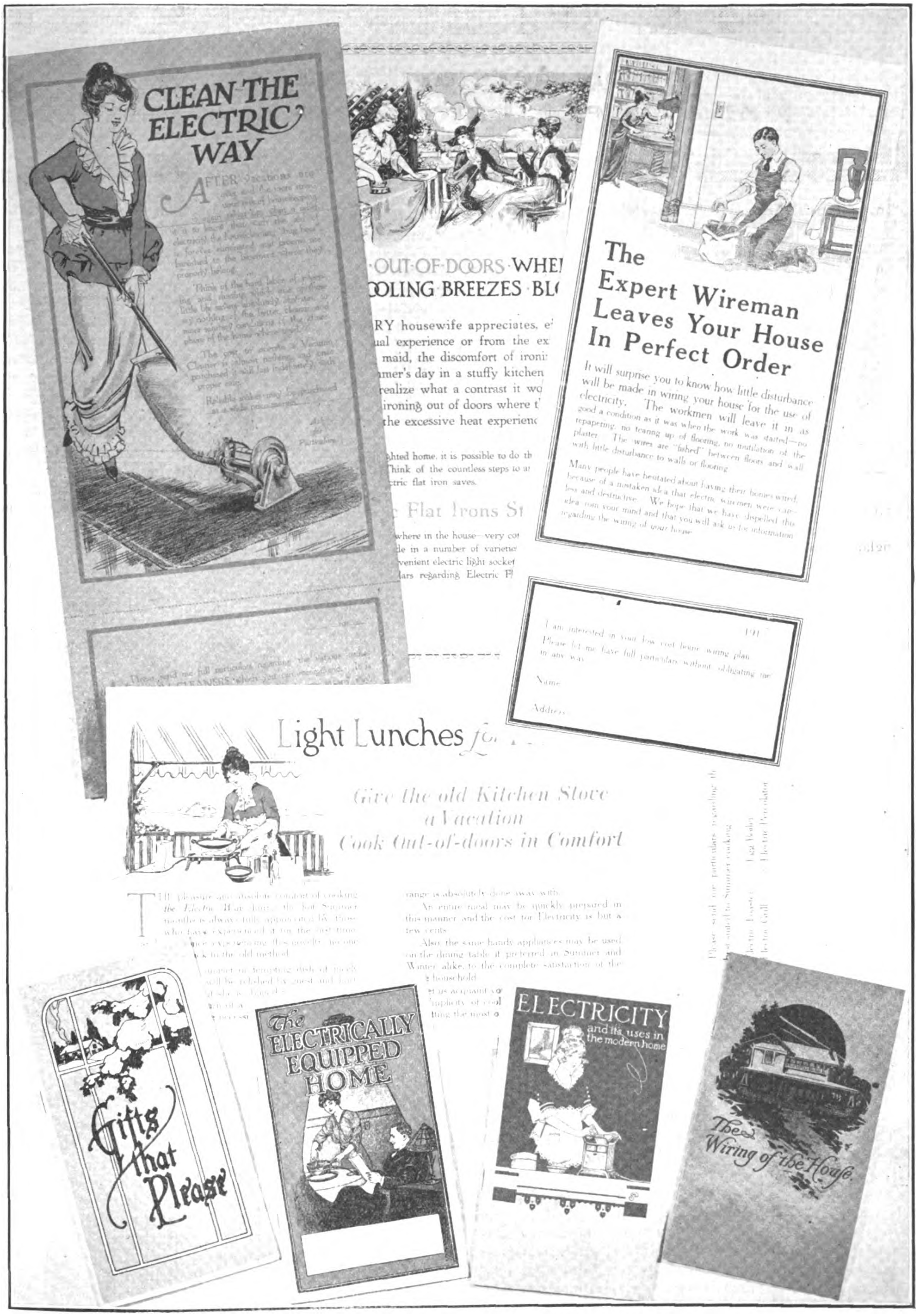
No more significant indication of the tremendous value of the Commercial Section's education work can be found than in its convincing answers to these three questions, as set forth in the Salesman's Hand Book, the Report of the Merchandising and Advertising Committee, and the Residence Service Campaign.

During the last three years, in answer to a widespread demand for "business-getting" booklets, the Commercial Section has issued eight or ten booklets aggregating upwards of half a million copies, through its Publications Committee.

Only a few months ago, however, it was realized that the most pressing need of the hour among member companies was a hammer-and-tongs residence-service campaign that would enable commercial managers to keep everlastingly after their unconnected residence prospects with rapid-fire publicity matter, covering a period of at least one year. Work was at once started on the preparation of this campaign, the first edition of which is now in press.

This service comprises 13 separate pieces of advertising literature, including snappy, suggestive booklets, mailing folders, and fac-simile letters with return cards, designed to cover a maximum period of twelve months, or to be mailed twice a month if necessary, space being provided on each piece of printed matter for the imprint of the local company making use of this service. The scheme is so flexible that large companies having their own advertising departments will find that this service may be dove-tailed into their existing or prospective new-business campaign with the greatest ease and with the most gratifying results. Other companies who may lack the facilities of an advertising department, or who can hardly afford the expense of employing advertising experts to build up special campaigns, will find this residence-service campaign a wonderfully effective and inexpensive solution of one of their most difficult problems in new-business work.

It is perhaps hardly necessary to add that this material has been prepared under the supervision of some of the leading advertising managers of the central-station industry,—men who are experts in this particular line of work and whose concentrated craft and experience in the gentle art of rounding up and corralling the prospective customer have been gratuitously contributed in the preparation of this campaign. Member companies of the Association are offered this service at actual production cost plus a small percentage to cover necessary overhead expense.


CLEAN THE ELECTRIC WAY
OUT-OF-DOORS WHE
OLING BREEZES BL
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Gifts that Please
The ELECTRICALLY EQUIPPED HOME
ELECTRICITY and its uses in the modern home
The Wiring of the House

RY housewife appreciates, e
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maid, the discomfort of ironi
mmer's day in a stuffy kitchen
realize what a contrast it wo
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Think of the countless steps to a
ctric flat iron saves.

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le in a number of varietie
venient electric light socke
lars regarding Electric F

The Expert Wireman Leaves Your House In Perfect Order

It will surprise you to know how little disturbance will be made in wiring your house for the use of electricity. The workmen will leave it in as good a condition as it was when the work was started—no repapering, no tearing up of flooring, no mutilation of the plaster. The wires are "fished" between floors and wall with little disturbance to walls or flooring.

Many people have hesitated about having their homes wired, because of a mistaken idea that electric wiremen were careless and destructive. We hope that we have dispelled this idea from your mind and that you will ask us for information regarding the wiring of your house.

191

I am interested in your low cost house wiring plan. Please let me have full particulars without obligating me in any way.

Name

Address

Give the old Kitchen Stove a Vacation Cook Out-of-doors in Comfort

range is absolutely done away with.

An entire meal may be quickly prepared in this manner and the cost for Electricity is but a few cents.

Also, the same handy appliances may be used on the dining table if preferred, in Summer and Winter alike, to the complete satisfaction of the household.

Literature Prepared for Residence Campaign by Commercial Section, National Electric Light Association.

Louisville Tannery Changes to Central-Station Power.

Thorough satisfaction with electricity as the motive power in one department of the tannery of William Schuff & Company, in Louisville, Ky., has resulted in the decision of the company to electrify the whole plant, and that improvement will be begun at once. Some time ago the company added a cutting department to its plant, in which the tanned hides are cut into blocks. It happened that the steam power equipment then in use was not adequate to the increased requirements, so electric motors using central-station current were installed. So completely did the new power meet the requirements that electrification of the whole plant was decided on and will be done gradually. Current for all operations in this case will be obtained from the Louisville Gas & Electric Company. The Schuff Company, which has need of much hot water in its operations, will continue to use its furnaces and boilers but will discard the steam engine. In most cases the plant will be equipped on the individual-drive system and the requirements will call altogether for about 250 horsepower.

In this connection the American Oak Leather Company's Louisville plant will soon dispose of its steam-drive apparatus in favor of electricity, which it will generate, however, at its plant. Bids have been advertised for and the contract is to be let soon at the Cincinnati, O., office.

◆

Central-Station Supply for Kentucky Coal Companies.

Central-station current is to be furnished before the end of the summer by the Kentucky Utilities Company to the coal-mining operations of the Wallings Creek Coal Company, the Clover Fork Coal Company and the Harlan Coal Mining Company, each of which has heretofore operated its own plant. The motor-generators for the mining companies will be furnished by the Westinghouse Electric & Manufacturing Company. The Kentucky Utilities Company, which has headquarters at Lexington, wil run a transmission wire into the section in which the mines are located, and it is expected, will get a lot of similar additional business.

◆

Slogan Sign for Pittsfield.

The Pittsfield Electric Company, Pittsfield, Mass., purposes to erect a large slogan sign in that city, and has been conducting a contest to determine upon a slogan. A committee of the Board of Trade was unable to decide upon a choice out of the 400 suggestions received, so submitted four of them to a popular vote. These were: "Pittsfield—Active, Attractive;" "Pittsfield—Heart of the Berkshires;" "Our Field, Your Field, Pittsfield;" "Pittsfield—Our Town."

Two prizes, of $10 and $5 respectively, were offered to the originators of the most popular slogans.

◆

"Safety First" Organization in Southern Indiana.

The employees of the United Gas & Electric Company, the Insull utility company which serves New Albany and Jeffersonville, Ind., and surrounding towns, are enrolled in the "Safety First" organization of the Insull properties in southern Indiana. Some 400 men altogether are members of the four divisions, one of which includes the shop men, another the train men, the third the electrical, gas and track construction men, and the fourth the other employees of the Gas & Electric Company. Heretofore the men have been loosely organized, holding quarterly meetings under the direction of the officers of the companies, but now the men are directly organized. Committees from each of the four divisions will work through a general committee, which is composed of the heads of the four organizations, and this general committee will take up recommendations and suggestions with the officials.

◆

Brooklyn Company Signs Million-Dollar Contract.

The Edison Electric Illuminating Company of Brooklyn has signed a contract with the American Manufacturing Company, the largest maker of bagging and cordage in the world, whereby the company will discard its 5,500-horsepower isolated plant and use central-station service. The contracted load was for 4,000 kilowatts, the guarantee being for not less than 3,000 kilowatts of demand, not more than 15 per cent of which is to come upon the peak. It involves a change from direct-current motors to three-phase 25-cycle motors, and the scrapping of a $300,000 plant. The change-over will require an outlay of approximately $80,000, and the contract, which is made for a term of years, will give the Brooklyn Edison company a gross aggregate income of between $1,000,000 and $2,000,000. To secure the contract required a trip to London, where the consulting engineers of the American Manufacturing Company are located, and a change in the regular labor schedule of the concern, which employs 2,000 men in its Brooklyn mills. The consumer agreed to close during November, December, January and February at 4:30 in the afternoons instead of 5:30, making a radical change in its labor schedule to take advantage of the central-station contract, which is one of the largest covering strictly electrical service ever written.

Virginia Power Company's Plant Opened.

More than 200 bankers, coal operators and other interested business men from New York, Boston, Philadelphia, Baltimore, Cincinnati and other large cities were present last week when the Virginia Power Company's big hydroelectric power plant at Cabin Creek Junction was placed in operation. The plant has a capacity at present of 26,666 horsepower, but additional units bringing its power up to 166,000 horsepower are to be placed later. The company has strung 125 miles of copper transmission lines on steel towers carrying current to numerous mining plants in that section, at an expenditure of $3,000,000. The Cabin Creek Junction plant was opened under the supervision of Chief Engineer G. O. Lenz. The company has practically completed arrangements for another plant near Hinton, on the New River, the project depending at present on the consent of the West Virginia Public Service Commission to the construction of a dam in the stream.

◆

Louisville Power-Plant Extension.

The addition to the water-front power station of the Louisville, Ky., Gas & Electric Company, which was begun some time ago and which will involve the expenditure of $500,000, has reached the state where it is ready for the steel work. The buildings will be of steel, concrete and brick construction and will take the place of the old offices of the Kentucky Electric Company, which was merged into the new concern. The present capacity of the plant is 5,000 kilowatts, while contracts are now outstanding for the installation of two additional 5,000-kilowatt turbines. One feature of the improvements will be the new coal bunkers which will connect with the elevated trestle of the Illinois Central Railroad in such a manner that they may be filled directly from the dump cars.

The plan of the company is eventually to generate all its electricity at the water-front plant, retiring the old plant of the old Louisville Lighting Company little by little.

◆

Central-Station Supply for Isolated Plants in Summer.

A feature of the summer business of the Louisville Gas & Electric Company is furnishing large private plants with their current for lights and fans. The latest additions to the list this season are the Galt House and the Herman Straus & Sons Company department store in Louisville, Ky. In the winter both these concerns operate their own electric plants in connection with their heating plants.

Electric Sign Data

Electric Sign Campaign in Denver.

The Denver Gas & Electric Light Company is conducting a very effective newspaper campaign in the interest of electrical advertising. A series of newspaper advertisements are being published, calling attention to the value of electric signs as an advertising medium and reproducing illustrations of prominent Denver signs. The advertisements are three columns wide and 17 inches deep. Each carries a testimonial from the head of the concern using the electric sign pictured in the advertisement.

The following is the copy used in one of the advertisements, that referring to the Knight-Campbell Music Company's installation.

The Knight-Campbell Music Company is a confirmed believer in the trade-getting power of lights. Their new electric sign is one of the largest and brightest in the city. The perfect window illumination attracts the attention of everybody and every part of the interior is effectively illuminated. The entire lighting scheme has a powerful advertising force, because it is artistic, unique and original.

Does this kind of advertising pay? Does it give a good return on the investment? Read the firm's letter:

The Denver Gas &
Electric Co.:

Gentlemen — No one who has seen our new electric sign can doubt for a moment but that the Knight-Campbell Music Company places the highest possible confidence in the business-getting qualities of electric-sign advertising.

The new sign is one of the largest in Denver, and, because of its great size and unique design, featuring as it does our trade-mark, the well known "Knight" and the "Campbell," has already gained us a great deal of beneficial publicity.

Our specially designed window and store lighting is another source of direct profit to us. So effective is this illumination that a person passing in front of our store can readily see the most delicate blending of colors in the woodwork of our fine pianos and victrolas. Very truly yours,

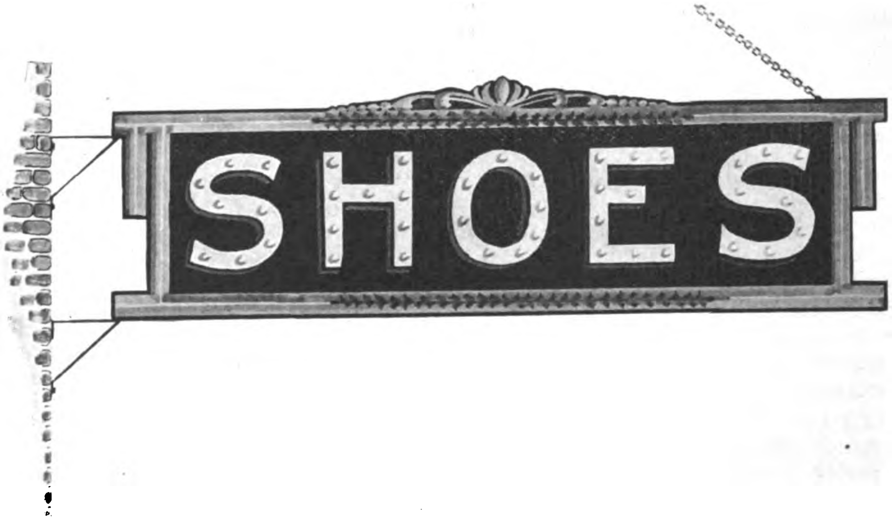
Current at the rate of $600 a year will be required to operate the big electric sign which will be erected in front of the Vienna Bakery & Restaurant in Louisville, Ky. The sign, which is to be a vertical one, will measure 35 feet in height, will have a double face and will burn 558 five-watt lamps. There will be numerous special flashing features and 32 special different color combinations will be displayed every minute the sign is in operation. The Greenwood Sign Company, of Knoxville, Tenn., is building the sign and the Miller Sign Company, of Louisville, will hang it.

The Union Pacific railroad system is planning to erect two large electric signs in Salt Lake City, Utah. One of them will be placed on the top of the Oregon Short Line Union Station and will cover the entire space on the roof. It will contain the words "Union Pacific System" and the trade-mark of the railroad, together with an ornamental border. The second sign will be placed over the freight house in the yards. It will contain the words "Union Pacific System" and a reproduction of a locomotive.

Contracts for the first two Kaleidoscope electric signs in Louisville, Ky., have just been closed with the Bensinger Outfitting Company, a house-furnishing concern on Market Street near Fourth, and the Vienna Bakery & Restaurant, on Fourth Street, north of Market. The signs will be put up by the Greenwood Advertising Company, of Knoxville, Tenn., while the current will be supplied by the Louisville Gas & Electric Company, the representatives of which are credited with having landed the contracts. Both of the signs will be vertical affairs, to hang in front of the houses and over the sidewalks. Each will take 500 five-watt lamps.

The Trumbull Public Service Company at Warren, O., has recently erected a "Do It Electrically" sign in front of its office. It is a vertical sign, the height of the building, operating on a flasher. The building in which the company's new office appears, has been called the Electric Block, and an electric sign, 4-foot letters, reading "Electric Block," has been installed on the roof.

An interesting incident of the big sign campaign which is being carried on by the Toledo (Ohio) Railways & Light Company is the sale of a good size display to the Toledo Public Library. This is a sign bearing the single word "Library" and makes just one more step in the universal adoption of the sign that is always on duty by night as well as day.



Sign sketch contributed by the Greenwood Advertising Company, Knoxville, Tenn.

Dimensions of sign are 9 feet by 2.5 feet. The letters are 16-inch raised, plain block type. Background of sign is glass smalt.

Receptacles are provided for 84 five-watt lamps and any flasher effect desired can be obtained. Sign is double faced.

Approximate price, $70.

Electrical Construction

ELECTRICAL INSTALLATION IN HOTEL GIBSON.—I.

Details of Power Plant.

This article describes the electrical installation of a large modern hotel. This, the first installment, describes the details of the power plant and power apparatus. The second installment will describe the methods employed in wire-shafts and floor-circuit construction.

The modern hotel stands in strong contrast to the large hotels of a decade ago. The travelling public demands the most modern conveniences—conveniences which necessitate the building of hotels that are in themselves almost equivalent to a small city in that under one roof must be contained a complete power plant for heating purposes and often for lighting purposes, a complete refrigerating plant, a water-supply installation, a laundry, a repair room, a complete telephone exchange, a clock system, a fire-alarm system, elevators, dumbwaiters, etc. In addition to these modern conveniences many of the larger hotels contain a number of large assembly rooms, a stage and numerous stores. All of these innovations have been rendered possible by the advances made in the various sciences during the period mentioned. Among these sciences that of electricity holds a prominent place, in that the modern hotel would be an impossibility without its use. The electric-wiring installation of a modern hotel is hence one of no mean proportions, as the applications of electricity in such a hotel are numerous and of varied nature.

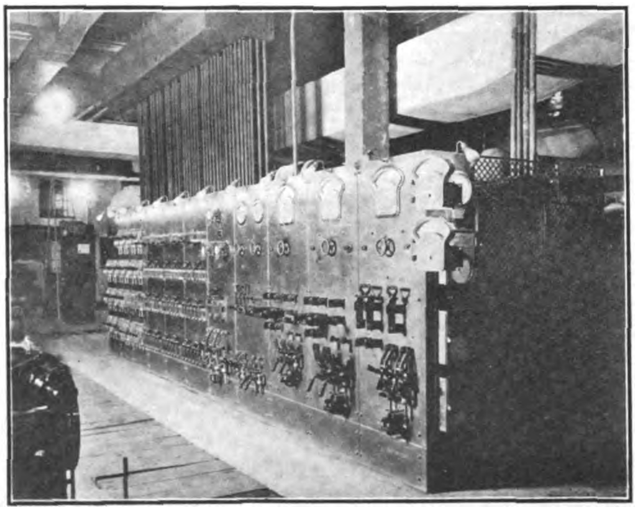


Fig. 1.—Front of Main Switchboard.

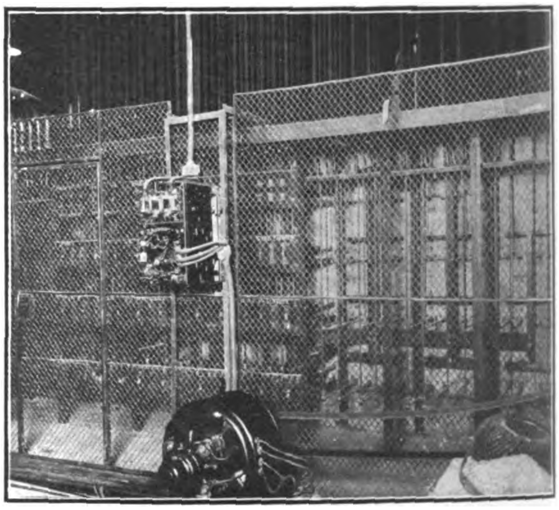


Fig. 2.—Rear of Main Switchboard.

This article is devoted to the electric installation in the new Hotel Gibson, Cincinnati, O. This is a twelve-story building with two basements and an attic. In the sub-basement is installed a complete isolated generating plant and a service connection with the mains of the City Gas and Electric Company, of Cincinnati. In this basement are located many of the power applications, all of which are supplied with 220-volt direct current.

Among the motor installations, that of the ventilating equipment is prominent. This ventilating system, which was designed by Bert L. Baldwin & Company, supplies purified and cooled air to the engine room, boiler room, barber shop, billiard room, grill room, banquet halls, private dining rooms and first and mezzanine floors. The ventilating ducts on the ceiling of the engine room are well insulated so as to prevent a reduction of temperature of the air passing through the ducts. Three separate sets of ventilating apparatus are employed, each of them having a 10-horsepower motor-driven fan and a motor-driven circulating water pump for the water span which cools and cleanses the air. When desirable this water is ice-cooled in order to cool the air in the ventilating ducts.

The bed rooms and baths are ventilated by means of vertical flues, with large motor-driven fans located in the attic.

In the basement are located two 20-horsepower Fairbanks-Morse motors driving house pumps through triplex gears, a 12.5-horsepower and a two-horsepower Triumph motor driving brine pumps, a five-horsepower Robbins and Myers motor belted to line shafting driving ice-cutting, ice-chopping and ice-cubing machines, two five-horsepower Crocker Wheeler motors driving a sewage-disposal plant and various miscellaneous motors. Cutler-Hammer controllers and control panels are used for controlling all motors. The master clock of an extensive electrically controlled clock system is also located in the basement. This clock is in an air-cooled and air-tight case. Among the other power installations are four passenger elevators, two freight elevators, one baggage elevator, two automatic dumbwaiters, motor-driven laundry machinery and numerous fans.

Bert L. Baldwin & Company, Cincinnati, O., were the engineers and A. S. Schulman, Chicago, Ill., had the contract for entire electrical installation.

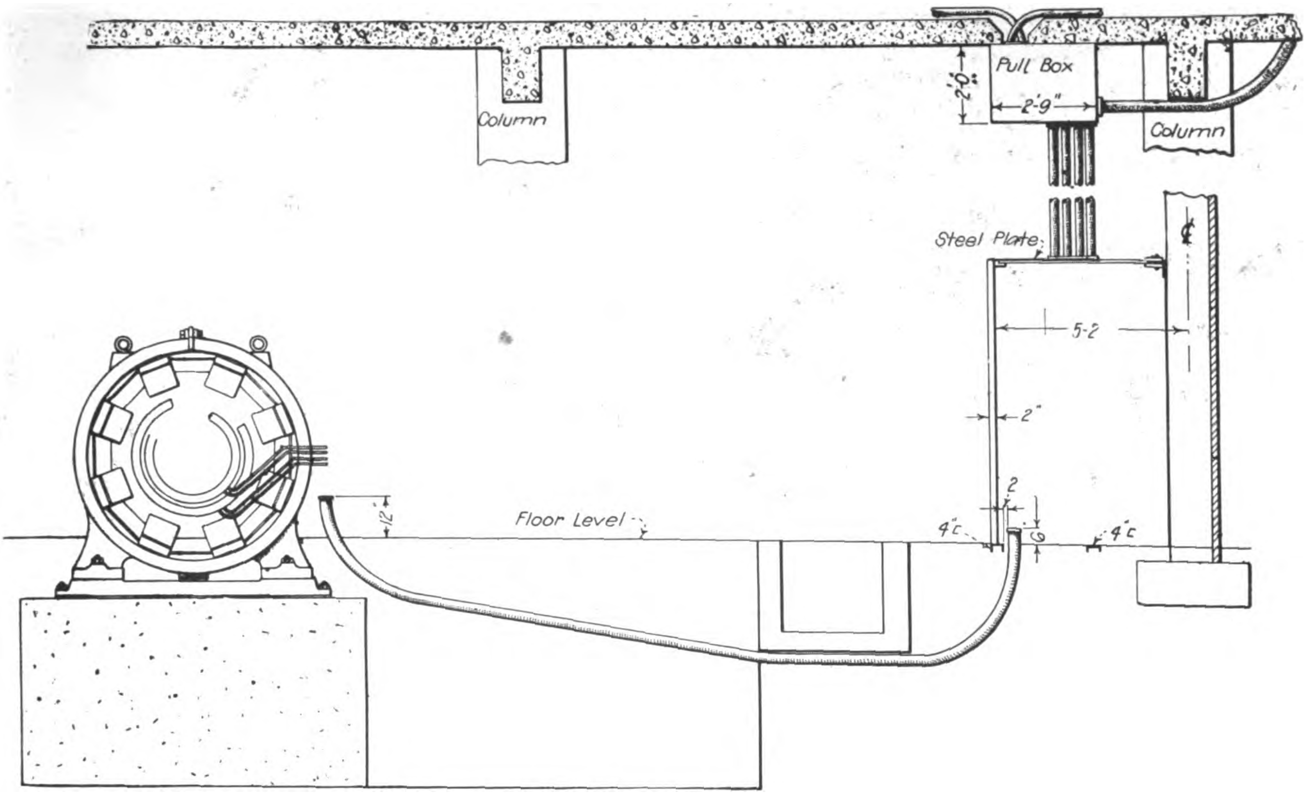

Column
Pull Box
2'-0"
2'-9"
Column
Steel Plate
℄
5'-2
2"
2
12"
Floor Level
4"c
6"
4"c

Fig. 3.—Generator, Switchboard and Pull-Box Layout.

Power Plant and Switchboard Wiring.

The power plant consists of one 200-kilowatt generator and two 250-kilowatt direct-current generators, manufactured by the Triumph Electric Company, Cincinnati, O. These generators are direct-connected to Hamilton high-speed Corliss engines. All of these generators are wound for 250 volts, two Triumph 25-kilowatt motor-generator sets being employed to deliver about 125 volts to the three-wire lighting circuits. These balancers are also used when central-station energy is employed, in that the service connection is made to the 250-volt power mains of the local central-station company.

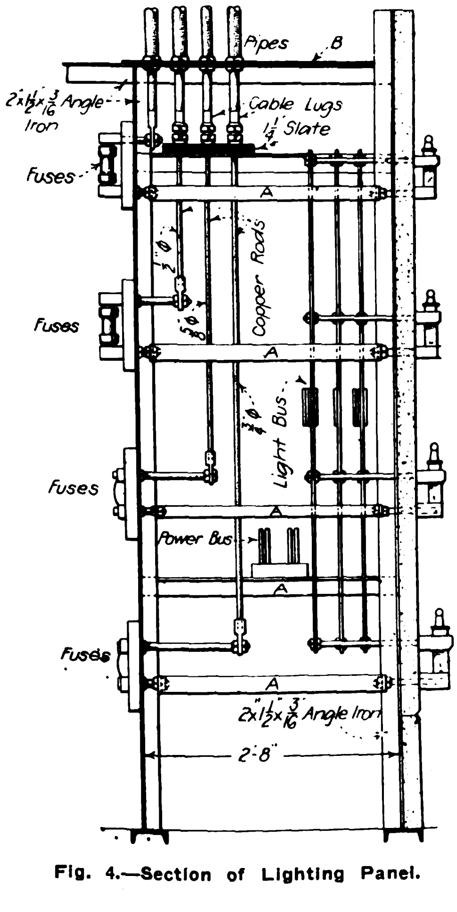

Pipes
B
2x1½x3/16 Angle Iron
Cable Lugs
1¼" Slate
Fuses
A
Copper Rods
Fuses
A
Light Bus
Fuses
Power Bus
A
Fuses
A
2x1½x3/16 Angle Iron
2'-8"

Fig. 4.—Section of Lighting Panel.

Fig. 3 shows the generator, switchboard and pull-box layout in the sub-basement. Three 800,000-circular-mil cables each in a 2.5-inch conduit and one No. 10 wire in a 0.75-inch conduit are run in the manner shown from the generator to the switchboard. The switchboard is mounted on 4-inch channel irons and has a three-sixteenth-inch steel plate mounted as shown between the top of the board and the columns. This plate is employed to fasten the ends of the conduits leading to the pull-box situated on the ceiling above the board. For this purpose lock nuts on the top side of the steel plate and bushings at the bottom side of the plate are employed. From the pull-box conduits are run as shown and as will be described later.

Figs. 4 and 5 show the construction employed in the rear of the switchboard. Fig. 9 shows the construction employed for the lighting panels. A 2-by-1.5-by-3/16-inch angle-iron frame is employed as a support for the circuits in back of the board. The three bus bars for the three-wire lighting service are placed near the board and slightly below the center. These buses are connected by copper rods to the points of three-pole knife switches on the panels. The knife blades of these switches are connected through three parellel connecting rods *A* to three fuses mounted on a slab of slate fastened several feet to the rear of the board. From each of the three fuses for a circuit, copper rods are run in a

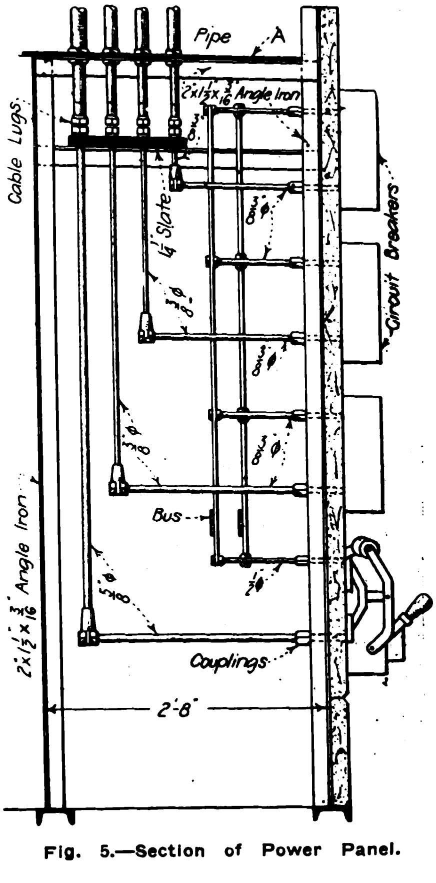

Pipe
A
2x1½x3/16 Angle Iron
Cable Lugs
1¼" Slate
Circuit Breakers
Bus
Couplings
2x1½x3/16 Angle Iron
2'-8"

Fig. 5.—Section of Power Panel.

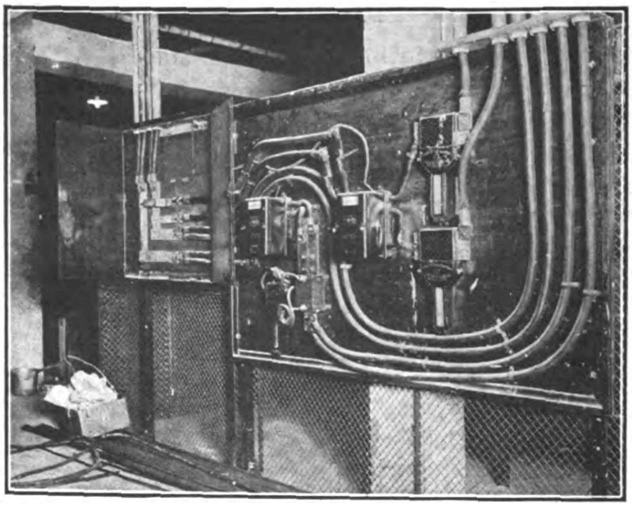


Fig. 6.—Service Metering Board.

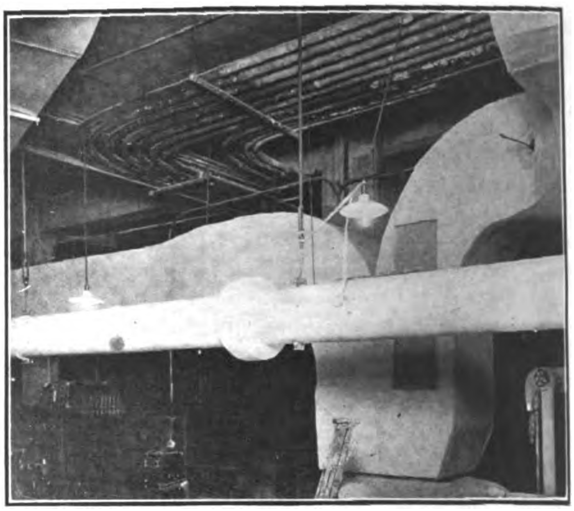


Fig. 7.—Conduit Supports in Power Plant.

vertical direction to a horizontal slate slab near the top of the board where they are connected to their respective cables by means of cable lugs. The three cables for any one circuit enter the proper line of conduit at the level of the horizontal steel plate *B*, previously mentioned.

Fig. 5 shows the construction employed in the rear of the 250-volt power panels. The two power busbars are located about three feet from the floor level as shown. As circuit-breakers and not fuses are used to protect each power circuit, the construction differs from that employed for the lighting panels. The circuit-breakers are mounted on the front of the boards as shown and copper rods and couplings are used to connect the terminals of these circuit-breakers to the buses and to the cable lugs which make the final connection to the distributing cables just before they enter the conduit pipes.

By using this construction for the rear of the switchboard, uniformity of appearance, simplicity of layout, good mechanical strength of connection, and excellent accessibility to all parts are obtained.

Figs. 1 and 2 show front and rear views respectively of this switchboard. In Fig. 2, which is a photograph taken through the wire netting used to inclose the passageway in the rear of the switchboard, the arrangement of the slate slabs holding the fuses for the lighting circuits and the arrangement of the buses and connecting rods can be seen.

Fig. 1 is a front view of the switchboard furnished by the Frank Adam Electric Company, St. Louis, Mo. The two panels to the left are devoted to power distribution, each circuit being provided with a two-pole circuit-breaker of time-limit type. These circuit-breakers were manufactured by the Condit Electric Manufacturing Company. The circuit-breakers vary in capacity from 80 to 300 amperes, the higher capacity circuits being carried to the bottom of the board. The next

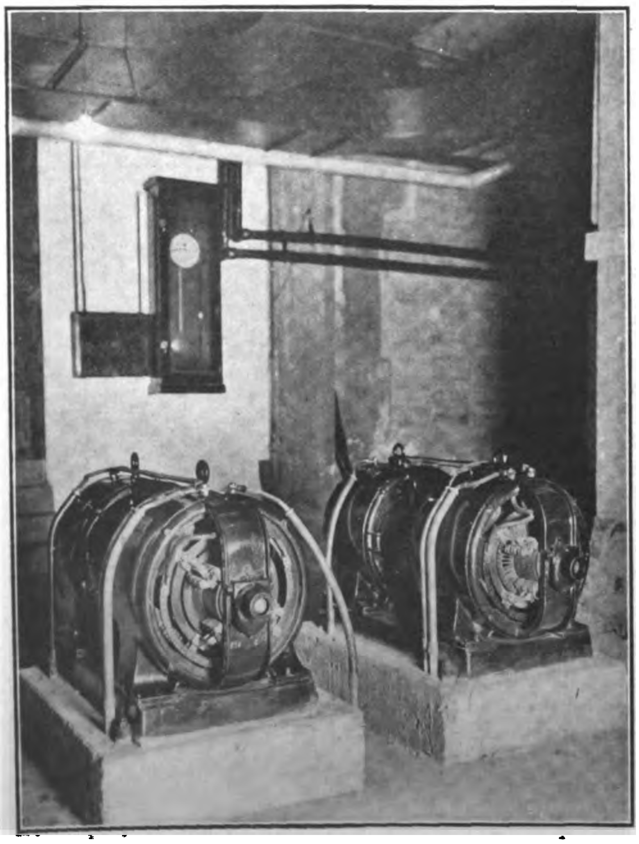


Fig. 8.—Balance Sets.

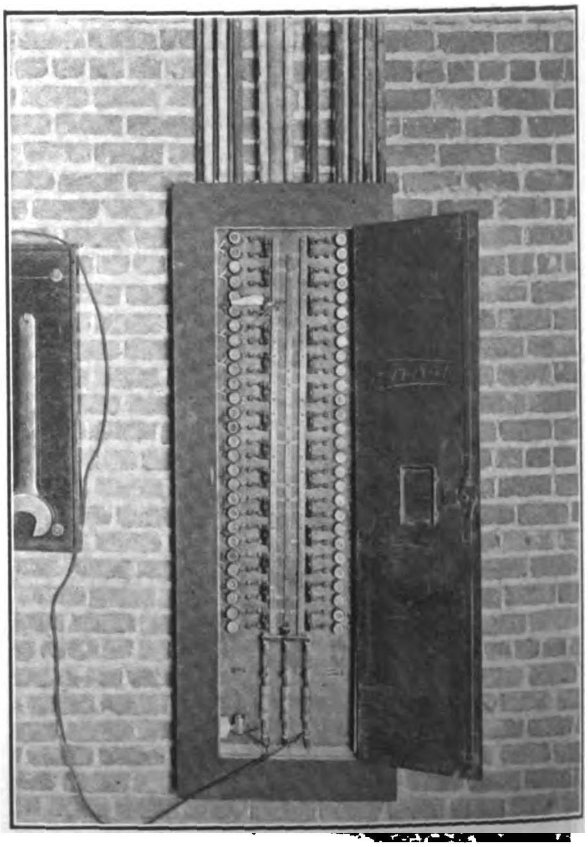


Fig. 9.—Power-Plant Lighting Cabinet.

three panels from the left are devoted to three-wire lighting-circuit distribution, the circuit switches varying in capacity from 200 to 400 amperes and the same arrangement of circuits on the panels as regards capacity being followed as in the case of the power circuits. The next panel is a totalizing panel, equipped with a three-pole 1,000-ampere circuit-breaker, a two-pole 1,500-ampere tie switch, a voltmeter plug receptacle, two Sangamo recording watt meters, and a 2,500-ampere ammeter. The next panel controls the two balancer sets; a circuit-breaker, a two-pole switch, a rheostat and a 200-0-200 ammeter being provided for each balancer set. The next three panels control the three generators, each panel having a circuit-breaker, a main-line switch, a field switch, a rheostat, voltmeter switch, and an ammeter. At the extreme right of the board are located bracket-type voltmeters, and to the side, Bristol-type recording voltmeters and ammeters. All other meters are of the Weston type.

Fig. 6 shows a view of the metering panel for the central-station emergency supply service. To the left is seen the service fuse cabinet of steel. Four 800,000-circular-mill cables each in a four-inch conduit carry the central-station service to the cabinet where the circuit is divided, one branch leading to the power meters and power circuits and the other to the lighting meters and lighting circuits. The two lower fuses in the cabinet are each connected to two 800,000-circular-mil flexible cables. A two-wire Duncan power meter is inserted in the circuit of lower set of cables as is also a 1,200-ampere shunt connected to a General-Electric Wright demand indicator. The remaining voltage terminal of the Duncan power meter is connected to the upper of the two power terminals in the cabinet. Four four-inch conduits each containing a 800,000-circular-mil cable lead to the main switchboard.

The lighting service is obtained from the two upper terminals of the cabinet, one 800,000-circular-mil cable being used for each of the two sides to a three-wire Duncan light meter mounted on the board, the voltage terminal of the meter being connected to neutral bus in back of the main switchboard by a wire run in a one-half-inch conduit shown to the right of the four service conduits entering the service cabinet. From the Duncan light meter the cables are run to two four-inch conduits leading to the main switchboard, a 600-ampere General-Electric Wright demand meter being inserted in each of the two cables.

This meter board is of 1.5-inch white-pine wood and is mounted against the wire netting inclosing the passageway in back of the main switchboard. This board is painted with asphaltum paint and the cables are mounted to it by means of U straps. The conduits after leaving this board are carried to the main switchboard, the pipes being bent in the form of an arc as they pass from one board to another, thus rendering no couplings necessary.

Two 25-kilowatt 125-volt Triumph generators each direct-connected to a 25-horsepower 250-volt Triumph motor are used as balancer sets to maintain the neutral of the three-wire lighting system when either private-plant or purchased power is used. These balancer sets are located to one side of the switchboard and are connected to it by means of conduit run underneath the engine-room floor. This conduit is brought up to the balancers sets which are mounted on concrete bases as shown in Fig. 8. The conduits pass through the bases and a coupling is inserted in each pipe a short distance above the base, where the conduit is made to follow a line parallel to the outline of the machine. When near the terminal board of the machine, the cables leave the pipes and are attached to the terminals by lugs.

This figure also shows the master electric clock, which is enclosed in an air tight case with temperature regulating means.

A somewhat similar construction is used for the various motors, controllers, etc. Fig. 2 shows that in such cases the wire leaves the conduit through a porcelain bushing and where the wires are liable to come into contact with metal parts, they are inserted in the circular loom.

Where conduits are run exposed, they are supported from the ceiling by an iron pipe hung by means of perforated iron strap as shown in Fig. 7. Throughout the basement exposed conduit work is employed, and sheet iron cabinets are used. For lighting service these cabinets are provided with inclosed fuses in the main circuits and double-pole switches and plug fuses for the branch circuits as shown in Fig. 9.

Details of the wire shafts and distribution circuits will be given in following installment.

(To be continued)

Duties on Electrical Supplies.

A statement of the rates of duty on storage batteries, cells, and carbons in a number of foreign countries, recently compiled by the Bureau of Foreign and Domestic Commerce, Washington, D. C., has been forwarded to manufacturers of the articles covered by the statement listed with the bureau. A few additional copies are available for distribution on request.

Selling More Appliances—A Suggestion.

In spite of the increasing uses of electricity it is obvious that people are not making enough of the benefits of these uses. The writer has observed that the same man who will pay $1,500 for an automobile or $125 for a graphophone outfit is the very one who will shy at $85 for a washing machine or even $5 for a combination portable light. There seems to be a prejudice against the use of electrical heating devices by some, who contrast the terrible expense to the economy of their supposed benefactor, gas. One of the fundamental reasons appears to be that the electrical industries have not yet quite caught the right little twist to make the use of electrical utilities and luxuries popular.

The automobile industry owes its existence largely to this popular notion that it is quite the style and a sure sign of prosperity as well as fashionable merit to own an automobile. There really is no reason why electrical luxuries should not be "just the ragiest thing," except perhaps that distributors of such profitable goods are not getting at the right class of customers, the great middle class, some of whom will mortgage a home to experience the joys of a buzz-wagon, while others skimp on a dinner in order to take in the movies.

Of course John Thompson Jones, who gets his $30 per, will not pay out $85 for a washing machine and he will tell you most honestly that he cannot afford to spend $125 for putting electrical wiring and fixtures in the bungalow, because thanks to 42 cent eggs and other salary consumers, he never has a surplus, much less a bank roll to blow on electrical luxuries. He will do with carbon lamps rather than spend $6.00 for a set of tungstens, if his place is already wired, yet he smokes three-for cigars, enjoys his blankola music, has as good furniture as the bank president, and perhaps owns a diamond or two.

The point is this. Distributors by adopting the sales methods of furniture, jewelry, and phonograph houses, first-class houses who keep up with the times by selling on an easy-payment plan without red tape, can very likely reach this middle class with surprising results. An average electrical dealer would probably blow up if one were to say that it would be a good plan to advertise wiring and electrical goods on such a plan; "perishable value once installed" and all of that. Still, when a house-furnisher can operate a full year with a credit loss of only a fraction of one per cent, and a jeweler can operate with a loss of 1.2 per cent,[1] there is much in such a plan that can well be considered by every concern selling things electrical for home use. Finally, it should be remembered that such concerns can do the usual cash business anyhow, the credit trade forming a sort of balance to fill in between the peaks of trade.

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[1] Some run up to four per cent just as some electrical dealers make no real money while others clean up a good sum.

Future advertising and lowering of prices will doubtless alter this matter, but when every home has its electrical service and complete conveniences, when every farm has its electrical comforts, it seems certain that such a condition will have been attained largely through either or both of the means set forth, namely, "Jones has it, so must I," or "I can get it now and pay later." Perhaps all who have meritorius goods requiring some little initial outlay might well bear these two points in mind oftener.

Philip E. Edelman.

◆

Inspection Trouble in Hutchinson.

Last spring the Board of Commissioners of Hutchinson, Kans., decided to enforce municipal inspection of electrical work, and appointed C. C. Barnes as electrical inspector on May 1. Mr. Barnes promptly started ferreting out departures from the Code, and developed an eye too keen to suit some of the wiremen of that town, who started a movement to replace him with a more obliging critic of their work. Charges of incompetence were filed against Mr. Barnes, but these were not sustained, and at a formal hearing the Board of Commissioners unanimously acquitted him and ordered him to continue rigid inspection. The commissioners concluded that the trouble was due to opposition to the inspection ordinance.

◆

More Inspection in Kentucky.

The Kentucky Actuarial Bureau has recently established a branch of its electrical inspection department at Owensboro, Ky., with D. T. Wadsworth in charge. This is the third branch office of the kind in the state, the other two being at Lexington and Covington.

◆

Missouri Contractors to Meet.

The annual convention of the Missouri Electrical Contractors' Association, scheduled to be held at St. Louis, Mo., on July 13, will be held on July 11 instead. Officers of the organization, after correspondence, decided that July 11, which falls on Saturday, is preferable to holding the meeting on Monday. Secretary A. J. Burns, of Kansas City, Mo., is in charge of the program and will shortly have it ready for announcement.

◆

Electrical Contractors' Association of Westchester County.

The leading electrical contractors in Westchester County, N. Y., which includes Yonkers, Mt. Vernon, Portchester, New Rochelle, White Plains, Ossining and Tarrytown have organized the Electrical Contractors' Association of Westchester County. The officers are: president, W. N. Barlow, Yonkers; first vice-president, F. E. Schmidt, Mt. Vernon; second vice-president, I. W. Austin, White Plains; secretary, C. E. Youmans, Yonkers; treasurer, Charles A. Sillery, Yonkers.

◆

Among the Contractors.

The Bushong Electrical Company, of Ottawa, Kans., has secured the contract for a $25,000 electric light plant at Wellsville, Kans., and will begin work at once.

Fred L. Kahn, who for the past year has been associated with the National Electric Company, of Baltimore, has severed his connection with that firm and has joined the Blumenthal-Kahn Electric Company, 505 North Eutaw Street in the same city. Mr. Kahn's brother is a member of the latter firm.

The firm of Wilson-Maltman, of Baltimore, Md., has secured the contract for the electrical installation in a coke-producing plant at Sparrows Point, Md., a suburb of Baltimore. The plant is being erected by the H. Koppers Company, of Chicago. This contract calls for installation of a large number of lights, also wiring for a total of 2,009 horsepower in electric motors. The amount of this contract is approximately $12,000. The same firm has been awarded the contract for the electrical installation in the Machinery Hall building for the Johns Hopkins University, Baltimore, the contract price being in the neighborhood of $20,000. Charles L. Reeder and Dr. John B. Whitehead are the associate consulting engineers.

The Blumenthal-Kahn Electric Company, Baltimore, Md., has been awarded the contract for the electrical installation in the warehouse for the Baltimore Bargain House, which will be nine stories in height. About 85,000 feet of one-half inch galvanized conduit will be used. Trumbull switches and panelboards will also be used. Henry Adams is the consulting engineer. The contract price on this installation is about $15,000.

The Beattie Electrical Company, of Toledo, O., has secured the contract for the electrical wiring in the new Cherry Street School at its bid of $1,754.

The National Electric Company, of Baltimore, Md., has been awarded the contract for the electrical installation in the new home for the B. P. O. E., which is to built on Fayette Street in Baltimore. James Posey is the consulting engineer. The specifications call for a complete electrical equipment for lighting, bells, annunciators and fire-alarm system. The amount of the contract is $4,250.

Harry B. Handly, Jr., formerly of Eugene I. Rosenfeld & Company, has severed his connections with that firm and has become associated with the National Electric Company, 613 East Lombard Street, Baltimore, Md.

The Standard Electrical Company, of Baltimore, Md., has been awarded the contract for the electrical work in the Baltimore ice-cream factory of William Hofferbert. This calls for an installation of 65 horsepower in electric motors.

The Durling Electric Company, of Baltimore, Md., has been awarded the contract for the electric installation in the new factory building for Strouse & Brother. Martin Schwab, of Chicago, is the consulting engineer; the contract price is about $8,500.

Freeman-Sweet Company, prominent contracting electrical engineers of Chicago, Ill., are preparing to remove from their offices in the Morton Building to Rooms 225-231, Transportation Building 608 South Dearborn Street. The company is also equipping a large store on the first floor of the building where they intend to engage in a general retail supply business.

The C. A. Bush Company of Chicago, Ill., has the contract for installing seven motors aggregating 200 horsepower in the plant of the Cargin Elevator Company, 1858 Laramie Avenue, Chicago, Ill.

Henry Newgard & Company, Chicago, Ill., has been awarded the contract for the electrical equipment involved in installing 60 lamps and ten motors aggregating 202 horsepower in the plant of the Grawoig Ice Company, 1018 South Hamilton Avenue, Chicago.

The Thomas Electric Company, Chicago, Ill., has the contract for installing 50 lamps and fan motors totalling 100 horsepower in the plant of G. A. Fuller Company, 115 South La Salle Street, Chicago, Ill.

◆

During 1913 the Appalachian oil field, embracing New York, Pennsylvania, West Virginia, southeastern Ohio, and Kentucky, showed a slight decline—1.72 per cent—in the production of petroleum, falling from 26,338,516 barrels in 1912 to 25,885,640 barrels in 1913. The value was $63,619,677.

Convention of Oregon Contractors.

The second annual convention of the Oregon Electrical Contractors' Association was held at Portland, Ore., on June 8 and 9. The first session was called to order on Monday morning in the Pittock Block by J. E. Werlein.

In opening the convention Mr. Werlein stated that if the members present at this convention derived as much benefit and entertainment as they did at the last convention their time would not be spent in vain.

Mr. Werlein then introduced the mayor of the City of Portland, who, he stated, would have a few words to speak for the City of Portland.

Mr. Albee, the mayor stated that he could see from the twinkle in the eyes of the men assembled that there was something doing. He stated that he lives in peace and quiet at all times and that nothing can spoil the smooth sea upon which he sails. He stated that we little realized what a wonderful work is being done along the electrical line, and what great things have transpired due to the efforts of men so engaged. Commenting upon the great future of the electrical industry reminded him of the story of a bookkeeper who had been working about ten days straightening out his trial balance. He went to bed in a very troubled state of mind and one night had a dream. He dreamt that the men working electrically had provided his place of business with buttons along the desk. The buttons were labelled "Trial Balance," "Balance on Hand," etc. When the manager wanted any information all the bookkeeper had to do was to press the button and the correct figures were at hand. Everything worked well with the bookkeeper until the end of the month, when the office manager told the bookkeeper that he could dispense with the bookkeeper's services, inasmuch as the office boy could do the pressing of the buttons.

He remarked that the City of Portland was taking note of their work and that it congratulated them on the wonderful work they were doing. He wished to extend the hand of fellowship and to impress upon their minds the fact that the city's welcome is hearty and sincere.

It was then duly moved and seconded that the mayor, Mr. Albee, be made an honorary member of the Oregon Electrical Contractors' Association. The motion was unanimously carried and he was thereupon asked by the chairman to be escorted to a seat as a member of the Association.

Mr. Werlein then stated that it would be well for the mayor to remain and hear the words of welcome of R. G. Littler.

Mr. Littler, the president of the Oregon Electrical Contractors' Association, being thereupon introduced by Mr. Werlein as the next speaker, stated that he was sure all members present appreciated the encouraging and kind words of Mayor Albee, and he thanked Mr. Albee for being present. Mr. Littler stated that the Oregon Electrical Contractors' Association now had practically 40 members, that the Association was close to the jobbers and that it was doing good work. During the past year it lost two of its members by death, George Ormsby and Charles Potter.

Mr. Littler then commented upon the great importance of the campaign for a state license law as to contractors in the electrical line. He stated that today there were a great many curbstone contractors who prey upon the public, collect 80 or 90 per cent of their money, and often never turn up to finish their work. Generally such a contractor has nothing to bind him. An ordinance in the City of Portland covers the deriliction of such irresponsible contractors, which ordinance requires that a bond be filed by each contractor with the City of Portland. This ordinance, however, should be further enforced by the passage of a state license law. An effort, he said, was made to have a state license law for contractors passed at the last session of the State Legislature but it was unsuccessful. He stated that it met opposition from the labor union, which, he thought, was ill advised in the matter; also that its defeat in the last Legislature was due to a confusion of its purpose and of the issues at stake, but that the merits of a state license law, both as to the public and as to the contractors, could not be assailed. He then quoted from figures of Joseph Fowler, of Tennessee, showing the immediate benefits of a state license law in that state. Prior to its passage there were in the City of Memphis about 75 different persons who were engaged in electrical contracting, Memphis being a city of about 110,000 people. Since the passage of the state license law in that state the number of contractors has been reduced in Memphis to about 30, or about one contractor to every six or seven thousand residents. In Portland there is one electrical contractor to every 2,200 residents. There are state license laws for a great number of trades and professions but apparently the electrical contractors have been left to shift for themselves. He stated that faulty wiring in wooden buildings has been the cause of many fires and that there should be laws to protect the public in the installation of this faulty work. A state license law would guarantee that first-class work would be done and would greatly increase desirability of credit risks which jobbers have to carry.

After thanking all those that have worked with him during the past year, he said that he felt that the Association had done a great deal of work and is growing. He stated that the Association wanted only as members those who are competent, capable contractors. He felt that the Association has so far a good, clean membership and that it was accomplishing much good.

Mr. Werlein then stated that he wanted to impress upon the minds of the members of the convention that the slogan of the convention is "DO IT ELECTRICALLY," and that this slogan would especially be emphasized at the Ball Park, where "Doing it Electrically" would be electrically emphasized in the publicity it would get. The city, he said, should be startled by this one slogan: "Do it Electrically."

Mr. Werlein thereupon handed the gavel, which he described as a great historic relic, to President Littler.

Mr. Littler then read a letter from Mr. Barnes, of Troy, N. Y., in which he asked that the president extend to every one present his personal regards. He stated that he hoped soon to grasp the hand of each member.

Being called upon by the president to speak, G. W. Baker, manager of the Rose Festival Carnival Committee, spoke enthusiastically of the approaching rose carnival, saying that the Carnival Committee hoped to give the people something just a little different from what has been offered in the past.

President Littler then stated that he had a paper written by G. W. Hill, special representative of the National Electrical Contractors' Association, which he believed the members would be glad to hear.

Mr. Hill's communication stated that no business can rise to any height without co-operation, association and education. Electrical contractors are poorly paid, but there has been a great improvement in the last ten years. He referred to the infancy of electrical development, the improvements in the art, the need of eliminating bad practises, etc.

Mr. Littler then read a letter from Ernest Freeman, president of the National Electrical Contractors' Association.

A paper entitled "The Electrical Jobbers" was then read by Ross Hartley, of Portland, manager of the Pacific States Electric Company.

This was followed by a communication from J. M. Wakeman, manager of the Society for Electrical Development, explaining the work of that organization. It was read by J. R. Tomlinson.

Mr. Underwood, treasurer of Failing McCalman Company, then made an address which was illustrated with lantern slides.

Mr. Underwood preluded his address by stating that he wanted to call the attention of the members to one very important feature in the electrical business which keeps cropping out and the lack of observance of which is the cause of most trouble. It is the desire to do business in a business-like way and the ability to figure correctly on jobs. There would be less fires and less falldowns on jobs, he said, if all contractors were held down to these two things.

He stated he would not tell the members anything they did not already know about the electrical business, because that was not his business, but that he would talk on fire insurance and protection. He regretted that so few people failed to inspect closely their fire-insurance policies, as so often the policy contained representations or conditions which the holder did not live up to. He emphasized the necessity of cleaning up. Many pictures of the surroundings of business houses and residences in Portland and in many towns of Oregon were shown, the object being to call attention to the many piles of rubbish, stacks of boxes and other matter of a combustible nature which so often lie close to some building that could be easily started to burn by someone simply dropping a match or cigarette, or a spark dropping on some of such rubbish.

He stated that if he ever built a house it would not have wooden shingles and that all of the electric wires would be placed inside of conduits.

Insurance companies, he stated, should not insure bad risks, because it was a hazard to good insurance. If insurance companies would not insure bad risks, he said, the fire traps would soon be torn down. Philadelphia has the best fire escapes in the world, and there are many, many fire escapes in every city that are supposed to be life protectors but they are instead life incinerators in case of fire, being improperly constructed. The Philadelphia fire-proof tower fire escape is a model to copy after.

Business Meeting.

The business meeting was called to order by President Littler at 1:30 p. m., with a good proportion of the State membership present. Many matters of interest to members were brought up and discussed and considerable time was given to the discussion of a proposed state license law which will be introduced at the next meeting of the Oregon Legislature. The Association has a commission working upon a draft of the proposed license law, which will soon be perfected, and the complete proposed law will then be submitted to different organizations throughout the state for their approval and support.

The proposition of amalgamating the State Association and the Portland Electrical Contractors' Association also was brought up by the secretary, F. C. Green, and the president appointed a committee consisting of Mr. Green and Mr. Tomlinson to look into this matter and report at the next regular meeting. By combining the two associations it is hoped to give members in the outside towns in the state more complete data of the proceedings of meetings, resulting in greater benefits to them from the organization.

The matter of the director's expense to the National Association convention was brought up and discussed and a letter from the California Association's secretary, W. S. Hambridge, was read. The meeting took no action upon this matter except to approve the action of the National Association's Executive Committee, which allows the maximum expense of $100 for each director. The Association elected J. R. Tomlinson to be the next director representing the State of Oregon in the National Convention; also to go to Detroit to attend the national convention in July.

The Association also voted to request the National Association to send its special representative, George W. Hill, to the Coast, as his assistance is needed in increasing membership and reviving the Association spirit.

The election of officers was postponed on account of the proposed amalgamation of the state and city associations. The meeting was closed at 3:30 p. m. and all attending the convention were then escorted to special cars and taken to Council Crest, one of the city's finest pleasure resorts.

In the evening, at 7:30, both ladies and gentlemen were escorted aboard the river steamer Ione and were taken for a pleasant ride up and down the Willamette River. This proved to be one of the most pleasant entertainments of the convention. All enjoyed themselves and were entertained with dancing, singing, etc. The "Ginger City Band," furnished by Robert Skeen, added to the pleasures and fun of this occasion in their make-ups representing country rubes, etc.

At 9:30 a. m. on Tuesday, June 9, the convention was taken on a tour of inspection of the plant of the Northwestern Electric Company, which is located in the sub-basement of the Pittock Block. This plant is tied in with a plant on the east side of the river, which in turn is fed by the high-tension line from the plant on the White Salmon River, at White Salmon, Wash., and acts both as an auxiliary electric light and power plant and also distributes steam heat throughout the city. The members of the Association displayed great interest in this modern installation and were greatly pleased to have been able to see the equipment and have it explained to them by the engineers of the Northwestern Electric Company.

From this place the crowd was taken in automobiles to the electric lighting-fixture factory of J. C. English & Company, in East Portland. This is a new factory, just completed by Mr. English, and the details were interesting to those in the fixture business. The plant is efficiently laid out and thoroughly capable of taking care of a rapidly increasing business. The crowd was then taken from Mr. English's factory to inspect the East Side station of the Portland Railway Light & Power Company, known as Station "L." This plant is an auxiliary to the Portland Railway Light & Power Company's station, principally as a street-railway service plant.

In the afternoon the crowd was taken by automobiles for a parade through the streets of Portland, which were at this time gayly decorated for the Rose Festival and filled with festival crowds. Each of the 18 machines in the parade was not only equipped with a banner of the Oregon Electrical Contractors' Association, but was equipped with a 12-inch gong and a Klaxon horn, and the noise made was terrific. The machines then proceeded to the ball grounds of the Pacific Coast League and saw the game of Portland versus Oakland.

In the evening, at 8:30, the members and ladies assembled in the main dining room of the Portland Hotel for the annual banquet, which was the closing event of the Association's meeting. J. E. Werlein presided as toastmaster, and the main speaker of the evening was Franklin T. Griffith, president of the Portland Railway Light & Power Company. Mr. Griffith's talk was along the lines of both business and pleasure, which he made most interesting to all those present.

R. C. Littler, president of the Association, made a short talk and expressed the appreciation of the membership for the kind co-operation and many courtesies which had been extended to the members in making the convention a success. A number of entertaining features were provided which were thoroughly enjoyed by those present. There were about two hundred people, ladies and gentlemen, present, and the banquet and entertainment as a whole were thoroughly enjoyed.

Public Service Commissions

Conducted by William J. Norton

ILLINOIS.

The Commercial Telephone and Telegraph Company applied to the Commission for an order restraining certain individuals from furnishing competitive telephone service in the village of Crossville. The individuals made respondents in this case have not received a certificate of convenience and necessity from the Commission but contend that they are not a public utility but have established an exchange "merely for the mutual advantage of themselves and their families." The Commission points out, however, that "they are occupying the streets and public ways of the village of Crossville with their poles, wires, and appliances, and have connected said telephone wires with a switchboard which they have installed in said village." Several farmers' lines and doctors, merchants and business men of the village are connected with the switchboard. "It quite clearly appears from the facts and circumstances in this case that the individuals made respondents in this case are installing and seeking to operate a telephone system for public use, in a village of about six hundred people which village is already served by one telephone company, without first securing from this Commission a Certificate of Public Convenience and Necessity."

The respondents are ordered to discontinue the operation of the telephone system "until such time as they shall have secured from this Commission a certificate of public convenience and necessity."

The Fayette Home Telephone Company applied for an order restraining William Kepner, et al. from constructing and operating a telephone system in the village of Laclede. The facts in this case are practically the same as set forth in the case given above involving the Commercial Telephone and Telegraph Company. The respondents propose to establish a "mutual" telephone company. Complaint was made that the service of the petitioner is inadequate. The Commission says: "While the testimony shows that the service furnished by the petitioner is neither adequate nor satisfactory and that its poles, wires, and other equipment are not in good condition, yet it further appeared at the hearing that an effort in good faith was being made by the petitioner to improve its equipment and service; and, in fact, that certain improvements had been made and additional work was then under way. It also appears that, with the improved service which the petitioner proposed to furnish, it will be in position to fully and adequately serve the village of Laclede and the surrounding community with satisfactory telephone service." The Commission further concludes that the proposed competitive plant is a public utility and an order was issued requiring respondent to discontinue construction and operation until a certificate be obtained from the Commission.

The Spring Valley Utilities Company was granted a certificate of convenience and necessity to construct and maintain an electric light plant and distribution system in the village of Annawan and to construct a high-tension line from the village of Mineral to the village of Annawan.

The Western United Gas & Electric Company was granted a permission to construct gas mains to and in the villages of Bensenville and Itasca for the purpose of furnishing gas service within the villages.

The Colfax Telephone Exchange was authorized to sell its plant to Edward Entwistle for the consideration of $16,560.

The Lincoln Water & Light Company. A complaint of the City of Lincoln is before the Commission alleging that the Company's rates for water and light are unreasonable.

Urbana & Champaign Railway, Gas & Electric Company. Complaint is made by the citizens of Champaign that the company's charges for electric service are exorbitant.

INDIANA.

Indianapolis Street-Lighting Rates. The City of Indianapolis has completed a contract with the Merchants' Heat and Light Company for furnishing the city with street-lighting service. The contract is to be in force for ten years and the rates to be charged are specified in the agreement. Suit was brought in the Circuit Court to declare the contract illegal and void and to enjoin the city from enforcing the terms of the contract. The contention is made that the Public Service Commission has the exclusive right to fix the rates to be charged for service by public-service corporations. It is alleged that the city of Indianapolis is attempting, in violation of law, to fix rates or prices to be paid the Merchants' Heat and Light Company for a period of ten years. By such attempt, it is averred, the city is seeking to deprive the Public Service Commission of its power under the law.

NEW HAMPSHIRE.

Peoples Gas Light Company. A decision was rendered, June 10, establishing rates for gas in the city of Manchester. In the decision considerable attention is given the subject of "going value" and the proper allowance to be made for preliminary and financing costs, attached business, and early losses. An extensive review is made of the holdings of various authorities in the treatment of going value and decisions of courts and commissions are cited at length. Other valuation matters receiving attention are actual cost or present value of land, paving over mains, depreciation reserve and amount of return.

OREGON.

Standards of Service. The Commission has adopted rules and regulations relating to standards of quality, pressure, voltage and other service conditions of light, gas, heat, water and power utilities effective as of July 1, 1907.

Overhead and Underground Construction. General regulations have been adopted by the Commission governing overhead and underground construction of telegraph, telephone, signal, trolley and power lines, effective as of May 12, 1914. These regulations apply to new construction.

WISCONSIN.

The Oakfield Light & Power Company was authorized to issue $10,000 of bonds to be sold at not less than 75, the proceeds of the sale to be used in paying off an indebtedness of $3,600 incurred on account of construction work already completed and the balance for the proposed transmission line of the company to the terminus of the lines of the Eastern Wisconsin Railway, Light and Power Company of Fond du Lac. The Commission had previously authorized the applicant to issue $2,000 of stock to pay off a part of the indebtedness referred to above and since only $300 was so paid off the order provides that the remaining $1,700 of this issue shall be immediately cancelled.

The Tomahawk Light, Telephone and Improvement Company received the sanction of the Commission to the issue of $8,000 of bonds, the proceeds to be used in increasing the capacity of its auxiliary steam plant and also to change from single-phase generation of 133-cycle frequency, to three-phase generation of 60-cycle frequency.

Stock and Bond Issues to Telephone Companies. An issue of $2,000 of stock to be made by the Eau Claire County Telephone Company was authorized by the Commission. The order recites that the proceeds of the sale of such stock shall be used for extending lines, buying new telephone instruments and equipment, and for paying as much of the cost of reconstructing the lines of the company as is properly chargeable to the capital account.

The Plymouth Telephone Company applied for and was granted authority to issue $500 of stock, the proceeds to be used in paying off an indebtedness incurred on account of construction.

The Elco Telephone Company received the commission's approval of an issue of $4,000 of stock. Of this amount, $1,340 of the stock was to be used in replacing void stock issued by the company in ignorance of the statutes requiring the approval of the Commission to all such issues. The Commission found in this case that the proceeds of the void issue had been applied to the making of additions and extensions to the plant. The remainder of the issue ($2,660) is to be used in further extending the lines of the company.

Among the Supply Men

Brisk Electric-Fan Business in Louisville.

Hot weather at the very outset of the season in Louisville, Ky., has done wonders for the electric-fan business in that city. An instance of the way in which this business increased over that of last year is supplied by the records of the Federal Sign System (Electric). According to R. E. Brian, manager of the Louisville office, he disposed of a total of 750 fans all last season. This year, up to and including the first ten days in June, he had sold more than 1,000 fans. Other concerns which supply the fan trade have similar reports to make. The increase is generally attributed to the hot weather early in the season. When the cool weather hangs on until people are getting ready to leave for their vacations, they do not invest as readily. Other influences have been the fact that the merger of the public utilities put the Fetter Electric Company, which supplied direct current only, out of business, thus rendering numbers of direct-current fans useless; the success which has met the house-wiring campaign of the Louisville Gas & Electric Company also contributed. To date 909 old houses have been wired by this company.

An interesting feature of the demand for fans is that the public generally is calling for a better article than used to be the case. The 12 and 16-inch oscillating types are much in demand for domestic uses, while the call for the six-blade, slow-speed fan for houses is gratifyingly large. Most of the fans sold last year and heretofore were for the 8 and 12-inch types. These are not being returned and are probably being put to use in the kitchens or elsewhere and used in connection with the new ones.

Last week also saw a marked departure in the fan trade in the purchase by the Consolidated Realty Company, of Louisville, of five dozen fans which it will supply to the tenants of its Courtland apartment house. These will not result in an increased charge for the rentals of the rooms in this house, which are all well furnished, and will be supplied to all the tenants for four months out of the year.

Electron
June 1914

Cover Design for June Issue of "Electron."

None of the other apartment houses in Louisville have considered such a move, according to the best available information, and the members of the Consolidated Realty Company had no similar experiences of other landlords to guide them. The company is now building a large new apartment house on Fourth Street in Louisville, which will have about 300 apartments.

The *Electron* for June, the interesting monthly publication of the Central Electric Company, Chicago, Ill., contains a great deal of very interesting matter. An article on the illumination of the Lucas County Courthouse described the lighting of this modern public building with Alexalite fixtures and shows some really remarkable photographic reproductions of illustrations of the offices taken at night under this system of indirect illumination. Another article of special value describes the collection of rubber and its relation to uses as insulation in the electrical industry. The front cover design is artistically rendered in colors, and portrays a vivid scene incidental to the gathering of the raw material. There are other items relating to diffused lighting, a description of new electrical material and an article by J. O. Holly regarding the functions of the billing department.

The Electric Supply & Equipment Company, Hartford, Conn., is increasing its scope of operation and now has men traveling in New Hampshire, Vermont, Massachusetts, Connecticut, New York and parts of New Jersey. Heretofore the company has covered principally Connecticut and western Massachusetts only.

A NEW PROCESS FOR THE STERILIZATION OF MILK, USING HIGH-POTENTIAL ELECTRIC DISCHARGES.

By John B. C. Kershaw.

The municipality of Liverpool, England, has for some time been regarded as one of the most progressive in that country, in all matters relating to the health of the community. For several years past the Health Committee of the Council has devoted great attention to the purity of the milk supply of the city, and to the provision of sterilized milk for those infants of the poorer people, who might be dependent upon cow's milk for their proper nourishment. Two depots for the sterilization of milk, by the usual process of heating by steam to 160 degrees Fahrenheit, were equipped in the center of working-class districts of the city, one at Earle Road and the other at Netherfield Road; and from these centers many thousands of bottles of sterilized milk have been distributed daily to those mothers and guardians who could be induced to take advantage of this supply.

The ordinary method of sterilization by heating, however, has been criticized recently by some eminent authorities, and the researches of Robert Mond and Dr. Ralph Vincent have unsettled opinion as to the efficiency of this method of preparing milk that is to be used as a food by infants and young children. According to these two investigators the system of boiling milk is now proved to be wrong, and this method of protecting the consumer against disease must apparently go, in company with modern practices of pasteurization and sterilization. When milk is heated above 150 degrees Fahrenheit the friendly bacteria, which are present in large numbers, are stated to be destroyed, although they are of vital importance to the child; while the dangerous germs, which are controlled in their presence, are said to resist the heat and to develop with great rapidity.

The need for some other method of sterilizing milk is therefore urgent, and it is now believed by many that electricity will supply the demand for a simple yet efficient germicide.

The earlier scientific investigations of the action of electricity upon bacteria in milk and other fluids appear to have been made in Germany, by Cohn and Mendelsohn in 1879, and by Spilker and Gottsetin in 1891.[1]

In America, more recently, Ayers and Johnson have carried out experiments upon the use of ultra-violet rays, emitted from a quartz-tube mercury-vapor electric lamp, for sterilizing milk. In England, Duffield has investigated the effect of high-tension electric spark discharges upon milk, the discharges being passed through a closed glass tube, and air or nitrogen being sucked in, and made to convey the products of the discharge to the samples of milk.[2]

None of these investigations or methods have resulted, however, in any practical success, the milk after the application of the electrical treatment being either unpalatable, or still crowded with harmful bacteria, and it has been left for the Liverpool investigators and experimenters to develop a method of treating milk by electricity, which appears to possess all the requisite essentials of success.

The methods of electric sterilization that have been tried at Liverpool are covered by British patents (No. 17554 of 1911, and Nos. 14840 and 26743 of 1912) granted to Alderman Anthony Shelmerdine, one of the members of the City Council. The two earlier patents protected processes that were mainly electrolytic in character; and although neither of these patents led to any practical results of value, the following summary of the patent claims is of interest, in connection with this description of electrical processes of milk sterilization.

Claim of patent No. 17554, 1911: "In the electrical method or process of sterilizing and purifying milk, subjecting the milk per unit of quantity (200 cubic centimeters) while flowing, to an amperage of about 1.5 to 6.5 amperes, at a voltage of about 200 volts, per 508 square inches of area of the electrodes."

Claim of patent No. 14840, 1912: "Sterilizing and purifying milk by subjecting it to the electrochemical action due to a passage of the electric current through it, and the generation of a halogen antiseptic, such as referred to, within the milk and created by the current, substantially as set forth."

0.01 per cent of common salt was added to the milk before electrolysis in this case.

The experimental work in connection with the development of the process was transferred at this stage to the Thompson-Yates Laboratories of the University of Liverpool, and the following account of the work is based entirely upon the facts and figures given in Professor Beattie's report referred to above.

The following problems were investigated by Professor Glynn, the acting bacteriologist at that time with F. C. Lewis:

(1) The possibility of utilizing an electric current as a sterilizing agent.

(2) The scientific and other factors underlying a successful method, if one could be discovered.

(3) The application of the knowledge gained in the experimental work, to large-scale practice.

It is necessary to discuss all the difficulties that were encountered in this work, which extended over two years, but the following are the main lines of the investigation, and the results achieved.

The effects of unidirectional currents on the milk.—It was found that not only did sterilization "not occur" under the conditions of the experiments, but that profound changes were produced in the constitution of the milk.

The effects of unidirectional and slowly alternating currents, after the addition to the milk of minute quantities of salt, with the object of producing electrochemical sterilization.—By this method sterilization could be brought about, and inoculation of the treated milk showed that the *B. tuberculosis* was destroyed. The milk, treated in this way, however, was spoiled from the consumer's point of view, on account of profound changes in the milk, and after many attempts to overcome the disadvantages, this method was abandoned.

The effects of static charges of electricity across a moving film of milk.—No appreciable effect was produced on the bacteria.

The effects of a rapidly alternating current at high potential.—This was a success, and is the basis of the new system of sterilization, which has been operated on a large scale at Liverpool for many months. Even in the early stages of the work with this method, it was shown that the bacterial contents of the milk could be reduced to a minimum, and that the chemical constitution of the milk was apparently unimpaired.

The last method is protected by Shelmerdine's patent No. 26743 of 1912, and is based upon the use of an alternating current of high potential for "electrocuting" the harmful bacteria contained in the milk.

The sterilizing apparatus consists of a long tube with electrodes inserted in cup or tube-shaped depressions placed at suitable points, and with connections to vats or tanks for holding the raw and sterilized milk.

The sterilizing apparatus used for the early experimental work, with this method, consisted of a long tube (see Fig. 1) with three "indentations" for insertion of the electrodes of aluminum, copper or other metal, the best distance between the electrodes being determined by experiments with extensible rubber tube. The central electrode was connected with one pole of the transformer, and the two outer electrodes were connected in parallel with the other pole. As the electric supply of the City of Liverpool is on the continuous-current system, an alternator driven by a direct-current motor was installed for these experiments. The whole apparatus was insulated by heavy glass supports and the milk was passed through the tube at a definite speed from a reservoir at a fixed height.

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[1] See Professor Beattie's report on "The Electrical Treatment of Milk," 1914.

[2] See Proceedings of the Roentgen Society, December 2, 1913.

The first trials with this method and apparatus proved that the greater number of the bacteria were destroyed during the passage of the milk through the tube, and its design was then improved, especially as regards the cups or branches for holding the electrodes. These were now made separate from the main tube, and were joined to the latter by rubber connections. (See Fig. 2.)

The dimensions of the apparatus were calculated to allow free and unimpeded passage of the milk without the production of any eddies or pools, and at the same time they made certain that the electrodes adequately commanded every portion of milk passing through the tube. The upper and lower ends of the central cylinder of the electrode chamber were made watertight with rubber stoppers, and in these stoppers the aluminum or copper electrodes were fixed. The improved design has been found to admit of general application and it is now incorporated in the large-scale plant. Instead of having a continuous tube, it is found advisable however, for many reasons, to substitute three of these electrode chambers, connected with one another by suitable lengths of glass tubing and rubber joints. These electrode chambers and their connections, are referred to in what follows as the "lethal tubes." At the inlet end of the lethal tubes, is a vessel containing the milk to be treated. This vessel is provided with valves so that the supply can be regulated at will by the operator; the outlet end is connected to the receiving vessel in such a manner as to avoid any possible infection. Fig. 3 shows the apparatus set up at the University Laboratory. The results obtained by means of this apparatus, according to the report, were remarkably consistent, and the average of 140 separate tests may be summarized as follows.

(1) *Bacillus coli*, and other bacteria of this group, which are practically always present in milk, and are particularly abundant where manurial contamination is present, were completely gotten rid of. It follows that the bacillus of typhoid fever, if ever present, would also be destroyed, as its general resistance to attack is rather less than its group relative *Bacillus coli*.

(2) The pus or abscess-producing bacteria (*Staphylocci*, etc.) were also destroyed, though in some of the earlier experiments of this series a few bacteria of these types escaped.

(3) *Bacillus of tuberculosis.*—Experiments were made with naturally and artificially infected milk, and while in some cases the control animals (those inoculated with the milk before it was treated) died of septic poisoning, and the others which lived long enough developed definite tuberculosis, yet none of the animals inoculated with the same milk after the electrical treatment died, and when these were killed six weeks after the date of inoculation, no trace of tuberculosis was found. These experiments proved that not only was the bacillus of tuberculosis destroyed, but that the bacteria which caused blood-poisoning were also destroyed, or so reduced in number as to render them harmless.

(4) *Other bacteria*, which have no definite relationship to disease, were also in large measure destroyed. In most cases, however, a few of these survived, and were found in the milk after treatment.

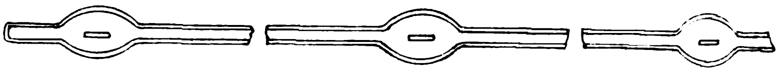

Fig. 1.—Early Sterilizing Apparatus.

The milk was only in rare instances absolutely sterile; but after treatment it was free from dangerous or disease-producing bacteria, and also from the ordinary milk-souring bacteria, and there was an enormous reduction in the number of all other forms of bacterial life. The actual reduction was over 99 per cent.

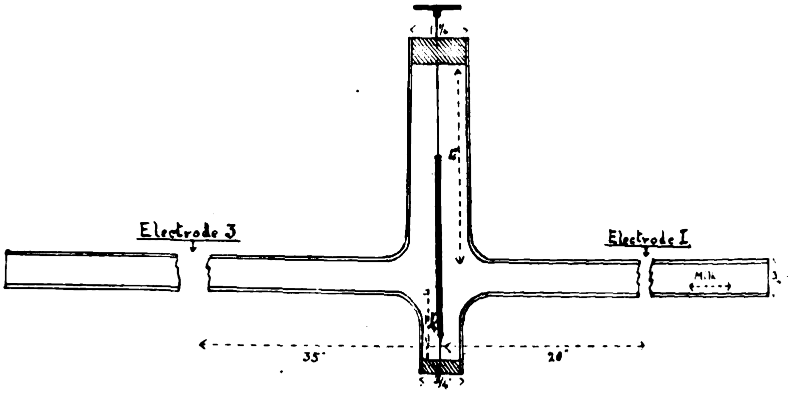

Fig. 2.—Improved Design of Sterilizer.

Professor Beattie states in his report that these remaining bacteria could be got rid of by more elaborate treatment. It was decided, however, that as they were comparatively few in number, and so far as could be ascertained, not concerned in the production of disease, the extra expense and the loss of time which this treatment would involve, could not be justified in connection with the Corporation Milk Depot. Since the ordinary milk-souring bacteria were destroyed, it was only natural to find a great improvement in the general keeping qualities of the milk. Thus, a tumbler of milk kept on the table in the laboratory, and merely covered to prevent dust contamination, would be perfectly sweet and drinkable three days after it had been treated; whereas, if it were kept absolutely free from air contamination, this period was increased, and samples have been found quite palatable after seven and eight days.

Having proved the efficiency of the process in the experimental plant, and having presented an interim report (dated June, 1913) on the work to the Health Committee of the Liverpool City Council, steps were taken to have a larger plant installed at the Earle Road Milk Depot. At this depot there is a large tank on the upper floor capable of holding the full day's supply of milk, 125 gallons. This is connected with a smaller tank, in which the milk can be maintained at a constant level, by a ball-valve arrangement. This constant-level tank is connected with the "lethal tube," which is situated in the ground-floor room, and the flow through the lethal tube is maintained by gravity. From the lethal tube the milk is collected in receiving tanks, and from these it is conveyed to the bottling apparatus, which is situated in the basement. The milk is tipped into the supply tank by means of a combined churn-lifter and tipper, worked by hand, and delivering the milk 15 feet above the street level.

The electrical apparatus consists of a direct-current motor coupled to an alternating-current generator, a high-tension transformer, together with a current transformer, a pressure transformer, and the usual switch-gear and regulating devices. The transformers are kept in a fireproof cupboard; the lethal tube in a glass-fronted cupboard; and the switchboard is so placed as to give the operator command over the whole installation.

Each electrode chamber is supported on detachable brass claws fitted on a brass back-plate, through which the high-tension cable passes, before it enters a vulcanite chamber, in which it is connected to a spring terminating in a flat circular disk. The vulcanite chamber is covered by a circular vulcanite cap, and the whole chamber, with its spring contact, forms a cap for the electrode chamber. A nail-headed copper electrode is placed in the electrode chamber, the nail head impinging on the circular disk of the spring, and thus establishing good electrical contact. The measurements of the lethal tube and electrode chamber, are given in Fig. 2. These electrode chambers, supported and fitted as described above, are fastened to a polished slate slab, which forms the back of the glass-fronted cupboard already referred to. For purposes of safety in manipulation, the milk passes through earthed aluminum tubes before and after passing through the lethal tube. Other parts of the apparatus are also earthed.

In order to show the voltage, amperage and temperature used in the experiments, Table 1, with the electrical readings at Earle Road for one day, is given as typical of the daily readings of the instruments.

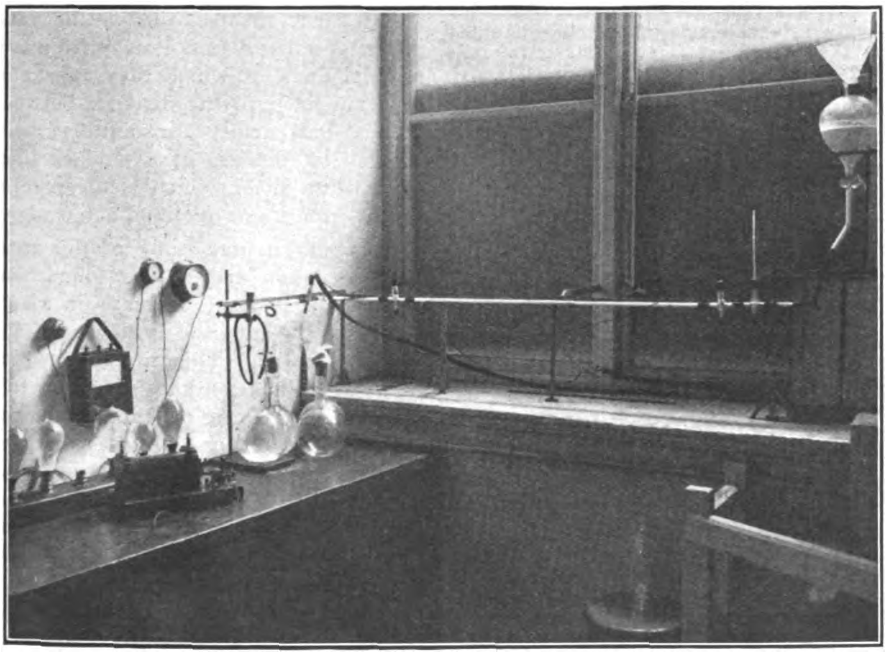

Fig. 3.—Sterilizing Apparatus in the University Laboratory.

TABLE I.—ELECTRICAL READINGS OF TEST AT EARLE ROAD, JANUARY 27, 1914.

Time. a. m.	Volts.	Amperes.	Maximum Temperature.*
8:47	3,950	2.3	61.5
9:00	3,950	3.25	60
9:10	3,900	2.2	60.5
10:00	3,900	2.22	63
10:15	3,975	2.15	62.5
10:30	4,050	2.2	63
10:40	4,050	2.15	63
11:00	4,150	2.1	63.5
11:20	4,200	2.02	62
11:35	4,200	2.05	64
12:00	3,650	2.19	62

*Each unit quantity of milk is exposed to the temperature noted in the table for such a brief period—some seconds—that heating effects can be neglected.

Soon after the Earle Road apparatus was working, difficulties from "flashing" and charring of the milk (which had not occurred except in a minor degree in the experimental plant) were met with. This "flashing" was only noticed at the central electrode, and it was thought that it was due to a slowing down of the milk flow, after the apparatus had been working for some time. A specially shaped electrode chamber, which would overcome the results of any such slowing down, was constructed, but the difficulty was not got over. Ultimately, it was found that by using an electrode of higher conductivity than aluminum, namely copper, the difficulty was overcome, and a reversion was made to the earlier type of electrode chamber. Flashing gives a burnt taste to the milk, and as this might occur just at the end of a day's supply, and spoil the whole of the milk, it was decided to introduce two small supplementary receiving tanks. These two small tanks are covered, and fitted with gauge-glasses; their inlets are connected by an open channel; and their outlets with a covered channel, commanding the main receiving tank The milk from the lethal tube is delivered into one tank until it is full, and then the delivery tube is put into the inlet of the other tank. During this transference a small quantity of milk collects in the open channel between the two inlets. This milk can then be tested, and if satisfactory, the contents of the first tank can be discharged into the main receiving tank. This tank is again filled, and the other tank discharged, if its supply is satisfactory, and so on. Working in this way, there is practically no risk of charred milk getting into the main supply.

Output of the Earle Road Plant.

The quantity of diluted milk handled daily at Earle Road is from 100 to 125 gallons, and this amount has to be distributed in about 3,000 bottles. Experiments had shown that the bottle-filling apparatus which was in use could still be employed, but that very special precautions would be necessary to ensure that gross re-contamination of the milk did not take place. It was therefore decided to alter the shape of the bottle in order to facilitate cleaning, and to substitute an ordinary cork stopper in place of the complicated spring and rubber stopper. It was anticipated that time would be saved and the chances of contamination greatly reduced by the change, while the cost of the bottles was also reduced. To further reduce opportunities for contamination, a much simplified filling apparatus was designed and introduced. This consisted of a covered tank, entering tubes from the electrical apparatus, gauge glasses, and delivery taps; the latter being operated by a lever handle and their outlets covered by an inverted funnel. In order to fill a bottle with the sterilized milk the operator pushes the neck of the bottle close up to the funnel top, and fills the bottle up to the necessary graduation mark with practically no air contamination. The bottles can be filled very rapidly, and it has already been found that time is saved by this new method.

Bacteriological Results.

Results of the tests made by the Liverpool City Bacteriologist.—Bacteriological examinations are made daily of the milk, both before and after treatment, and from time to time bottles are picked out at random from the stock which is being sent out, and the milk in these is also examined. The results of 15 consecutive days' tests in 1914 are given in Table II.

TABLE II.—TEST RESULTS OF THE LIVERPOOL CITY BACTERIOLOGIST.

	Control sample (untreated milk) 1 cubic centimeter		Treated milk 1 cubic centimeter	
1914.	Bacteria present (grown on agar at 37° C.)	Bacteria grown on neutral red agar at 37° C.	Bacteria present (grown on agar at 37° C.)	Bacteria grown on neutral red agar at 37° C.
Jan.				
26	777,000	1,140	642	0
27	uncountable	180	327	0
28	125,400	1,320	53	0
29	158,400	29	189	0
30	568,000	656	316	0
31	567,600	912	168	0
Feb.				
2	80,000	600	100	0
3	97,500	798	16	0
4	126,500	105	22	0
6	35,400	436	0	0
8	96,400	25	87	0
10	152,460	17	130	0
12	112,200	676	75	0
13	19,840	96	348	0
14	950,000	432	49	0

The bacteria which grow on agar at 37 degrees Centigrade give a fairly accurate representation of the total number of bacteria present in any sample; while those which grow on neutral red agar are *B. coli*, and its allies, which are mainly derived from manurial contamination, etc., and from the main milk-souring organisms.

Results of the tests made by Professor Delepine, Manchester.—The untreated milk was coagulated on the third day at a temperature of 68 degrees Fahrenheit. The sample of electrically treated milk, although slightly acid, was not coagulated in four days at the same temperature.

From the untreated milk, 352,950 colonies per cubic centimeter developed in four days at room temperature; no colonies were obtainable from the electrically treated milk in ten days at the same temperature.

The untreated milk showed "at least 1,700" *B. coli;* this bacillus was absent from the electrically treated milk.

Bacteria of four types were found in the treated milk when kept at 37 degrees Centigrade, but the numbers were considerably reduced as compared with the untreated sample.

Professor Ritchie, Edinburgh.—From the untreated milk 180,000 colonies were developed in 48 hours, at room temperature, from one cubic centimeter of milk. From the electrically treated milk no colonies were obtainable for six days, after which 20,000 were estimated at room temperature.

The ordinary milk contained 1,330 *B. coli* per cubic centimeter. The electrically treated sample did not contain any *B. coli.*

Professor Woodhead, Cambridge.—The total number of bacteria in the untreated milk was 16,000,000; in the treated sample the number was 185 per cubic centimeter at 37 degrees Centigrade.

The untreated milk showed 60,000 *B. coli* per cubic centimeter. The electrically treated sample did not contain any *Bacillus coli.*

The practical and bacteriological results of the electrical process of milk sterilization as carried on at Liverpool, England, are summarized as follows by Professor Beattie, the city bacteriologist.

(1) The electrical method of treating milk destroys the disease-producing bacteria, which are found in it.

(2) The main milk-souring bacteria are either completely destroyed or, if some members of this class are left, they may be neglected so far as the keeping power of the milk is concerned, for ordinary household use.

(3) The milk is not sterilized in the strictest sense of the word, but there is a reduction in the total number of bacteria by 99.93 per cent (See Table II).

The whole of the bacteria are not destroyed in heat-sterilized or pasteurized milk, for the reason that some bacteria can resist a boiling temperature for some minutes; and that at temperatures below boiling point, they may resist for prolonged periods This differentce is, no doubt, also exhibited towards electricity.

(4) The milk will keep perfectly sweet for at least three or four days after treatment, and this period will cover distribution and use in all cases of household milk supplies The keeping power is much prolonged if the milk is protected from after contamination.

(5) The chemical constitution of the electrically treated milk, so far as can be ascertained by chemical analysis, is unimpaired, and the taste is not in any way altered. The milk, from this point of view, may be described quite accurately as "raw milk."

(6) The milk is not only rendered nonpathogenic as regards ordinary bacteria, but in two cases in which the control supply was tuberculous, the electrically treated milk was non-tuberculous.

(7) The milk after treatment is perfectly satisfactory as a food for infants.

The most important perhaps of these conclusions from the point of view of the general public is (6), which states that milk which is tuberculous and capable of producing tuberculosis in animals or human beings who drink it, is rendered harmless by the electrical treatment described in this article.

Now that the "white scourge" of the human race is receiving so much attention, and such great efforts are being made to stamp it out, a method of attack which takes one of the chief sources of the disease, namely cow's milk, and kills the dangerous germs contained in it, before they have time or opportunity to do any harm, ought certainly to be adopted by all civilized countries.

The Liverpool City Corporation, as already stated, is acting as the pioneer in this new method of treating milk, but in time it is likely that private firms of milk purveyors will see the wisdom of adopting the electrical process of sterilization, and that every dairy of any size and reputation will have its electrical equipment, and "lethal tube," for electrocuting the dangerous bacteria that lurk in our milk supplies.

The writer's thanks are due to Dr. G. W. Hope, chief medical officer of health for Liverpool and to Professor Beattie, the city bacteriologist, for their kind assistance and the loan of photographs, etc., used in the preparation of this article.

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Joint Electrical Illumination Meeting in Chicago.

On the evening of June 10 there was held a joint meeting in Chicago in which participated the Chicago Sections of the Illuminating Engineering Society and the American Institute of Electrical Engineers, and the Electrical Section of the Western Society of Engineers. Announcement was made that the letter ballot on the election of Chicago Section officers for the American Institute had resulted in the choice of E. W. Allen as chairman, W. J. Norton as secretary, and D. W. Roper as member of the Executive Committee to serve three years. A communication was presented from Secretary Hutchinson, of the Institute, stating that persons attending its annual convention in Detroit next week will be met at the railroad depots by automobiles provided by the local committee; any that wish to take advantage of this service should communicate their time of arrival to C. C. Owens, chairman of the local committee, Dime Savings Bank Building, Detroit, Mich.

Design of Illuminated Signs.

The first of the two papers presented was entitled "The Design of Illuminated Signs." This was by Arthur H. Ford, professor of electrical engineering, University of Iowa. In opening his paper Professor Ford stated that he would attempt to set forth the laws governing the legibility of illuminated signs and a method of designing which will procure legibility at any predetermined distance. Legibility of a sign is dependent on the acuity of vision of the observer. An explanation of this, based on the anatomy of the eye, was made. It has been found both by optical measurements and by experiment that the maximum possible acuity is about 2,000, that is, this is the ratio of the greatest distance away from two parallel lines, at which they appear as separate lines, to the distance between them. This acuity constant has been derived by the use of two black lines on a white sheet, which is the reverse of the conditions in illuminated signs.

An experimental study of this matter was made and it was found that there is a marked decrease in visual acuity as the intrinsic brilliancy of the lamps increase. This is explained as follows: Whenever the images of two parallel lines form on the retina, the lines appear as one unless the images are sufficiently far apart to leave a row of cones between them that are stimulated weakly or not at all, in the case of two lines lighter than the background, or a row of highly stimulated cones when the lines are darker than the background. The effect does not seem to be confined to the cones upon which the image falls, when the stimulus is intense, but it seems to spread to adjacent cones. Thus, two bright images must be further apart in order that there may be an unstimulated row of cones between them than is the case when two dark lines have a row of stimulated cones between them.

In the design of solid-letter designs with dark background, the distance between the letters and the elements of the individual letters must be greater than the maximum distance at which the design is to be read, divided by the visual acuity for the luminosity used in the letter. If the sign has dark letters on a light background the width of an element of a letter must be greater than the maximum distance at which the sign is to be read, divided by the visual acuity for the luminosity of the background. Therefore, the letters of the dark-letter sign must be larger than those of a light-letter sign in order to have equal legibility. A luminosity of three lumens per square foot is satisfactory under most conditions. Experiment showed that as the luminosity is increased the distance of legibility first increases and then decreases to a definite minimum.

The design of point-letter signs is a difficult problem on account of a number of limitations. The individual lamps of each letter must be closer together than the elements of the letter. The lamps should be so closely spaced that there will be two in the shortest element of the letter.. Signs made with a large number of lamps per letter are very legible. In approaching a point-letter sign a person first sees a blur of light, then the letters, and finally the individual lamps; at this time the forms of the letters almost disappear. This is particularly noticeable when approaching the sign at an angle. By using frosted lamps these defects are overcome to a large extent. Point-letter signs made from illuminated bull's eyes are usually more legible than those made up of lamps.

The defects of the point-letter sign are largely overcome, while retaining the drawing power of the brilliancy of such a sign, by mounting the lamps on a solid-letter sign in which the troughs are of light color. This is because the reflection of light from the letter fills the dark gaps between the individual lamps. Most makers have used too few lamps per letter. This was borne out by experiment. It is futile to use high-power lamps unless they are of such size that a large number of lamps can be used for each letter.

Professor Ford suggested as the most desirable sign for ordinary use, one with solid letters for its legend and a border of lamps, if it is desired to attract the attention by means of brilliancy of the sign. The spaces between the letters or parts of the letter should be greater than the distance of the observer, divided by 1,000 when the observer is at the greatest distance at which the sign is to be read. The next best sign from the standpoint of legibility, in his opinion, is one with trough-shaped letters, in which are bowl-frosted lamps having V-shaped filaments. The frosting should be thick enough to reduce the light received directly from the lamp to the same intensity as that reflected from the trough. The shape of the trough should be such as to equalize the light given off in different directions so as to make legibility independent of the angle at which the sign is observed.

The discussion on Professor Ford's paper was opened by R. E. Cleveland, of Cleveland, O., who told of some research work he had conducted along similar but more practical lines. A special photometer was arranged to permit making a study of the best proportions of letters. It was found that greatest legibility at a distance resulted when the height of the letter was about 15 times the width of its lines. Legibility also was increased when the width of the letter was increased, also when the spacing between letters increased. Mr. Cleveland's work was made with adjustable letters and is being continued.

A communication was presented from Evan J. Edwards, Cleveland, O., who corroborated Professor Ford's conclusion that legibility increases when the intrinsic brilliancy is decreased. However, commercial considerations require a striking appearance in order to attract and, moreover, many signs are mounted so that view of them is obstructed from a distance so that legibility at a distance is not called for.

L. G. Shepard, Chicago, Ill., said that sign manufacturers had given much attention to the influence of many factors on sign legibility. There are many considerations, such as cost and size of sign, that limit the designer in laying out a sign on scientific lines. Atmospheric conditions, like smoke, fog and dust, also influence the legibility of signs. Mr. Cleveland admitted that these affect the legibility, but not always in the same way; some cloud and fog conditions have the opposite effect that others produce.

Dr. Harry Gradle, Chicago, touched on the influence of the anatomy of the eye on sign legibility. Since the greatest acuity of vision is in the macular region of the retina, a sign should not be too large to be taken in at a single glance. Professor Ford's conclusions as to the relation of legibility and intensity of illumination are borne out by the observation of several ophthalmologists.

Mr. Shepard and Mr. Cleveland both called attention to the influence of the subject. Scarcely two people get exactly the same impression from an illuminated sign. In closing the discussion, Professor Ford said that his aim was to reduce his investigation to the simplest possible basis, that of parallel lines. Therefore, his results are simpler to interpret than those of Mr. Cleveland, who is working with variously shaped letters. It all reduces to the fundamental proposition that the elements of a letter, or two separate letters, must be kept far enough apart to distinguish them as different points.

Street Lighting in Chicago.

A paper with this title prepared by P. E. Haynes, of the Department of Public Service of the City of Chicago, was read in the absence of the author by W. R. Matheny. This paper opened with a brief review of the development of street lighting in Chicago. At the present time four general types of lamps are used, namely, arc lamps, tungsten lamps, incandescent gas lamps and incandescent gasoline lamps. The use of arc lamps is confined chiefly to business districts, streets having heavy traffic, residence streets which have relatively few trees, and those districts where the density of population does not warrant the high initial cost of ornamental tungsten lighting. At present there are in use about 19,000 arc lamps; of these about 1,160 are flame arcs supplied by the Commonwealth Edison Company; there are about 10,280 ten-ampere flame arcs on the city's circuits; about 1,000 direct-current open arcs and about 6,000 alternating-current inclosed arcs are still in service.

The paper described the chief features on which the selection of the standardized flame arc lamp was determined. A total of 168 points was determined as being required for the ideal lamp and the various characteristics were given weight in about the following order: reliability, 30 points; carbon consumption, 25 points; accessibility of mechanism, design, materials, each 20 points; total light flux, light distribution, light constancy and light efficiency, each 10 points; mechanical efficiency and voltage regulation, each 5 points; power factor, 3 points. The manner in which the various lamps that had been submitted were tested for these points was described, particularly the test of accessibility. The various lamps were taken apart and reassembled by skilled mechanicians who were timed during the operation.

All of the posts now standardized for Chicago street lighting, and which were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 6, 1913, were illustrated in the paper. Ornamental tungsten-cluster lighting must all be converted into a standard type of post within the next few years. This post, as well as the posts used by the city itself, have been designed by the Municipal Art Commission. For the series tungsten system used in residence streets where trees are abundant, the old gas lamp-posts were employed. Although the illumination values are not high, it has been found that the actual visual efficiency is very good.

The illumination of a large number of street subways under elevated steam-railroad tracks was described. Some of the track-elevation ordinances require the railroads to illuminate the subways in accordance with specifications drawn up by the city, the remainder are now lighted by the city itself. The system proposed by the railroads produced a number of glare spots, alternating with deep shadows. An installation was then made by the city and this, with some slight modifications, has been adopted as standard; 25-watt tungsten lamps are used throughout the subway lighting. The roadway is lighted by means of lamps placed in angle reflectors at the curb line, which are turned 45 degrees in the direction of traffic, to avoid glare in eyes of drivers. The sidewalks are illuminated by lamps placed directly overhead. For each 400 square feet of subway area one 25-watt lamp must be provided. All lamps are provided with porcelain-enameled steel reflectors. In those subways lighted by the city over 4,000 lamps are now used. Incandescent lamps were selected instead of arc lamps on account of the large number of track-supporting columns which cast annoying shadows where only few lamps were used.

The paper also described gas and gasoline street lighting, which is gradually being restricted. All the gas lamps have been converted into the incandescent-mantle type, chiefly with inverted mantles. On some of the streets where a more ornamental effect is desired the inclosed globe is an opal vase-shaped globe. Where neither electricity nor gas are available incandescent-gasoline lamps are used, but on account of the increasing cost of fuel these are being diminished rapidly. A method of testing gas and gasoline lamps for maintenance was described; 25 per cent of all these lamps in service are inspected each month while lighted. The inspection includes a general supervision together with a simple photometric test. The monthly bill of the contractors providing these types of lighting is based on the percentage found as a result of these inspection tests. The paper closed with a brief description of the city's street-lamp testing laboratory, the facilities in which are arranged to permit of quick tests of any type of lamp in service.

Discussion of this paper was opened by A. J. Sweet, Milwaukee, Wis. He reviewed in a brief analytical manner the objects of street illumination, which are sixfold: safety from collission, safety from attack, safety from burglary, convenience in recognition of passers by, convenience in avoiding stumbling, convenience in avoiding puddles. Mr. Sweet also analyzed the four methods by which we discern objects in a lighted street, these are by silhouette effect, by illumination effect, by shadow effect, and by glint effect. In all street-lighting problems the first thing to consider is exactly what we are trying to accomplish, then it is possible to lay out the lighting to accomplish this in the most effective manner.

Hans Schaedlich, of the Chicago City Department of Gas and Electricity, describes some tests made on a Chicago street with gas-filled tungsten lamps. Seven of these were connected into a 10-ampere arc circuit, alternating with flaming arcs. The Chicago lighting circuits are all fed from the star-connected secondaries of transformer banks, whose primaries are delta-connected. The neutral point of the secondary Y is grounded; any ground on a line therefore forms a short-circuit of the line. To test the effect of such grounding on the gas-filled lamps, two of them were put into a fully loaded experimental circuit and all the rest of the load suddenly short-circuited though an oil switch; although repeated some 20 times, the lamps withstood the strain perfectly and are now in service on arc circuits. This test was much more severe than any strain likely to be imposed on the lamps in operation. The city has selected for trial installation 300-watt, 600-candlepower lamps of this type, each equipped with a 10 to 20-ampere compensator, special refractor, diffusing globe and a housing designed to correspond closely with that used for flame arc lamps. This type of lamp, on account of its steadiness of light and lack of light depreciation during life, is considered superior to the flame arc lamp with its maximum of 1150 candlepower through a diffusing globe.

J. R. Cravath, Chicago, spoke of a recent evening inspection he had made of the different systems of street lighting used in Chicago. On West Congress Street, where some nitrogen lamps were alternated with flamed arcs, he was surprised at the excellent manner in which the new lamps showed up to their arc rivals. Big differences were noticeable in the performance of the latter, whereas the nitrogen lamps were perfectly steady. It looks as if the days of the arc lamp are really numbered. Of the various systems of electric lighting in use on Chicago streets, probably the most pleasing and satisfactory all around is that using 80 or 100-candlepower series tungsten lamps in single inclosed units for each 75 feet of street length. Although the illumination these give is not very high, it is quite uniform. The question comes up in each installation, how far can we go in increasing the number of units and decreasing the space between them to get uniformity of illumination without prohibitive cost?

Program of Society for Promotion of Engineering Education.

The twenty-second annual meeting of the Society for the Promotion of Engineering Education will be held at Princeton, N. J., June 23 to 26. The sessions will be held in the Palmer Physical Laboratory. Sessions for the reading of papers will be held each morning and afternoon. The following papers and reports will be presented: "The Financial Department of a School or University," by T. H. B. McKnight; "The Relation of the Administrative Department to the Teacher," by C. R. Mann; Report of the Committee on College Administration; "Education in Scientific Management," by Hugo Diemer; "Academic Efficiency," by L. M. Passano; Reports of Committees on Improvement in Laboratory Instruction, by Charles F. Scott, F. P. McKibben, A. M. Greene, and F. W. Sperr; Report of Committee on Teaching Mechanics to Engineering Students, by E. R. Maurer; Report of Committee on Teaching Physics to Engineering Students, by D. C. Miller; "Practical Mathematics," by W. S. Franklin, Barry MacNutt, and R. L. Charles; "The Calculus Without Symbols," by E. R. Hedrick; "The Use of the Differential in Calculus," by E. V. Huntington; Report of Committee on Entrance Requirements, by J. J. Flather; "The Preceptorial System and Electrical Engineering at Union College," by W. L. Upson; Report of Committee on Statistics, by A. J. Wood; "Teaching Engineers How to Study," by George L. Sullivan; "Giving Instruction in Methods of Study," by W. H. Kenerson; Report of Joint Committee on Engineering Education, by Desmond Fitzgerald; "Co-ordination in Engineering Instruction," by A. B. McDaniel; "Study of Technical College Catalogs with Respect to Descriptions of Courses of Study and Instruction," by H. S. Jacoby; "Grading of Students by Universities versus Grading of Technical Graduates by Employers," by C. F. Harding; "Better Textbooks," by F. H. Sibley; "A Report of Progress in Co-operative Education," by A. M. Wilson; Report of the Committee on Co-operation with Secondary Schools, by H. E. Webb; Report of the Committee on Technical Nomenclature, by J. T. Faig; "A Department of Engineering at the John Hopkins University," by J. B. Whitehead; "Proposed Courses in Structural Engineering for Civil Engineering Students," by W. M. Wilson; "The New Mechanical Engineering Course at Columbia University," by Charles E. Lucke.

On Wednesday evening there will be a lecture by W. F. Magie on "The Meteor Crater in Arizona." On Thursday evening the annual dinner will be held, followed by the presidential address by G. C. Anthony. On Tuesday afternoon there will be a reception by President and Mrs. Hibben,, and on Tuesday evening a smoker.

Cottrell Electrical System of Smoke Deposition.

F. G. Cottrell, of the United States Bureau of Mines, delivered a most interesting talk before the Utah Society of Engineers at the Consolidated Music Hall, Salt Lake City, Utah, on the evening of June 10, on his electrical system of smoke deposition.

Dr. Cottrell's talk was an especially timely one, in view of the strong agitation which has developed in Salt Lake City during the past three or four years looking to some solution of the smoke nuisance, which has become so serious with the rapid growth of the industrial plants of the city.

Dr. Cottrell pointed out that it was known as early as 1824 that finely divided solid particles carried in suspension in the air could be deposited on a plate by means of a brush discharge from a static machine in the field. No practical progress was made, however, owing to the fact that the static machines available at that time were entirely inadequate in commercial application.

Again in 1850 in an article in the *Mechanics Magazine*, of London, the same phenomenon was reported and attention was called to the fact that this could be used for the purpose of throwing down finely divided particles carried in suspension in the air.

Sir Oliver Lodge in 1884, without a knowledge of the work of previous discoverers, reported before a meeting of the British Society of the Chemical Industry his discovery of this fact, and patents on the general principle were taken out at that time in Great Britain and several other countries. These patents have long since expired.

In 1905-6 Professor Cottrell, then connected with the University of California, took up the work. The big advance which he made in the process consisted in the abandoning of the static machine as a source of high-potential direct current. He arranged to tap off the peak of the voltage wave from a high-potential alternating-current circuit, thus securing a high-potential unidirectional source of energy. This permitted the practical application of the process to sulphuric acid plants, powder works, cement plants, and smelters.

At Riverside, Cal., 90 tons of cement dust per day are recovered from the flues of the Riverside Portland Cement Works by this process with a power expenditure of only 35 kilowatts. It is reported that the waste product recovered practically pays for the expenses of operating the system.

Dr. Cottrell frankly states, however, that he does not see how this process can be successfully applied to the solution of the smoke problem in Salt Lake City except in special cases. He believes that the solution lies more in the direction of securing a smokeless fuel and urged that the city take steps to have a careful economical survey made to determine whether or not the problem may be thus solved.

Dr. Cottrell has been conducting a series of experiments on the Murray plant of the American Smelting & Refining Company for the past several months and these experiments have been highly successful. The prospects for the complete elimination of the poison-laden dust from the smelter flues are quite assuring.

The smelters in the Salt Lake Valley have had to pay thousands of dollars per annum in damages to the farmers on account of the injury to their crops by this flue dust, and a solution of the problem will be welcomed.

New York Electrical Society.

The annual meeting of the New York Electrical Society was held on June 10.

The treasurer reported that 75 per cent of the heavy debt with which the Society started the season has been removed, and it is now certain that the whole amount will shortly be paid off.

The secretary reported that during the year 83 members have been elected, 43 have resigned and 128 have been dropped for non-payment of dues. The actual membership numbers 702. The average attendance has been 148, which in these days of multiplied organizations is an excellent indication of the interest attaching to the subjects treated.

William P. Kennedy's lecture on "The Electrical Vehicle in New York City" was followed by a series of motion pictures.

Wireless Weather Forecasts for Great Lakes.

A daily weather bulletin for the Great Lakes is now being sent out from the radio station at Radio, Va., according to an agreement just arrived at between the United States Weather Bureau and the United States Naval Radio Service. This bulletin is sent out in two parts. The first consists of code letters and figures describing the weather conditions actually prevailing at 8 p. m. that day at various points along the Great Lakes. The second part of the bulletin is a special forecast of the winds that will probably be encountered on the lakes. This is distributed to shipmasters on the Great Lakes by the Naval Radio Service during the season of lake navigation—usually from about April 15 to December 10—in the same way that weather conditions for the North Atlantic Ocean and the Gulf of Mexico are sent out.

Civil Service Examination for Assistant Radio Inspector.

The United States Civil Service Commission will hold a competitive examination for assistant radio inspector at the usual places on July 8. The salary for this position is $1,200 per annum; vacancies are to be filled in the offices of the radio inspectors of the Bureau of Navigation at New York City, San Francisco and Cleveland, and possibly others. One-half the credit in the examination will be based on practical questions on the use and adjustment of radio apparatus and auxiliaries; the other half of the credit will be based on experience and education in the line of the required duties. These are primarily to assist radio inspectors in the enforcement of the wireless communication laws. The assistant inspectors are required to inspect radio equipment on board vessels and in land stations.

Applicants must be men over 20 years years of age and should be graduates in electrical engineering from technical schools of recognized standing or have had not less than two years' experience in special radio work. While not essential, it is desirable that they be wireless operators. Applicants should write to the Commission at Washington, D. C., for application form 1312, stating also the title of the examination for which the form is desired.

Trenton Telephone Gathering.

The fourth annual banquet of the Trenton (N. J.) Telephone Society of the Bell Telephone Company was held at the Trenton House in that city on June 12. J. Henry Daly, president of the society, officiated. Among the guests were L. H. Kinnard, vice-president and general manager; F. I. Daly, assistant secretary and treasurer; J. H. Crosman, Jr., general commercial superintendent; and W. F. LaRoche, general superintendent of plant.

Additional Street Lighting for Pittsfield.

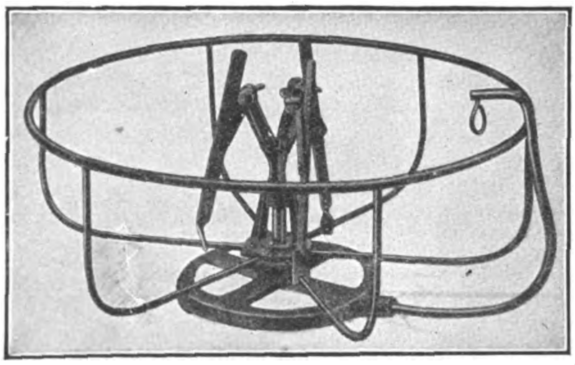
The committee of the Pittsfield, Mass., city government in charge of street lighting has voted to recommend the installation of 51 6.6-ampere luminous arc lamps by October 1 on West and North Streets, between the Boston & Albany station and Maplewood Avenue. The City Council was to act upon the proposed street-lighting contract with the Pittsfield Electric Company at a meeting on June 15. The contract is of five years' duration and the company has offered to supply service at a price of $101 per year, compared with the present price of $108 paid for 500-watt, 10-ampere flaming arc lamps on these streets. The Pittsfield Electric Company is to install and own the entire system.

New Electrical and Mechanical Appliances

A New Wire Reel.

The Wiring Equipment Company, 30 Church Street, New York, N. Y., has recently put on the market a new reel, known as the "Real" reel, for handling wire. This reel will handle any kind of wire manufactured, whether plain or insulated, single or multiple strand; flexible conduit, wire or manilla rope, bare iron wire, copper wire, aluminum wire, in other words any material put out in coils, barbed wire included. When a coil of wire is placed on this reel, it need be given no further attention, and it can be drawn off at any speed without snarling, tangling or kinking.

The coil is held in a basket revolving on a ball bearing, which prevents the wire from escaping. The wire is fed out through a loop on a stationary arm, and when the operator stops reeling off the wire, the reel automatically brakes itself. The reel has no wearing parts nor loose parts, and needs no oiling. This reel has an expanding core which snugly fits coils having any inside diameter from 4 to 15 inches.



New Wire Reel.

For dealers in wire, the new reel has proven a great convenience in winding off wire for sale. These reels are made in two stock sizes, one weighing 12 pounds, with 24-inch inside diameter, and another weighing 6 pounds, with 12-inch inside diameter. Special sizes can be made to order on short notice.

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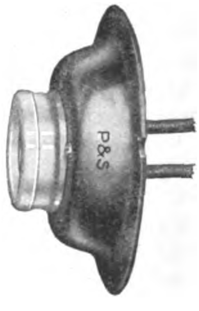
New Designs in Parian Glassware.

"Parian" is the name chosen for the well known line of illuminating glassware sold by the H. W. Johns-Manville Company. It was selected because of the close resemblance of this material to beautiful Parian marble. The glass, even when unlighted, is highly attractive. The makers claim that Parian ware absorbs a minimum amount of light. The excellent diffusion results in a peculiar soft radiance that is very pleasing.

Because of its characteristics, Parian ware is being adopted extensively by stores, offices, churches, theaters, public buildings, auditoriums, for residences, and especially in those edifices where harmony and beauty are considerations.

Period designs have been artistically produced and there are now ready, Louis XV, Grecian, Empire, Dresden, Elizabethan, Venetian, etc. These are offered as bowls, hemispheres, spheres, wall lights, pendants, showers, and reflector shades. The colors offered afford a wide choice and include many delicate pastel shades, such as old rose, old ivory, ecru, verde, rose verde, gold verde, old gold, gold, etruscan brown, etc. Other tints of this Parian ware can be ordered to match special furnishings.



Outlet-Box Cover and Receptacle.

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Improved Outlet-Box Receptacle and Cover.

In line with its policy of continually improving its products, the firm of Pass & Seymour, Incorporated, Solvay, N. Y., has recently changed the combined receptacle and cover for four-inch boxes. Formerly this was supplied with a flat cover. By making it cup-shaped, however, it has been found that there is a great deal more room in the box for working.

This fitting is made with either brass or iron cover. In the former case it is finished in brushed or polished brass. The iron covers are either japanned or sherardized. Each receptacle is furnished with six inches of No. 14 stranded, new-Code rubber-covered wire for convenience in connecting to the outlet.

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Motor-Driven Meat Chopper.

A noteworthy feature of the motor-driven meat chopper shown in the accompanying illustration is its extreme simplicity. It forms an exceedingly compact unit, with all working parts totally inclosed so that it is perfectly safe and is readily kept clean. Finished in red and aluminum bronze, it forms an ornamental addition to any butcher shop.

The height is 23 inches, width 16 inches, length 28 inches, and weight 240 pounds. With a one-half-horsepower motor, its capacity is 350 pounds of beef per hour. The chopper can be removed and placed in the cooler so that cleaning after every run is unnecessary.

Electric Meat Chopper.

It is made by the Cleveland Electric & Manufacturing Company, Cleveland, O., and is driven by a Westinghouse inclosed motor.

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Improved Motors for Chicago City Railway Company.

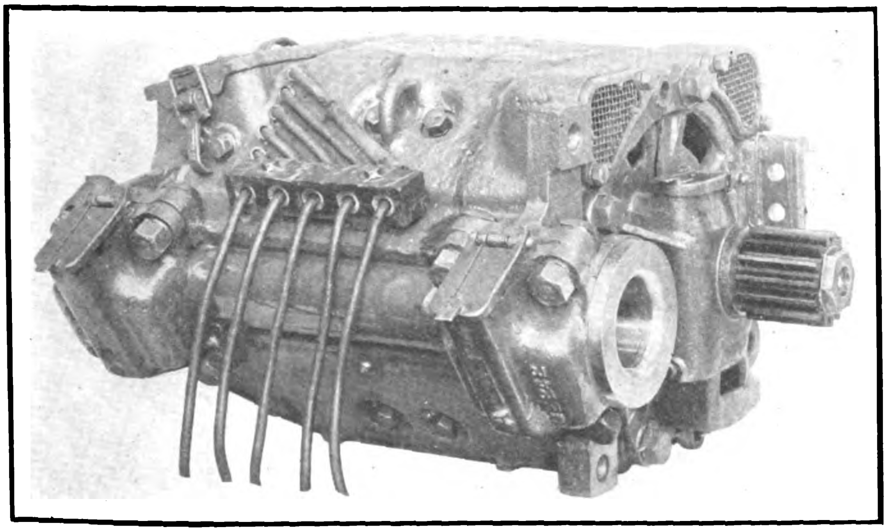
The 200 new motors in two-motor-equipments recently supplied by the General Electric Company to the Chicago City Railway Company, for service on its new cars, while following generally the well defined lines of modern railway-motor practice, embody many improvements in details of design and construction that are of interest. These motors, known as GE-242-A, are of the ventilated, commutating-pole type, designed for tapped-field operation, and are fitted with the system of induced ventilation which has been developed and very largely applied by the General Electric Company during recent years.

Under the standardization rules, the new motor has an hourly rating of 65 horsepower on 600 volts, and of 55 horsepower on 500 volts, but has a largely increased service capacity when compared with motors of the closed type having the same hourly rating, on account of the positive circulation of air which is maintained through the motor.

The use of cast iron has been entirely eliminated from the design, steel or malleable iron being used for castings, and pressed steel or drop forgings wherever practicable.

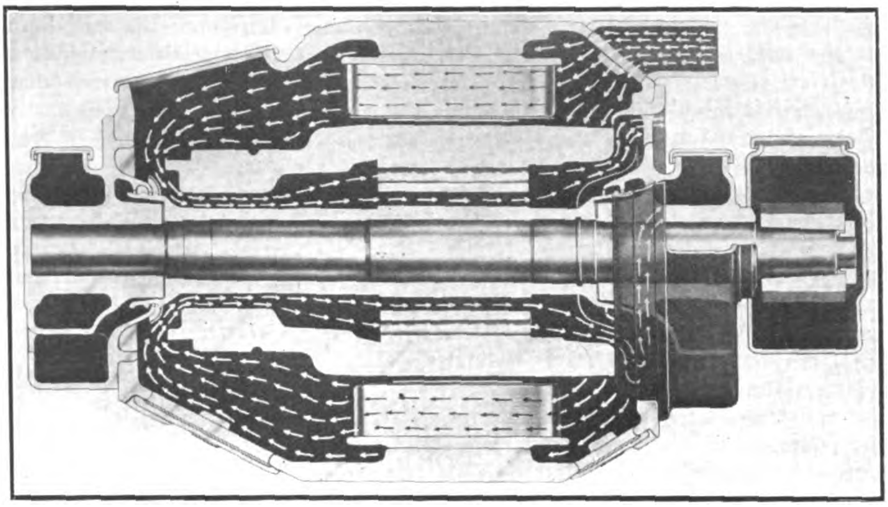
The frame, which is of soft cast steel, approximately octagonal in section, is of the box type, admitting of efficient design of field coils, armature and bearings. A bored opening, to take the frame head, is provided at each end, the one at the pinion end being sufficiently large to enable the armature, field coils and pole pieces to be easily inserted or removed.

The frame heads are solid and form the housings for the armature-shaft bearings. They are provided with large boxes for oil and waste, and have auxiliary oil wells for filling and gauging the supply of oil. They also have wells into which is drained any oil that may be thrown off by the deflectors on the shaft.



New Ventilated Direct-Current Railway Motor.

Ample facilities for internal inspection have been provided. The cover over the commutator is fitted with a spring locking device, which, while being absolutely secure, admits of instant removal of the cover. The armature bearings are of bronze, lined with babbitt of such a thickness that, should the babbitt be melted out by overheating, the bronze will still support the shaft without injuring the bearing surfaces and also prevent the armature from touching the pole pieces. The axle is completely inclosed between bearings by a sheet-steel guard, which effectively protects the bearings from dust.



Section Showing Ventilation Paths.

Four exciting pole pieces are built up of soft-iron laminations and assembled on a key, into which are screwed the bolts securing them to the frame. They are located at an angle of 45 degrees to the vertical, with the commutating poles on the vertical and the horizontal center lines. The commutating pole pieces are drop forgings.

The field coils are wound of strip copper, insulated between turns with asbestos, the whole being mummified and insulated with varnished cambric and heavy tape, making them practically indestructible and moisture-proof. They are supported by improved spring-metal seats and spring flanges, giving an evenly distributed pressure, and preventing movement and abrasion.

The armature core has 35 slots. The soft-steel laminations are keyed to the shaft and securely held between steel armature heads. Provision is made for removing the shaft without disturbing the windings or connections to the commutator.

Rectangular wire is used in the armature windings. The coils are pressed to exact shape in a steam mold, covered with insulating material, taped and impregnated with insulating compound by the vacuum process. When all coils are assembled, the armature is heated and temporary binding bands put on under considerable tension, which press down the coils well into place. When cold, these bands are removed and permanent bands of tinned steel wire are wound on in recesses provided for the purpose. These are secured by mechanical means in addition to their being soldered. This construction positively insures permanently tight armature coils.

The commutator is built up of hard-drawn copper bars, insulated from the steel shell by cones of the best grade of mica. The bars are insulated from each other by similar mica, grooved 3/64 inch below the surface of the commutator.

For the brush-holder supports drop forgings are used, into which are pressed two mica insulated studs. These pass through porcelain insulators having exceptionally long creepage distances, and are securely held by drop forgings bolted to the frame by tap bolts inserted from the outside. The brush-holder body slides in finished ways on the support and maintains correct alinement throughout the range of adjustment. The body, which is of bronze, is of substantial design and affords thorough protection to the fingers and springs. The brushes slide in accurately machined ways, independent pressure fingers being provided for each brush.

These fingers have drop-forged copper tips, which are pressed against the brushes by open-wound spiral springs. These springs are of steel, oil treated, and of such a design that the tension remains practically constant throughout the limits of wear of the brushes. The tension can be adjusted by means of a ratchet wheel and pawl. A flat shunt of woven copper wire is provided. The brush-holder lead is attached to the support, which admits of removal of the holder without disturbing any electrical connection.

A positive circulation of air through the motor is maintained by means of a powerful fan cast integral with the pinion-end armature head. Air is drawn in through screened openings in the corners of the frame at the pinion end. It passes over and around the field coils and pole pieces to the commutator end; thence it returns through the commutator shell, through longitudinal ducts in the armature core to the fan, and is exhausted through cored holes in the pinion-end frame head to the exterior. The circulation of air is shown in the sectional view, page 1255. By this means heat is very effectually dissipated from the motor and the service capacity very largely increased.

Gears and pinions of armorized steel have been supplied. These have a ratio of 4.73 to 1, a diametral pitch of three, and a working face of five inches.

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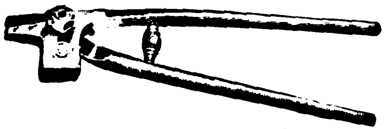
The "Red Devil" Handy Hammer Snip.

To the mechanically inclined every new need in the vast field of industrial machinery, whether for a special tool or a special manufacturing process, suggests some particular instrument or appliance to meet the new condition.

Such indeed seems to be the constant experience of the Smith & Hemenway Company, Incorporated, whose fertile inventiveness has just added to its "Red Devil" tools a most useful and practical little tool, which has been called a "Handy Hammer Snip."



Handy Hammer Snip.

Resembling somewhat a tinner's "snip," the blades of this tool are very narrow so that circles may be cut as easily as a straight line. But the most unique feature of this tool consists in the happy combination of hammer and snip. The hammer head, slightly convexed, is placed opposite the turning center. Since the length of the tool is only eight inches and its weight but eight ounces, its action is quite effective and powerful for its size.

The illustration herewith gives a clear idea of this clever little tool, for which machinists, tinners, and automobilists in particular, will undoubtedly find many uses. Samples and prices can be secured by applying directly to Smith & Hemenway Company, Incorporated, 150 Chambers Street, New York City.

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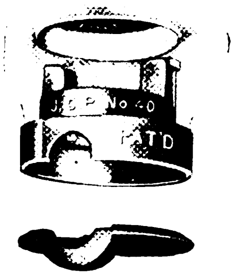
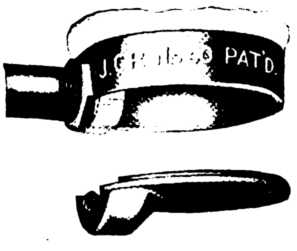
New Outlet-Box Attachments.

Another addition to the well known line of J. C. P. specialties, making the line of outlet-box attachments manufactured by James C. Phelps, of Springfield, Mass., most complete, is a new and practical device for extending conduit from an open outlet-box cover. This is a very convenient fitting for connecting exposed conduit work into an open outlet-box cover that is plastered into the ceiling.



Outlet-Box Attachment Ready for Insertion in Open Outlet-Box Cover.

This attachment is also made for extending metal molding in the same manner as extending conduit. It is easily and securely attached, no special screws or lugs being necessary on the outlet-box cover.



Conduit Extended from Outlet-Box Attachment.

These fittings are marketed exclusively by L. E. Frorup & Company, 232 Greenwich Street, New York, N. Y.

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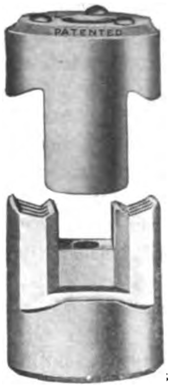
The Buckeye Reversible Split Knob.

The Findlay Electric Porcelain Company, Findlay, O., a few years ago placed on the market the Findlay interchangeable, self-centering, split knob, which was described in these columns in the issue of April 6, 1912. This knob met with such favor that the company has now developed a new split knob which will probably still further increase the usefulness of these devices.

It will be observed from the illustrations herewith that the new knob, which is known as the Buckeye, is not only reversible and has both parts exactly alike, but has two wireways in each part, thus making it a two-pole knob in straight wiring and a four-pole knob in cross-over work. The two parts fit together so neatly as to interlock and prevent displacement while installing them. Small projections are provided on the face that engages the wall or other mounting surface to prevent this knob from turning. Either screws or nails may be used to fasten the knobs, as required. The taper of the wireways, together with their transverse ribs, wedge the wire tightly without injuring the insulation. These knobs are made for No. 12 and No. 14 wire. Three sizes are made: 1.125 and 1.25-inch diameter round and 1.125-inch square. All the knobs are made of strong, high-grade porcelain.



Two Symmetrical Parts of Reversible Split Knob.

Knob Complete.

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Frantz Premier Convention.

Sixty distributors of the Premier Vacuum Cleaner Company from all parts of the country were guests of the company at Cleveland on June 2, 3 and 4. All were enthusiastic over the new plans announced which include the marketing of over 100,000 Frantz Premiers during the next twelve months. Edward L. Frantz, president, announced a reduction in the price and told about the $100,000 advertising campaign which starts immediately in the big magazines.

Mr. Frantz was host at two banquets, one at the Cleveland Athletic Club and the other at the Hollenden Hotel.

The business sessions were interspersed with several open-air luncheons, bathing parties, etc., and the meetings closed with the announcement that the convention would hereafter be an annual affair.

The Premier Vacuum Cleaner Company started business four years ago in a single room with three employees. It now occupies a modern factory and employs 300 men. Last year's output totaled over 60,000 machines.

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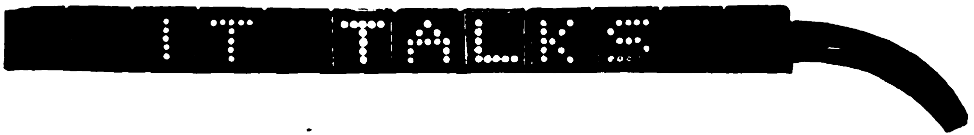
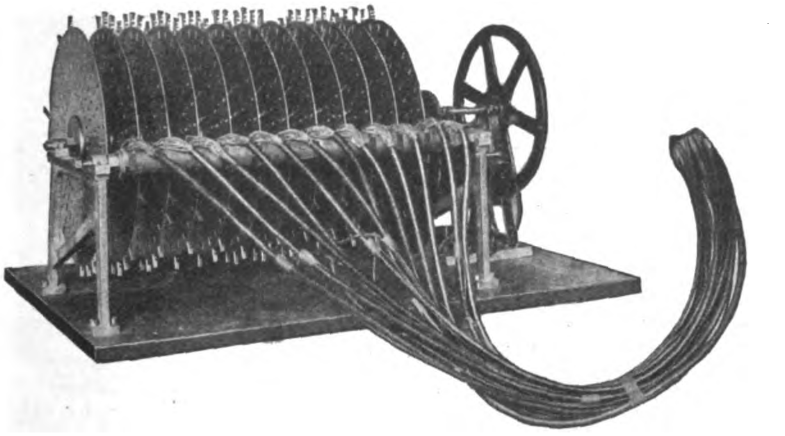
A Talking Window Sign.

A novelty in the way of electrical signs, which is suitable for use in window displays, bulletin boards, train announcers, theater program boards, etc., has been placed on the market by the E-B Electric Sign Company, Incorporated, 209 North Jefferson Street, Chicago. An illustration of one of these signs that was recently installed in the show window of a haberdashery shop in Chicago is shown herewith. This sign had a unique distinction in that shortly after its installation its use was forbidden by the Police Department, because it had attracted such a large crowd in front of the window as to almost obstruct the sidewalk and hamper traffic. It was shown, however, that although the sign did attract large crowds, it did not come within the regulations of the city ordinance prohibiting window shows and sidewalk-obstructing attractions, because the reading matter on the sign was continually repeated after an interval of approximately a minute: the crowds that congregated before the window watched the display for a short time and then moved on, giving room to other spectators, and thereby preventing a complete stationary blockade of the sidewalk, which is prohibited by the municipal ordinance; in other words, it was a moving crowd and was therefore finally permitted.



Talking Window Sign.



Operating Mechanism for Talking Sign.

This sign can be made up in a variety of forms and sizes. The particular sign shown consists of twelve block spaces suitable for as many changeable letters, each space being three inches high and three inches wide. The front of each of these spaces has a glass cover, sandblasted on the inside. This hides from view 25 small tungsten lamps directly behind the glass plate. These lamps are arranged in five rows of five each, and the principle of the sign consists in lighting selected lamps in such a way as to form any desired letter or figure. The manner in which this is done is shown by the illustration of the flashing or control device which is connected by a series of cables with the sign. The flasher can be placed at some distance from the sign and is automatically operated by motor, so that the entire outfit can be obscured from view. This makes the sign mysterious in its action, and therefore particularly attracting.

The operating device has 12 disks, one for each of the letter plates. These disks are mounted on a common shaft, which is rotated intermittently by a motor through gears. Between each of the disks is a contact arm that holds 25 contacts. Each of these contacts is connected through a cable containing as many wires and leading to the 25 lamps in a letter plate in the sign. Small projections shown sticking beyond the periphery of the sign are known as "letter sticks"; these fit into grooves in the disks and are easily inserted and removed. These letter sticks control the letter or symbol which the corresponding letter plate will show. A standard window sign makes 32 complete changes and then repeats, in other words, there are 32 segments to each disk, each of which may receive a letter stick. The entire group of letter sticks can be set up in half an hour, and the sign is then ready to operate.

The lamps are operated at low voltage, the current being obtained by a one-sixth-horsepower rotary converter and step-down transformer. The cost of operation of a twelve-letter sign, such as shown, is in the neighborhood of one cent an hour. There are furnished with each of the twelve-letter signs 600 assorted letter sticks, including letters, figures and characters. There are also furnished several extra tungsten lamps, several blank letter sticks and extra glass covers. The standard length of cable is ten feet. The sign is also equipped with an automatic cut-off, which takes the place of a time switch. The sign is fully equipped, ready for operation, and requires merely mounting in the desired place and connection to an ordinary lighting circuit. Although the standard sign at the present consists of only twelve letter plates, any number of these can be furnished, and they can be grouped in any desired combination. The letter plates also may be of any size desired

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Locomobile Adopts Westinghouse Electric Equipment.

The Locomobile Company of America has adopted the latest Westinghouse electric six-volt starting and lighting equipment for its 1915 models. This consists of generator, starting motor, switch, voltmeter and junction boxes. The main features of this Westinghouse automobile equipment were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 25, 1913.

The lighting generator is especially designed for operation at slow speeds, developing ample output for all lamps, and has splendid characteristics for battery charging. It is of the differentially wound, self-regulating type.

The starting motor is designed for high starting torque and a minimum consumption of current. It is of the series-wound type, the power being applied through a shift pinion. By novel arrangement the sequence of starting operations is practically instantaneous.

The flush-type voltmeter indicates the exact condition of the battery at all times. All lettering on voltmeter scale is white on a black ground, to avoid glare when the meter is illuminated.

By using junction boxes all electrical wiring on the chassis and body is centered at one point, thus facilitating removal of the car body from chassis. All connections, both of the starting and lighting systems, are on single-wire circuits, reducing the wiring to a minimum, and contributing to the efficiency of the electric system.

A Large and Striking Central-Station Sign.

The Commonwealth Edison Company, Chicago, has maintained for several years on the roof of its old Harrison Street station a large electric sign calling attention to Edison light and power service. The sign faces north and is just west of the river, so that it can be readily seen from all of the bridges and adjacent viaducts for about three-quarters of a mile northward. The announcements on the sign have been changed from time to time, principally by substituting the names of large Commonwealth power customers. Recently, however, the sign has been completely remodeled and now presents one of the most strikingly original departures from the usual central-station flashing sign advertising electric power.

A view of the new sign is shown herewith. It has been declared by competent persons to be one of the finest examples of electrical advertising. The size of the sign is remarkable, but it does not appear to be as big as it is, because the nearest approach to it, the Van Buren Street bridge, is a long block north of it. The total length of the sign is 204 feet and its height from top to bottom, 42 feet. The picture portion at the left is 55 feet long. Probably the best idea of its real size can be obtained from the statement that the figures of the two men in the picture portion are 36 feet high each.

This part of the sign is beautifully worked out in color, the effect being secured by Reco color hoods fastened to the individual lamps, as desired, by means of small springs, a system which avoids the necessity of coloring the lamps and is much more economical. The outline of the machine is in green lights around the painted sheet-iron portions. The picture represents the forging of a hot steel bar under a converted steam hammer, the steam having been superseded by compressed air supplied from a compressor driven by an electric motor using central-station energy. The workman at the right holds one end of the large steel bar under the hammer. That portion is set thickly with bright red lamps. The part of the metal adjoining this portion has some amber tips on the lamps indicating a lesser degree of heat. The bright red lamps being very much more noticeable to the eye, they indicate a higher degree of heat.

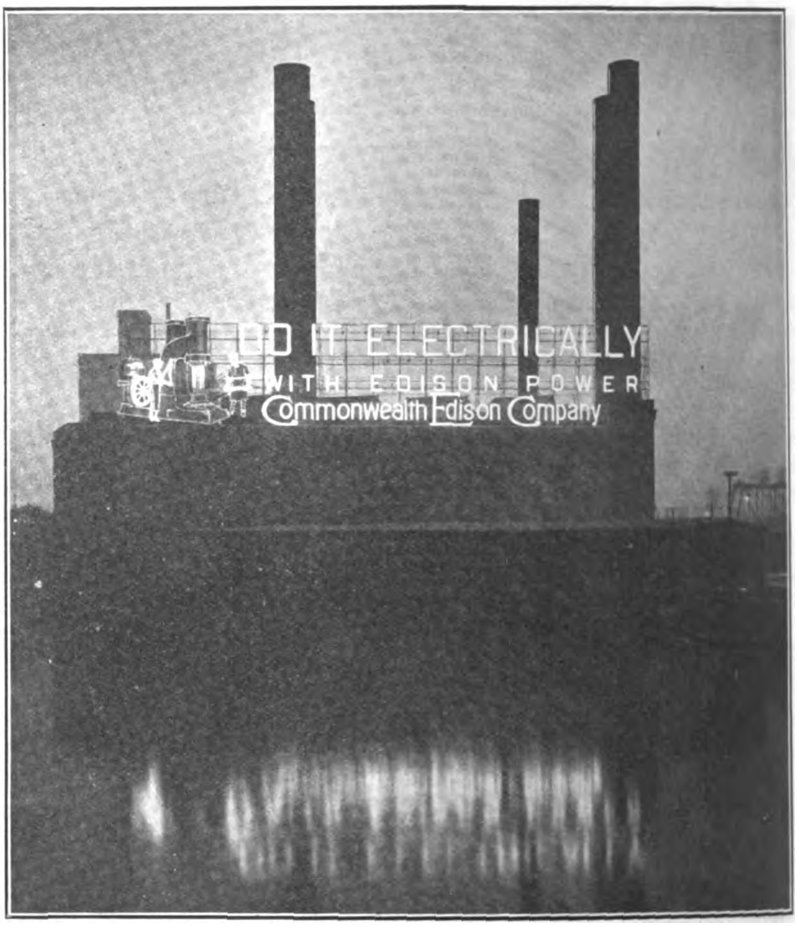
Another clever feature is the careful reproduction of the actual motions of the workman who controls the machine by means of the lever. He stands at the left with his hand on this lever and moves it a very little, once or twice, feeling the pulse of the hammer, just to make sure that the compressed air is working right. This being proved to his satisfaction, the blow is struck. The short try-out movements are not produced for each descent of the hammer, but only as in practice.

The letters in the top line of the reading matter are 12 feet high; those in the two lower lines are 6 feet high. The sign contains 3,617 ten-watt tungsten lamps. The load is nearly 50 horsepower. The total candlepower is 29-300.

The flashing part of the sign contains 1,600 of the lamps, all equipped with colored caps, as follows: green hoods for the outline of the hammer, opal hoods for the hammer and figures of the men, ruby and amber hoods combined for the metal and the sparks.

The complete operation of this "electrical movie" lasts for about ten seconds, the bar being in the anvil for eight seconds and lowered for two seconds, during which time the hammer is constantly in operation. The sparks which fly from the first blow of the hammer constantly decrease as the iron apparently cools.

The flasher for this sign was built by the Reynolds Electric Flasher Manufacturing Company, Chicago. The sign was designed and built by the Federal Sign System (Electric), Chicago.



New Striking Electric Sign on Harrison Street Station, Chicago.

Iron and Steel Industry to Take Prominent Part in Panama-Pacific Exposition.

The iron and steel industry will be given a prominent place among the various attractions at the coming Panama-Pacific International Exposition at San Francisco next year by the comprehensive exhibit of the United States Steel Corporation and subsidiary companies.

A general committee headed by A. T. DeForest of the United States Steel Products Company, of San Francisco, has been directing the work and H. V. Jamison, advertising manager of the American Sheet & Tin Plate Company, of Pittsburgh, who has just been appointed director of exhibits for the entire corporation, is busily engaged mapping out plans for the exhibits of the various companies.

Among the features which will be shown will be one showing the process of manufacturing iron and steel products, from the mines where the ore is taken out of the ground to the production of hundreds of products of the corporation. It is intended to show how the ore is transported both by rail and water, the dock operations, the production of coal, coke and pig iron and thence to the specialized lines of manufacture. The exhibit will even show

how the by-products are produced and will show many of the products in practical use.

A motion-picture show will be part of the exhibit and through this medium will be portrayed the operations of the corporation throughout all its departments. In the pictures will also be shown the great benefit to the social world brought about by the United States Steel Corporation, through its endeavors to further the social welfare of its employees. The corporation's many devices for insuring safety of employees will be exhibited and data will be given as to the enormous amounts expended for this purpose.

This is the first time in the history of the steel industry that the United States Steel Corporation has planned a comprehensive exhibit or display of any kind embracing all of the subsidiary companies. It is certain that this feature of the coming exposition will make a strong appeal to visitors at San Francisco in 1915.

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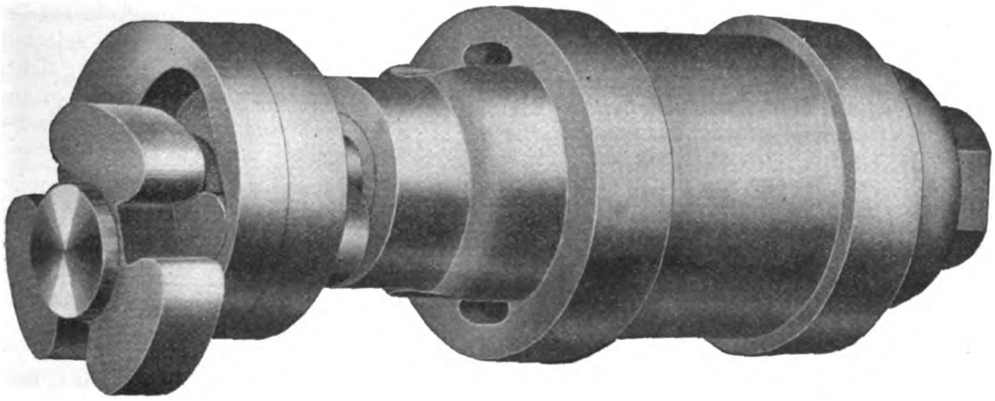
A New Turbine Cleaner for Fire-Tube Boilers.

The illustrations herewith show a new type of air or steam-turbine-driven vibrator knocker head for dislodging scale from the outer surfaces of tubes in return tubular boilers. This cleaner also removes the soot from the inner surfaces of the tubes. The soot is loosened by the vibrating knocker and is blown out of the tube ahead of the cleaner by the steam or air exhausting from the front of the turbine.

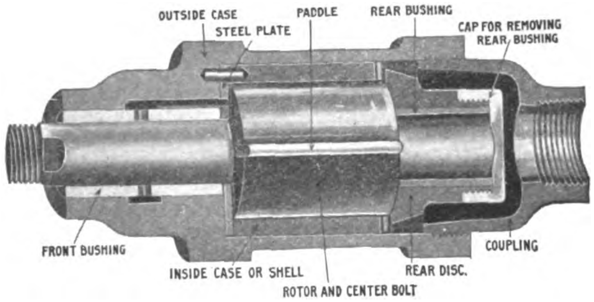
The knocker head consists of a cylindrical body somewhat smaller in diameter than the boiler tube and an eccentrically pivoted lever carrying a clover-shaped knocker on a stud at its free end. The lever fits flush into a triangular recess in the forward face of the main body, the free end swinging in an arc through the center of the head. The three hammer faces of the knocker are shaped to fit the inner circumference of the boiler tube, thus giving a greater area of contact with the tube than is possible with former types. This advantage permits the hammer being made heavier and a firmer blow struck without injury to the tubes. The extra weight and force of blow is proving successful in loosening stubborn scale.



Rotor of Turbine Cleaner, Showing Knocker Head.

The head is driven at high rotative speeds, the eccentrically pivoted lever carrying the knocker is thrown from side to side and the knocker caused to revolve on its axis at each contact with the tube, giving a resultant gyratory motion to the knocker, causing it to hit all points of the interior circumference of the tube.

The cleaner is fed into the tube by the flexible rubber hose furnishing the air or steam pressure, the revolving motion of the head eliminating the necessity of turning the cleaner by twisting the hose.



Sectional View of Turbine.

The motor for driving the head is intended for either steam or compressed air and is of the rotary-engine type. The air or steam strikes upon radial paddles, giving a high speed to the shaft. The paddles themselves are continually held out by the air or steam which is admitted to a chamber behind the paddles so that they always form a tight fit with the case. The motor has four paddles, two of which are always under pressure, making it impossible for the motor to stall.

All wearing parts are made of high-carbon steel carefully tempered and ground to fit. The wear is very slight, but as all parts are machined to jigs, they can be easily replaced.

A specially designed oiling device which is furnished as an extra for these motors, mixes the oil with the air or steam supply, thoroughly blowing it into all the bearings and rubbing parts.

This new turbine tube cleaner is one of the many types of cleaners manufactured by the Lagonda Manufacturing Company, Springfield, O.

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Recent Installations of Telephone Train-Dispatching Equipment.

The increasing use of the telephone system of train dispatching by leading railroads of this country and Canada is conclusive proof that its advantages—quickness, the personal relationship factor, and absolute dependability—have become thoroughly appreciated. The telephone greatly simplifies the complex business of the train dispatcher. As a servant the telephone is always ready; as a saver of time and energy it has no equal. Experts agree that it makes for safer, more reliable and more efficient railroading. Through the agency of the telephone discipline is enforced and efficiency increased. When a towerman comes under direct personal supervision of his chief by telephone he is more apt to carry out his orders with care and dispatch than if they are ticked in by the more or less impersonal telegraph sounder. The dispatcher also can increase his range of operation by as much as 50 per cent.

One of the recently equipped lines is the 80-mile circuit on the Western Maryland Railroad between Hagerstown and Cumberland. While this road does not handle many first-class passenger trains a day, the dispatcher has his hands full maneuvering loose engines and freight trains; 1,000 minutes out of the 1,440 in a day his wire is busy with orders governing the movement of approximately 200 trains which come and go over one track. With 15 Western Electric way-station equipments and 30 siding telephones in use the entire line is in constant touch with the dispatcher at the terminal.

The Butte, Anaconda & Pacific Railroad Company, the electric ore-carrying road operating between Butte and Anaconda, Mont., whose power equipment was recently described in these columns, has installed a telephone dispatching system to cover 76 miles of its line. The dispatcher is located at Anaconda and is in communication with 13 stations on the system; 13 locomotives are equipped with telephones, jack boxes being so placed on the outside of the engine cab that connections can be easily made to the overhead wires by line poles. This road has an unusually fine system overhead construction in its electrical plant, using a No. 10 B & S gauge copper circuit for the telephone line.

On the Chicago & Alton, 29 way-stations between Bloomington and Chicago, and 32 way-stations from Bloomington and St. Louis, will be connected by the latest type of Western Electric selector equipment. The dispatchers for both circuits will be located at Bloomington, Ill.

In addition to the foregoing the Western Electric Company reports the following installations:

The Monroe, N. C., division of the Seaboard Air Line has put into commission within the past few months a system of telephone dispatching to extend over 282 miles. Selectors have been installed at 38 way-stations. About the same number of siding sets have been placed at various points along the line for the use of trainmen.

On the St. Louis Southwestern, from Illmo, Mo., to Jonesboro, Ark., about 136 miles of line has been equipped with 24 selectors and telephone equipment. The dispatcher is located at Illmo.

The Pittsburgh, Shawmut & Northern has extended the 47-mile telephone circuit between St. Mary's and Brookville 53 miles by the equipping of 12 additional way stations.

The Chicago, Milwaukee & St. Paul Railroad Company is preparing for the installation of selectors on a circuit to cover a new division now in the process of construction between Great Falls, Mont., and Lewiston, Idaho, a distance of 137 miles. The number of way stations to be equipped at present is fifteen.

The Southern Electric Development Company, of Saginaw, Mich., is installing a train-dispatching circuit consisting of a dispatch office and nine way stations. This circuit is exclusively for the control of train movements. There is also to be a commercial circuit, consisting of 38 telephones. This is for the handling of commercial business from various offices along the line. Both circuits are 57 miles in length, with the dispatcher's office located about midway in the circuit, at Saginaw. The commercial circuit goes into a Western Electric sectional unit type switchboard at Saginaw, being divided there at the north and south ends of the circuit. A notable feature of this installation is the use of 3,000 feet of submarine cable in Saginaw. Since the city ordinance does not permit the erection of poles. This submarine cable will run along the bed of the Saginaw River within the town proper, forming one end of the train-dispatching circuit.

The Cedar Rapids & Iowa City Railway Company has installed a telephone train-dispatching circuit between Marion and Iowa City, with the train dispatchers' office at Cedar Rapids. The circuit has 14 selectors, 8 distributed on the south end, 2 in Cedar Rapids in the general office and 4 between Cedar Rapids and Marion.

The New York, New Haven & Hartford Railroad is now using telephone train-dispatching equipment on a line between New Haven, Conn., and Springfield, Mass. The distance covered is 60 miles, with the dispatcher located at New Haven.

The Northern Pacific has equipped the line between St. Paul and Staples, a distance of 142 miles, with train and message circuits. Both lines are arranged for simplex telegraph service.

The dispatcher is located at St. Paul. Western Electric telephone jack boxes have also been installed by the road.

The Denver & Rio Grande is now using two circuits, one from Salt Lake City to Helper, 152 miles, and another from Helper to Grand Junction, 177 miles. Dispatching stations are at Salt Lake City and Helper. Both train and message wires run from Salt Lake City to Helper, but only a train wire is in operation from Helper to Grand Junction. On the last mentioned circuit 42 selectors and the necessary telephone apparatus are in commission; 15 selectors of the same type are used on the circuit to Grand Junction.

The Cleveland, Cincinnati, Chicago & St. Louis Railroad (Big Four) will install 70 selectors and equipment over two dispatching circuits. One line is to extend from Kankakee, Ill., to Indianapolis, Ind., covering 144 miles, while the other, from Indianapolis to Springfield, Ill., is of about the same length. The dispatcher is to be located at Indianapolis. The main line of the Alabama, Tennessee & Northern will, within a short time, put into operation 9 selectors over the line between York and Reform; 73 miles of road will be included in the circuit, with the dispatcher at York, Ala.

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Artistic New Lighting in Old Theater.

The theater-going public must be pleased not only with the performance but also with physical comfort at the theaters it attends. Realizing this, the Pitt Theater, of Pittsburgh, Pa., recently remodeled the entire house and installed the latest improvements in lighting.

The details are of interest, as there is much theater building going on now owing to the steadily increasing popularity of motion pictures. Illumination for this class of work is special and there is a noteworthy lack of definite information on the subject.

In the following description of the Pitt is given a good example of recent practice in this line.

The main ceiling has three Parian bowls, a 500-watt lamp in each, hanging 20 feet from ceiling. In front of the second balcony are 14 eight-inch Parian acorns with a 40-watt lamp in each. In front of the first balcony are 17 Parian panels with two 16-candle power carbon linolite lamps and Frink reflectors behind each panel. The ceiling over the first balcony has four Parian bowls with 250-watt lamp in each. The second-floor corridor has six bowls each with 150-watt lamp. In the first-floor corridor are five bowls, 250-watt lamp in each.

On the newel post at the foot of the stairs are Parian urns with a 150-watt lamp in each. Under the first balcony are four bowls, 250-watt lamp in each. In the first-floor box eight bowls are used as ceiling lights with three 25-watt round-bulb tungsten lamps in each. The second-floor boxes have eight Parian acorns suspended with arms so that they give the appearance of urns, a 150-watt lamp being in each. The height of the main ceiling is about 40 feet. The floor space of main floor, including corridor, is 80 by 100 feet. The area of the first balcony is about 35 by 100 feet.

The color scheme of the theater is blue and old ivory. The hangings, draperies, etc., dark blue. All the glass work is decorated light blue and old ivory, with a blue band, the fret work on the Grecian band being brought out in blue. For the ladies' retiring room special bowls colored old rose to match the hangings were selected. Frink reflectors are used over the ticket window, around the inner edge of the marquise, and inside the framework of the two billboards in front.

Parian balls are set on the marquise and on the top of the theater. The inside brackets use blue and old-ivory-decorated shades. Special bracket fixtures for mirrors, handle trimmings and silk shades, candlebra fixtures, fire logs, etc., complete the lighting installation which, was furnished throughout by the H. W. Johns-Manville Company, New York City.

The architects, Simpson & Isles, of Pittsburgh, Pa., have received much praise from the management and patrons for the excellent effects they have secured. Formerly with the ordinary fixtures the lamps were exposed and gave the usual disagreeable glare. With the new equipment, beside accomplishing a decided current decrease, not a lamp is visible and the restful comfort and beauty are conspicious.

Latest Approved Fittings

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Killark Electric Manufacturing Company, 2005 Locust Street, St. Louis, Mo.

"Electrolet." A porcelain fitting having a separate opening for each wire and secured over the end of a piece of conduit by a threaded metal plate.

For use only at an exposed end of conduit (but not under fixture canopies) and only where the conduit wires pass out through the fitting without splice, joint or tap within the fitting.

Approved April 17, 1914.

CUTOUT BASES, CARTRIDGE FUSE. — The Trumbull-Vanderpoel Electric Manufacturing Company. Bantam, Conn.

Slate-base cutouts for N. E. C. inclosed fuses, one, two, three and four-pole.

250 volts, catalog Nos. 2400-05 inclusive, 2408-13 inclusive, 2416-21 inclusive, 2424-29 inclusive.

600 volts, catalog Nos. 2432-36 inclusive, 2440-44 inclusive, 2448-52 inclusive, 2456-60 inclusive.

Approved April 1, 1914.

FIXTURES.—The Bradley & Hubbard Manufacturing Company, Meriden, Conn.

"B. & H." electric and combination fixtures.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced, bear uniform labels by which they can be identified.

Approved May 7, 1914.

FIXTURE WIRE.—A-A Wire Company, Incorporated, 48 Nesbitt Street, Newark, N. J.

Marking: Two or more olive-green threads parallel with the wire between insulation and braid.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 8, 1914.

INCUBATORS AND BROODERS. —United Electric Manufacturing Company, 926 La Fayette Street, New Orleans, La.

"Reed's" electric incubator and brooder.

Electrically heated incubators and brooders shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved **May 18, 1914.**

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

PANELBOARDS.—United Electric Manufacturing Company, 926 La Fayette Street, New Orleans, La.

125 and 250-volt, two and three-wire boards equipped with knife switches and terminals for cartridge inclosed fuses. Also two and three-wire metering panel, 125-250 volt, when mounted in suitable slate-lined cabinets.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 18, 1914.

PANELBOARDS.—The Cleveland Switchboard Company, 430 Prospect Avenue, N. W., Cleveland, O.

Two and three-wire panelboards, 125, 125-250 and 250 volts, with double-pole knife switches in branch circuits, with open-link, Edison plug or cartridge inclosed fuses.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.

Approved May 13, 1914.

RECEPTACLES, Standard. — General Electric Company, Schenectady, N. Y.

"G. E." wall sockets, brass shell.

Key, 250 watts, 250 volts.

Catalog Nos. GE247, GE278, GE288, GE527.

Key, 660 watts, 250 volts.

Catalog Nos. GE255, GE281, GE285, GE528.

Keyless, catalog Nos. GE246, GE279, GE283, GE411, GE526.

Pull, catalog Nos. GE254, GE280, GE284, GE529.

Also the above with shadeholders attached.

"G. E." wall sockets and receptacles, porcelain shell.

Conduit box, catalog Nos. GE297-98.

Approved May 15, 1914.

RHEOSTATS. — General Electric Company, Schenectady, N. Y.

Motor starters, types CR-1000, 1102, 1007, 1022, 1025, 1027, 2301, 2303 and starting panels CR-2320, 2322-2326 inclusive, 1100, 1102.

Speed controllers, tyes CR-1314, 1220, 1221, 1224, 1225, 1200, 1240-45 inclusive, control panels CR-1303, 1315, 1320 and (for printing presses) 6010, 6011, 6032, 6033, 6060, 6052, 6106, 6220.

Field rheostats, types CR-8000, 8001. 1226-1228 inclusive, 8132, 8192, 8322, 8390.

Theater dimmers, 9300-9304 inclusive, 9310-9314 inclusive, 9320-9324 inclusive, 9330-9334 inclusive.

Battery charging rheostats, types CR-9200, 9202, 9204.

Resistance units, types CR-9000, 9010, 9042, 9145.

Drum controllers (for industrial service), types CR-3100, 3105, 3110, 3133, 3134, 3136, 3202 (without primary oil-switch attachment), 3204, 3900, also K (for non-grounded circuits).

Types CR-1000, 1100, 1220, 1221, 1224, 1225, 1240-1245 inclusive, starters are approved only when circuit-breakers or fuses are installed in connection with them.

Drum controllers are approved only when properly installed in connection with resistance elements.

Approved April 20, 1914.

SWITCHES, Combination Cutout. **—H. T. Paiste Company,** Thirty-Second and Arch Streets, Philadelphia, Pa.

"Paiste" panel cutout and service-entrance switches, two and three-wire.

Panel cutouts Edison plug-fuse bases and knife switches, 30 amperes, 125 volts, catalog Nos. 4017-19 inclusive, 4021, 5130-49 inclusive.

Approved May 14, 1914.

SWITCHES, Combination Cutout. The Trumbull Electric Manufacturing Company, Plainville, Conn.

Panel cutouts, with or without copper busbars and lugs, 10 amperes, 125 volts; catalog Nos. 385-388 inclusive.

Approved May 2, 1914.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

Chandelier switches. Adaptations of the standard Bryant pull-socket mechanism for attachment to threaded stems of canopies, clusters and chandelier bodies.

Canopy switches, 1 ampere, 250 volts, 3 amperes, 125 volts; catalog Nos. 491-92.

Approved April 29, 1914.

SWITCHES, Push-Botton Flush.—Chapman & Walker, Limited, Submitters, Manufactured by Sterling Telephone & Electric Company, Limited, 210-212 Tottenham Court Road, London, West, England.

Double-pole, 10 amperes, 250 volts; catalog No. A-232.

Three-way, 10 amperes, 125 volts, 5 amperes 250 volts; catalog No. A-233.

Approved May 16, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

NEW HAVEN, CONN.—A permit to build a big new power house station in New Haven at a cost of $90,000 has been granted by the building department to the United Illuminating Company. The new building means an important extension to the company's plant in this city, according to President James English, who said the new station will not replace the old one but will add to it.

CLYDE, N. Y.—The proposition to raise $400 for ornamental lighting for the village park and extra lights in the outskirts of the village carried. Address Engineer J. T. Lawyer for desired information.

SPENCERPORT, N. Y.—At the special election, held in this village, an appropriation of $16,000 to install a system of electricity has been decided upon.

BAYONNE, N. J.—The Common Council has passed a resolution providing for a referendum on the ballots at the next election for the establishment of a municipal electric lighting plant. A.

NEWARK, N. J.—The Public Service Electric Company is considering the installation of an underground conduit system along Orange Street, from Broad Street to the East Orange line, supplanting its present overhead lines. A.

PENNINGTON, N. J.—The Hopewell Township Committee is considering the installation of a lighting system on Pennington Road. The improvement will be made by the Public Service Company. A.

NEW HOPE, PA.—The Bucks County Electric Company has made application for a franchise for the construction and operation of an electric light and power system throughout the borough. A.

PITTSBURGH, PA.—Plans are being made by the Citizens' Light, Heat & Power Company, of Johnstown, Pa., to establish a great central power plant near Seward, Pa. The company has acquired rights on a small stream near Seward and many acres of land are said to be under option. The site has been selected in the heart of a new coal field recently opened up and the purpose is to have the coal conveyed directly from the mine to the boilers, by means of a short haulage system, which would be electrically equipped. The location will afford easy access for power lines to Blairsville and other points and will cause Seward to become the center of that region. S.

SOUTH ATLANTIC STATES.

GARY, W. VA.—The Tug River Power Company, recently incorporated here by J. J. Stout, G. C. Sledge, J. H. Barker, G. W. Kanode and H. N. Eavenson, plans to construct a hydroelectric power plant to furnish current to municipalities and factories in this section. The capitalization of the company is $10,000. L.

ABINGDON, VA.—A large dam and power plant will be erected at the middle fork of the Holston River near here by the Abingdon Water & Light Company. This company was given a 30-year franchise by the City Council to furnish day and night current.

PROSPERITY, S. C.—The city will construct electric light system at a cost of $10,000. J. B. McCrary Company, Atlanta, Ga., has prepared the plans.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Andrew Jergens Company is preparing to construct a four-story office and factory building on the south side of Alfred Street, west of Spring Grove Avenue, adjoining its present large plant, and will require a large amount of electrical equipment, both in the way of transmission equipment and motors for the operation of machinery. The structure will be of concrete, 99 by 120 feet, and will cost $45,000.

CINCINNATI, O.—The N. Manichewitz Company, Eighth Street and the C. H. & D. Railroad, will build a four-story addition to its factory, which will require a number of motors and other electrical equipment. Architect Harry Price has the plans. L.

GOSHEN, IND.—The Indiana Public Service Commission has granted the petition of the Hawks Electric Company for extending electric lines to Waterford and New Paris. The corporation is now engaged in buying the necessary right of way.

UNIONDALE, IND.—Uniondale is to receive electric light and power service from the Fort Wayne and Northern Indiana Traction Company, if plans proposed by the company are accepted. A power line will be built from the company's right of way near Kingsland, to Uniondale.

AURORA, ILL.—The contracts for electric wiring, plumbing and heating for the new City Hospital at Aurora, Ill., are to be let shortly. The contract for the general construction work on the new building was let to W. H. Graham, an Aurora contractor, for $65,585. Worst & Shepardson are the architects. Z.

CLINTON, ILL.—There is considerable talk here of building a municipal electric light plant and it is likely that such a proposition will be shortly submitted to the voters. Z.

MOLINE, ILL.—The contracts for the electric wiring, heating and plumbing for the new fire station to be built by the city of Moline will shortly be let. E. L. Eastman, Commissioner of Public Health and Safety, is in charge of the work.

BATTLE CREEK, MICH.—The Commonwealth Power Company will extend its lines to the Urbandale suburb. Address R. R. Thompson, superintendent.

LANSING, MICH.—The Northern Michigan Power Company, a foreign corporation incorporated in Maine with headquarters at Portland and New York City, has filed articles of incorporation, capitalized at $6,000,000. This will give the company permission to do business in Michigan.

LAURIUM, MICH.—The present lighting system is inadequate, and as the present contract with the Houghton County Electric Light Company expires this month, it is expected improvements will be made.

MILWAUKEE, WIS.—Twelfth Street merchants in the vicinity bounded by Vliet and Walnut Streets are investigating better street lighting. At the meeting of the Twelfth Street Advancement Association, a committee for the purpose was appointed. It consists of Ernst Demin, Jacob Poss, William Klug, Louis Scheich and Aloys Knoernschild.

TREMPELEAU, WIS.—$8,000 electric light bonds have been voted and work on the new plant will be commenced at once. It is thought that the city will be supplied with electric light by the first of August. The Wisconsin Railway, Light & Power Company, of Hatfield, will furnish the power. The city will own and operate the plant.

COTTONWOOD, MINN.—An electric light franchise was granted to Velat and Michal, of St. Paul.

ROCKFORD, MINN.—The Council is considering installing a new lighting system.

TAYLOR, N. D.—An electric light will be installed here.

SIOUX FALLS, S. D.—An improved lighting system for the business district of Sioux Falls, which is being agitated by the business men now seems a certainty. The plan includes the installation of 127 new curb lights.

DES MOINES, IOWA.—Plans are being prepared by the Des Moines Electric Company for construction of a high-tension transmission line to Oskaloosa covering all intervening and surrounding towns. Cost $200,000. Address W. H. Thompson, general manager.

ESTHERVILLE, IOWA.—$60,000 will be spent for more lights and water.

KANSAS CITY, MO.—The ordinance providing for the installation of 56 ornamental electric light and trolley poles on Main Street between Fifteenth and Twentieth carried at a meeting of the City Council on June 17. R. L. Gregory is chairman of the Board of Public Works. M.

SALINA, KANS.—The Salina Heat & Power Company is arranging for improvements to its plant. New boilers and switchboards will be purchased. J. E. Harsh is manager of the company.

SOUTH CENTRAL STATES.

BURLINGTON, KY.—The Walton Electric Light Company is installing a lighting and power plant here. H. W. Mayfield is interested in the improvement. G.

ELSMERE, KENTON COUNTY, KY.—Several bids are under consideration by the town board of Elsmere for the construction of an electric light plant and its operation. The trustees passed the franchise ordinance last month and will let a contract to the best bidder for an initial period of ten years. G.

LEXINGTON, KY.—An ornamental lighting system will be installed in the business section. Address the mayor for particulars.

LOUISVILLE, KY. — Complete plans for the building of a new addition to the big power station of the Louisville Gas & Electric Company were announced. The addition according to estimates furnished the company will cost at least $500,000. The plans and specifications call for the erection of brick and concrete building, equipped with the most modern machinery for the manufacture of electricity.

OOLTEWAH, TENN.—The citizens of Ooltewah are much enthused over the prospects and assurance of having in the near future electric lights and the possibility of water works. Several prominent men have taken steps to have the matter urged before the people for a vote.

SPRINGFIELD, TENN.—The City Commissioners contemplate improving electric light plant and $10,000 in bonds will be issued. Address the city clerk for general information.

CUERO, TEX.—The Texas Southern Electrical Company, which is a Boston, Mass., concern, has purchased the electric light and power plants at Cuero, Beeville, Victoria, Bishop and Kingsville and is negotiating for several other similar plants in southern Texas. The company has also taken over the rights and franchises of the Cuero Light & Power Company which were recently granted by the Legislature for the construction of a series of dams across the Guadalupe River and the installation of hydroelectric plants. It purposes also to construct an extensive system of interurban electric railways to connect the different towns where it has holdings. D.

HOUSTON, TEX.—The Houston Electric Company has increased its capital stock from $4,000,000 to $6,000,000 and will make improvements to its property here.

SAN ANTONIO, TEX.—J. N. Brown, president of the Alamo National Bank, is organizing the Guadalupe Water Power Company, which is capitalized at $1,000,000.

WESTERN STATES.

LOVELAND, COLO.—A committee has been appointed to secure ways and means to establish a municipal lighting plant. It is estimated that the plant will cost about $1,000,000.

SAFFORD, ARIZ.—The electric light plant here was completely destroyed by fire, and work of erecting another plant will be commenced at once.

PROVO, UTAH.—Certificate of the incorporation of the Southern Utah Power Company has been filed with the County Clerk. The company is organized under the laws of Delaware with Wilmington as the main office. A. L. Woodhouse is the president, H. R. Waldo, secretary and treasurer, and W. L. Biersach, the agent of the company for Utah. Provo is named as the principal place of business in this state. The authorized capital stock of the company is 600,000 shares at the par value of $1.00 each. The company is organized for the purpose of taking over and operating the properties of L. L. Nunn in Sevier County which have been formerly operating under the name of the Beaver River Power Company.

GOLDENDALE, WASH.—The Pacific Light & Power Company has been granted a 50-year franchise here.

NORTH YAKIMA, WASH.—The Yakima Central Heating Company is petitioning the City Commissioners for a 40-year electric light and power franchise, the company promising to expend $188,000 if the franchise is granted. The terms have not been agreed upon as yet, as the Commissioners want more compensation. The company will not agree to give more than one-half of one per cent at any time. O.

SEATTLE, WASH.—The City Council has declared its intentions of installing a cluster lighting system on Madison, Marion, and Columbia Streets, west of First Avenue, also on Railroad Avenue. Bids will be received for this work by the Board of Public Works, A. L. Valentine, chairman, shortly. O.

VANCOUVER, WASH.—The North Bank Railroad is planning to electrify its road from Vancouver to Portland and use heavy motors instead of engines to handle the traffic between the two cities. Address the general manager at Vancouver.

AUMSVILLE, ORE.—At a special election recently, on an electric-light franchise, the measure carried by a large majority, and the Aumsville Flour Mills Company will shortly begin the construction of an electric light and power plant. The plant will be one of the best small plants in the state, and will furnish light and power to Aumsville and nearby territory. O.

EUGENE, ORE.—The City of Eugene will receive bids shortly for the installation of a cluster lighting system on Olive Street, between Fifth and Ninth Avenues, and on Eighth Avenue, between Willamette and Lincoln Streets. The work entails the expenditure of approximately $5,000. O.

MAPLETON, ORE.—R. H. Clow was today granted the right to maintain and operate a power distributing system at Mapleton. He is building a dam and power plant on the creek which flows through the city and proposes to sell electric power and lighting.

LINDSAY, CAL.—The Tulare County Power Company will issue $1,000,000 six-per-cent bonds to be used in constructing and erecting main lines and extensions, adding to its steam plant and equipping the same and to purchase machinery to equip a hydroelectric generating plant on the Tule River. Address A. M. Drew, attorney.

REDDING, CAL.—Charles Kornel, of San Francisco, construction engineer for the California Power & Manufacturing Company, which is to develop the Fall River section, passed through Redding recently on his way to the scene of construction for the first time. The project of the company calls for an investment of about $40,000, including the construction of a power plant and the installation of 20 miles of transmission line.

SANTA BARBARA, CAL.—The Santa Barbara Gas & Electric Company has agreed to complete a power line to Carpinteria within 30 days. It is planned to light the coast highway from the top of Ortega Hill to the Ventura County line.

PROPOSALS.

FIRE-ALARM BOXES.—Sealed proposals will be received at the office of the purchasing agent of the city of Portland, until June 26, for furnishing the city with 35 positive noninterfering successive fire-alarm telegraph boxes, according to specifications on file in the office of the purchasing agent. Check for 10 per cent of proposal, payable to city of Portland, Ore., is required.

ELECTRICALLY OPERATED CENTRIFUGAL PUMPS.—On June 23 bids will be received for the erection in place of three electrically operated centrifugal pumps, each to have a capacity of 2,800 gallons per minute when operating against a total head of eight feet. Address Frank V. Guthrie, clerk of the Board of Public Works, Logansport, Ind.

LEASE OF ELECTRIC POWER PLANT.—Sealed proposals will be received at the office of the United States Reclamation Service, Fallon, Nev., until June 25 for the lease from the United States of the electric power plant at Lahontan, Truckee-Carson project, Nevada. For particulars address the United States Reclamation Service at Washington, D. C., Fallon, Nev., or 605 Federal Building, Los Angeles, Cal.

VERTICAL ALTERNATING-CURRENT GENERATOR.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, Cal., until July 14 for furnishing a three-phase 25-cycle 2,300-volt vertical generator, giving an output of 4,000 kilowatts at 80 per cent power-factor. Prospective bidders should write for specifications No. 272 to either the Los Angeles or Washington offices of the Reclamation Service.

VARIABLE-HEAD TURBINE.—Sealed proposals will be received at the office of the United States Reclamation Service, Los Angeles, Cal., until July 14 for furnishing a variable-head turbine for the Roosevelt power plant, Salt River project, Ariz. The machine must run at heads ranging from 90 to 220 feet and should give its best efficiency with an output of 5,650 horsepower at 160 feet effective head. Prospective bidders should write for specifications No. 271 to the Los Angeles or Washington offices of the Reclamation Service.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 14 for furnishing the interior lighting fixtures for a two-story building for the post office at Covington, Va.; until July 16 for furnishing the same for a two-story building for the post office at Delavan, Wis.; until July 21 for the same for a two-story building for the post office at Jennings, La., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites named or the office of the Supervising Architect.

FINANCIAL NOTES.

At the annual meeting of the Montreal Water & Power Company, former directors and officers were re-elected.

At the annual meeting of stockholders of the Rochester Electric Railroad, A. H. Smith, president of the New York Central, was elected a director, vice W. C. Brown, resigned. Other retiring directors were re-elected.

The Westinghouse Electric & Manufacturing Company, at its annual meeting, elected John R. McCune, H. H. Westinghouse, Paul D. Cravath and James N. Wallace to fill the vacancies caused by resignations and deaths in the board.

The Fort Worth Southern Traction Company, under the management of Stone & Webster, has received permission to change its name to the Tarrant County Traction Company, and has increased its capital stock from $1,500,000 to $2,500,000. The company will build and operate the interurban line between Fort Worth and Denton.

A. B. Leach & Company, New York, have purchased $3,300,000 Virginia Power Company first-mortgage five-per-cent bonds, and will offer these bonds at an early date. The electric generating plant built by the Virginia Power Company has recently begun supplying electricity to the coal mines in the Kanawha-New River district of West Virginia. The plant is about fifteen miles from Charleston, W. Va., on the Kanawha River, and its transmission and distribution lines are about 129 miles long.

Announcement is made that the Youngstown & Sharon Street Railway Company, the Youngstown Park & Falls Street Railway Company, Mahoning Valley Railway Company, Youngstown Consolidated Gas & Electric Company, Mahoning & Southeastern Railway Company and the Poland Street Railway Company will be consolidated and operated under the name of the Mahoning & Shenango Railway & Light Company. The move is made in order to obtain better transportation facilities and to effect economies in operation. All the companies thus consolidated are operating subsidiaries of the Republic Railway & Light Company.

The Ohio Public Utilities Commission has approved the issue of $400,000 five-per-cent first-mortgage bonds and $300,000 common stock by the Chardon, Jefferson & Meadville Interurban Railway Company for the purpose of financing the construction of an electric railway between Chardon and Jefferson, a distance of 30 miles. Bonds and stocks are each to be sold at not less than 80.

Plans for the reorganization of the Chicago & Milwaukee Electric Railroad Company are now being worked out and are expected to be completed soon after July 1. A judicial sale of the properties will be made shortly under the receivers, winding up all legal formalities preliminary to the actual reorganization. The company has been in the hands of receivers for several years, reorganization being held up by protests of a small minority of bonds. The reorganization committee controls 98 per cent of the Illinois division five-per-cent bonds of 1922 and 96 per cent of the Wisconsin division five-per-cent bonds of 1925. Under the former reorganization plan the proposed new bond issue was to have been underwritten by the National City Bank and Samuel Insull was to have been chairman of the board of directors of the new company and was to have used his influence to secure a trackage agreement with the Northwestern Elevated by which Chicago & Milwaukee Electric cars would have a downtown entrance into Chicago. It is probable that the reorganization will be carried out along lines originally planned, with changes which may be made necessary by present financial conditions.

The management of the Pacific Gas & Electric Company has mailed to stockholders of the company plans for refinancing the company so as to provide for present and future requirements. The plan involves an amendment to the company's charter reclassifying the capital stock into $100,000,000 common and $50,000,000 first preferred six-per-cent cumulative and $10,000,000 of the present preferred making the total, as at present, $160,000,000.

The report of the Northern Ohio Traction & Light Company for the month of May, shows very satisfactory business and revenues, as compared with May, 1913, as there was an increase in gross passenger earnings of $22,409, the amount being $254,365. This made the increase for the first five months of the year $92,806, which is considered excellent in view of the presence of many unfavorable factors.

Dividends.

	Term	Rate	Payable
Am. Cities	S-A	3%	July 1
Am. Gas & Elec.	Q	2%	July 1
Am. Gas & Elec.	Q	1.5%	August 1
Ashev. Pr. & Lt. pf.	Q	1.75%	July 1
Bangor Ry. & El. pf.	Q	1.75%	July 1
Bell Tel. (Can.)	Q	2%	July 15
Cal. Ry. & Pr. pf.	Q	2%	June 10
Cal. Ry. & Pr. prior pf.	Q	1.75%	July 1
Can. Gen. Elec.	Q	1.75%	July 1
Can. Westhse.	Q	1.75%	July 10
Capital Traction	Q	1.5%	July 1
Caro. Pr. & Lt. pf.	Q	1.75%	July 1
Cinn. Gas & Elec.	Q	1.25%	July 1
Cinn. St. Ry.	Q	1.5%	July 1
Cinn. & Sub. B. Tel.	Q	2.5%	July 1
Cleveland Ry.	Q	1.5%	July 1
Col. Ry. Pr. & Lt. pf.	Q	1.5%	July 1
Consum. Pr. pf.	Q	1.5%	July 1
Demerara El. Ltd.	Q	1%	July 2
East Texas Elec.	S-A	3%	July 1
E. L. & P. of Abington	Q	4%	July 1
Illinois Trac. pf.	Q	1.5%	July 1
Inter. Rap. Tran.	—	5%	July 1
Nor. Ohio Trac.	Q	1.5%	July 1
Otis Elevator	Q	1.25%	July 15
Otis Elevator pf.	Q	1.5%	July 15
Ot'wa Lt., Ht. & Pr.	Q	2%	July 1
Providence Tel.	Q	1%	July 1
Puget S. Tr., Lt. & Pr.	Q	1%	July 15
Puget S. Tr., Lt. & Pr. pf.	Q	1.5%	July 15
Toronto St. Ry.	Q	2%	July 2
Trinidad Elec.	Q	1.25%	July 10
Unit. Utilities pf.	Q	1.75%	July 1
West End St. Ry.	Q	$2	July 1
Western Union Tel.	Q	1%	July 15

FOREIGN TRADE OPPORTUNITIES.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., and at the branch offices of the Bureau, 315 Custom-house, New York, N. Y., 629 Federal Building, Chicago, Ill., Association of Commerce Building, New Orleans, La., and 310 Custom-house, San Francisco, Cal. Apply for addresses in letter form, giving file numbers.]

No. 13,181. CHASSIS AND ELECTRIC MOTOR CAR.—Tenders are invited by the Wellington City Council, Wellington, New Zealand, for the supply and delivery of an electric chassis for a 2,000-pound parcel delivery van and an electric motor car, required for the Electric Tramways Department. Copies of the specifications, etc., may be obtained from the office of the Tramways and Electrical Engineer, Harris Street, Wellington, on payment for each of the contracts of $5.11, which will be refunded upon receipt of a bona fide tender. Bids must be submitted by July 9, and local representation is necessary.

NO. 13202. HOUSE TELEPHONE APPARATUS.—A report from an American consular officer states that the manager of a private telephone installation concern in France desires to enter into business relations with American manufacturers of house telephone apparatus. Correspondence may be in English.

NO. 13209. ELECTRICAL APPARATUS AND INDUSTRIAL GOODS.—An American consul reports that a local business house handling electrical apparatus, ventilating fans, vacuum cleaners, X-ray apparatus, etc., desires direct correspondence with American manufacturers of these articles.

NEW PUBLICATIONS.

ELECTRIC TOURING.—The New York Electric Vehicle Association has issued a booklet presenting a number of electric automobile tours in New York, New Jersey and Connecticut. A map of the roads is included and tours are given to Morristown, Lakewood, Trenton, Oyster Bay, Bay Shore, Poughkeepsie and New Haven.

INSULATED RETURN FEEDERS.—A report by A. F. Ganz, F. N. Waterman, Samuel S. Wyer, H. S. Warren and Elam Miller on the insulated-return-feeder system for mitigating electrolysis installed by the United Railways Company of St. Louis, Mo., in the Ann Avenue Substation district, has been printed. It describes the tests made and shows satisfactory results.

ELECTRIC RAILWAY MANUAL—The thirty-first annual number of the the McGraw Electric Railway Manual has been issued by the McGraw Publishing Company, Incorporated, 239 West Thirty-ninth Street, New York City. It contains full statistics of the electric railways of the United States, Canada, Cuba and the West Indies, with maps of the more important systems. It has been edited by Frederic Nicholas.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 15.	June 8.
American Tel. & Tel. (New York)	123¼	123¼
Commonwealth Edison (Chicago)	136	135½
Edison Electric Illuminating (Boston)	250	250
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	148¼	148
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	12	11½
Massachusetts Electric preferred (Boston)	62	58⅜
National Carbon common (Chicago)	113¼	110½
National Carbon preferred (Chicago)	119	118
New England Telephone (Boston)	25¼	25⅝
Philadelphia Electric (Philadelphia)	25¼	25⅞
Postal Telegraph and Cables common (New York)	80¾	81¼
Postal Telegraph and Cables preferred (New York)	67½	68½
Western Union (New York)	61¾	61¾
Westinghouse common (New York)	76¼	76½
Westinghouse preferred (New York)	124	124

PERSONAL MENTION.

MR. WILLIAM S. SAMUEL, of the contracting firm of Kingsbury Samuel Electric Company, Baltimore, Md., was married on June 7 to Miss Carrie Bass.

MR. P. E. HAYNES, formerly with the Department of Gas and Electricity, Chicago, Ill., has resigned and will undertake research work for the Linde Liquid Air Company, in New York City.

MR. M. McINTYRE has been appointed traffic manager of the Central California Traction Company, Stockton, Cal., taking the position from which Mr. S. W. Barnes recently resigned.

MR. WAYNE D. JONES has resigned as electrical engineer of the Spring City (Pa.) Institution for Epileptics and Feeble Minded to become superintendent of the Phoenix Water Power Company, Phoenixville, Pa.

MR. W. T. WALLACE, of the firm of Sanderson & Porter, the newly appointed general manager of the Great Shoshone & Twin Falls Power Company, Twin Falls, Idaho, has assumed office and has the reorganization plans for this company well under way.

MR. I. F. SHANNON, secretary of the Board of Public Works and treasurer of the municipal electric light and water plant at Carthage, Mo., has tendered his resignation and will leave shortly for Roanoke, Va. His successor has not yet been selected.

MR. W. A. McGOVERN, formerly assistant division superintendent at Pocatello, Idaho, of the Oregon Short Line, has been appointed general manager of the Northern Electric Company, of Sacramento, Cal., to fill a vacancy created by the resignation of A. D. Schindler.

MR. S. F. DIBBLE, who for 17 years has been manager of the small-motor department in the Chicago office of the General Electric Company, has been appointed manager of the Duluth office of the company and will assume his new duties during the present month. Mr. Dibble was graduated from the University of Michigan in 1893 and was the representative of the General Electric Company at its exhibit at the Columbian Exposition in Chicago in that year. He afterwards served four years as chief electrician of the Public Lighting Commission in Detroit, Mich.

S. F. Dibble.

MR. BERTRAM SMITH, assistant manager of the Pacific Coast Division of the Edison Storage Battery Company, was in Butte, Mont., recently in connection with some orders for electric truck sprinklers and fire equipment which are under consideration by the Butte City Council.

MR. A. E. BARKER, founder and for many years active head of the Dean Electric Company, Elyria, O., and for a long time actively engaged in telephone promotion work, has become affiliated with Dodge Brothers, of Detroit, Mich. Mr. Barker will be the Cleveland district representative for the company, and will be in charge of sales in sections of Ohio, New York, Pennsylvania, West Virginia and Maryland. Announcement will be made respecting the Dodge Brothers' motor car and policy in the near future.

A. E. Barker.

DR. WILLIAM McCLELLAN, of New York City, presided at the second annual conference of Associated Pennsylvania Clubs, which was held at Chicago on June 11 and 12. Dr. McClellan is an enthusiastic alumnus of the University of Pennsylvania and this is the second conference at which he has presided.

MR. F. H. BARBER, sales manager of the Western Electric Company in Salt Lake City, Utah, has been transferred to the company's office at Dallas, Tex., where he will take charge of the sales department. Mr. Barber has been connected with the electrical industry in Salt Lake City for the past four or five years and leaves there a host of friends.

SIR WILLIAM MARCONI has been awarded the Albert Medal for the current year "for services in the development and practical application of wireless telegraphy" by the Council of the Royal Society of Arts, with the approval of its president, the Duke of Connaught. The medal was instituted in 1862. The first medal was given to Sir Rowland Hill.

MR. R. W. TAVEY, an engineer of the National Lamp Works of General Electric Company is in Salt Lake City, Utah. Mr. Tavey is making a tour of the western states, visiting all of the Western Electric Company offices in that territory with special reference to the introduction of the Type C or gas-filled Mazda lamp. He reports that it is taxing the capacity of the factories to supply the demand for this unit, which is meeting with especial favor for exterior lighting purposes.

DR. HAROLD PENDER, professor of electrical enginering at Massachusetts Institute of Technology, has been appointed professor-in-charge of the Department of Electrical Engineering at the University of Pennsylvania, to become effective next fall. Heretofore the Departments of Mechanical and Electrical Engineering at the University of Pennsylvania have been under the direction of the Whitney professor of dynamical engineering. Beginning next year the Department of Electrical Engineering will be on an independent and co-ordinate footing with the Departments of Civil and Mechanical Engineering.

MR. E. P. DILLON and MR. M. B. LAMBERT have been appointed to the newly created positions of assistant managers of the railway and lighting department of the Westinghouse Electric & Manufacturing Company. This is in connection with the work of railroad electrification and heavy power-house apparatus. Mr. Dillon will have charge of the commercial activities of the company in connection with the generation and distribution of power, involving power houses, substations, transformer stations and similar apparatus. Mr. Lambert will have charge of all sales work pertaining to electric traction, including steam, interurban and city railway propositions. Both Mr. Dillon and Mr. Lambert have been connected with the railway and lighting department of the Westinghouse Company for a number of years and are widely known in the electric profession.

MR. FREDERICK A. SCHEFFLER, who has just been elected president of the New York Electrical Society, is one of the best known men among the pioneers of the electrical industry. He was associated in the early days with Thomas A. Edison, in 1881 as engineer, and designed the second electric locomotive Mr. Edison built for experimental purposes at Menlo Park, N. J. Mr. Scheffler has held many important positions in the electrical industry, being at one time general superintendent of the Westinghouse Electric & Manufacturing Company's works at Pittsburgh, general superintendent of the Brush Electric Company's works at Cleveland, O., and manager of the factory of the Sprague Electric Works at Watsessing, N. J. Mr. Scheffler was early connected with the introduction and sale of the Stirling boiler, now manufactured by the Babcock & Wilcox Company, with which firm he is now associated. He is a member of the American Institute of Electrical Engineers, of the American Society of Mechanical Engineers and of the Engineers' Club of New York.

F. A. Scheffler.

MR. GEORGE BARTON MULDAUR will shortly leave the staff of Barclay Parsons & Klapp to take the position of field representative with the Society for Electrical Development. Mr. Muldaur was graduated from Stevens Institute of Technology in 1889 and gained his first electrical experience with the Edison Electric Illuminating Company of New York. He was associate editor of the *Electrical Engineer* under T. C. Martin for several years and in 1893 was sent as fair editor to the Columbian Exposition at Chicago. He has had experience in the financial and commercial end of engineering and manufacturing enterprises and recently has specialized, chiefly in the South and Southwest, as a development engineer in connection with new railway, light and power companies. Mr. Muldaur's wide acquaintance in the industrial field and his general knowledge of the entire electrical industry fit him for the work he will undertake with the Society for Electrical Development.

OBITUARY.

MR. A. BRUCE ANDERSON, chairman of the British Electrical and Allied Manufacturers' Association, was one of those who lost their lives when the ill-fated *Empress of Ireland* sank in the St. Lawrence River on May 29. Mr. Anderson was managing director of Ferranti Limited, a director of Bruce Peebles & Company, Limited, had a member of the council of the Institution of Electrical Engineers.

MR. ALBERT SHERMAN, superintendent of transportation of the Saginaw-Bay City Railway Company, and a resident of Saginaw, Mich., for several years, met death recently by what indications seem to have been foul play. His partly decomposed body was found at Moyles' Corners some days after he had left Saginaw to visit his brother-in-law, Mr. Jacob Strub, electrical inspector of Toledo, O.; the body was bruised and cut. Mr. Sherman was 52 years old and left a wife and two children. He formerly resided at Toledo.

MR. JAMES J. ROBISON, one of the traction pioneers of the Middle West, died in Toledo, O., June 11, of apoplexy at the age of 59 years. He is survived by a wife, two sons and a daughter. With his father and brother he organized the Toledo Street Railway Company in 1888, this being one of the pioneer systems adopting motor power in the Middle West. Mr. Robison was identified with the company as general manager until the concern was absorbed by the Toledo Traction Company, now the Toledo Railways & Light Company. Mr. Robison was also connected with steam railroads and was instrumental in organizng the company which built the 35-mile Toledo belt railway, which at the time was the only complete city belt railroad in the United States. In addition to these interests, he was connected with many business enterprises and at the time of his death was president of the Ohio Savings Bank & Trust Company.

MR. JAMES CAMPBELL, one of the most prominent men in the development of railroads and public utilities in the United States, and for some time president of the North American Company, died on June 12, at the age of 67 years, at his summer home at Indian Field near Greenwich, Conn. Three weeks ago he was operated on by Drs. Delafield and Rundequest, of New York, for a carbuncle on his neck. Pneumonia developed later and caused his death. Mr. Campbell was born in Ireland, and when he was two years old his parents came to this country, settling in West Virginia. He went to school until he was 11 years old, and then took a job as a grocer's clerk. At that time he became a protegé of General Fremont, who employed him as his special messenger and aid for many years. It was through General Fremont's instrumentality that the boy was placed in the engineering department of the Southwest Pacific Railroad, which ran 50 miles out of St. Louis, and was projected as a link on a new transcontinental railroad. He worked as assistant surveyor and by self-education equipped himself to become head of an engineering corps. Later he was appointed chief engineer of the Kansas City, Missouri & Mobile Railroad, which later became a part of the Frisco system. He bought up the bonds of a number of counties in Missouri which were in default in 1873. Railroad building restoring prosperity in the state, he soon reaped immense profits. In 1877, he opened a brokerage office in St. Louis and purchased the franchise of the Bellefontaine line, transforming it from a mule car line to an electric line, and building up a very valuable property. After that he continued to acquire public utilities until, when he quit active business a few years ago, he controlled practically all of the public utilities of St. Louis. He entered the field of railroad building and operation, and became interested in a number of electric roads and was a pioneer in the field of supplying heat, light and power by electricity. He acquired a large interest in the St. Louis & San Francisco Railroad, becoming vice-president. He later became president and was at his death chairman of the board of directors of the North American Company.

DATES AHEAD.

Minnesota Electrical Contractors' Association. Annual convention, St. Paul, Minn., June 22. Secretary, G. M. Jones, 14 North Seventh Street, Minneapolis, Minn.

American Institute of Electrical Engineers. Thirty-first annual convention, Hotel Ponchartrain, Detroit, Mich., June 22-26. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Society for the Promotion of Engineering Education. Twenty-second annual meeting, Princeton, N. J., June 23-26. Secretary, Henry H. Norris, Ithaca, N. Y.

Canadian Electrical Association. Annual convention, Montreal, Canada, June 24-26. Secretary, H. G. Martin, Toronto, Ont.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 4. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery Place, New York, N. Y.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

MacGovern & Company, Incorporated, New York City, has issued its June catalog of used apparatus. A number of large generators, turbogenerators and motors are listed.

Meirowsky Brothers, Jersey City, N. J., have recently issued a price list covering sheet mica, block mica and various mica products for use as insulations for electrical machinery and apparatus.

The Adapti Manufacturing Company, Cleveland, O., announces that after July 1 its address will be 919 West Street. It has been found necessary, owing to the great increase in the demand for this company's apparatus, to move into larger quarters. A three-story building has been leased for a term of years and its entire capacity will be utilized by the company.

Wagner Electric Manufacturing Company, St. Louis, Mo., has issued a handsome art calendar, the calendar pad covering the remainder of this year and part of next year. The last sheet of the pad contains a small calendar covering the period up to the middle of 1916.

Dielectric Manufacturing Company, St. Louis, Mo., has recently issued a pamphlet containing data on various insulating paints and varnishes, impregnating compounds, sealing compounds, mica insulations and varnished tapes. A number of insulation curves showing the dielectric strengths of the various types of insulations described under several conditions are given.

Western Electric Company, New York City, has recently issued a folder illustrating and describing numerous sales helps for electric washers. This folder lists a number of electrotypes for newspaper advertisements, lantern slides, mailing folders, street-car cards and window displays, all of which will be imprinted and sent free to interested dealers.

Phoenix Electric Lamp Company, Incorporated; 253 Thirty-Sixth Street, Brooklyn, N. Y., has absorbed the **United Electric Lamp Company.** Arrangements are being made to establish an office in New York. J. H. Rees, former manager of the United Electric Lamp Company, has been appointed general manager of the Phoenix Electric Lamp Company, Incorporated.

The Waverley Company, Indianapolis, Ind., has recently issued a handsome new-model announcement. This announcement covers the new four-chair car, known as model No. 109. Changes in the shape of the car, enlarged windows and improved batteries are among the new features. The announcement booklet contains a number of excellent reproductions of the car and its parts.

The Robbins & Myers Company, Springfield, O., has recently issued a bulletin describing Type F direct-current factory sewing-machine motors. These motors are designed so as to be able to do such heavy service as is required in tent and awning factories, mattress factories, etc. The motor can be started, stopped or speed regulated by means of varying the pressure of the foot on the treadle.

The Electric Storage Battery Company, Philadelphia, Pa., has issued bulletin No. 144 devoted to the principles of its axle-lighting system for railway trains. The dynamo employed of this system is designed for constant voltage rather than constant current, and the dynamo instead of the battery controls the circuit voltages. The bulletin fully describes and illustrates the system and a typical performance record is given.

The Hess-Bright Manufacturing Company, Philadelphia, Pa., has issued a pamphlet discussing the application of ball bearings to axle-lighting generators. This pamphlet, which is well illustrated, discusses the hard service that bearings of train-lighting axle generators must stand, and shows the adaptability of ball bearings to this service. Two loose-leaf binder pages covering ball-bearing mountings for columns of jib cranes and for semi-floating rear hubs have been issued. Another publication that has recently been issued is devoted to the application of ball bearings to flour and feed-milling machinery.

Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has published a finely illustrated book entitled "Lade und Löschvorrichtungen." This describes a very ingenious system for loading and unloading vessels while at sea. The system is electrically operated and is used for coaling vessels either from colliers at sea or from coaling stations on land to which the vessel cannot tie up; it also has been used quite extensively on the coasts of Chili and Peru for loading nitre and other products to steamers without extra handling on lighters. The system is very fully described with the aid of numerous illustrations, both of the equipment and of vessels using the system.

Standard Underground Cable Company, Pittsburgh, Pa., has recently issued bulletin No. 680-1, describing steel-tape-armored cables. These cables provide a convenient and economical method of installing underground transmission lines for electric light or power service at a low cost. The bulletin is well illustrated by cuts showing the construction of these cables. A full line of fittings for use with this cable are described and illustrated, and complete information regarding the installing of the cable and fittings is included. The company has also issued a folder describing and illustrating Standard wires, cables and cable accessories. This folder includes trolley wire, copper-clad steel wire, weatherproof wires and cables, rubber-insulated wires, lead-covered and steel-tape armored cables and fittings for the same.

Pass & Seymour, Incorporated, Solvay, N. Y., have recently issued catalog No. 22 which is an 80-page book listing, illustrating and describing P & S handy electrical wiring devices. Three pages of this catalog are devoted to color illustrations showing in an excellent manner the various special socket-shell finishes. Another special feature is that of a handy list of conduit box fittings of various manufacture that may be used with the company's outlet-box receptacles. Several excellent views of spectular outline lighting accomplished by means of P & S ready-wired sockets are given. Numerous types of key, keyless, pull-chain, Shurlok and other sockets, wall receptacles, outlet-box receptacles, interchangeable porcelain sockets, weatherproof sockets, switch rosettes, ready-wired porcelain sockets, sign receptacles, miscellaneous fittings, etc., are included in this catalog.

Standard Electric Stove Company, Toledo, O., has been incorporated with $100,000 capital to manufacture electric heating appliances for use in homes, hotels, restaurants, railroad dining cars and ocean-going vessels. The new concern has opened offices on North Twelfth Street, near Jackson Avenue, where it will begin the manufacture of electric stoves and other kitchen appliances within a very short time. Perry C. Tiedemann is president; S. L. Kelly, first vice-president and manager; Charles S. Turner, second vice-president; Luther Smith, secretary; F. M. Bostater, treasurer. Luther Smith has been identified with the stove-manufacturing business for many years and has spent most of his time during the past five years perfecting the electric cook stove which is to be the leading product of the new plant. It is stated that the new concern will begin a nation-wide advertising campaign for its product within sixty days.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a number of new publications. "Drawing the Crowd and Keeping It" is the title of a folder with an exceedingly attractive cover showing a large crowd being attracted to a motion-picture theater. The folder deals with arc lamps for illumination and projection purposes, rectifiers, ozonizers, and radiators, all of which are used in these theaters. Reasons are advanced for attracting the crowd to these places of amusement and for making the conditions so pleasant that the crowd will remain. Westinghouse Railway Data Exchange No. 8 deals with the efficient use of cars, giving considerable data as to the relative cost of operation of different systems. The cost of stops is also treated and some interesting data in dollars and cents given as to the cost of different lines. Westinghouse Wicker Type Electric Linotype Pots is the title of a somewhat elaborate publication in which the linotype pot is described and illustrated.

Record of Electrical Patents.

Issued by the United States Patent Office, June 9, 1914.

1,099,164. Party-Line Ringing Key. A. J. Carter, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Has interlocking means to restore keys to normal position.

1,099,199. Thermic Balance or Radiometer. R .D. Parker, Ann Arbor, Mich. A Wheatstone bridge arrangement.

1,099,241. Rectifier. T. A. Edison, West Orange, N. J. A rotating-segment rectifier. (See cut on next page.)

1,099,259. Electric Traffic-Controlling System for Railroads. W. H. Lane and A. V. T. Day, assignors to Hall Switch & Signal Co., New York, N. Y. An alternating-current signal system with primaries of transformers connected across rails.

1,099,283. Railway Signaling System. A. V. T. Day, assignor to Hall Switch & Signal Co., New York, N. Y. A track-operated alternating-current signaling system.

1,099,313. Electric Switch. J. G. Peterson, Hartford, Conn. A rocker switch.

1,099,332. Circuit-Breaker. C. Aalborg, assignor to Westinghouse Electric & Mfg. Co. Covers details.

1,099,338. Combined Signaling and Telephone System. M. J. Carney, Chicago, Ill. Employs a normally charged circuit.

1,099,343. Automatic-Exchange Selector. E. B. Craft, assignor to Western Electric Co., New York, N. Y. An electromagnet-operated rotary selector.

1,099,365. Combined Spark Plug and Vaporizer for Internal-Combustion Engines. J. C. Henderson, Washington, D. C. Includes heating coil.

1,099,374. Insulator. I. Hunter, assignor of two-thirds to G. C. Rafferty, Carlisle, Ky., and one-third to L. Wells. A grooved insulator.

1,099,375. Electrode Material for Vapor Electric Apparatus. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Composed of mercury and a fractional percentage of lead.

1,099,380. Cable-Telegraph System. I. Kitsee, assignor to American Telephone & Telegraph Co., New York, N. Y. Covers details.

1,099,381. Electric Pocket Lamp. W. Krafft, Berlin, Germany. Has a series resistance mounted on one of the spring contacts.

1,099,384. Trolley Pole. J. Ledwinka, assignor to Trackless Trolley Co. of America. For trackless vehicles.

1,099,386. Station Indicator. C. S. Mackearnin, Boston, Mass. A motor-operated magnetically controlled station sign for cars.

1,099,397. Alarm System. G. A. Sabine, Robinson, Md. Operates upon change of resistance.

1,099,406. Relay for Telephones. C. Stille, Wilmersdorf, Germany. Microphonic contact, located within two rotatably suspended coils. (See cut.)

1,099,421. High-Voltage Switch. A. W. Burke, Pittsburgh, Pa. Covers details of an arc-horn switch.

1,099,440. Electrical Induction Furnace. K. A. F. Hiorth, Christiania Norway. Covers details of coil arrangement.

1,099,475. Flash Lamp. O. R. Tucker, St. Louis, Mo. A signal lamp for attaching to arm of vehicle operator.

1,099,480. Signal Alarm. F. Winter, New York, N. Y. Conducting wires inbedded in glass window.

1,099,512. Safety Stop. L. R. Palmer, Pittsburgh, Pa. Means for braking by short-circuiting series motor.

1,099,550. Telephone Set. P. L. Jensen and E. S. Pridham, assignors to Commercial Wireless & Development Co., San Francisco, Cal. Has a special sounding box.

1,099,558. Electrode. F. J. Machalske, assignor to American Ferrolectride Corporation, Plattsburg, N. Y. A magnesium and carbon electrode for smelting furnaces.

1,099,559. Electric Furnace. F. J. Machalske, assignor to American Ferrolectride Corporation. A carbon and magnesite wall construction.

1,099,562. Electrical Current-Limiting Device. M. Mertens, assignor to General Electric Co. Means for intermittently interrupting current when it exceeds predetermined value.

1,099,589. Fuse. F. B. Cook, assignor to Frank B. Cook Company, Chicago, Ill. Covers details of arranging and supporting wire in inclosed fuses.

1,099,590. Protective Device. E. E. F. Creighton, assignor to General Electric Co. Includes selective inductive discharge path through arrester to ground.

1,099,625. Motor-Operated Switch. H. M. Stevens, assignor to General Electric Co. Covers details.

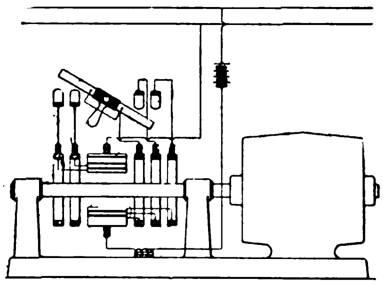
1,099,635. Non Short-Circuiting Lamp Socket. E. E. Brown, Philadelphia, Pa. Has a spring contact for center contact.

1,099,654. Method and Means for Treating Electrodes. C. P. Landreth, Philadelphia, Pa. Includes means for rendering both electrodes electronegative.

1,099,673. Automatic Ship's - Telegraph Alarm. J. A. Sullivan, Victoria, British Columbia, Canada. A dial-operated engine-room signal.

1,099,680. Pneumatic-Cleaner Controller. E. F. Weirich, assignor of four-fifths to L. D. Matchette, Milwaukee, Wis. Motor-control circuit carried along vacuum pipe.

1,099,683. Meter - Control Panel Board. F. B. Adam, assignor to Frank Adam Electric Co., St. Louis, Mo. An adjustable plug meter shunt.



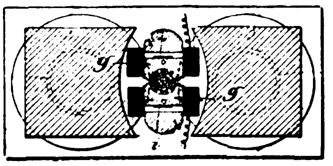
1,099,241.—Rectifier.

1,099,704. Manufacture of Metallic Illuminating Bodies for Electric Incandescent Lamps. E. Hurwitz, assignor to General Electric Co. Cementing process eliminated.

1,099,721. Incandescent Lamp. M. von Pirani, assignor to General Electric Co. Silver chloride contained in bulb.

1,099,744. Guard for Electric Conductors. H. W. Gonia, Berwind, W. Va. A pair of vertical hinged boards protect wires.

1,099,783. Electric Shade Holder. L. W. Andersen, assignor to The Plume & Atwood Mfg. Co., Waterbury, Conn. A combined shade holder and socket.



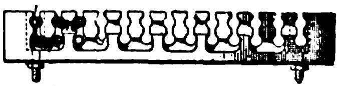
1,099,406.—Telephone Relay.

1,099,786. Electric Heater. C. F. Brown and W. T. Lowry, assignors to C. S. Steward, Chattanooga, Tenn. A plate for supporting and insulating two separate heating coils. (See cut.)

1,099,812. Circuit Contact-Closing Device. G. C. Murphy, Louisville, Ky. A plunger contact device.

1,099,861. Portable Wireless-Station Tower. J. Raes, Schenectady, N. Y., assignor of thirteen-fiftieths to E. F. Wetherell and four twenty-fifths to S. W. Berry, and four twenty-fifths to J. Raes. Has sectional masts and sectional six-wheel wagon body.

1,099,865. Wireless Receiving System. E. G. Stalnaker, minor; C. W. Stalnaker, guardian, assignor to C. W. Hoff, Chicago, Ill. Has a rotating tuning coil and means for stopping same upon synchronism with sending station



1,099,786.—Electric Heater.

1,099,879. Barber Pole. F. O. Hutchings, San Francisco, Cal. Motor rotates the device and controls flashing lamps.

Patents Expired.

The following United States electrical patents expired June 15, 1914:

584,338. Magneto Apparatus. H. H. Eldred, Brooklyn, N. Y.

584,341. Apparatus for Controlling Electric Motors. B. A. Fiske, U. S. Navy.

584,342. Current Motor. W. P. Francis, Philadelphia, Pa.

584,352. Party-Line Telephone System. W. H. Harter, Norwalk, O.

584,356. Electric Arc Lamp. I. H. Hegner, Paris, France.

584,382. Electrical Circuit-Closing Thermometer. A. Luraschi, London, England.

584,384. Automatic Electric Signal-Transmitter. A. B. Macklin, New York, N. Y.

584,393. Telephone System. F. R. McBerty, Downer's Grove, Ill

584,414. Apparatus for Telephone Switchboards. C. E. Scribner, Chicago.

584,415. Telephone-Line Circuit. C. E. Scribner.

584,416. Electromagnet. C. E. Scribner.

584,417. Telephone Circuit. C. E. Scribner.

584,418. Spring-Jack for Telephone Switchboards. C. E. Scribner.

584,420. Hoisting Machinery. A. J. Shaw, Muskegon, Mich.

584,427. Production of electric Sparks for Signals or Theatrical Effects. Tabulewitsch, St. Petersburg, Russia.

584,428. Flexible Conduit. A. L. Tucker, Chicago, Ill.

584,431. Armature for Dynamo-Electric Machines. H. H. Wait, Chicago, Ill.

584,462. Electric-Circuit Protector. A. L. Creelman, Memphis, Tenn.

584,463. Electric Signal. A. L. Creelman.

584,464. Telegraph Sounder. A L. Creelman.

584,465. Circuit-Protecting Sounder. A. L. Creelman.

584,466. Telegraphic Sounder. A. L. Creelman.

584,474. Primary Cell. I. Kitsee, Philadelphia, Pa.

584,476 and 584,477. Insulator. S. H. Libby.

584,482. System of Distribution. E W. Rice, Jr., Schenectady, N. Y.

584,496. Electric Headlight. F. W. Dressel, Yew York, N. Y.

584,511. Electric Railway. T. W. Kloman, Montclare, N. J.

584,618. Telephone Transmitter. H. C. Alexander, Bonham, Tex.

584,632. Lightning Arrester and Multiple Automatic Fuse-Block. G. X. Gast, New Orleans, La.

584,639. Electric Railway. H. M. Jones, Meridan, Conn.

584,644. Bond for Electric Railways F. T. Newberry, San Francisco, Cal.

584,649. Secondary-Battery Plate and Method of Producing Same. W. P. Patton, Jersey City, N. J.

584,694. Increasing Illuminating Power of Electric Arc Lamps. P. Mersch, Paris, Frace.

584,700. Electrical Advertising Annunciator for Cars. J. P. Orr and G. H. Fugh, Pittsburgh, Pa.

584,722. Perforator for Electric Telegraphs. C. G. Burke, Brooklyn, N. Y.

584,733. Electric Wire-Barbing Machine. W. O. Bates and W. J. Hutchins, Joliet, Ill.

584,737. Telephone. C. C. Gould, Philadelphia, Pa.

584,750. Incandescent Electric Lamp. C. E. Scribner, Chicago, Ill.

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BASING POWER RATES ON MOTOR CAPACITY.

The cost of supplying electrical energy to a motor installation comprises two important elements—fixed charges upon plant and the running expenses of the system devoted to power service. It is a widespread practice to make an allowance for these costs in rates by compiling monthly bills upon the basis of an energy charge recorded by meter plus either a charge based upon the measured demand or a flat rate based upon the capacity of the motor. A logical rate system takes these matters into account as a fundamental necessity in selling central-station service to motor users, barring motors of insignificant rating which can be operated upon lighting circuits without serious disturbance of voltage conditions.

Whether a customer uses the full capacity of a motor or not, the company must be ready to supply service up to this capacity, and for such readiness to serve is entitled to full compensation. An interesting case involving this principle came before the Public Utility Commission of New Jersey a year or so ago (Reilly and Manz vs. Public Service Electric Company, Report of New Jersey Public Utility Commissioners, vol. I, p. 286). It appears that this firm prior to a certain date received power service based on the maximum demand measured by the demand meter, which showed a monthly use of 6 horsepower maximum in a single motor installation rated at 15 horsepower. The concern was later put on the retail power rate of the company, under which the demand was assumed to be 80 per cent of the rated capacity, amounting to 12 horsepower in the case of the complainants. The latter alleged that the mechanical equipment in service would at no time require 12 horsepower input at the motor; that the demands of the business had been accurately tested prior to the change in method of charging; and that an assumption of use in excess of the actual requirement should not be permitted.

The use of a 15-horsepower motor was not denied, and the commissioners found in the company's favor, pointing out that a charge based on the capacity of the motor rather than on the actual consumption per month is a minimum charge whose principle should be upheld. The fact that a motor may be, in exceptional cases, in excess of the power that the customer requires, was held not to justify an order by the Board requiring departure from a general rule applicable to other customers having similar

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motors. It is obvious that an installation in which the motor capacity is closely related to the load requirements yields the consumer a better rate than one operating at a load as low as the one in the case cited, not only cutting down the demand charge but also by reason of more efficient operation, using less energy. The moral of the case is the wisdom of careful motor selection and the desirability of testing the local load requirements from time to time, rather than leaving motor installations once made severely alone.

PLACING SECURITIES.

The public utility in a growing city is under the necessity of continually increasing its investment. Otherwise it cannot render good service to all of those who are ready to avail themselves of its facilities. The problem of financing extensions is ever before certain utility companies. In times when capital is plentiful, this problem may offer no serious difficulties to the utility manager. At other times and in certain places very real difficulties arise, and large discounts or commissions are sometimes allowed in order to secure the necessary funds. The practical result of this condition is that the utility pays a comparatively high rate for the additional capital, while the investor may receive little or no more than the nominal rate, the difference going to the banker or other financial agent who has negotiated the loan or sale of securities.

It is generally recognized that such an agency performs a useful function as a middleman and is entitled to compensation for his services. This is especially true where securities are widely disseminated among investors knowing little regarding the utility's affairs, since such investors often depend largely upon the judgment and advice of the investment banker in making purchases of securities. It is true, nevertheless, that such agents frequently lay an undue burden upon the utility, and enforce a commission which represents their power to dominate the situation more than it represents the intrinsic value of the service rendered.

A method of placing securities which should appeal especially to the smaller utilities was suggested by Commissioner Halford Erickson in his recent address to the Michigan Section of the National Electric Light Association. This is to dispose of securities locally as far as possible, and to reach the small investor by utilizing small denominations. While this suggestion is not entirely new, it is one which has not received the general attention which it merits. With the confidence inspired in utilities under commission regulaton, it should prove more feasible now than in the past. The bonds of public utilities would seem to afford such small investors the opportunities they are looking for provided, of course they are issued in the right amounts.

An important merit possessed by this method is its tendency toward better feeling on the part of the public toward utility corporation. When customers are also investors there is likely to be less difficulty in cultivating the good will which is such a desirable asset for the utility company.

THE ADVANCE OF THE WIRELESS.

To the heavy debt which the world already owes to wireless telegraphy further obligations are likely soon to be added, if the experiments now in progress on the Canadian Northern steamship *Royal George* are as successful as is hoped. This vessel, which left Avonmouth, England, last week, for Quebec, is equipped with a wireless direction-finder designed to enable a ship in the thickest weather, without the aid of compass or sextant, to ascertain her position when within a radius of 50 miles of a fixed radio station or of a radio-equipped vessel whose nautical position is known. It is also claimed for this apparatus, which is known as the Marconi-Bellini-Tosi system, that should the *Royal George* pick up a wireless distress signal, she would be able to set her course toward its source, even though the distressed vessel might be unable to indicate her position. The method of operation is by a system of triangular aerials and a telephonic comparison of the intensities of signals received when cutting in and out various sections of aerial designed to respond to waves from particular directions. On account of their arrangement, the triangular aerials cannot receive a message simultaneously, and the position of the sending station is not the limit of the equipment's capabilities, which are planned to include at least approximate indications of distance corresponding to the intensity of signals within the 50-mile radius.

It has been determined that within the last five years nearly 3,000 lives have been saved by wireless on the Atlantic Ocean alone, including disasters due to fire, collision, grounding, and other causes. The work of the radio engineer is constantly broadening and new applications of wireless are likely to enter many fields of transportation and remote control not now appreciated. One of these is the development of the wireless-controlled fog gun, six of which are now in service in Scotland, while one has been brought to this country for experimental service. Located on an isolated point of shore, with remote control of starting and stopping the firing, the possibilities of usefulness of this device are very considerable and the results of the experiments will be awaited with interest both in this country as well as abroad.

In the naval field, recent successful experiments in the highly specialized branch of radio work known as teledynamics, are producing remarkable results. Although as yet the technical details as closely reserved from publicity, some striking achievements in the distant control of torpedo-boat movements from shore have been effected, and it is not unlikely that many new problems in railroad signaling and train communication will occupy the attention of transportation experts within the next few years. All of this does not mean that the holder of telephone and telegraph securities should get scared and part with his bonds and shares; but it does mean that the man who wants to keep up with the times cannot afford to overlook the experiments under way and the results attained in this important and fascinating field of electrical service.

THE MOONLIGHT SCHEDULE AND ITS TROUBLES.

Economically minded municipalities which see in the moonlight schedule a solution of the street-lighting problem should take to heart the case of Monson, Mass., which is thoroughly disgusted, not with the local central-station company, but with the parsimonious policy of those who arranged the existing schedule of thoroughfare illumination. Last year's Board of Selectmen, in an endeavor to furnish street lights in the morning during the winter months, without increasing the lighting expense to the town, signed a contract whereby the town was to be without lights five nights each month, to cover the cost of the early morning service. The contract called for lights during the winter months for an hour before daylight, and specified that the street-lighting expense should not be increased; that on the night of the full of the moon and on the two nights before and after this event, the lights should be turned off.

The results have been anything but satisfactory. An effort was made at the last annual meeting to appropriate the necessary amount for lighting the streets every night, but the plan failed because the moonlight schedule worked fairly well during the winter, when the trees were without foliage, and because a spirit of economy ruled the meeting. Apart from the fact that the trees were denuded during the winter and early spring, it so happened that there was pleasant weather each month at the full of the moon. Last month storm clouds hid the moon on each of the five "open-circuit" nights, and even those familiar with the streets found it next to impossible to grope their way about after dark. During June, with its accompanying heavy foliage, the moon has been of little value and on many nights the streets have been as dark as on stormy nights earlier in the season. Business men have had a double reason for complaint, as they are compelled to be out in the darkness and be denied much of their night trade. One of the recent no-light evenings fell upon a Saturday, when the local merchants look for about one-third of their week's business. The company offered the voters at the town meeting to turn on the lights any stormy night during the full moon, cutting them off on another night to offset the cost. This left the town in darkness when there was no moon to pay for the stormy night.

As a practical example of the drawbacks of a policy of rigid economy in street lighting, this situation is worth considering by all municipalities tempted to save a small sum on a total yearly lighting bill by counting upon the moon as a cost-free and efficient illuminant. Care in spending the public funds is an excellent thing in the right place, but no fair-minded citizen who believes in progress can fail to admit that pitch-black streets are a mistaken policy when considered in relation, not only to the stimulation of local trade, but to the prevention of accidents on the highways. There may be places where the moonlight schedule has its usefulness, notably in towns having few trees and a very high percentage of fair nights, but the experience of Monson and many other places whose service could be paralleled with it indicates that an every-night service is much to be preferred, even at a slight increase in cost.

THE STORAGE BATTERY FOR SUBSTATIONS.

Stand-by storage batteries are a commonplace feature of large central-station practice in cities where a considerable area of direct-current service is maintained, and in exciter operation nothing has come to be a greater reliance than the set of floating cells which safeguards the bus from voltage collapse in case of even momentary trouble with these small but important generating sets. A larger field for the storage battery, however, is in sight in connection with combined electric railway, power and lighting distribution from substations in the so-called alternating-current districts of large central stations. Separated from the generating plants by long lines, often with mixed overhead and underground sections, many of these substations are coming into such prominence as load centers that every possible precaution is demanded for the maintenance of continuous and even service.

Investigations indicate that much success is assured along the lines of safeguarding continuous service, not only in the direction of the local customers' requirements, but in connection with temporary troubles elsewhere on transmission systems, the battery feeding back to other stations or substations through a booster installation and via the transformers. In the study of installations of this kind great skill is desirable in the analysis of existing and the anticipation of future load curves, and the determination of the maximum investment is a problem of no mean dimensions. Some sort of compromise must evidently be made as to the size of substation stand-by battery which can be installed without undue outlay, and in many cases it will doubtless be necessary to make preparations for subdividing the emergency service of such installations between the more important classes of load, according to conditions prevailing at the time of the line interruption.

It may seem to some engineers as though the reliability of moderate-voltage transmission is now high enough to warrant the exclusion of substation stand-by facilities of the kind in prospect, but as the value of the load increases, and particularly as the standards of the public rise, companies whose service is constantly advertised as superior to that offered by the isolated plant will have to face the investment which such stand-by facilities impose. It may be sufficient to carry the local load for 15 or 30 minutes in case of interrupted transmission, but in many communities this filling of the gap in case of outside trouble will be worth all that it costs.

Association of Edison Illuminating Companies to Meet in West Virginia.

The annual convention of the Association of Edison Illuminating Companies will be held on September 14 to 17 at the Greenbrier Hotel, White Sulphur Springs, W. Va. The usual reception will open the convention on Monday evening, September 14. Convention sessions are scheduled for the three following days; these will be held in the large ballroom of the White Hotel adjoining and connecting with the Greenbrier, leaving the latter entirely free for the entertainment and social features of the convention. An unusually large attendance of ladies is expected, and arrangements will be liberally provided for their comfort and entertainment.

It is planned to confine the active work of the convention to about 12 general papers and 10 special committee reports. With a few exceptions presentation of these papers and reports will be confined to 20 minutes each, so as to leave as much time as possible for discussion. It is expected that a few exhibits showing the latest developments in incandescent lamps and possibly a few other electrical developments will be shown.

Excellent facilities are available for golf, tennis, swimming, riding and driving. As usual, a large number of prizes will be awarded. Arthur Williams, New York Edison Company, is president of the association and has sent preliminary notice of the convention.

Program for Ohio Electric Light Convention.

As previously announced in these columns, the annual convention of the Ohio Electrical Light Association will be held in the large assembly room of the hotel.

At the first session Tuesday afternoon there will be presented the address of President J. C. Martin, also reports of the secretary and a number of the standing committees, including the Executive, Advisory and Insurance committees. A special report will be presented by the Committee on Illumination, of which S. E. Doane, Cleveland, O., is chairman.

On Wednesday morning there will be presented reports by the Meter Committee, A. H. Bryant, Cleveland, O., chairman; Committee on Electric Transmissions, M. H. Wagner, Dayton, O., chairman; Committee on Uniform Accounting, L. H. Funkhouser, Dayton, O., chairman; Nominating Committee.

On Wednesday afternoon there will be given an illustrated lecture by Dr. Thomas Darlington, secretary of the Welfare Committee of the Iron and Steel Institute; the subject will be "Welfare Work in Industry."

The Thursday morning session will open with a paper entitled "Power Service," by J. H. Mitchell, of the Columbus Railway, Power & Light Company. Reports will be submitted by the Committee on New Business Cooperations, Thomas F. Kelly, Dayton, O., chairman, and the Committee on Electric Vehicles, M. F. Turner, Cleveland, O., chairman.

On Thursday afternoon there will be an illustrated lecture by M. Luckiesh, Cleveland, O., on the subject "Light, Shade and Color in Illumination."

The final session will be held Friday morning. A report will be presented to the Appraisal Committee. Halford Erickson, chairman of the Wisconsin Railroad Commission, will deliver an address entitled "Indeterminate Franchises." An address on municipal ownership is also expected from some one representing municipal plants.

As usual, elaborate entertainment features have been planned in connection with the convention. Special entertainment will be provided for the ladies as follows: Musicale and card parties on Tuesday afternoon and Friday morning; launch ride on Sandusky Bay Wednesday afternoon. On Tuesday evening all attending the convention will be invited to an informal ball. On Wednesday evening will be given the annual Association banquet. Thursday evening there will be a musicale in the hotel lobby, followed by the Annual Association ball.

D. L. Gaskill, Greenville, O., is secretary of the Association.

Anthony N. Brady Medals to Promote Safety on Electric Railways.

The family of the late Anthony N. Brady has made arrangements with the American Museum of Safety, New York City, for the annual award of a gold medal to any American electric railway company which, during the year of award, shall have done the most to conserve the life and health of its passengers and employees. In addition to the gold medal to be awarded to the company, a replica in silver will be awarded to the member of the operating staff who has contributed most to the successful record of the company; another replica in bronze will be awarded to the employee of the company whose services have been of the greatest value to the promotion of safety and health. A committee, of which Arthur W. Brady is chairman and Charles S. Sergeant and Frank Hedley are the other members, has been appointed by the American Electric Railway Association to formulate the conditions of the competition. These have now been printed and are available to electric railway companies. Dr. William H. Tolman, director of the Museum, is secretary of the committee.

World's Insurance Congress at Panama-Pacific Exposition.

Arrangements are now being made for a World's Insurance Congress to be held from October 1 to October 15, 1915, in San Francisco, Cal., in connection with the Panama-Pacific International Exposition. It will be held under the auspices of a national council, created through representation from every national and international association whose membership derives livelihood from the business of insurance or its allied professions. Up to the present time over 50 of these associations have already indorsed the movement by resolution, and named their representatives to serve on the council. Electrical organizations interested in fire-prevention work are now being invited to participate in the congress.

In connection with insurance matters, the authorities of the Exposition have designated the week beginning April 18, 1915, as insurance week; this will commemorate the ninth anniversary of the destructive San Francisco earthquake and fire of 1906. It is believed that San Francisco, completely rebuilt by insurance money, will afford the most interesting exhibit in this line and emphasize the value and efficiency of insurance. W. L. Hathaway, Exposition building, San Francisco, is commissioner of insurance and has these matters under his direction. Garner Curran is deputy commissioner.

Special Fourth of July Illumination for New York City.

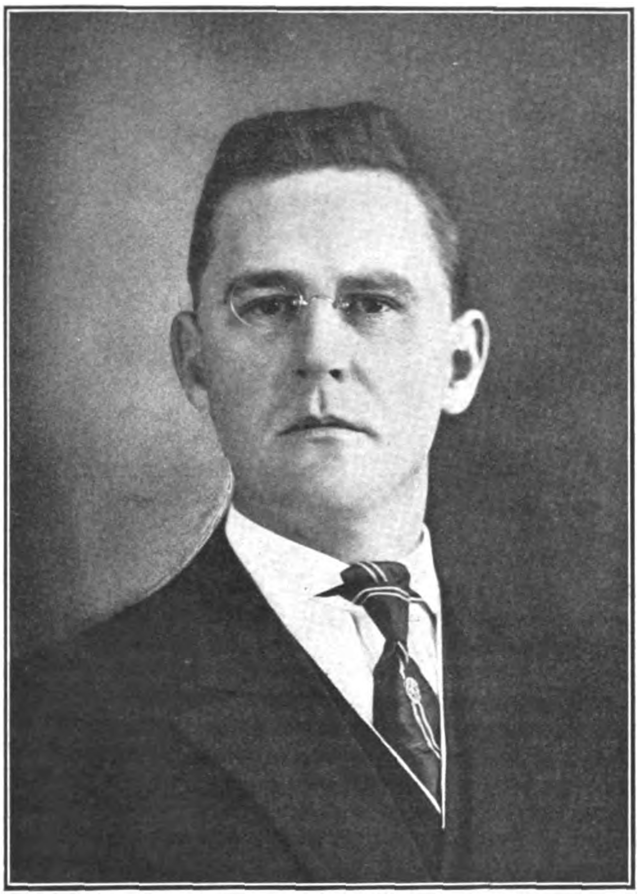
About 25,000 multi-colored electric lamps will illuminate the parks and monuments of Manhattan Island and the other boroughs of New York City on July 4. Each of the boroughs will have its quota of illumination in the plans drawn up by the Illumination Committee, of which Arthur Williams is chairman. $25,000 has been appropriated by the city for celebrating the "Fourth," of which $11,000 will be spent to wire the monuments and parks for lighting. The current for all of the illuminations in Manhattan will be donated, as in previous years, by the New York Edison Company, and in the other boroughs by the local electric light companies.

Raymond J. Andrus.

Of considerable variety and certainly of remarkable interest, the career of Raymond J. Andrus, vice-president and general manager of the Northwest Electric & Water Works, is worthy of distinct and elaborate comment.

Mr. Andrus was born at Rockford, Ill., in 1884. He received his early education in the country schools and completed this work in high school at Mason City, Iowa. He entered the College of Engineering and Mechanical Arts of the University of Minnesota, in the fall of 1902, graduating in 1907 with the degree of Electrical Engineer. Upon graduation he entered the employ of the Helena Power Transmission Company, now the Missouri River Power Company. After some time spent in establishing a thorough knowledge of attending to the polishing of the brass cooling pipes and dusting transformers he considered his education complete in this direction and decided to graduate from the employment of that company. As he says himself, he was short of railway fare to reach Seattle, so he stopped off at Spokane, where for some months he was employed with the Spokane Engineering Company. He soon became chief draftsman of that concern. It was not long, however, before he decided that the outlook over the edge of the drafting table was limited in scope, so he hied himself to the offices of the Washington Water Power Company, where he got on the blind side of M. C. Osborn, at that time and now commercial agent of the company. Mr. Osborn gave him a start in the bad account department, his principal duty being to "get the money" or remove the plugs without getting kicked out or otherwise maltreated. It is understood that his work in this department was so bad that Osborn decided he should be a success in securing new customers as his record in the elimination of bad ones was very unfortunate. He was, therefore, made assistant agent in a new residence territory, and made good so quickly that he was soon in charge of a downtown district as district agent. In the fall of 1909, Robert E. Strahorn, who promoted and completed the North Coast Railway, acquired a number of properties in the Yakima Valley, extending from North Yakima to Pasco. It was here that Osborn's great friendship was again demonstrated, and when Strahorn asked for a good man to take the managership of his plants Andrus was recommended and took responsible charge of the electric and water power plants in the lower valley. During the time of his association with Mr. Strahorn, the company constructed a transmission line 90 miles in length from Kennewick to North Yakima, and built up an irrigation load of several thousand horsepower in electric motors for irrigation pumping. Mr. Andrus was also in charge of the design and construction of a large auxiliary steam plant at Kennewick.

In 1911 these properties were acquired by the Pacific Power & Light Company, of Portland, Ore., a subsidiary corporation of the Electric Bond & Share Company of New York. Mr. Andrus remained with the purchasers in the capacity of manager of their interests at Pasco, Kennewick, Benton City, Richland, White Bluffs, Burbank, Finley and Attalia until March, 1912. At that time he joined forces, in the capacity of new business manager, with the Northwest Electric & Water Works, making his headquarters at Montesano, Wash. He assumed the title of vice-president and general manager on January 1, 1913, and at the present time is making further reputation in this capacity.



Raymond J. Andrus,
General manager of the Northwest Electric & Water Works.

Administration Water-Power Development Bill.

The bill providing for the development, control and leasing of water power on public lands, which has been drafted in accordance with the ideas of Secretary of the Interior Lane and which has met the approval of President Wilson, has been favorably reported to the House of Representatives in Congress, by the Committee of Public Lands. Special efforts are being made by friends of the administration to secure the passage of the bill and other conservation measures favored by the administration.

This water-power bill gives authority to the Secretary of the Interior to prepare regulations for leasing to individuals, associations or corporations public lands for the purpose of constructing dams, reservoirs, transmission lines and other things necessary for the generation and transmission of water power.

Leases are to run for 50 years, revocable only for breach of terms, and the property is then subject to revision to the Government, if desired, on payment of the actual cost of the water-power plant with permanent land improvements as necessary equipment.

The Secretary of the Interior has the power to give preference in granting leases to state, county or municipal systems.

To prevent monopoly, no lessee will be permitted to sell to any one consumer more than half the output of any plant, and the Secretary is to control all combinations of plants or lines to prevent restraint of trade or agreements to increase prices.

Control of charges for service and issuance of stocks and bonds will be under the supervision of the Secretary.

Sale or delivery of power to a distributing company is restricted to a 30-day term, and the written assent of the Secretary is necessary to an assignment of the lease.

Leases of power opportunities solely for municipal use, or not in excess of 25 horsepower to individuals or corporations for domestic, mining or irrigation purposes shall be without charge, but in all other leases the Secretary shall specify a rental, the proceeds to be paid into the reclamation fund. On receipt of the rental fund by the Reclamation Service one-half of the amount is to be given to the state.

Electrical Exports for April.

The Bureau of Foreign and Domestic Commerce has issued its monthly summary of imports and exports of the United States for April. From this report are taken the following data on the electrical exports during that month.

A considerable falling off is to be noted in the April total as compared with the immediately preceding months and with April of last year. For the four classes for which the numbers are reported there were shipped in April 3,040 fans, 38 arc lamps, 35,830 carbon-filament lamps, 104,714 metal-filament lamps.

The detailed figures are given in the following table, together with those of April, 1913:

Articles.	April, 1914.	April, 1913.
Batteries	$ 65,001	....
Dynamos and generators	176,469	$187,098
Fans	38,525	28,517
Insulated wire and cables	86,993	....
Interior wiring supplies, etc. (including fixtures)	60,891	....
Lamps—		
Arc	1,063	25,059
Carbon-filament	4,621	23,799
Metal-filament	20,820	34,284
Motors	341,369	408,093
Static transformers	93,247	....
Telegraph instruments, (including wireless apparatus)	8,654	16,484
Telephones	73,061	106,848
All other	770,837	1,720,949
Total	$1,741,551	$2,551,131

Warren Jovians to Hold Exposition.

Members of the Jovian Order in Warren, O., are making plans for elaborate electrical displays of various sorts for the electrical exposition which is to be held in that city under their auspices in September. The street lighting is to be a special feature, original designs calling for the use of a large number of lights being contemplated. Electricity will also play an important part in a night pageant which is to be one of the spectacular events of the exposition. The new National Guard Armory, now nearing completion, will be used for a display room, in which the exhibits of manufacturers and dealers who have indicated their intention of being represented will be shown.

Jovian Activities in Dayton.

W. W. Freeman, vice-president and general manager of the Union Gas & Electric Company, of Cincinnati, O., and past-president of the National Electric Light Association, was the guest of honor and the principal speaker at a meeting of the Jovians of Dayton, O., on the evening of June 22. The affair was the last of the monthly dinners, which have featured the spring and winter sessions of the organization, before the summer vacation. A large attendance, embracing practically the entire membership of the organization, as well as a number of guests, greeted Mr. Freeman. There were informal talks from a number of other electrical men of prominence. The banquet room was rendered cool and comfortable by the use of a large number of electric fans, of the small desk size, placed on the table, a unique idea especially appropriate for use at a gathering of representatives of the electrical industry. Committees were appointed for the purpose of arranging for two picnics to be held by the Jovians during the summer, one in July and one in August, which will take the place of the monthly dinners heretofore held.

Telephone Pioneers of America Will Meet at Richmond.

The fourth annual meeting of the Telephone Pioneers of America will be held at Richmond, Va., October 29 and 30, 1914. The headquarters will be at the Jefferson Hotel.

The officers of the Association are:

President, Theodore N. Vail.

Vice-presidents, Thomas D. Lockwood, Thomas B. Doolittle, Charles F. Sise, George E. McFarland.

Secretary, Henry W. Pope.

Treasurer, George D. Milne.

Excutive Committee, Angus S. Hibbard, chairman; Charles G. DuBois, Charles E. Scribner, Edgar F. Sherwood, James T. Moran.

Corresponding Secretaries, P. Kerr Higgins, St. Louis, Mo.; Darwin P. Fullerton, San Francisco, Cal.; William B. T. Belt, Omaha, Neb.; William J. Maiden, Chicago, Ill.; Kenneth J. Dunstan, Toronto, Ont.; Howard B. Emery, Boston, Mass.; William J. McLaughlin, Philadelphia, Pa.; Henry W. Bellard, Denver, Colo.; George W. Foster, Dallas, Tex.; Edward E. Bawsel, Nashville, Tenn.; William H. Adkins, Atlanta, Ga.; William T. Naff, New Orleans, La.

British National Wireless Research.

The committee appointed by the British postmaster-general to report upon the measures that the government should undertake in providing for wireless telegraph research, recommends the setting up of some body or institution to initiate and control research in matters of general principle, which cannot conveniently be investigated in departmental laboratories. The said body is also to coordinate the work now undertaken by the postoffice admiralty and war office, respectively, in wireless experiment and research, so as to prevent overlapping. A national research laboratory is proposed at a first cost of $37,000 and an annual operating cost of $24,000; it will be located at Teddington and will co-operate with the National Physical Laboratory. The laboratory would conduct research work bearing on the practical needs of the services principally in wireless telegraphy, but "it is undesirable to exclude the problems of ordinary telegraphy and telephony."

In the same connection it is proposed that the government shall appoint a national committee for telegraphic research to promote, both by theoretical investigation and by experiment, the progress of scientific telegraphy and telephony, and co-ordinate and supplement the work of the government departments named above. This national committee will be composed of the following representatives: One from Admiralty, one from War Office; two, Postoffice; two, Treasury; three nominated by the Royal Society; one nominated by the Institution of Electrical Engineers.

Tax Valuations of Ohio Electric Light Plants Increased.

Increase in the taxable value of all electric light plants in Ohio for 1914 amounts to $3,848,030. The total is $40.291,830, as compared with $36,443,800 in 1913. This announcement has just been made by the State Tax Commission. The list includes 13 new corporations which have been started during the past year.

One of the large increases was in the properties of the Columbus Railway & Light Company, now operated by the Columbus Railway, Power & Light Company, which was raised from $11.911.140 to $12,464,700, making a boost of $553.560 The Canton Electric Company is another concern which received a big advance, being listed for $2,116,170 this year as compared with $1,760.080 in 1913. The Ohio Light & Power Company is raised to $1,662,110 from $1,455,150; and the Cleveland Electric Illuminating Company to $17,792,560 from $16,513,560.

Coast-to-Coast Telephony Predicted for 1915.

John J. Carty, chief engineer of the American Telephone & Telegraph Company, in a recent statement said that such progress has been achieved in completing the telephonic connection between Denver, Colo., and San Francisco, Cal., as to make quite certain that good telephonic communication between New York City and the Golden Gate will be achieved as one of the features marking the opening of the Panama-Pacific International Exposition next February.

Banquet of Schenectady Section.

The annual banquet of the Schenectady section of the American Institute of Electrical Engineers will be held on the evening of June 30.

Michigan Section N. E. L. A.

Annual Convention-Cruise on Great Lakes, June 17 to 20

For the third time in the history of the Michigan State electrical organization, its annual convention was held aboard ship, the cruise this year being in the nature of an elaborate sight-seeing trip, taking in such points as Niagara Falls, the Thousand Islands of the St. Lawrence River, and Toronto, Ontario.

About 125 members and guests had registered on Wednesday evening, when the steamer *City of Cleveland III* sailed from Detroit for Buffalo, N. Y. Special interurban cars were provided at the latter destination, which conveyed the entire party to Niagara Falls. The day was spent here visiting the many wonderful sights and an opportunity was also had to inspect the plants of the Ontario Falls Power Company and the Niagara Falls Power Company, guides being delegated by the respective companies for this purpose.

At 4 o'clock a special train was boarded for Youngstown, N. Y., proceeding by way of the Royal Gorge route. At Youngstown the steamer Rochester was waiting for the party and set sail immediately upon arrival of the special train. The Thousand Islands were passed at 6 a. m. on Friday, and at 10 a. m. the city of Ogdensburg, N. Y., was reached. Time was allowed here for viewing the historic points in the vicinity, and a special excursion was also made to the State Hospital.

Sailing from Ogdensburg, the next point visited was Alexandria Bay, where a specially constructed steam yacht conveyed the party through the channels not accessible to the larger boats. Leaving Alexandria Bay at 5 p. m. Friday, the trip to Toronto was made without stop, arriving 8 a. m. on Saturday. Here a special train was boarded for Detroit, running over the Canadian Pacific Railway, arriving at 2:30 p. m.

During the entire trip pleasant weather was encountered, and the cruse will long be remembered as one of the most interesting and enjoyable meetings of Michigan electrical men. Herbert Silvester, secretary of the section, is deserving of great credit for the manner in which he arranged every detail, and the success of the trip is, in a large measure, due to his efforts.

The trip was not all given over to pleasure, four business sessions being held, three aboard ship and one on the train en route to Detroit, the latter being an executive session. The three principal sessions were held at night, and the large number of papers scheduled for presentation did not allow sufficient time for discussion.

The first session was held in the dining room of the steamer *City of Cleveland III*, being called to order by President H. C. Sterling, at about 8:45 p. m. In the opening address President Sterling called attention to the work which was done during the past year by the various committees, and of the meetings attended personally by the president. He spoke of the recent convention of the National Electric Light Association at Philadelphia and a need for change in the method of holding conventions, because of the increasing size of this organization. He suggested that a solution of the problem would be conventions of geographical sections, with selected delegates from these attending the convention.

Mr. Sterling suggested that the gas and electric interests co-operate in the matter of conventions, as it is to the best interests of all concerned to have harmonious relations between such companies. Mr. Sterling quoted from census figures, showing the status of the central-station business in Michigan, and emphasized the fact that it is the second state in the number of municipal plants. He thought that if central-station managers would practice frankness and fairness with their customers, there would be less agitation for municipal ownership. In this connection, he called attention to the report of the Public Policy Committee, presented at the recent national convention. In conclusion, Mr. Sterling recommended that a committee be appointed to keep in close touch with the proposed utility regulation legislation, and also that the number of vice-presidents of the Association be increased from one to three.

A paper entitled "Reserves for Depreciation" was then presented by H. A. Fee, of Adrian, Mich. This paper points out that there is always a more or less insistent demand on the part of the public that public utilities reduce their rates, and regardless of the reasonableness of such rates, laws have been passed and regulatory bodies created with the idea that such reduction would be had. It is probable in the majority of cases the rates would not have been lowered at all had the companies concerned with the reductions been prepared to demonstrate that the apparent excess element in their rates was only that part of the rate that the users of their service must pay if they were to make suitable provision against the depreciation which was constantly accumulating from the various parts of their physical property, but which would not have to be met until some time in the future. Usually the book-keeping system is at fault, and one of the most common defects is in the treatment of depreciation. The subject of accumulated depreciation, inadequacy, obsolescense, disaster, and franchise loss, were discussed in this connection, and two methods of figuring depreciation discussed, i. e., the straight-line and the sinking-fund methods. The paper holds that the simplest method is a combination of the two. Under it one-twelfth of the annual depreciation, as calculated on the straight-line method, is set each month, and the funds so accumulated are then handled so as to yield the greatest earnings possible with safety.

Following this, Halford Erickson, railroad commissioner of Wisconsin, presented a very interesting and pertinent paper entitled "Regulation of Public Utilities and Returns Allowed Thereunder." This paper is presented elsewhere in this issue.

James B. Oxtoby, of Detroit, next presented a paper entitled "Contract and Franchise Rates as Affected by the Public Service Commission Laws." This paper discussed the rights of the commission to revise rates established by contract previous to the existence of the commission, and also to revise rates fixed in franchises granted by municipalities previous to the establishment of such a commission. A number of decisions bearing upon these two questions were recited, from which the following conclusions are drawn: All contracts entered into between a public utility and its customers are subject to cancellation or revision by a commission, exercising the police power of the state.

A public utility cannot by its conduct or course of dealing waive its obligations to properly perform its duties, or bind itself to continue in force rates or practices which are unreasonable or discriminative.

Rates named in contracts entered into prior to the enactment of the act authorizing the Michigan Railroad Commission to fix electric rates are cancelled upon the filing by the utility of its rate schedules as required by the orders of the Michigan Railroad Commission, when such schedules fix a new and different rate for the service.

Rates fixed by contract between a public utility and its customers are binding only so long as they are in accordance with the utility's published schedule of rates. When a rate is filed and published as required by law it becomes the legal rate to be charged thereafter, notwithstanding the existence of outstanding contracts, which contracts are thereby modified to that extent.

Rates fixed by a franchise are binding as between the municipality and the public utility. Whether or not such rates are subject to change directly or indirectly by legislative authority, where express power is conferred upon the municipality to agree upon rates, is open to question. The courts have not settled the question whether the legislature, under its "reserve power," has the right to alter, amend or repeal such franchises as it has expressly authorized. The courts have generally been content to hold that the power conferred upon the municipality to agree upon the rate was not absolute, and therefore the rate was subject to change.

Rates fixed by franchise may not be changed by the public utility alone, such as by its filing a new schedule of rates with the commission. A franchise rate, if subject to change at all, may be changed only by the legislature or by a public service commission, after a hearing.

Provisions in city charters recently adopted in Michigan, under the Home Rule act, undertaking to empower the city to regulate rates of electric utilities, are void, as in conflict with the provisions of the general law giving the railroad commission jurisdiction of the subject matter.

At this point a Nominating Committee, composed of R. W. Hemphill, Jr., Ann Arbor; J. L. Cavanaugh, Benton Harbor; and R. R. Thompson, of Battle Creek, was appointed.

An address by W. J. Norton, of Chicago, was then delivered on "Wild Schedules I Have Known." In his introductory remarks Mr. Norton commented on the mistakes made by utility companies by filing rate schedules with commissions, and urged uniformity in rate schedules, although there must necessarily be some difference in the actual rates.

This paper points out that rate-making for the sale of electricity is not a theory. It is an art. There are but three basic elements which should enter into the form of electric rates:

(1) quantity, (2) demand, and (3) customer expense.

The element of quantity is found in all rates, either in a simple form, as in the meter rate, or in an estimated quantity, as in the flat rate. The element of demand in electric rates is based upon the individual consumer's responsibility for the investment of the central station which stands ready to serve such customer. Demand may be measured by instrument, estimated as a percentage or connected load, by the use of statistics originally based upon measurement, or it may be based upon other functions of the customer's use or of the customer's premises.

Customer expense is a minor element in rate-making, and represents the cost to the company for such charges as meter reading, billing, postage, bookkeeping, etc., and bears no relation to either the quantity used or the demand of the customer upon the station.

The accepted forms of electric rates may be divided into two main classes: (1) meter rates; and (2) demand rates. There are four types of meter rates: straight-line meter rate; step meter rate; block meter rate; customers output rate.

The term "Meter Rate" is applicable to any method of charge of electric service which is based solely upon quantity. The quantity is expressed in units; as, kilowatt-hours of electricity used, tons of ice made, gallons of water pumped, etc. The term "Straight Line" as used in connection with a meter rate indicates that the price charged per unit is constant, i. e., does not vary on account of any increase or decrease in the number of units. The term "Step" as used in connection with a meter rate indicates that a certain specified price per unit is charged for all or any part of a specified number of units, with reductions in the price per unit based upon increases in the number of units, in accordance with a given schedule. The term "Block" used in connection with a meter rate indicates that a certain specified price per unit is charged for all or any part of a block of such units, and reduced prices per unit are charged for all or any part of succeeding blocks of the same or a different number of such units, each such reduced prices per unit apply only to a particular block or portion thereof. The term "Customer's Output Rate" is applicable to any method of charge for electric service based upon the customer's output of a certain definitely named commodity. The unit of customer's output may, for example, be a gallon of water pumped, a barrel of flour manufactured, or a ton of ice made.

The block meter rate is certainly the best of the meter rates, and in general it attempts to provide certain blocks which correspond in general averages to rates of the demand type. It certainly fails, however, to give the small but long-hour customer a rate as low as he is entitled to, and on the other hand, it gives to the large short-hour customer a discount to which he is not entitled. The general simplicity of the rate and the ease with which it is understood by the customers are the reasons for its adoption by many companies, especially for retail lighting, and on the whole it has given satisfactory results. The customer's output rate has been tried many times, but on the whole with very little success, and it generally results in a customer obtaining service at an unduly low rate, and as there is no inclination on the part of most customers to protect the company, the rate has a tendency to cause waste.

The term "Demand Rate" is applicable to any method of charge for electric service which included a charge which is based upon, or is a function of the use of maximum demand during the given period of time. The demand is expressed in such units as kilowatts, or horsepower. The term "Flat Demand Rate" is applicable to any method of charge for electric service which is based upon the customer's installation of energy consuming devices. Sometimes this type of rate is nominally so much per customer per year or per month for each of various classes of customers, but estimated demand, and quantity of energy likely to be used, play an important part in the determination of the class. Such a rate may be modified by the "Block or Step" method or features. The term "Wright Demand Rate" is applicable to that method of charge in which a maximum rate is charged for a certain amount of energy, and one or more lesser charges are made for the balance used on the block principle, in accordance with a schedule which is based upon the length of use of the maximum demand, as measured or estimated. The term "Hopkinson Demand Rate" is applicable to that method of charge for electric service which consists of a demand charge, a sum based upon the actual or estimated capacity of demand of the customer's installation, plus energy charge, a sum based upon the quantity of energy used. The term "Block Hopkinson Demand Rate" is applicable to any method of charge for electric service in which the charge made to the customer consists of a demand charge and a series of energy charges arranged on the block principle; or a series of demand charges and energy charges both of which are arranged on the block principle. Where either a series of demand or energy charges enters the rate, they may be arranged in two or more blocks. The term "Three

Charge Demand Rate" is applicable to that method of charging for electric service which consists of a customer charge, a charge per customer or per meter, plus a demand charge, a sum based upon the actual or estimated capacity or demand of the customer's installation; plus an energy charge, a sum based upon the quantitiy of energy used.

The demand rates may thus be divided into five general classes: (1) flat demand rate, (2) Wright demand rate, (3) Hopkinson demand rate, (4) block Hopkinson demand rate, (5) Doherty or three-charge rate.

Of the nine simple rate forms outlined seven are distinctly good and two, one the step meter rate and the other the customer's output rate, are bad. Any rate schedule should be based absolutely upon one of these seven good types and after the cost curve for any particular class of business has been properly determined, the company has its option of choosing one of the seven types. It is doubtful if the companies will ever have uniform rates, as rates are entirely a function of cost and cost must vary in different localities, but it ought not to be difficult to have all of our rates established on one of the standard forms, and when so established better results are obtained by adhering closely to the standard form rather than by attempting to complicate a rate.

The second session was held Thursday evening in the observation parlor of the Steamer *Rochester*. The first paper of the evening was by R. C. Hall, entitled "Deep Well Pumping." This paper discussed some of the general advantages of pumping by electricity, commenting on the direct-plunger lift and air-shaft methods. The installation of deep-well pumps now in service in the village of Richmond, and operated by the Eastern Michigan Edison Company, furnishing water to the water works system of that village, is described. The water supply is obtained from three deep wells, 131 feet deep, in which the water normally rises to within 65 feet of the surface of the ground. One well is equipped with an American Well Works motor-driven pump, operated by 25-horsepower motor, with automatic starting equipment. The second well is pumped with a Luitweiler non-pulsating, double-acting motor-driven pump head, operated by 15-horsepower motor, with automatic control equipment. The water is all pumped into a reservoir 100 feet high, and having a capacity of 87,000 gallons, so that under normal conditions the pumps have to work against a total static head of about 185 feet. Conditions in this plant are somewhat different than the ordinary water works, inasmuch as approximately 50 per cent of the total water pumped is re-sold in bulk to the railway company, and as railroads use much more water in the winter than in the summer, the winter consumption of the plant is about as large as the summer. The entire plant, including transformer substation for light and power service, is operated by one man, who is on duty in the day time only. Data on results of tests are presented and lantern slides showing the interior and exterior of the pump house were shown.

G. W. Bissel, following the presentation of this paper, called attention to the Hill-Trip deep-well pump, which has a motor on a vertical shaft, and an impeller at the water level, which raises the water to a centrifugal pump directly beneath the motor. Such a unit was found to have an efficiency of only about 25 per cent. H. A. Fee, of Adrian, reported unsatisfactory experiences with such a pumping unit, because of the frequent breaking of impeller blades. He also found the efficiency to be extremely low.

H. A. Fee,
President-Elect, Michigan Section,
N. E. L. A.

Mr. Fee first began electrical business in 1886, at which time his father, J. H. Fee, purchased the Adrian (Mich.) lighting plant from W. A. Foote. On reaching his majority he was taken into the business under the firm name of J. H. Fee & Son. The business grew and in 1894 it was taken over by the Electric Light & Power Company, with H. A. Fee as manager. The business continued to prosper and in 1903 it became necessary to still further increase the investment and the present company was organized with J. H. Fee as president and H. A. Fee as manager, to take over the property of the Electric Light & Power Company. The new company built a new generating plant and greatly increased the business. In December, 1913, J. H. Fee died and H. A. Fee became president and general manager, which position he now holds.

A paper entitled "Hydroelectric Power in Michigan," was then presented by G. W. Bissel, of the Michigan Agricultural College. This paper presents the results of inquiries made during the past few months to ascertain the extent of water-power development at the present time. Replies to these inquiries are tabulated, showing the name and location of all hydroelectric plants in the state; the geographical distribution of the plants by county, city, or town, and drainage basin, the maximum horsepower of each, and in most cases the operating head. There are also maps of the upper and lower peninsulas of Michigan, showing the location of the various plants.

Following this a paper entitled "The Rowena Street Substation of the Edison Illuminating Company," was then presented by James W. Bishop, of Detroit. This paper describes the automatic rotary converter station of the Detroit Edison Company, which houses a 500-kilowatt, 60-cycle rotary converter, operating on an Edison three-wire direct-current system. It is started and stopped from another station a little more than a mile away. No other wires are used betwen stations, excepting the three-conductor 4,600-volt cable, supplying the three-phase current. There is no attendant at this station excepting for inspections, cleaning, etc. This station is located in a residential district, where there is no day load, and operates from lighting time until about 10 p. m. The paper was illustrated by numerous lantern slides, showing views of the equipment.

A paper entitled "Out-Door Substations" was presented by A. A. Meyer, of the Edison Illuminating Company, of Detroit. This paper first points out the possibilities that the wider development of out-door type substations will open up. Smaller towns, villages, farms, dairies, etc., bordering on transmission lines, have just as much need for electric service, but could not be supplied because of the lack of inexpensive transforming apparatus. Several distinct types of out-door substations, which differ, according to the voltage, nature and size of the load, were described and illustrated. Comment was made on the general requirements of such apparatus, and a brief description of the equipment necessary presented. Mr. Meyer concludes that while some of the more conservative engineers disapprove of the out-of-door station, on the basis of jeopardizing service, it is believed that such an argument will in time be proven groundless. The results which are being obtained by this type of station, and the large number which are being installed, seems to prove conclusively the practicability of the out-door substation. Slides were shown, demonstrating the wide application of the out-door substation, emphasizing the big field possible to develop by the employment of such equipment. Among the interesting applications were those for dredging with transformer installation on a float; irrigating, quarrying, and for farm work.

J. A. Cavanaugh, Benton Harbor, opened the discussion describing an installation of five miles of single-wire line, recently completed by his company. Such construction is not substituted for standard line construction, but is used only where it is possible to secure the business of small customers, which would be impossible to obtain unless line costs were extremely low. The load of the average power customer served from these single-wire lines does not exceed 0.5 horsepower.

R. R. Thompson, Battle Creek, stated that the Commonwealth Power Company is just starting the installation of out-door substations of the steel-construction type. He inquired of Mr. Cavanaugh as to whether the customer pays for cost of installation or not. Mr. Cavanaugh replied that the Company pays all costs, the customers along this line being farmers on small farms, ranging between 25 and 40 acres. Bills average from $2 to $25 per month. In reply to a question of Mr. Fee, as to rates charged for this service, Mr. Cavanaugh added that regular city rates were maintained, with a separate cooking rate of 5 cents per kilowatt-hour, with a 5 per cent discount. Cooking has become quite popular among the rural customers of the Benton Harbor Company.

The third session was held on Friday evening, in the dining room of the Steamer *Rochester*. The meeting was opened with an address by Charles B. Scott, of Chicago, on "Safety in the Electrical Industry." Mr. Scott said that not enough attention is given to preservation and conservation of human life, although the present agitation for "Safety First" is doing great good. In one case of an electric railway in a western state, from 12 to 15 per cent of the annual gross earnings were paid in settlement of damage suits for various injuries. After a systematic campaign to improve this situation, the amount paid out annually was reduced to a fraction of 1 per cent. Mr. Scott said that it has been proven in innumerable cases that accident prevention work is effective. He urged that employers should get the benefit of their employees' suggestions for the betterment of the work, as such suggestions have been found to be much more valuable than suggestions made by outsiders. Of 2,670 accident reports from electric utility companies investigated during a certain period by Mr. Scott, 1,085 were found to be common accidents, not due to an electrical hazard. This demonstrates that general prevention work, as carried out in other industries, can be effectively used by the central-station companies.

An illustrated paper entitled "Fundamental Principles of Interior Illumination" was then presented by M. Luckiesh, of the National Lamp Works. This paper discussed quality and distribution of light, as the two fundamental factors in any problem of illumination. In connection with the distribution, physiological conditions were discussed, as also the influence of surroundings and aesthetic conditions. Illustrations were presented, showing the effect of proper and improper distribution of light for illuminating paintings, statues, etc., and illustrating the effect of light on color values.

Following this a paper entitled "The New Mazda Lamp" was presented by J. R. Colville, of the National Lamp Works. This paper describes rather fully the new high-efficiency lamp, and the steps which led to its development. Processes of manufacture are described, and data given on its applications. President Sterling opened the discussion by inquiring if the new lamps could be burned in an upright position. Mr. Colville stated that the inert gas in the bulb reduces evaporation, which tends to reduce the blackening effect. With the lamps inverted, blackening takes place in the stem, which does not effect the efficiency of the lamp.

H. A. Fee, of Adrian, asked as to the difference in cost betwen the 6.6-ampere lamps, and 20-ampere lamps with compensator. Mr. Colville thought that there was enough saving in current to justify the use of the compensator with 20-ampere lamps.

Following this session, a rejuvenation of the Jovian Order was held, at which H. C. Sterling, statesman for Michigan, presided. Thirteen candidates were initiated into the Order.

An Executive Session was held in the dining car of the special train en route to Detroit, at which the following offiers were elected for the ensuing year.

President, H. A. Fee, Adrian.

Vice-president, Samuel A. Freshney, Grand Rapids.

Secretary and Treasurer, Herbert Silvester, Detroit.

The new Executive Committe is composed of A. C. Marshall, Detroit; H. C. Sterling, Three Rivers; R. R. Thompson, Battle Creek; A. D. Furlong, Saginaw, and Thomas Chandler, Sault Ste. Marie.

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Electrics in India.

Although it has been a common belief in India that, on account of very cheap labor, the bullock-cart mode of transport is the cheapest possible under the circumstances, yet lately experiments with motor trucks have shown that motor transport is really a much cheaper means of meeting the necessities of trade.

Lighting Rates Reduced to Large Customers in Cleveland.

Officials in charge of the operation of Cleveland's municipal electric plants are somewhat worried over a change in rates recently announced by the Cleveland Illuminating Company, which enable large users of current to secure power at much lower rates than the city can afford to quote, it is understood. The new plant at East Fifty-third Street, which is to be opened shortly, will be considerably affected by the change in rates, it is feared, as the probability is that many large consumers will contract with the Illuminating company, thus depriving the new municipal plant of a market for its current. So far, however, the City Council has taken no action on the matter, altough several members have expressed an opinion that the company should have lowered the rates for small rather than large consumers.

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Sandusky Lighting-Rates Investigation.

H. Whitford Jones, an electrical engineer of Cleveland, O., has been employed by the city Council of Sandusky, O., to assist in arriving at an equitable basis for the adjustment of the commercial and street electric lighting rates in that city. His fee for the work will be $25 a day and all expenses. Mr. Jones recently installed a municipal electric plant for the city of Barbertown, O. He intends, if the Council desires it, to present plans for the installation of a "White Way" lighting system for the business district of Sandusky, and has already suggested tentative plans for that purpose.

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Clever Window Display by Central-Station Company.

The Selina, Kans., Light, Heat & Power Company, which has attracted much favorable comment through its clever window displays, varied its offering recently by placing a lion and a kitten in its windows together. The two animals got along nicely, allaying the fears of those who watched with concern least the king of animals devour his tiny playmate. Investigation by passersby revealed the fact that the lion was stuffed, explaining its kindness.

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There is perhaps no better example of the remarkable progress being made by Canada in providing transportation facilities throughout the length and breadth of the Dominion than the construction of an automobile highway from ocean to ocean, which is nearing completion.

Commercial Practice
Management, Rates, New Business

ORIGINAL COST AS A FACTOR IN REGULATION OF GAS AND ELECTRIC UTILITIES.[1]

By A. P. Watson,[2]

One of the gratifying facts in connection with the regulation of public utilities in general, and gas and electric utilities in particular, in Oklahoma, is that the men in charge of the active management of these utilities are constantly on the alert for improved methods and higher efficiency.

More and more is this true throughout the utility world, but especially, I feel, is this true of the gas and electric service world. Considering the fact that your organization includes also the managers of electric railways, I perhaps should make my observation sufficiently broad to include the managers of those corporations. However, as I understand your request for a few remarks from me, the subject you wish to hear discussed is that dealing with Corporation Commission Order Number 774, which has to do with gas and electric utilities only. Therefore, I will not, for the sake of seeming agreeable, attempt to broaden my remarks beyond the proper scope of their application.

Regulation a Matter of Cause and Effect.

In dealing with Order No. 774, which is, as indicated by its title, an order "relating to the reporting of original cost and filing of profiles and plats of gas and electric utilities, with classification of property accounts," we are dealing with an effect for which there was a cause. Regulation of utilities of any kind, anywhere, for that matter, is nothing more nor less than the operation of the law of cause and effect. Had there been no infringement by utilities upon the rightful interests of the public, regulation would not have been resorted to as a corrective of such infringement, and if the public were at all times reasonable in its expectation of what service it should receive and the terms upon which it should receive it, regulation would be less one-sided in its application than, as I fear some of you gentlemen sometimes feel, it now is.

Order No. 774, then, is an effect. In seeking its cause we must go back to the time when the relations between gas and electric utilities and the public first became a subject for the attention of the Corporation Commission. The constitution had been written with a view to putting all public utilities of whatsoever name or character under the jurisdiction of the Commission, in order that differences arising between the public and utilities of all kinds should be settled in the modern and orderly manner of recourse to the offices of the Commission instead of in the high-handed manner in vogue before commissions became general.

Settlement on Merit Sought.

The theory of the Commission adjustment of such differences was that investigation and deliberation as to the merits of the contentions of both sides should be the basis for action. Previously it had been the practice that adjustment of such differences had to be made on any basis that the utility management saw fit to impose if the complaining patron were just an ordinary citizen, or on any basis that the patron saw fit to impose if he happened to be a mayor or a member of a board of aldermen, an assessor or a county commissioner, or a person related to such a dignitary by even a remote degree of consanguinity or association. So, theoretically at least, the constitution provided a desirable and useful thing when it provided an orderly and uniform system for the adjudication of differences between utilities and their patrons, whether it be a difference arising over the matter of rates, or of franchises, or of service. It was much better for the utility, for instance, when application for an extension of mains was received, to have the matter decided upon a basis taking into consideration the number of patrons to be served, the cost of the extension and the probable return upon the investment, than to have it decided upon the arbitrary consideration that it was intended to serve the son-in-law of the assessor, and would involve an expenditure making it incumbent upon the company to deprive a more deserving locality of an extension in order that the applicant might be accommodated.

Shawnee Rate Case Raised Question.

It happened, in our case, that the first big complaint upon which the Commission could not bring the contending parties into agreement as to a fair basis for settlement was a complaint on the subject of gas rates at Shawnee. Consumers believed and contended that the rates in effect were too high, and the corporation believed and contended that they did not yield more than a reasonable return upon the investment, and should not be reduced.

The constitution having provided that when differences between utility managers and their patrons could not be adjusted by agreement of the parties they should be adjusted by the Corporation Commission, the Commission assumed jurisdiction in the Shawnee gas-rate controversy and took evidence upon the merits of the case. After due deliberation it was decided that there was a sufficient element of substantiality in the complaint and an order seeming to the Commission to afford a just solution of the trouble was agreed upon by the Commission and entered in accordance with the procedure it held to have been prescribed.

The corporation, however, was not satisfied with the order, and opposed it in the courts. The result of its opposition was that the court said the writers of the constitution and laws had not said what the Commission held they had said, and that because two or three words that were intended to have been written in the provisions describing and prescribing the jurisdiction of the Commission had been omitted, the Commission was without jurisdiction to enter the order it had entered in the Shawnee case. The relief assumed to have been afforded was held to have been beyond the power of the Commission to grant and was declared null and void.

This was a revelation that could have but one result, and that one result was recorded in due course of time. The state legislature said: "If the constitution and laws have failed to afford the measure of jurisdiction intended, the deficiency needs to be corrected," and Chapter 93 of the Laws of 1913, "an act extending jurisdiction of the Corporation Commission over gas and electric utilities," was passed, approved by the governor and established as the law of the state.

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[1] Paper presented before convention of the Gas, Electric and Street Railway Association of Oklahoma.

[2] Corporation Commissioner.

It is not necessary to quote this law at this time, either in whole or in part, but it is generally conceded that the scope of the law is sufficiently broad to cover all probable eventualities for the future. Whether this observation is correct or not, the adoption of this law imposed upon the Corporation Commission the duty of its administration, and the first step toward compliance with such duty was necessarily the establishing of a uniform system of reports to be used as a basis for determining important factors in the valuation of the properties thus brought within the definite scope of the Commission's jurisdiction.

One of the greatest obstacles in the way of proper regulation of rates for utilities of all kinds, is the difficulty of arriving at the actual valuation of the property used.

A controversy over the sufficiency or excessiveness of a rate for public services presents no question for solution that is not offered by any business that is conducted for profit. The sufficiency or excessiveness of the charge for service can be demonstrated only by taking into consideration the amount of the charge, the expense of furnishing the service and the investment involved.

Uniform System Essential.

If like conclusions are to be reached in the case of like services, furnished at like expense and involving the use of a like investment, it is necessary that they be reached by the application of like formulae. If equally fair conclusions are to be reached where service is not identical, where expense is not the same and investment involves such dissimilarities that there is little or no basis for comparison of one property with another, it is essential that such conclusions be arrived at by following a uniform classification of property and accounts.

There is no advantage in going into detail in explanation of the meaning of this order at this time. The result would be, probably, that the details discussed would impress a few as important while for the great majority they would involve no difficulty whatever, while some other detail, not touched upon, would be one that has been causing consternation in the mind of some manager who finds it particularly difficult to adapt the requirements of the order to his particular property.

Protection for All Concerned.

The purpose in the mind of the Commission in the promulgation of this order was not alone the establishing of a basis for reduction of rates where rates are too high but equally the protection of the utility against unjust demands for reduction in rates. The Commission does not exist as a guarantee of a profitable return on operation of utilities. Such concerns, like any private business, may be established in communities which are not ready for them and are incapable of supporting them. They may be burdened with extravagant or incompetent management. They may be overdeveloped in the matter of readiness to serve, or for any other of a multiplicity of reasons it may be impossible for them to make a sufficient return on operation to satisfy the expectations of their promotions, and losses may result. Such cases must stand or fall on their merit, and it is the purpose of Order No. 774 to determine what is the merit in each case.

It would be impossible for us to devote our attention to a more important subject than is involved in this order. There is scarcely a community anywhere, receiving gas or electric service, that does not contain a certain percentage of population that believes rates for such service are too high. There is nothing to prevent such persons from appealing to the Corporation Commission for a reduction in charges, and when such applications are received it is incumbent upon the Commission to dispose of them. While the Commission may see nothing in the survey of the situation possible to be made by its engineering department or by its accountants that indicates an unreasonable charge, the Commission cannot arbitrarily rule that there is no merit in the complaint and dismiss the same. There must be a basis for getting at the facts and developing a conclusion doing justice to all parties concerned, and it is a candid expression of my belief that compliance with the requirements of Order No. 774 will protect the utility against unjust complaint over its charges more often than it will result in a reduction of the rate.

The present is not the first instance wherein the Commission has imposed requirements that have at first caused uneasiness on the part of the utilities involved, especially the smaller ones.

While a large part of the fear that Order 774 would prove burdensome that has been heard by the Commission has been expressed by the smaller concerns, it is the large ones on which the requirements of the orders entail the most work. On all alike, however, falls the benefit of the established system of handling these heretofore troublesome questions, when once the system is thoroughly established. It is the wish and the purpose of the Corporation Commission to assist in the operation of all utilities by removing causes of friction and of injustice and substituting therefor a harmonious relationship between the utility and the public and an adjustment of differences on a basis of fairness and justice.

Utah Light & Railway Company Section, N. E. L. A.

The employees of the Utah Light & Railway Company held their first summer outing at the beautiful Pinecrest Inn at the head of Emigration Canyon which is reached by the electric line of the Emigration Canyon Railroad Company.

The 150 employees with their ladies left Salt Lake City on the 2:30-p. m. train and spent the balance of the afternoon tramping over the hills and resting in the countless shady nooks which make this mountain resort so pleasureable. At 6:30 p. m. the company sat down to the celebrated trout and chicken dinner served by the Pinecrest Inn. At the conclusion of the dinner short toasts were responded to by G. B. Walker, Wm. Scott, and A. W. Milgate. F. A. Keyworth acted as toastmaster. Lloyd Garrison read the Company Section "Gimlet" which contained numerous jibes on the various company employees. H. C. Dunbar, the popular comedian from the line and service deparment, provided his usual fund of amusement. At the conclusion of the dinner the following officers were elected for the ensuing year:

President, A. E. Kennelly, lines and service department; vice-president, W. E. Turner, engineering department; secretary and treasurer, E. C. Cathcart, storekeeper.

The party then adjourned to the hotel ballroom where dancing followed until the return of the special train.

Electric Cooking in New Railroad Depot.

One of the most interesting features of the new depot which the Oregon Short Line is constructing at Pocatello, Idaho, at an expense of $350,000, will be its kitchen equipment, which will be electrical throughout. All the mixing, baking, and cooking in this model kitchen will be done by electricity. The only coal used about the building will be for general heating purposes. The decision to go over to electric cooking was made by the Oregon Short Line engineers after a careful investigation of practically all of the large hotel equipments using electricity in Idaho and Utah.

It is quite likely that, if the installation proves to be as successful as the company's engineers anticipate, the use of electricity will be extended to the railroad's hotel service at many other points in the system. The electric power at this installation is purchased from the Great Shoshone & Twin Falls Water Power Company under a blanket contract between this company and the Oregon Short Line covering its entire system in Idaho reached by the distribution system of the Twin Falls Company.

Electric Sign Data

Electrical Advertising.

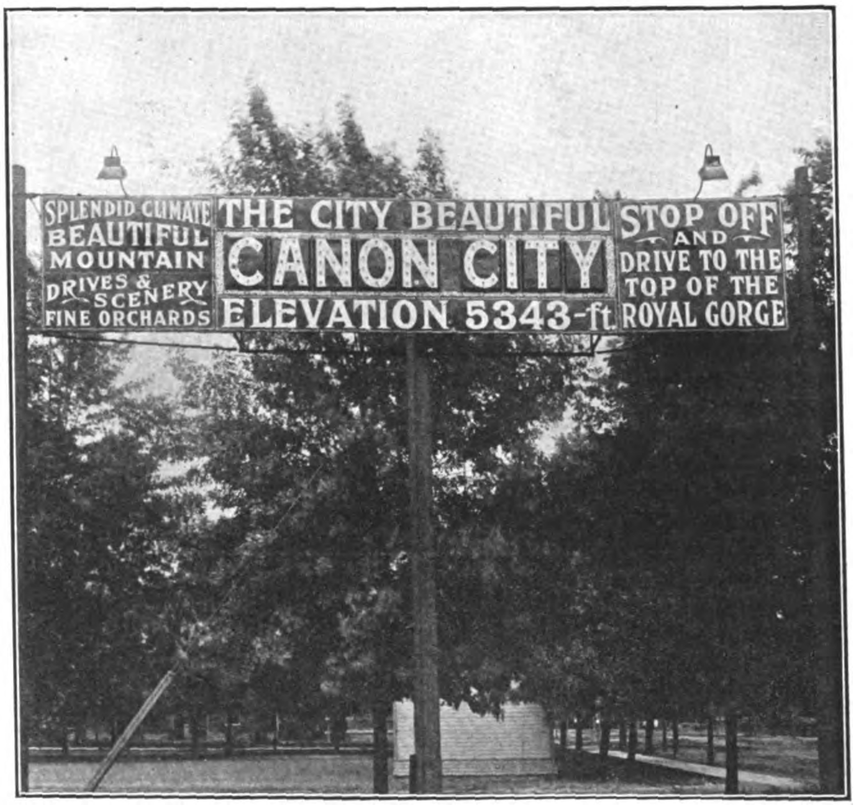
Norman B. Hickox of the Greenwood Advertising Company, Knoxville, Tenn., makes the following pertinent suggestions regarding electrical advertising in an electric sign journal.

In the first place to be successful you must keep everlastingly at it.

Advertising must be active, the kind that doesn't have to be sought out—positive not negative.

It must be carefully written, straightforward, truthful and purchased with discretion.

What do you buy when you buy advertising? You buy impressions on the public mind of your name, your goods, or your trademark, which incorporates, ofttimes, both. Electrical advertising is the cheapest medium through which you may purchase these impressions. Considered in any field or district, it compares so favorably with the circulation of the various advertising mediums of other natures, that its use has become universal. It has doubled the efficiency of outdoor publicity in effectiveness, scope and circulation—it has added a night shift to an already highly organized and developed selling force, and in its present form it can be readily made to converse familiarly with the public.



Inexpensive slogan sign installed by the Federal Sign System (Electric).

The words "Cannon City" are in standard 16-inch Federal letters, using 92 five-watt lamps. The entire sign is made of blue-enameled steel with white letters.

At each end of sign is a 60-watt lamp in reflector for lighting lettering.

Very economical and satisfactory installation.

Like all other forms of advertising, the demand is constantly for novelty, varied effect, distinctiveness, and above all, individuality. With the coming of electricity into general advertising use, comes the need of the made-to-order display, for which it would be impossible to supply the demand, were it not for the designing departments now maintained by progressive manufacturers. These departments are made up of highly paid artists and engineers, who must work together in the creation of new ideas, so as to produce designs consistent with modern methods of construction. Satisfying displays cannot be turned out by a mere crew of metal-workers and electricians; the individual artistic touch must be there—the idea and the engineering layout must first be constructed—every detail worked out carefully—ofttimes expensive experiments made—and the standards of electrical construction always respected. Finish, too, is an important factor, as the cost of an average display makes it imperative that its use be continued a number of months, or even years in the case of large signs.

The stock signs serve admirably with only a few in the locality, but any community becomes quickly saturated with such styles, while the possibilities of working out trademarks, special lettering, decorative effects, etc., in the individual sign are unlimited. The individual electrical display produces a more lasting impression on the mind of the public, so far as the individual advertiser is concerned; it is forcefully fixed on the mind, and while other signs may be "observed," it gets an audience.

The liberal use of Electrical Advertising has been responsible for the advancement of many of our cities, their gain in prestige being given an impetus by the increasing business of their individual enterprises. While the user of electrical advertising is helping his own profits to climb, he is also aiding in the general advancement.

Strangers shun the unlighted town, while every well lighted business district will always be thronged with after-dark crowds.

Electrical displays fulfill the prime requisites of all advertising—they keep everlastingly at it—every day and every night—they are active—they flash and move and whirl in a medley of color and motion. The thoughtless gaze of those awaiting the evening car strays invariably to some electrical display which has been carefully prepared to subtly leave its impression on the public mind.

So in selecting electrical advertising great care should be given even to the smallest detail.

Electrical Construction

ELECTRICAL INSTALLATION IN HOTEL GIBSON.—II.

Details of Wire Shafts, and Floor Wiring.

This is the second installment of an article describing the electrical installation of the Hotel Gibson, Cincinnati, O. A. S. Schulman, Chicago, Ill., had the contract for the entire electrical installation and Bert L. Baldwin & Company, Cincinnati, O., had charge of all the engineering features of the building.

Three wire shafts are employed to effect the distribution of energy for light and power in the main building. In addition to these wire shafts, light and power risers supply the annex, machinery in the sub-basement and basement of the main building, stores, stage pockets, etc. The complete riser diagram for the building is shown in Fig. 11, the upper part of the figure being devoted to the risers carried in the three shafts and the lower part of the figure being devoted to the power and light feeders for the hotel annex, stores, stage pockets, and basement and sub-basement power and lighting apparatus. From the lower right part of Fig. 11 it is seen that all the sub-basement power apparatus, including motors for service hoist, fans, ash lift, sewerage ejectors, house pumps, agitators, brine pumps, etc., are supplied direct from the switchboard. The third and fourth-floor laundry and the basement kitchen are supplied in a similar manner.

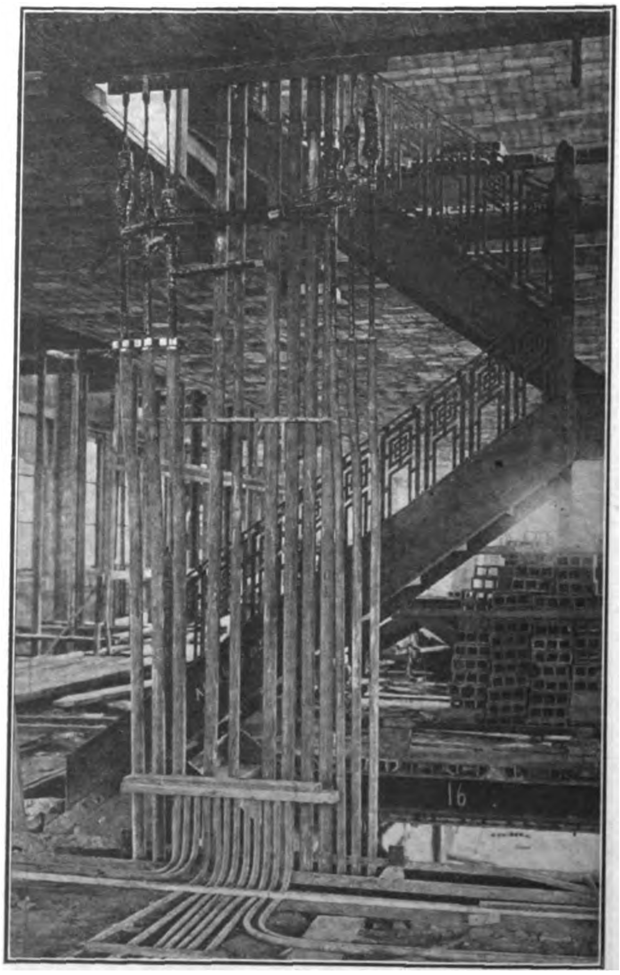


Fig. 10—Method of Anchoring Cables.

Of the three wire shafts, shaft *C* is devoted to power feeders supplying the elevator motors in the pent house and the attic fans, shaft *A* is devoted entirely to lighting feeders and shaft *B* is devoted to lighting and power feeders, the latter supplying elevator motors in the pent house and the attic-fan cabinets. All stairway lights are supplied from a shaft-*B* cabinet located on the fifth floor. For roof signs, etc., a separate set of three No. 0 wires carried in a one-half-inch conduit located in shaft *A*, is employed. The remaining feeders in shaft *A* are used to supply floor circuits, a set of three No. 00 cables being carried in a one-half-inch conduit and each set supplying from 60 to about 98 floor circuits.

Most of the feeders in shaft *B* are heavier than those in shaft *A*. A separate set of three No. 2 wires carried in a one-half-inch conduit is run in this shaft to supply some of the 50-ampere stage pockets. Two power feeders are run in this shaft, one set supplying the attic fans and the other leading to the elevator pent house. The remaining risers in this shaft supply 110-200-volt three-wire lighting energy to the various circuits on the floors of the building. In general one set of feeders is employed to supply three floors or from about 70 to 120 circuits. On the lower floors where the load is heavier, one set of feeders supply only one or two floors.

In laying out the plans for these wire shafts, a complete cable schedule was worked out so that the various reels of cable could be used in the most efficient manner, that is, with a minimum of waste. Each reel of cable was numbered, and the runs on which various reels were to be used were indicated.

In order to support the heavy cables in the various shafts, cable boxes and racks were inserted about 50 feet apart. These cable racks are made of No. 10-gauge steel plates supported by hangers of the same material bent to fit over and partly around a convenient wall or beam.

Fig. 12 shows one of these cable racks used in connection with the main feeders from the switchboard to the upper floors. The conduits are supported with 0.375-inch U bolts to the racks and the cables are supported by porcelain cleats to the steel cross bar of the rack. The upper portion of the pipe rack where the pipes and conduits are supported for the upper floors is not shown but the same type of construction as shown for the lower part of the rack is used. Near the floor are seen the conduits which are to lead to and from a cabinet panel controlling the branch circuits for the floor shown.

Fig. 14 shows this pipe rack and cable support after the wire shaft has been closed. The entire opening is not closed, a space being left open so as to permit access to the cable supports. An iron box with a hinged cover is placed at this opening. The conduits for the floor branch circuits and the floor feeders are shown ready for the placing of the panel-board box, the pipes being held in their proper positions by the wood beam as shown.

When long vertical runs of cable are employed, it is not only necessary to employ cable racks to relieve the cable from bearing its entire weight, but suitable cable anchors are necessary.

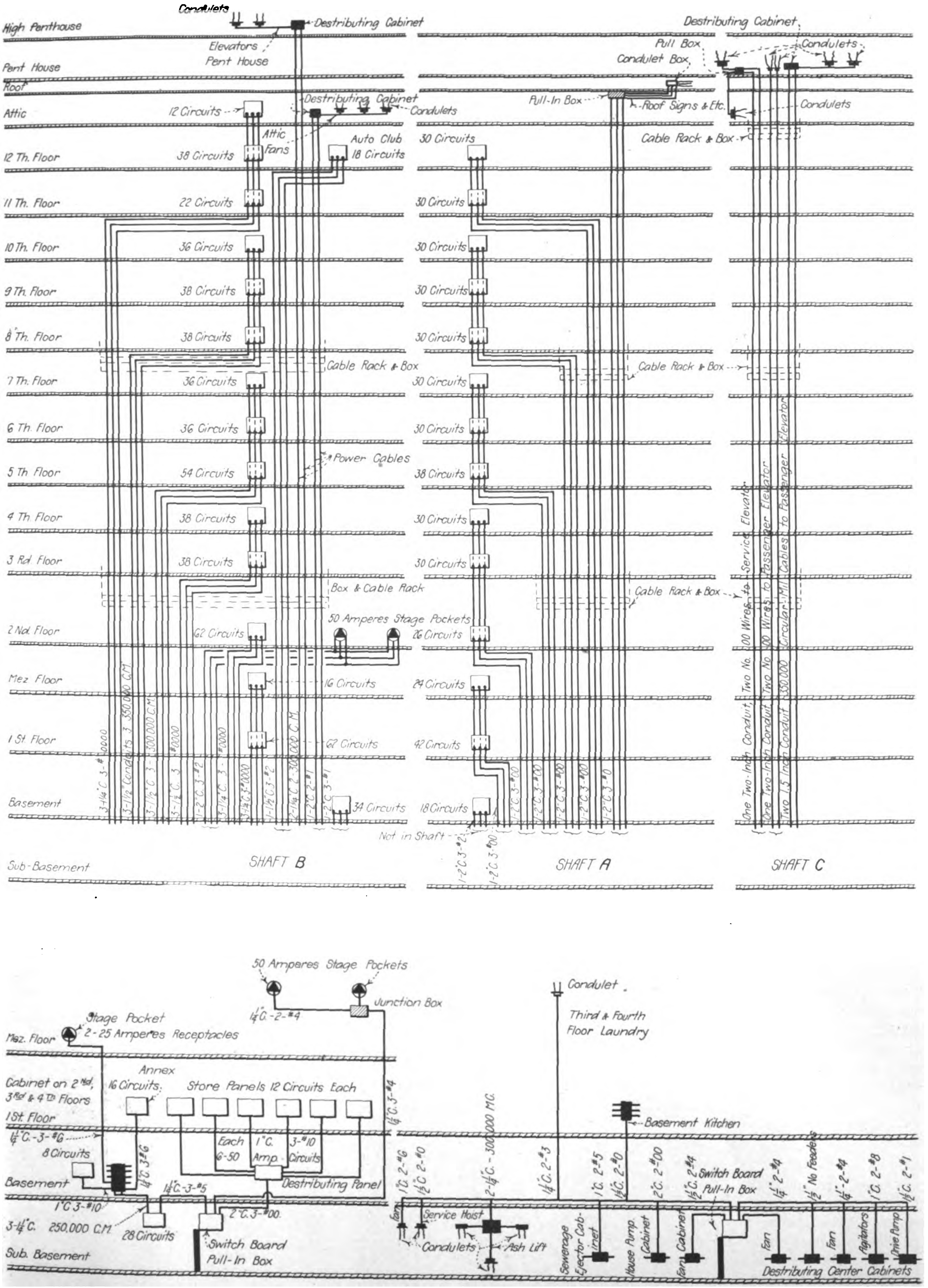

High Penthouse
Condulets
Destributing Cabinet
Elevators Pent House
Pent House
Roof
Attic
12 Circuits
Attic Fans
Destributing Cabinet
Condulets
Auto Club 18 Circuits
12 Th. Floor
38 Circuits
30 Circuits
11 Th. Floor
22 Circuits
10 Th. Floor
36 Circuits
9 Th. Floor
8 Th. Floor
7 Th. Floor
6 Th. Floor
5 Th. Floor
54 Circuits
Power Cables
4 Th. Floor
3 Rd. Floor
2 Nd. Floor
62 Circuits
26 Circuits
Mez. Floor
16 Circuits
24 Circuits
1 St. Floor
42 Circuits
Basement
34 Circuits
18 Circuits
Sub-Basement
Cable Rack & Box
Box & Cable Rack
50 Amperes Stage Pockets
3-1¼" C. 3-#0000
3-1½" Conduits 3 350,000 C.M.
3-1½" C. 3-300,000 C.M.
3-1½" C. 3 #0000
1-2" C. 3-#2
3-1¼" C. 3-#0000
3-1¼" C. 3-#0000
1-1½" C. 3-#2
2-1¼" C. 2-300,000 C.M.
1-2" C. 2-#1
1-2" C. 3-#1
Not in Shaft
1-2" C. 3-#2
1-2" C. 3-#00
1-2" C. 3-#00
1-2" C. 3-#00
1-2" C. 3-#00
1-2" C. 3-#00
1-2" C. 3-#0
SHAFT B
SHAFT A
SHAFT C
Destributing Cabinet
Pull Box
Condulet Box
Condulets
Pull-In Box
Roof Signs & Etc.
Condulets
Cable Rack & Box
One Two-Inch Conduit, Two No. 00 Wires to Service Elevator
One Two-Inch Conduit, Two No. 00 Wires to Passenger Elevator
Two 1.5 Inch Conduit 350,000 Circular-Mil Cables to Passenger Elevator
50 Amperes Stage Pockets
1¼" C. -2-#4
Junction Box
Stage Pocket 2-25 Amperes Receptacles
Mez. Floor
Annex 16 Circuits
Store Panels 12 Circuits Each
Cabinet on 2 Nd, 3 Rd & 4 Th Floors
1 St. Floor
1¼" C.-3-#6
8 Circuits
Each 6-50 Amp.
1" C.
3-#10 Circuits
Basement
Destributing Panel
1¼" C. 3-#6
1¼" C.-3-#5
1" C. 3-#10
2" C. 3-#00
3-1¼" C. 250,000 C.M.
28 Circuits
Switch Board Pull-In Box
Sub. Basement
1¼" C. 3-#4
Condulet
Third & Fourth Floor Laundry
2-1¼" C. - 300,000 M.C.
Basement Kitchen
1" C. 2-#6
1½" C 2-#0
1¼" C. 2-#3
1" C. 2-#5
1½" C. 2-#0
2" C. 2-#00
1½" C. 2-#4
Switch Board Pull-In Box
1¼" 2-#4
1½" No Feeders
1¼" 2-#4
1" C. 2-#8
1½" C. 2-#1
Fan
Service Hoist
Condulets
Ash Lift
Sewerage Ejector Cabinet
House Pump Cabinet
Fan Cabinet
Fan
Fan
Agitators
Drive Pump
Destributing Center Cabinets

Fig. 11.—Riser Diagram.

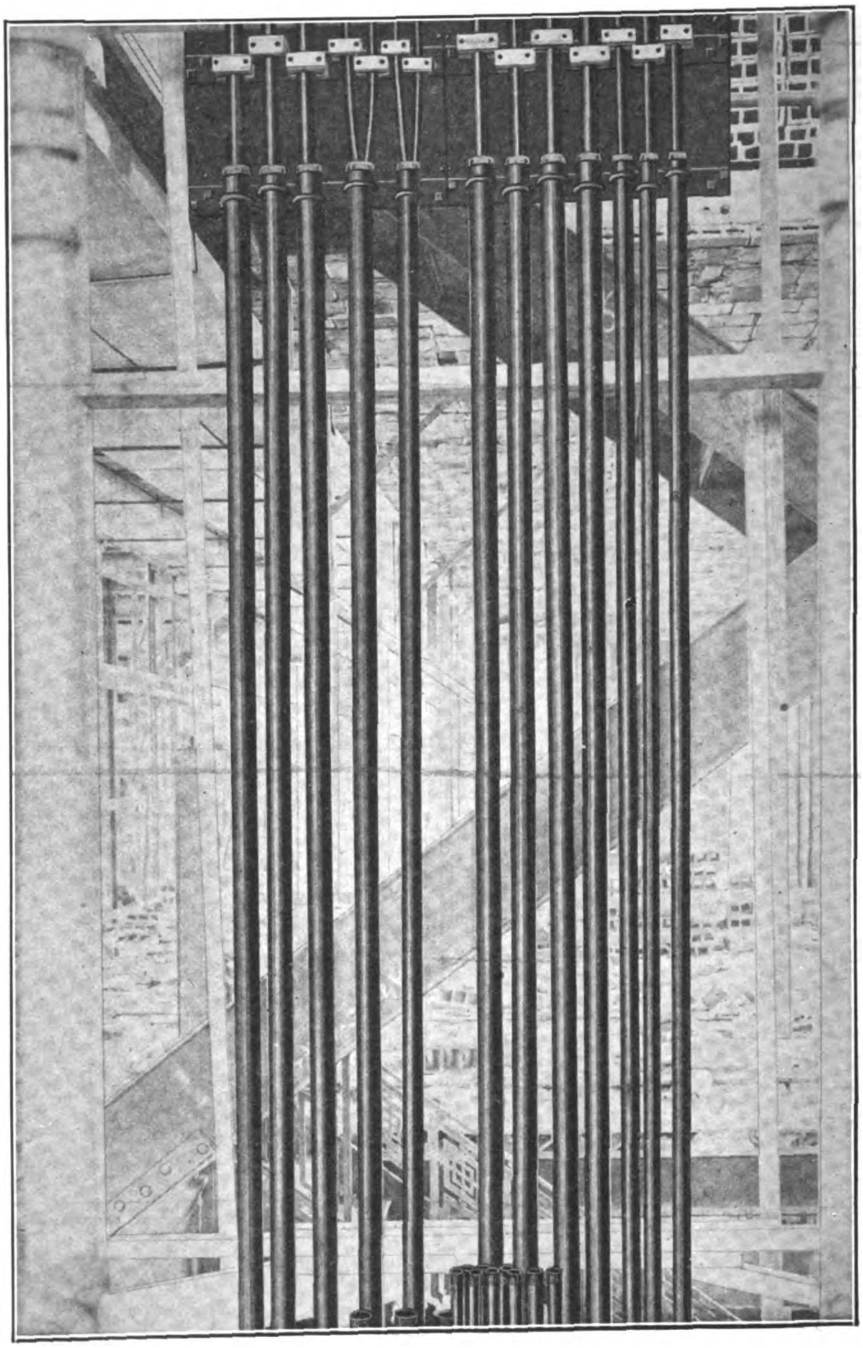


Fig. 12.—Cable and Conduit Rack.

Fig. 10 shows the conduits and cables as anchored at one of the distributing centers on an upper floor of the building. The heavy cables are supported at their ends by means of strain insulators and turn buckles hung from the steel frame of the building. All the supports for the ends of cables were made in a similar manner throughout the building, the concrete floors and steel framing of the building being utilized as a support in every case. The use of turn buckles as a part of the supporting member, has the advantage of permitting any slack in the cable due to expansion from temperature, strain or other causes, to be readily taken up. In order to permit access to these terminals at all times a sheet-steel box with a removable cover is placed in such a manner as to inclose the insulators and turn buckles but at the same time to permit of ready access to them.

This figure also shows the ends of the floor-circuit conduits, ready for the insertion of the floor-panel cabinet. During the process of construction work the ends of such conduits were always kept closed by boards or other means until the proper connections were made, thus preventing the entrance of concrete and other foreign material into the pipes.

Figs. 13 and 15 convey some idea of the great number of branch circuits required in the modern type of hotel. Fig. 13 shows the branch circuits brought into an angle-iron form. These forms were used whenever the panel-board cabinets were not available at the time of laying the conduits for the branch circuits. They consist of an angle-iron frame supported on jacks at the correct height from the floor. At the base of each rack a board is placed with holes at intervals corresponding to those that will be provided for the different conduits in the panel-board cabinet. These forms hence keep the conduits in their correct positions and construction work may proceed without any danger of displacing any runs of conduit.

In order to prevent cement and other foreign material from entering the ends of the conduits and thus either clog the pipes or render fishing difficult, a board is fastened over the conduit ends as shown in the figure.

Fig. 15 shows another one of these forms and a slightly different method of running the main and branch circuits leading from the panel-board form to the various outlets.

As can be seen from both of these figures, sharp bents were avoided as far as possible and no angle fittings employed in carrying the conduits to the panel-board cabinets, thus rendering the fishing of the cables a comparatively simple matter.

Floor Circuits.

In a hotel appearance is always of great importance, and not only is unslightly ex-

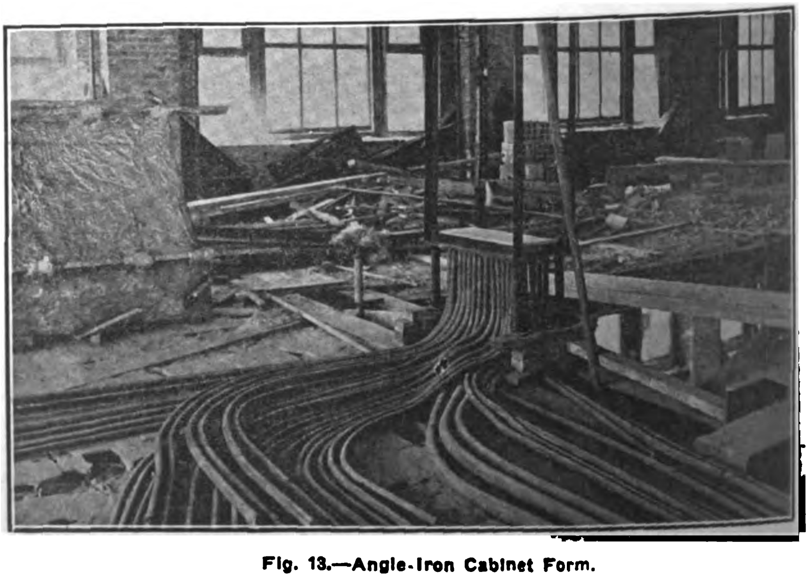


Fig. 13.—Angle-Iron Cabinet Form.

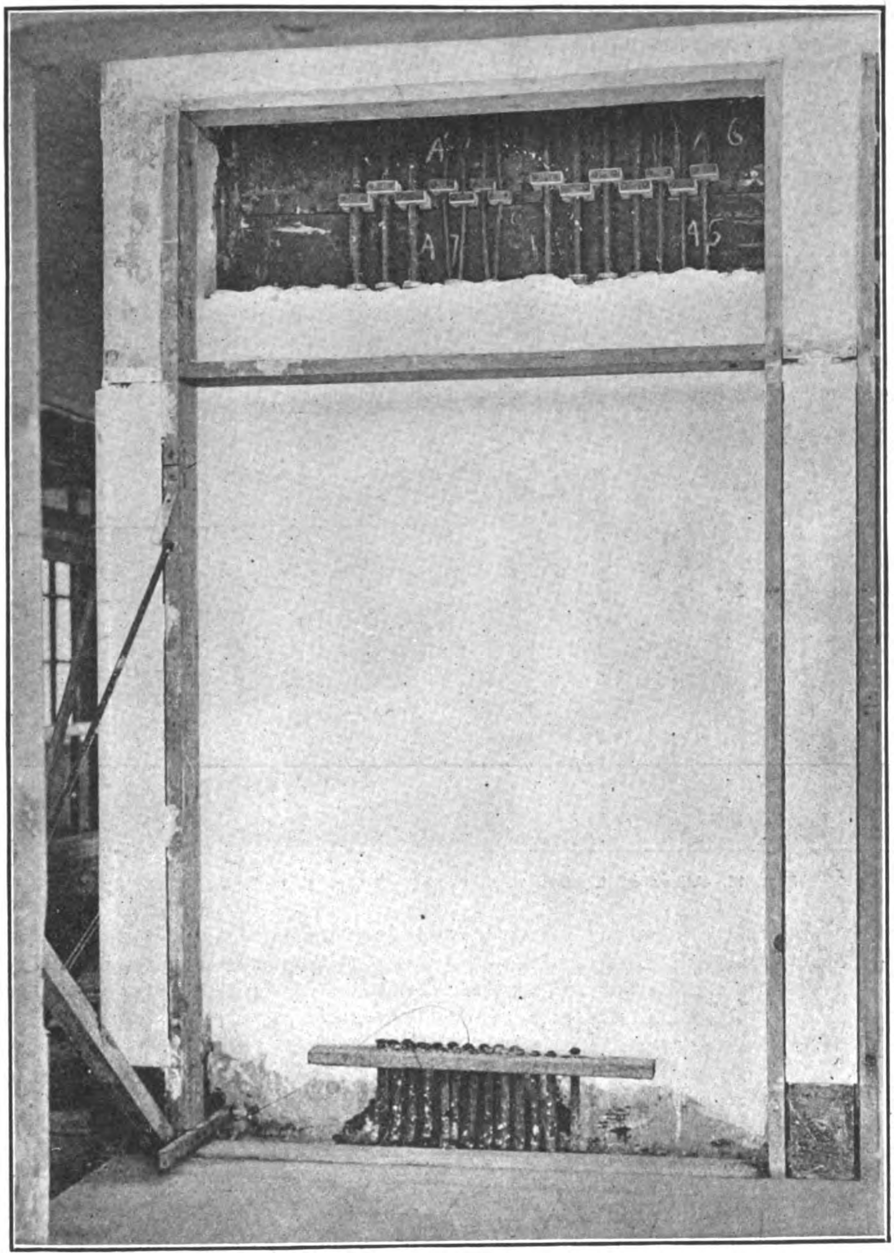


Fig. 14.—Cable and Pipe Rack Partly Inclosed.

posed wiring, cords, etc., prohibitive, but the various panel-board cabinets and distributing cabinets on the various floors in the guest portion of the hotel must be rendered as unobtrusive in appearance as possible. As far as possible, the wire shafts in this hotel were located in business sections, but where a shaft cabinet is located in a public section of the building, it is inclosed in a wall opening which is closed by a wood door matching in size and color the woodwork in the section. These wall openings also serve to conceal telephone cabinets.

All lighting cabinets are of sheet steel and slate and are equipped with N. E. C. standard inclosed fuses in each of the three supply mains, a three-pole main switch, and the same type of fuses with snap switches for the branch circuits. Between the slate panel board and the steel plate forming the back of the steel case, a horizontal steel bar is mounted to which are fastened porcelain cleats for fastening the various feeders entering the cabinet. The power cabinets and store lighting cabinets are smaller and less elaborate.

The wiring diagram for a section of a typical floor is shown in Fig. 19. From this diagram it is seen that each guest room has a ceiling outlet, and a bracket outlet for the dresser lights and a wall-receptacle outlet for use with a portable lamp. Each bath room contains a ceiling outlet and a bracket outlet. The ceiling lights in each room are controlled by a push-button switch near the door, and the ceiling lamp in each bath room is controlled by a similar switch situated near the bath-room door. In general all ceiling outlets for several rooms are attached to one circuit, the bracket and receptacles being attached to another. In this way the wiring of the rooms is greatly simplified.

The corridor lamps are supplied from two sets of feeders, each set of feeders supplying the corridor lamps in one section of the floor. The number of wires employed for feeding the corridor lamps in various sections of the floors varies as shown in the diagram. A four-wire system of distribution is in general employed, but in some sections, only a two-wire circuit is employed as shown.. In other sections a duplicate set of either two or four-wire feeders are employed in order to give control of the lamps from the main switchboard, thereby permitting certain lamps to be turned off during the early hours of the morning without the use of a number of individual switches. The connections for the various lamps and the corresponding feeder circuits can be traced on the diagram, the various circuits being lettered. In all cases the four or two wires constituting the distribution feeders for the corridor lights in any one section of the building are run in a single conduit, 0.75-inch conduit being employed for four feeders and 0.5-

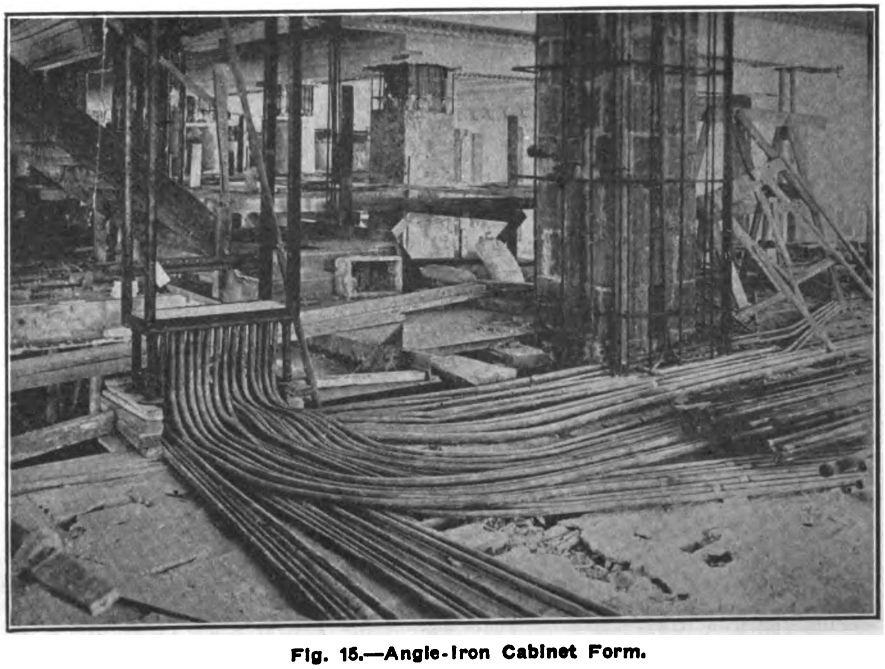


Fig. 15.—Angle-Iron Cabinet Form.

inch conduit being employed for two feeders.

The sample rooms are adequately lighted by means of numerous ceiling fixtures on one circuit extending around the ceiling several feet from the wall and controlled by one switch, by center ceiling fixtures on a separate circuit, and by bracket fixtures on still another circuit.

All stairway lights and red emergency lights are fed up and down from the fifth floor from an independent set of feeders.

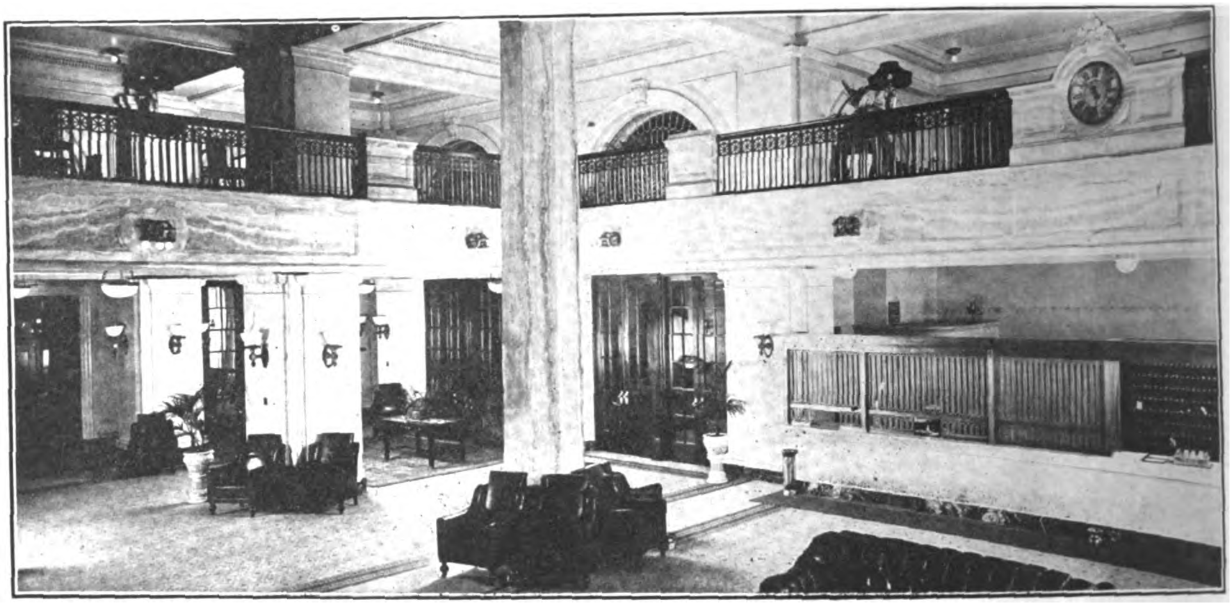


Fig. 16.—View of Lobby.

The laundry, which is on the third floor of the annex, is wired with exposed conduit, all outlets being three feet above the floor level. The laundry machinery including washing machines, tumblers, etc., was made by the American Laundry Machinery Company. Most of the machines are worm-geared to the motors, and push-button starters are used. These push-button starters and the motors are connected to a panel board on which are mounted the automatic starter for the motors. The washing machines are of the automatic reversing type, drum controllers on the panel board effecting the reversal of motion.

Fig. 18 shows a view of the fountain or grill room. The fountain is supplied by a motor driven pump in the sub-basement, provision being made for cooling the water when desired. Fifteen semi-indirect Cassidy lighting fixtures are employed in this room. These are controlled from six push-button flush switches.

Fig. 17 shows a view of the main dining room. Eight semi-indirect Cassidy fixtures are used in this room, together with a number of column candle brackets. The column lights are on independent circuits and are controlled from push-button flush switches on the columns and walls.

The ball room is illuminated by several large crystal chandeliers and a number of bracket fixtures. In the resting rooms semi-indirect fixtures are employed. Special provision is made for supplying energy for motion-picture machines. A stage is also provided, the special wiring for the same having been described when considering the riser circuits.

The main lobby which is shown in Fig 16, is illuminated by a number of plain semi-indirect fixtures and several ornate semi-indirect fixtures, as well as column bracket fixtures. The column bracket fixtures are controlled by push-button flush switches located on the columns. On the railing of the mezzanine floor are located a number of bracket lamps. These are all on one circuit. At the desk, special cage lamps are employed, the upper cornice of the metallic cages being hollow and provided with a glass under side. In the hollow space incandescent lamps supplied by wiring carried in conduit are placed thus casting their light upon the counters.

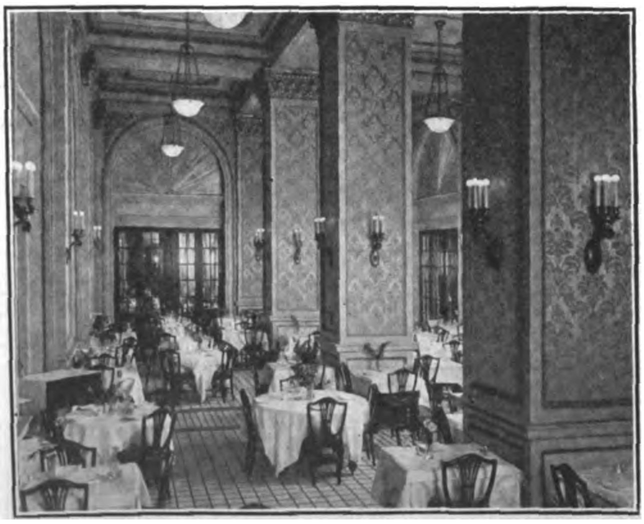


Fig. 17.—Main Dining Room.

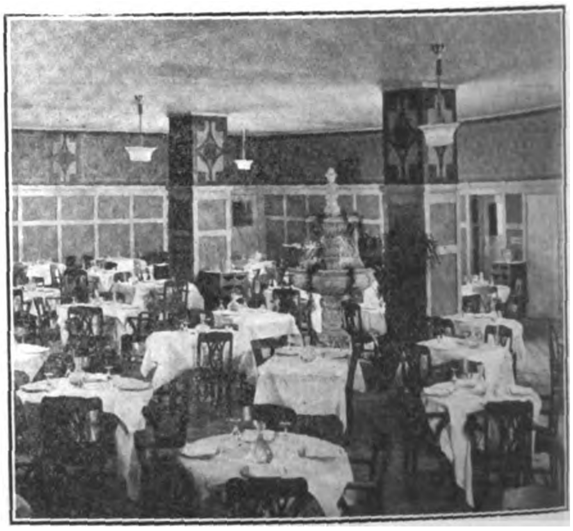


Fig. 18.—Fountain or Grill Room.

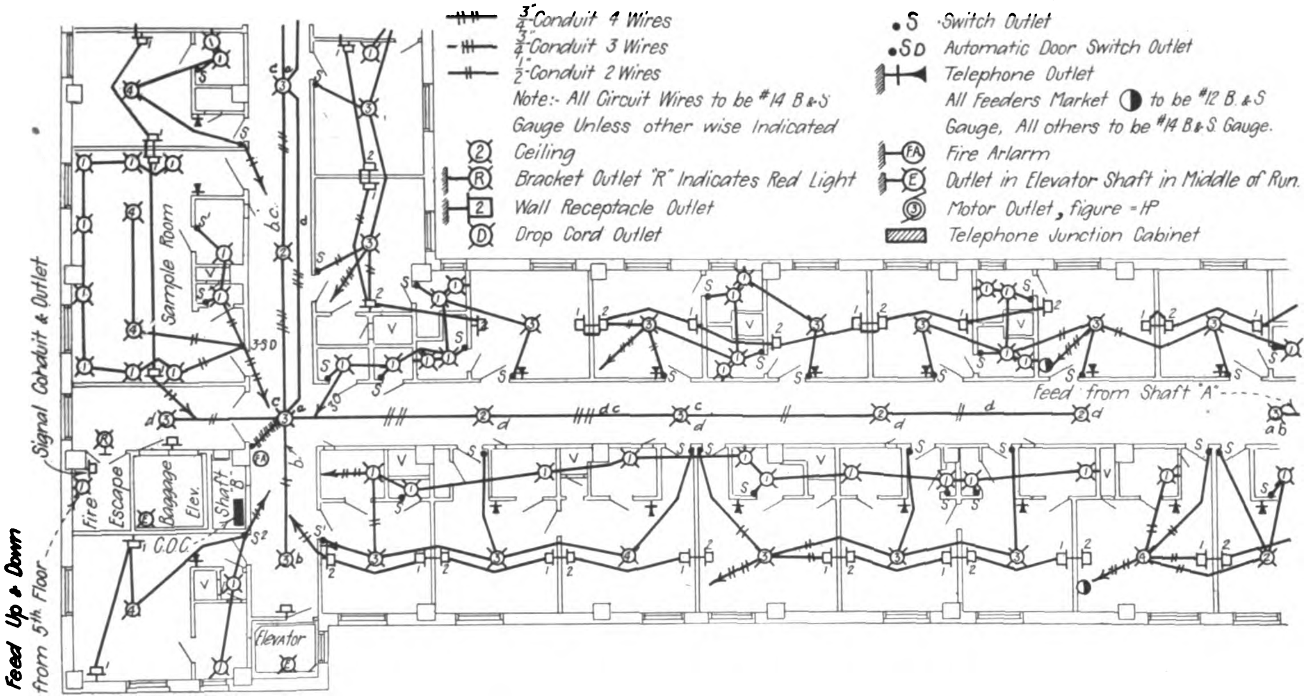

3/4" Conduit 4 Wires
3/4" Conduit 3 Wires
1/2" Conduit 2 Wires
Note:- All Circuit Wires to be #14 B.&S Gauge Unless other wise Indicated
Ceiling
Bracket Outlet "R" Indicates Red Light
Wall Receptacle Outlet
Drop Cord Outlet
S Switch Outlet
SD Automatic Door Switch Outlet
Telephone Outlet
All Feeders Market ◐ to be #12 B.&S Gauge, All others to be #14 B.&S Gauge.
FA Fire Arlarm
E Outlet in Elevator Shaft in Middle of Run.
Motor Outlet, figure = HP
Telephone Junction Cabinet
Sample Room
Signal Conduit & Outlet
Feed Up & Down from 5th Floor
Fire Escape
Baggage Elev.
Shaft "B"
C.O.C.
Elevator
feed from Shaft "A"

Fig. 19.—Wiring Diagram of Section of Typical Floor.

The mezzanine floor is equipped with numerous floor receptacles supplied by conduits carried immediately below the floor surface. These floor outlets supply current to table lamps, and to any special lamps that may be installed on special occasions, thus eliminating the necessity for running long lengths of unslightly lamp cords.

The main café has a large ellipse of lamps on its ceiling. The ellipse is supplied by four feeders, each set of two supplying the lamps on half of the ellipse.

Exposed conduit is largely employed in the kitchen and service rooms. Motors are employed for many of the operations, and special stove, refrigerator and other lamps are provided.

Numerous telephone stations are located in the hotel, each guest room, public room, and business room being provided with one or more telephones. The main telephone switchboard is situated near the desk. Telephone cabinets on the various floors are located in the wall openings for the main lighting cabinets. All telephone wires, clock wires, and signal wires are run in conduit throughout.

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Anthracite Again Breaks Record.

The production of anthracite coal again broke the record in 1913, exceeding the highest previous output by nearly 1,000,000 tons, according to figures compiled by E. W. Parker, coal statistican of the United States Geological Survey. Including the coal recovered from old culm banks and a small quantity dredged from Susquehanna River, the production of anthracite for the year was 81,718,680 long tons, valued at $195,181,127.

A Few "Don't for the House Wiremen.

Don't hurry when testing out complex switch connections; it may be costly in the end.

Don't fold carpets or art squares, roll them.

Don't spend time talking to the servants, this time is not figured in the overhead expenses.

Don't when boring up from the floor below, fail to have the helper near the calculated spot where the bit is expected to appear in order to rap a warning on the floor should the bit come wrong.

Don't fail to doubly instruct the often clumsy helper that lath and plaster will not support his weight and that he should walk on the beams at all times.

Don't smoke the ceiling with a blowtorch when soldering joints, it is the mark of incompetancy.

Don't drag the coil of flexible steel-armored cable up and down the polished stairs, carry it.

Don't fail to be courteous to the residents of the house you are wiring, it may mean more business in the future.

Don't when wiring a finished house with the resident at home, fail before leaving for the day, to place in position temporarily all floor boards taken up during the day.

Don't fail to clean up at once all plaster that is cut away for outlets, it is quickly tracked through the house, and is ruinous to polished floors.

Don't watch the clock if you wish to succeed in any line of human endeavor. William E. Rhodes.

Program of National Contractors' Convention.

The annual convention of the National Electrical Contractors' Association will be held in Detroit, Mich., July 14-18, the headquarters being at the Cadillac Hotel.

On Tuesday morning, July 14, there will be a meeting of the Board of Directors and Executive Committee at 9:30 a. m.

At the morning session on Wednesday, July 15, Commissioner J. C. Gillespie, of Detroit, will deliver the opening address. He will be followed by Messrs. John Trix and W. N. Mathews, both of whom will deliver short talks. Honorable J. E. Kinnane, chairman, Michigan Industrial Accident board will deliver an address on "Workman's Compensation and Employer's Liability."

The afternoon session will be a business one and will be addressed by T. I. Jones, Commercial Section, National Electric Light Association.

Thursday morning will also be devoted to a business session.

At the business session on Thursday afternoon, S. E. Doane, chief engineer of National Lamp Works of General Electric Company, will deliver an address on the subject, "Observations of Central Stations and Contractors' Conditions in Foreign Countries."

Friday morning and afternoon will both be devoted to recreation.

On Saturday morning there will be a meeting of the Directors and of the Executive Committee. These meetings will be preceded by a business session if necessary.

Among the entertainment features will be a complimentary dinner at 12:00

noon on Wednesday, by the Detroit Jovian League, in Hotel Cadillac. Robley S. Stearnes, New Orleans, La., statesman for Louisiana, will be the toastmaster.

On Wednesday, at 7:00 p. m., there will be a Jovian rejuvenation at the Detroit Board of Commerce Building, Lafayette Boulevard and Wayne Street.

On Wednesday at 7:00 p. m., the annual dinner will be held in Hotel Cadillac, L. W. Eddy being chairman of the committee in charge.

Friday, the birthday of the Association, will be devoted to automobile rides in the morning under the direction of Chairman J. H. Busby, and to a boat trip and outing on the steamer *Pleasure* the boat leaving the foot of Bates Street at 1:30 p. m., and the excursion being under the direction of T. M. Templeton.

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Fire-Protection Equipment Needed in India.

In view of the enormous losses which have lately been occasioned by fires in India, especially by the cotton fires in Bombay, and the general state of apprehension which at present exists as to the mysterious causes of such fires and the possibility of further costly disasters, the important business interests in that country would probably prove to be in an especially receptive state of mind as regards the larger use of fire-protection equipment. The time therefore seems opportune for an active campaign on the part of American manufacturers of such goods to extend their sale in India.

The total losses in Bombay alone during the present shipping season amounted to over $3,500,000 from fires in cotton bales stored for shipment. Their origin is believed by many to be incendiary. There has also been an epidemic of fires in other parts of India as well as Bombay, the cities of Calcutta, Lahore, and Simla having been visited by especially destructive conflagrations, causing the loss of goods valued at some hundreds of thousands of dollars.

Investigation has been begun by the government authorities. Soldiers have been stationed in the districts where cotton is stored, but fresh fires have frequently occurred. The prevalence of these cotton fires at Bombay will probably lead in the future to greater effort to store cotton in warehouses, which may be properly equipped with fire-protection apparatus. American automatic sprinkling devices are already used to an important extent in the best equipped mills and warehouses, and have been so successful in checking fires that the Bombay Fire Insurance Association makes substantal reductions in premiums in such cases.

ELECTRICAL INSTALLATION FOR CHILD'S RESTAURANT, LOUISVILLE.

By F. F. Valinoti.

This is the third and last installment of a report on progress in the installation of lighting and power equipment of Child's restaurant, in Louisville, Ky. This installment covers the power and lighting-circuit wiring.

The original specifications for Child's restaurant, Louisvile, Ky., called for 220-volt three-phase current for the motors, but as 220-volt single-phase current is now available in the fire district it was decided to take advantage of this fact.

There are 12 motors in all, and as nine of them are in the basement, it was deemed advisable to wire them in groups, placing several on one feeder. On the north wall of basement there was placed a six-circuit special power panel with a 200-ampere 250-volt fused main switch, meter loop and six 60-ampere 250-volt double-pole single-throw fused branch switches. This panel was placed in a surface-type No. 10-gauge steel cabinet with a steel door and trim, the door being equipped with catch and lock. This cabinet has a three-inch wiring gutter all around the panel.

The service feeder, consisting of two No. 00 stranded, double-braid wires in 1.5-inch conduit, was taken from the top of the cabinet, through the wall, and up on the outside to a point 15 feet above the alley grade. From the branch switches in the panel, feeders consisting of two No. 8 double-braid rubber-covered wires were employed to supply motors as given in the table, switches Nos. 1, 2 and 5 being reserved for future use.

Switch No. 3.

Motor horse-power.	Type of connected machine.
1.3	Mangle.
2	Extractor.
2	Washer.
1.5	Batter mixer and bread crumber.
1	Meat chopper.
1	Coffee mill.
	Switch No. 4.
2	Ice-cream freezer.
1	Potato peeler.
1	Sterilizer.
2	36-inch roof fan.
0.25	Buffer.
	Switch No. 6.
3	Belted to 60-inch first-floor exhaust fan.
2	Direct-connected to dish washer.

Outlet boxes were used whenever it was necessary to tap a feeder, and the No. 8 wires were carried direct to the motor switches. All motors of one horsepower and over, except the two operating the fans, were equipped with double-pole double-throw motor-starting switches with running fuses. The two fan motors were equipped with 30-ampere single-throw switches and speed regulators.

The local inspectors allow the weatherproof carrying capacity of wire when alternating-current motors are installed, and when the capacity required comes in between two sizes of wire the closer size may be used. That allowed as much as 59 amperes on No. 8 wire. In figuring the size of feeders, three times the running current of the largest motor plus the running current of all additional motors on that feeder was taken as the total current, and the size of wire which carries that amount of current was used. The feeders are carried to the switches of the various motors before being reduced in size. From the switches, which had running fuses, to the motors, wires which would carry three times the running current of that particular motor were used.

The double-throw motor-starting switches mentioned above are a great protection to the motor, as the running fuses will blow under a serious overload, while under ordinary conditions with a single-throw switch the large fuse required to take care of the starting current offers practically no protection to the motor.

However, a little objection to the double-throw motor-starting switch was found due to the fact that the operators would hardly touch the starting contacts with the blades before throwing the blades over to the running side, thereby blowing the fuses. In one or two cases the switches were thrown in the running position without even touching the starting contacts. After a careful explanation this trouble was overcome, as the employees now understand the operation of the switches.

As soon as this work was completed the lighting fixtures and fans were installed. In the balcony there were installed three three-light showers and in the restaurant proper 13 semi-indirect fixtures consisting of 16-inch transparent bowls with three 100-watt Mazda lamps in each. These bowls were suspended from three nickel chains. The seven ceiling fans were also finished in nickel. In the toilet and dressing rooms nickel brackets were installed. The other outlets were equipped as described in the previous installments.

On the cashier's desk a nickel-plated push button controlling a bell in the basement was installed. For the dumb waiter return-call buzzers were installed on the first floor and basement. A bronze push button was placed beside the lift door in alley to ring a bell in basement.

From the beginning to the end of the remodeling operations eight arc lamps and 50 incandescent lamps were used to furnish illumination for the work being done by other trades.

Work was started on April 18 and completed on June 9. During this time the average labor was man and helper for each working day. The restaurant opened for business on the morning of June 10.

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Lightning a Prolific Source of Forest Fires.

Exhaustive inquiry has established the fact that lightning ranks next to railroads as a source of forest fires. Forest officers say that the increasing care with fire on the part of the railroads and the public generally, tends to make lightning the largest single contributing cause.

This statement represents a change of view from that held less than a decade ago in this country, when forest journals gravely argued whether lightning caused forest fires, though it was known that trees were the objects most often struck. Trees are said to be struck oftenest simply because they are so numerous, and extending upward they shorten the distance between the ground and the clouds; further, their branches in the air and roots well into the earth invite electrical discharges.

It seems to be a fact that any kind of tree may be struck, and the most numerous tree species in any locality is the one most likely to suffer. Other things being equal, lightning seeks the tallest tree, or an isolated tree, or one on high ground. A deep-rooted tree is a better conductor than a shallow-rooted one, and a tree full of sap, or wet with rain, is of course a better conductor than a dry one.

Lightning sets fires by igniting the tree itself, particularly when it is dead, or partly decayed and punky, or by igniting the dry humus or duff at its base. The forest soil, when dried out, ignites readily, because it is made of partly decayed twigs and leaves, and it can hold a smouldering fire for a considerable period. It is probable that most of the lightning-set fires start in the duff.

In the mountains of southern California, Arizona, and New Mexico there are likely to be each year a number of electrical disturbances known as "dry thunder storms." They come at the end of the long dry season, and being unaccompanied by rain, are very likely to start many serious fires. For this reason the forest service has to keep up its maximum fire-fighting strength in those regions until the rains are fully established. In the plans and organization for fire-fighting the service aims particularly to catch these unpreventable lightning-set fires at the time they start.

John R. Tomlinson.

John R. Tomlinson, of Pierce-Tomlinson Electric Company, Portland, Ore., is a self-made man, whose energetic effort caused him to rise rapidly from an office boy to a member of a prominent electrical contracting company. As a result, Mr. Tomlinson was recently elected national director and representative of the Electrical Contractors' Association of Oregon.

Mr. Tomlinson was born in Portland, Ore., on May 7, 1876, and received a grammar-school and business college education in that city. He was first employed as an office boy in the master mechanic's office of the Southern Pacific Railroad in Portland, but it was not long before he was transferred to the store department and later promoted to the position of division storekeeper.

But commercial business seemed more attractive to Mr. Tomlinson, so he resigned his railroad position and took a position with a local electrical dealer. Becoming financially interested in the business he rose to the position of office manager. In 1911 Mr. Tomlinson and T. F. Pierce, an experienced electrical man, formed the firm of Pierce-Tomlinson Electric Company. The new firm immediately took rank among leading and responsible contracting firms of the state.

John R. Tomlinson.

Mr. Tomlinson has never had any training or experience as an electrician, and confines his efforts to the commercial phase of the business. From the inception of the new firm Mr. Tomlinson has taken an active and enthusiastic interest in promoting the organization of the electrical contractors of the state.

Upon the formation of the Electrical Contractors' Association of Portland, Mr. Tomlinson was elected treasurer, a position to which he has been successively re-elected. At the recent convention in Portland on June 8 and 9, he was elected as the next director to represent the association in the national convention and was instructed to attend the national convention in Detroit.

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Among the Contractors.

George Hammer, of the National Regulator Company, and recording secretary of Local No. 8, Electrical Workers' Union, appeared before the Board of Education of Toledo, O., at a recent meeting of that body to protest against the letting of contracts to other than local contracting concerns. The Board declared that the contracts had to go to the lowest bidder under the laws of the state of Ohio, but agreed to recommend that the firms obtaining contracts should employ Toledo workmen wherever possible.

The Stowell Electric Company, recently completed the erection of a handsome new electric sign in front of the Hotel Jackson, Fremont, O., The sign is vertical, 20 feet high, with cross pieces at top and bottom. The sign adds to the brilliance of Front Street, which is rapidly taking on the appearance of a "Great White Way."

The Adams Electric Company, Incorporated, was organized at Youngstown, O., recently. This firm handles a fine line of chandeliers and electrical supplies and does a general construction business. Its headquarters are at 548 Market Street. E. Carlson is manager.

The Satterlee Electric Company, of Kansas City, Mo., has occupied new quarters on the ground floor at 22 East Ninth Street. The company heretofore has been located on an upper floor. Commodious display windows, which will allow the exhibition of electrical contrivances of various kinds, are a feature. W. B. Satterlee, head of the company, is the son of William A. Satterlee, general manager of the Joplin & Pittsburg Railway Company.

Eardley Brothers, the enterprising firm of electrical contractors of Salt Lake City, Utah, had as their guests the employees of their company at a strawberry and dancing festival on a recent Thursday evening. The company slogan "Let Eardley Brothers Do It If You Want It Done Right" is an ample guaranty that the evening was a most enjoyable one.

Theodore Smith & Sons Company, Jersey City, N. J., has been awarded a contract by the New York Central & Hudson River Railroad for machinery and electrical equipment for two transfer bridges at Weehawken; the contract is for $46,780.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

Opinions and Orders.—The decision of the Railroad Commission rendered within the period from July 1, 1913, to December 31, 1913, have been published in bound form. This is the third volume of decisions issued by this Commission and is published in the same form as the former volumes.

The Annual Report which has just come out in bound form is for the year ended June 30, 1913. This is a large volume containing 2,005 pages. The report contains an account of the work of the various departments of the Commission and a summary of the formal applications and informal complaints handled by the Commission. Statistics compiled from company reports are published.

ILLINOIS.

The Plainfield Telephone Company was authorized to change its schedule of telephone rates as set forth in its application to the Commission. Under the new schedule, rates for service within the village are increased $1.00 per year and the charge for switching farmer-line stations is increased 60 cents per year.

The Edwards River Power Company was authorized to issue its promissory note and chattel mortgage for $27,837.56 to the Tri-County Light & Power Company in accordance with a contract entered into between the parties. The funds received by the Edwards River Power Company are to be used in installing additional equipment to enable that company to supply the Tri-County Company with electrical energy.

MARYLAND.

The Consolidated Gas, Electric Light & Power Company. In an opinion, rendered informally, the Commission upheld the company's rule requiring an advance deposit of five dollars. The complainant refused to pay the deposit and the company declined to install a meter or furnish gas service. Upon appeal to the Commission, the complainant was informed that the company's rule is reasonable. It stated that it is a common practice for gas and electric companies to require such a deposit before giving service to a new customer. The company does practically a credit business and unless the deposit is required the company would have nothing with which to reimburse itself in case the consumer refused to pay his bill. The deposit is returnable to the consumer upon demand, should the company's service be discontinued.

NEW YORK.

Discriminations in Telephone Rates. The Public Service Commission, Second District, issued a general order directing all telephone companies in the state to immediately terminate, where the terms of contracts are terminable, all telephone service at free and reduced rates and to cease all discriminations. The Commission states that while there are hundreds of such apparent violations in cases where the jurisdiction of the Commission to deal with the matter is clear, there are a large number of cases where the telephone corporations defend the free service furnished on the ground that it is rendered under contracts existing prior to June, 1910, when the telephone companies came under the jurisdiction of the Commission. In many of these cases the corporations have installed free telephones in private residences of village and other officials under clauses in the franchise which bound the company to furnish a certain number of free telephones "for municipal use." There is doubt whether, in all cases at least, this franchise clause is an adequate defense under the statute. Provision is made in the order for companies to report all such alleged contracts which are not terminable according to the contention of the companies. Counsel for the Commission has been instructed to proceed immediately against those corporations which fail to comply with the Commission's demands to at once cease all discrimination and violations of the statutes.

The Westchester Lighting Company. The Commission, Second District, has consented to the merger by the Westchester Company of the Pelham Bay Park Electric Light, Power & Storage Company.

The Central Hudson Gas & Electric Company. The complaint requesting the company to extend service to a section of West Newburgh has been dismissed by the Second District Commission after the company had made a thorough canvass in an attempt to secure customers in this section.

The Federal Telephone & Telegraph Company, of Buffalo, was authorized to issue $500,000 par value of its seven-per-cent cumulative preferred capital stock to be sold at not less than par. The proceeds are to be used for the payment of current liabilities and for reimbursements to its treasury for expenditures from income.

The Nassau & Suffolk Lighting Company was authorized to issue $80,000, six-per-cent cumulative preferred capital stock, to be sold at not less than par, proceeds to be used for the purchase of material for its plant.

OKLAHOMA.

The Pioneer Telephone & Telegraph Company. The Corporation Commission has completed the matter of refunding overcharges collected by the telephone company under its advance in rates without authority of the Commission. It has involved the determination of the amount of refund in practically 10,000 accounts. In accounting under the Commission's direction, the company was permitted to protect itself in the matter of offsets against the refund account in cases where subscribers were owing the company and a large number of checks were for very small amounts, a number being for one cent. The telephone company, when the court decided that it must obey the ruling of the Corporation Commission, and not raise its rate without first securing permission to do so, immediately filed an application for permission to raise the rates to the basis which the company has been charging without authority.

This application was filed January 1, 1913, and bond was furnished to protect the subscribers against further excess collections, should the commission and courts finally decide that the application for higher rates was not justified.

Disposition of this application will involve a valuation of the property of the company, and a complete investigation and analysis of the results of its operation under the rates in effect. Should it be decided that the lower rates would have been sufficient to yield a lawful return upon the property of the company another accounting and refund will have to be made. Should the application of the company be sustained the rates now being collected will become the legal rates and the company and its sureties discharged from responsibility under the indemnifying bond now in effect.

PENNSYLVANIA.

The Schuykill Light, Heat & Power Company has appealed to the Daupin County Court from the decision of the Commission in the Ashland case. The Commission's decision withheld approval of an ordinance of the borough of Ashland granting the applicant the right to render competitive service in the borough. The appeal states that the Commission erred in conferring upon the Eastern Light, Heat & Power Company monopolistic rights and in finding that the Commission had the power to impose the municipality of Ashland a public service company whether it desired it or not.

Long-Term Lease. The Public Service Commission has approved the proposed lease of the railroad, other property and franchise of the Northern Central Railway Company to the Pennsylvania Railroad Company. Similar action has been taken by the Maryland Public Service Commission and, to remove all doubt of the legality of the action, the Maryland Legislature passed a law specifically conferring the power upon the Commission. The lease provides that the Pennsylvania Railroad take over and operate the Northern Central Railway for a period of 999 years, the former company agreeing to guarantee a dividend of eight per cent on the stock of the Northern Central, pay the stockholders of the latter 10 per cent in cash out of the company's surplus and give a bonus of 40 per cent in stock of the local road.

VERMONT.

The Franklin County Telephone Company has been granted a rehearing in the matter of rates. Certain reductions in the company's rates were ordered following the general investigation of the telephone rates made by the Commission. The company asks that the rates be permitted to stand in view of certain improvements which are being made.

WISCONSIN.

The Brownton Municipal Light Plant. The Brownton municipal authorities applied to the Commission to adjust rates so as to place the plant upon a self-supporting basis, or to request that the operation of the plant be discontinued. The Commission found that the receipts of the business were only about half of the expenses and that the increases asked for would not net sufficient revenue to sustain the plant. The application for a minimum bill of $1.00 per month was denied and a 75-cent minimum charge ordered in effect. All other increases were allowed. In addition the Commission increased the street-lighting rate from $294.52 a year to $510.00 per year.

The Commission points out that the village in going into the electric business must have had in mind the amount of business which could be secured and such being the case it is not fair that all the loss of revenue should be borne by present consumers.

Protection from Competition. The Wisconsin Telephone Company applied for a certificate of convenience and necessity authorizing it to make certain extensions to its lines in the town of Anson. The Chippewa County Telephone Company objected and applied for permission to make extensions in the same territory. The Cadott Telephone Company also objected to the extension on the ground that it was already serving some of the territory. The Commission found that the Cadott Company was serving part of the territory satisfactorily and extensions of other companies into its field was not authorized. It was found that part of the territory was contributory to the Wisconsin Telephone Company's line and could be more economically served by it. As to the remaining part of the extension it was found that although the Wisconsin Telephone Company had first solicited the business, the prospective subscribers, desired Chippewa County Telephone Company service for social and marketing reasons. The application of the Wisconsin Telephone Company was accordingly dismissed and that of the Chippewa County Telephone granted in connection with the extension to this latter group of subscribers.

The Crawford County Farmers Mutual Telephone Company doing business in various parts of Crawford County applied to the Commission for authority to establish a checking station in the city of Prairie du Chien. The applicant states that it connects with two lines which run into Prairie du Chien and in order to have an accurate accounting of its business it desires that a checking station be established to which all lines running into the city would be connected.

Incidental to the above application, the company claims that it has authority to establish the checking station and to serve other subscribers in Prairie du Chien because it is at present serving subscribers in that city.

The Commission relying upon the decision of the Supreme Court of the state in Citizens Telephone Company vs. Railroad Commission, 146 N. W. 798, finds that the applicant cannot further extend its business in Prairie du Chien because the subscribers which it has at that place are merely incidental to its rural business. The Commission further finds that the checking station is not necessary and, therefore, dismisses the application. The decision was rendered June 9.

Physical Connection Ordered. The Rock County Telephone Company and the Wisconsin Telephone Company do a competing business in the city of Janesville and surrounding territory. The complaint was entered that there is no physical connection between these companies so that subscribers on one company's lines cannot use the service of the other.

The Commission in its decision finds as a matter of fact that physical connection is possible, and that no irreparable injury will be done by allowing such physical connection. Neither will it be a detriment to the service of either company. The requirements of the statute being thus fulfilled, the Commission finds that public convenience and necessity warrant the physical connection being made. The cost and upkeep are to be divided equally.

The Sevastopol Farmers' Telephone Company applied for a certificate of convenience and necessity to build a telephone line north of Green Bay, in Door County. Objections were raised to the proposed line by the Matt Peffer lines and the Door County Telephone Company, it being claimed that such line would parellel existing lines. The applicant contended that the service of the objectors was inadequate and unreasonable and that the rates were excessive. The Commission holds that where service is inadequate such matter should be brought by formal complaint. Such inadequacy of service does not warrant the establishment of a competing company if the defects can be remedied. The companies objecting had proposed to substitute metallic lines for the grounded ones in use. The Commission states in its decision that it will make a special investigation of the present service, and the application is denied.

The Fayette and Blanchard Telephone Company was authorized to issue $560 to replace a similar issue of void stock. The company had issued such void stock in ignorance of the requirement of the statutes.

The Newton-Manitowoc Telephone Company was authorized to issue $1,450 of stock, $175 of this issue being to replace void stock, and the balance to be used for making extensions.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 218.—PANAMA CANAL LOCOMOTIVES.—What reasons were considered for adopting the very low potential of 220 volts for the towing locomotives for the Panama Canal? Why was three-phase current chosen instead of direct current, which has many advantages as long as high voltage was not to be employed? Why are two very heavy and costly copper "third" rails used as contact lines? Why is the rack-rail construction such a one as to take hold of the rack pinion?—A. G., Wilkinsburg, Pa.

No. 223.—STREET OR STATION INDICATOR.—Is there on the market an automatic device, usable inside of street cars, that will automatically, through electrically illuminated signs in each end or one end of the car, indicate intersecting streets by name as and when the car approaches such intersecting streets, irrespective of the number of such streets, and is the same practicable? Where is such a device used and by whom manufactured?—W. H. W., Kansas City, Mo.

No. 226.—REWINDING MOTOR.—How can I change a bipolar, 110-volt, direct-current, 250-revolutions-per-minute, series fan motor into a generator giving 10 to 20 volts and about 20 amperes? At present there is wound on each field one-half pound of No. 27 single cotton-covered wire; the armature has 12 slots and 12 bars and 120 turns of No. 30 double silk-covered magnet wire in each slot. I have two machines like this, exactly alike, and wish to make a motor-generator of them by changing one as indicated above.—H. J. G. J., New York City.

No. 227.—REWINDING ANOTHER MOTOR.—I have a General Electric one-sixth to one-eighth horsepower, 110-volt, direct-current motor, whose armature core is 3.25 by 3.25 inches and has 12 slots. The commutator has 24 segments. The original armature winding has 150 turns of No. 31 wire; the fields have 550 turns of No. 28 wire. I want to rewind it to run on 120-volt, 60 cycle, single-phase circuit. What size wire and how many turns must be used on the fields and armature?—W. T. E., Ansonia, Conn.

No. 228.—PANELBOARDS.—Are panelboards made in which the three leads are 110-volt three-phase and all the branch circuits single phase, being evenly divided among the three phases? If such a panelboard is not on the market, could one be built with a four-wire, three-phase main, the single-phase branch circuits being connected between the three outer wires and the neutral?—J. B. E., Evanston, Ill.

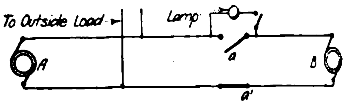
Answers.

No. 221.—QUARTZ LAMPS ON ALTERNATING-CURRENT CIRCUITS—Why can the ordinary quartz-tube lamp not be used on alternating-current circuits? Are any such lamps available for these circuits?—B. W., Denver, Colo.

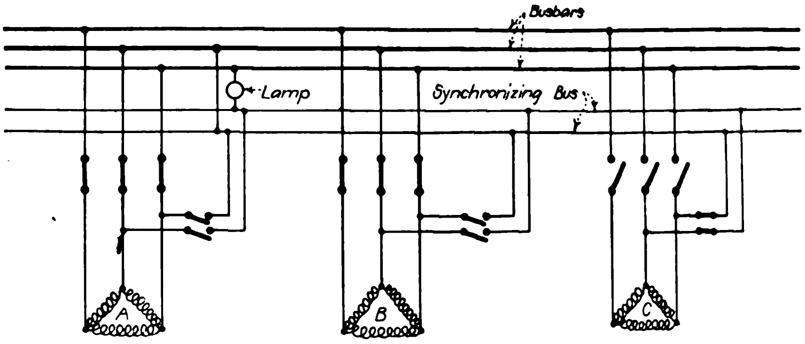
I have had considerable experience with the quartz mercury-vapor lamp and have found on the market a very reliable and dependable lamp which burns on alternating-current circuits. As a transformer is used in conjunction with this lamp, the same can be used on either 110 or 220-volt circuits, the consumption of current being about five amperes on 110-volt circuits and about three amperes on 220 volts. Owing to the extreme richness of the mercury-vapor arc in the ultra-violet rays and also to the absolute non-absorptive qualities of fused quartz to these extremely active rays, the medical profession seems to have created a considerable demand for such lamps for the treatment of skin diseases, rheumatism and kindred diseases, and for the quick healing of cuts, burns and ulcers. These lamps seem to be entirely free from any electrode trouble, the current being led in through a mercury-sealed ground joint, the conductor terminating in a reservoir never emptied of mercury, so that the arc can never touch the electrode and cause blistering or any other form of damage.—W. S. Q., Newark, N. J.

No. 224.—ALTERNATING-CURRENT MACHINES.—(A) In connecting a two-phase or three-phase alternating-current generator to a switchboard to which several other machines of the same kind are already connected, what methods may be used to insure getting the new machine in the proper phase relation to the busbars? (B) What is the purpose of the synchronizing resistance connected across the collector rings of a rotary converter while starting from the direct-current end?—P. M. B., Hudson, Ill.

(A) If an alternating-current generator is to be connected in parallel with one or more others to share a given load, it is important that at the instant of closing the switches, the voltage and time-phase of the incoming generator be the same as the voltage and time-phase of the generators to which it is to be connected. If either or both of these conditions are not met, there will be an interchange of current between the generators which may be disastrous if the difference in voltage or phase relation is sufficiently great. To see that the voltage is the same it is only necessary to compare voltmeter readings, but to insure that the incoming machine is in step with the others, more elaborate precautions are necessary. The process of bringing an alternating-current generator into step with others to which it is to be connected is called synchronizing, or "phasing-in" and the circuit by which it is accomplished is called a synchronizing circuit.

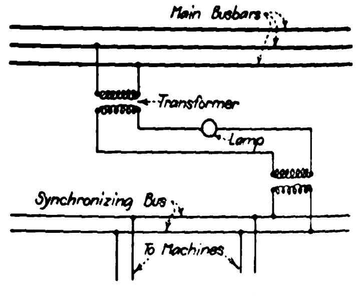


No. 224.—Fig. 1.



No. 224.—Fig. 2.

In Fig. 1, generator *A* is shown supplying current to a load. If switch *a* were closed, the two machines would be in parallel with regard to the load, but would be effectively in series with each other, and if they were not in step there would be an interchange of current between the two machines as above noted. With switch *a* open and the small switch in the lamp circuit closed any interchange of current will take place through the lamp. If the machines were 180 degrees out of phase, i. e., one generator arriving at the peak of a negative wave at the instant the other arrives at



No. 224.—Fig. 3.

the peak of a positive wave, the voltage across the lamp would be twice that of either generator since, as indicated, they are in series with each other and the lamp. For any other phase difference the voltage at the lamp would be correspondingly less, dimishing to zero when the machines are in step. With switch *a* open and the machines running at exactly the same speed, any difference in phase would remain constant and, if the switch in the lamp circuit were closed, the lamp would continue to burn. In practice, however, this condition would not obtain, as it is unlikely that the machines would be running at identically the same speed or, if they were, that they would continue to do so for but a moment. The difference in phase will not therefore be maintained at a constant amount but will vary periodically as the faster machine overtakes the slower one and the lamp will flicker accordingly. By adjusting the speed of generator *B* the flickers can be made to become slower and slower, indicating that the machines are approaching the same speed and phase relation. Now if the main switch *a* were closed at the instant the lamp was dark, i. e., when the machines are in step, they will continue in step because the machine which is running the faster will tend to run the other as a motor, thus increasing its speed and the current so supplied would act as a drag on the speed of the faster running machine, thus tending to slow it down.

Ordinarily, machines will be connected through main switches to busbars and Fig. 2 gives a diagram of three three-phase machines with a synchronizing circuit. Machines *A* and *B* are shown with the main switches closed and with the switches to the synchronizing bus open. To throw in machine *C* it is brought up to busbar voltage in the usual manner, after which the switches in the circuit to the synchronizing bus are closed, the main switches, of course, being open. When the flickers on the synchronizing lamp become quite slow, the main switches may be closed as the lamp goes out, and the machine made to assume its proper share of the load by adjusting the field rheostat. After the machine is phased in, the switches in the synchronizing circuit should be opened. It is to be noted that the synchronizing bus and circuits are connected to but one phase of the machines and main busbars, since if the machines are in step on one phase they will, of course, be in step on all of the others. The wiring will be practically the same for two-phase machines.

As noted above, the voltage across the synchronizing lamps may be twice the machine voltage and a sufficient number of lamps of the proper voltage capacity should be provided to meet this condition. If the generators were of considerable voltage, a large number of lamps would be required and to avoid this, the usual procedure is to connect the lamp through transformers of the proper ratio, as shown in Fig. 3.

The use of lamps in synchronizing alternators has certain disadvantages. The ordinary incandescent lamp does not glow under about 50 per cent of the normal voltage and thus a rather large difference in phase might occur without any indication from the lamp. This may be obviated to some extent by reversing one of the primaries of the synchronizing transformer (or the connections between the synchronism bus and the main busbars) so that when the machines are in synchronizing the lamp is burning at full voltage, the lamp being dark when they are 180 degrees out of phase. This scheme also eliminates the possibility of a broken filament leading to the closing of the main switch with the machines out of step, but even with the circuit so connected, the lamps do not show whether the incoming machine is runing too fast or too slow.

To meet these disadvantages, modern practice usually employs some form of synchroscope, many types of which are made by various manufacturers. The synchroscope is an indicating instrument constructed on the revolving-field induction-motor principle with a pointer connected to the rotor. The pointer rotates to right or left according as the speed of the incoming machine is less or greater than that of the other machines, coming to rest when the generators are in step. Instructions for using and connecting the synchroscope are usually furnished by the manufacturer.—H. S. P., Bloomfield, N. J.

No. 225.—Blame for Faulty Connection.—A certain building was wired and pronounced O. K. by the inspector. After meter was installed (it was a three-wire job) the lamps connected to the switches on the left side of the switchboard burned out. A test showed that the neutral wire had been connected to the right-hand pole of the entrance switch instead of to the center pole, thus giving 220 volts on the left and 110 on the right. The meter man supposed that the neutral was in the center and, as there was nothing to indicate the contrary, ran the two outside wires through the meter and onto the switchboard, as is customary. The entrance wires came in through conduit and could not be traced to the outside connections. The owners of the building blame the meter man; we contend that he was not at fault. Who is right?—J. S., New Knoxville, O.

I do not think the meter man is entirely to blame, although he should know that the neutral wire enters the meter as a pressure wire only, but if final inspection was deferred until the meter and lamps were installed and before current was turned on, as is the practice in Detroit, Mich., the trouble could have been caught before serious damage was done.

Herewith is a tag which I think will explain itself, and which the Public Lighting Commission furnishes the Edison Company to be placed on all meter switches, fastening same with a seal and wire. When final approval is made the inspector brings in the tag with his report.—B. W. C., Detroit.

NOTICE

The seal wire attached can only be broken by an authorized Inspector of the Public Lighting Commission, on approval of electrical work; and current must not be turned on by anyone else under penalty of the City Ordinance governing the use of electricity.

SEE REVERSE SIDE

PUBLIC LIGHTING COMMISSION

No. 225.—Tag for Meter Switches.

Sec. 2. The Public Lighting Commission may, with the consent of the Common Council, employ a sufficient number of competent electricians, as inspectors, whose duty it shall be to examine each electrical equipment hereafter erected and make a detailed report of same to said Commission as to whether it is in compliance with the rules and regulations of the Commission, and a record of all such reports made by said inspectors shall be kept on file in the office of said Commission, and when an equipment is found to conform to the rules and regulations adopted, the said Commission shall issue a certificate in duplicate that the terms of this ordinance have been complied with, but no such certificate shall be granted until the equipment is made to conform to the rules prescribed herein, and it shall be unlawful to use any such electrical equipment or to furnish electrical current or currents for the same until certificate has been furnished in accordance with the terms of the ordinance, and the rules and regulations of said Commission.

No. 225.—Reverse Side of Tag.

Illinois Contractors Meet.

The semi-annual meeting of the Electrical Contractors' Association of Illinois was held in Danville, Ill., on June 19 and 20, the headquarters being at the Plaza Hotel and the sessions being held in the assembly room of the Hotel Savoy.

The meeting was called to order at 10:30 a. m. on June 19 by President W. J. Ball of Moline, Ill., who introduced City Attorney B. H. Snyder. Mr. Snyder extended the regrets of the mayor, W. C. Lewmann, who was unable to extend the city's welcome in person, and in the mayor's name welcomed the association to the city.

G. W. Hill, special representative of the National Electrical Contractors' Association, was then asked to deliver an informal address. Mr. Hill, after explaining his duties as special representative, spoke on the general subject of co-operation, saying that he believed the last ten years have seen an increase of about 100 per cent in the good will and co-operation existing among contractors.

The remainder of the morning session was devoted to short talks by representatives of manufacturers, jobbers and supply men. Among those who spoke were C. Brown, of the American Electric Supply Company; W. T. Clausen, of the Edison Storage Battery Company; H. Larson, of the Inland Electric Company; H. Russell, of the G. C. Richards Company; G. H. Lounsbery, of the Western Electric Company; C. Methot, of the Manhattan Electric Company; W. J. Collins, of the Faraday Electrical Association; P. Lyons, of the Indiana Rubber & Insulated Wire Company; P. F. Henchel, of S. H. Couch Company; C. R. Hunt, of the General Electric Company; E. Kerns, of the Monarch Electric & Wire Company; E. T. Ward, of the Phoenix Glass Company; E. W. Joseph, of the Electric Appliance Company; T. Endsley, of the Diamond Electric Company, and J. T. Marron, of the Electric Construction & Machinery Company.

C. Brown, of the American Electric Supply Company, emphasized the necessity of exercising extreme care in selecting the membership of any society and the necessity for all members living up to the standard of their societies. He also emphasized the need of maintaining good credit and good will in the electrical contracting business.

C. Methot, of the Manhattan Electric Company, called attention to a curve sheet published by the Manhattan Electric Company, which indicates the minimum number of circuits required for a room in accordance with rule 23. D of the Chicago electrical code which requires one watt per foot of floor surface.

W. J. Collins explained the purpose of the curve sheet and told how the same could be used.

J. T. Marron, of Rock Island, emphasized the necessity for co-operation between contractors, jobbers and manufacturers; and the necessity for each doing business only in its legitimate field. He quoted a number of incidents showing what can be done by co-operation between the various interests.

W. J. Collins, of the Faraday Electrical Association, was then called upon to make a few remarks. Mr. Collins said that manufacturers and jobbers can do much to increase the business and interests of electrical contractors. Jobbers, he said, could render valuable services to the legitimate contractors, by refusing to aid the curbstone contractor in his work and business. It should be the aim of the association, he said, to increase its membership, thus educating and aiding the non-member contractor and at the same time eliminate much price cutting due to the fact that many contractors not in the association do not employ a bookkeeping system that enables them to make an intelligent estimate.

Friday Afternoon's Session.

The afternoon session on Friday, June 19, was a closed session which was devoted to the business of the association. At this meeting E. J. Burns, now secretary and special representative of the Electrical Contractors' Association of Illinois and of the Electrical Contractors' Association of Iowa, gave a very interesting and instructive talk on the subject of liability insurance, calling attention to the results he had accomplished during the past year. Mr. Burns, who was hired by the association to handle matters pertaining to liability insurance, state licenses and all matters of legislature character, stated that the various liability-insurance companies were found to be charging electrical contractors of the state of Illinois from $1.50 to $2.00 per $100 of pay roll for liability insurance covering both the public and employees as required by law. Mr. Burns had negotiated with one of the largest risk companies in America, and was successful in obtaining from this company a uniform rate of $1.00 per $100 of pay roll for liability insurance covering both the public and employees. The average saving to electrical contractors under this rate he has found to vary from $25 a year for contractors conducting a small business to $500 a year for some of the contractors conducting a large business, the average saving being $70.36 per year for each contractor that has taken advantage of the rate. The established rate for conference companies, Mr. Burns said was $1.44 per $100 of pay roll for employees and $0.25 per $100 of pay roll for the public, making the total $1.65 per $100 of pay roll.

Considering the fact that the payroll of all the electrical contractors in the country is estimated at between $50,000,000 and $75,000,000, the value of this field for liability insurance companies is very great. Mr. Burns aims to keep the electrical contracting business from the mercy of any large liability company and hopes in time to be able to obtain all of the contractors' liability insurance.

Under the present conditions Mr. Burns does all soliciting and collecting, thus eliminating a large part of all the overhead expense common to liability companies.

Owing to the importance of liability insurance to the electrical contractor and the success of Mr. Burns in securing a low rate from one of the large liability-insurance companies, he intends to bring the subject before the convention of the National Electrical Contractors' Association in Detroit on July 15-18, so as to enable all contractors to take advantage of the low rate and to cause a nation-wide movement against the unreasonable and varying rates now being charged.

Saturday's Session.

At the closed session on Saturday morning, the reports of the Committee on State Associations and of the Committee on Membership were presented. The report of the membership committee showed an increased in membership.

A. M. Knauber, of Oak Park, Ill., then delivered an interesting address on "Central Station Co-operation," in which he told of the value of co-operation between central stations and contractors.

The meeting was then thrown open to suggestions from members. G. W. Hill spoke on co-operation and the value of organization. It was suggested that state education could well be discontinued in view of the efforts of the National Association along these lines. However, the discussion brought out the fact that the field for education was so wide that it would be unadvisable to discontinue state education at this time.

A general discussion followed on the subject of electrical contractors working with and estimating with general contractors, but the tend of opinion favored separate estimates for electrical work.

The following officers were elected: president, W. J. Ball, of Moline (re-elected); vice-president, J. T. Warren, of Rock Island; secretary and treasurer, E. J. Burns, Rock Island; board of directors: E. Pendergest, L. E. Crowley, G. Carlton; national directors: J. T. Warren, W. McGuineas and F. L. Decker.

Entertainment Features.

During the afternoon of Friday, June 19, the ladies were entertained on an automobile ride to Soldiers' Home and the surrounding country. In the evening a dance was held at Forest Park. Saturday afternoon was devoted to a baseball game between the contractors and jobbers, the contractors winning by a score of 12 to 3. On Saturday evening a successful banquet was given at the Plaza Hotel.

English Electric Supply Problems.

In the month of June every year some of the more pressing questions that are agitating the minds of managers and engineers of municipally owned electric central stations in England are brought under profitable discussion at the convention of the Incorporated Municipal Electrical Association. Here both engineers and their non-technical committeemen fraternize and confer together. This year's convention, opened at Birmingham on June 16, was in point of subjects brought forward as important as any convention of the organization.

The president, R. A. Chattock, is the city electrical engineer of Birmingham, and his address at the inaugural meeting bristled with points of interest for all concerned in electrical progress. The papers were chiefly commercial in character, and as there is perhaps no subject on which more ingenuity has had to be exercised of late than that of rate schedules, the paper by J. H. Bowden, borough electrical engineer of Poplar (London) was most timely. Under the title "Standardization of Tariffs" he set out a system of charging which he considered was, by adaptation, possible of application to any area of supply, and was a step forward in the standardization of tariffs. The principal feature of the system is that each consumer obtains the benefit of his own load-factor, or in other words, the "good" consumer does not make up for the "bad" consumer.

Another exhaustive paper coming in the same category was that of W. A. Vignoles, borough electrical engineer of Grimsby, on "The Commerical Development of Electricity Supply in Moderate-Sized Towns." He showed that electric supply undertakings were passing through a period of great development, where an energetic and pushing policy had been adopted, and the outlook for the future was exceedingly bright. The proper demand would continue to grow at a rapid rate, but it must be carefully tended and inquiries closely followed up. He showed that the sale of electricity for heating and cooking at one cent per kilowatt-hour or at least at one cent plus a demand charge, was a sound proposition, while the supply for charging vehicles should bring in a good revenue in the course of a year or two. There were financial rocks ahead of some undertakings, especially where the change from continuous current to three-phase generation was made, but this change would be to the advantage of the undertaking in the long run. If a financially sound policy had been followed the losses, to be met during the first year or two after the change could be satisfactorily faced.

The other paper was by S. E. Fedden, city electrical engineer of Sheffield, and it dealt with "Design and Operation of Modern Boilerhouse Plant."

Other features of the meeting included a supper of the Point Fives Club, and a demonstration of five firms of electric vehicles.

The presidential address by R. A. Chattock was far from being one of merely local interest, its several sections covering, among other matters, contract conditions, installation work, electric-vehicle progress, the need for a new electrical organization, centralization of electric generation, etc.

On the vexed question of the aspiration of the municipal electricity authorities to secure Parliamentary authority to carry out installation work, Mr. Chattock considers that failure to come to agreement with the contractors was due to the action of those who are opposed to wiring being carried out by municipal supply authorities under any circumstances whatever. He believes that contractors exaggerate the quantity of work that it would be possible for a municipality to undertake if it secured the powers now being sought.

"First of all, we seek these powers not for the purpose of securing more trade, but to ensure good work, especially in the cheaper classes of installations. The expensive work in hotels and good-class business houses and residences, which is well paid for, is, as a rule, well done. Moreover, there is the wiring work for telephones and bells which the contractors must obtain, because the municipality has no power to do it and does not seek such powers, with the result that a customer will probably prefer to place the whole order with one person instead of two. In addition, the contractor can calculate the profit on the whole combined order, and he could probably successfully compete in price with the municipality. With the cheaper work, the case is entirely different, the margin of profit is so small that the quality of work often suffers, and the men who do it, as a rule, are not worth going for if trouble results. It is this jerry work that we want to eliminate. If we obtain the power we seek, we shall be able to put to the contractors who are at fault that they must do good work or we will do the work ourselves. There is surely nothing to be alarmed at in this."

The single fact that some electricity-works engineers have shown themselves unfriendly to the contractors should not be allowed to influence the general body of contractors. "Supply engineers, in order to hold their positions, must be good business men and I cannot imagine a good business man following a policy of opposition and unfriendliness toward the contractors operating in his area. If he does such a thing . . . . he will not occupy such a responsible position for any length of time." A satisfactory agreement is still hoped for. "It is unthinkable that supply undertakings can do without electrical contractors."

Passing on to consider the progress of the electric-battery-vehicle movement in England, President Chattock impressed upon his hearers that manufacturers of these vehicles could not give extended trials in more than a few towns. Yet it was only by bringing and keeping these vehicles before the public that interest would be aroused; he therefore holds that supply undertakings should be prepared themselves to bear some of the cost. Municipalities ought to practically demonstrate by using electrics for street cleaning, collection of house refuse, conveyance of supplies between departments, etc. Money so spent would amply repay the electrical undertaking. "There is no doubt that in a large city many thousands of pounds of revenue will be obtained annually from the use of these vehicles when their adoption becomes general, and the sooner we engineers take pains to push their use, the sooner will our revenues be augmented."

The Industrial Committee of the Institution of Electrical Engineers having found it impossible to do work it desired in advancing the interests of the electrical industry, because it had not adequate powers, has been dissolved, and the industry is therefore now without any organization capable of co-ordinating and supporting the work of sectional associations. As a member of that now defunct committee Mr. Chattock thinks that some body should be called into existence which would be capable of offering its services in the event of disagreements arising between different interests, such as, for example, the electrical contractors and the central stations. A central association formed from all the associations connected with the electrical industry could arrange conferences to consider disagreements between individual associations, and, if necessary, arbitrate upon them; it could be called together by any individual association requiring support in its operations, whether political or industrial. That such an organization would be of inestimable advantage to all branches of the industry, Mr. Chattock is fully convinced; but he also recognizes that the Institution of Electrical Engineers cannot deal with disagreements so well as the suggested organization, as it has so many and varied interests to represent.

The possibilities of combining gas and electric undertakings under one control does not commend itself to Mr. Chattock's mind; he holds that there is a field for both.

The growing importance of centralization of electric supply was among the other present-day themes touched upon in the address. The signs of the centralization movement are present in London where both the companies and the municipalities have been considering it, and they are also evident in the provinces where the larger municipalities have been extending their boundaries, taking over plants situated in the acquired areas. Parliament recognized the principle when it gave authority to the big power companies to serve large areas. "All these instances are steps in the right direction, though we are as yet a long way off the goal—where it will be possible to obtain, all over the country, and at one rock-bottom price, a supply of electrical energy for any purpose, such as power, heating, lighting (and this will ultimately be such a small percentage of the whole that the poor load-factor can be safely ignored), domestic requirements, traction by rail, road, or tramway, etc. The provision of cheap power and cheap transit for both goods and workmen are essential to a manufacturing nation. Germany and America both recognize this and England "must do the same unless we are content to take a back seat in the future." Centrally controlled systems of supply are imperatively necessary and Parliament, in Mr. Chattock's opinion, should "tackle the question of nationalization" under one authority. There can be no further marked reduction in the cost of electrical production and distribution until some such scheme is brought into operation.

It is only by tackling the problem boldly, by being prepared to supply current at prices much lower than are ruling at present, and recognizing that for a few years there must necessarily be a deficit on the large initial capital expenditure incurred, that it will be possible to attract and develop the large volume of business that will be necessary to make such a scheme a financial success in the future. The following are its outlines:

"Large bulk-supply power stations should be installed in various parts of the country, having regard to the three following chief requirements: proximity of an ample quantity of coal; proximity of an unlimited supply of water for condensing purposes; proximity of the various large centers of industry where the major portion of the energy is likely to be required. Railways, of course, cover practically the whole of the country, so that these can be fed economically at any point or points throughout their length. As soon as these bulk-supply stations are available and the distributing trunk cables installed, the majority of the small generating stations in the country should be at once shut down and utilized as substations. It would probably be found most satisfactory to, in many cases, adhere to the existing methods of distribution, and to utilize these as far as they will serve, possibly, as they become filled up, installing alongside of them other schemes for distribution of energy which may prove more economical to handle."

There need be no fear that engineers would have to be dispensed with when these stations were shut down. The object of the scheme being to increase business in all these centers by giving supply at a more attractive price, the men on the spot had the best knowledge required, and the chief engineers in charge would be especially valuable in this direction. "We electrical engineers have to be managers of our business as well as engineers in charge, and the business control is every bit as important as the engineering control. The commercial side of the business is so dependent upon technical matters that it is necessary to have an engineer at the head."

Mr. Chattock closed his address by formulating a definite proposition. As the scheme is so vitally important to all industrial centers, it is in their own interests that the large municipalities who at present control the major portion of the bulk supplies in the provinces, should meet together and discuss the matter, and if possible formulate a satisfactory scheme which could be brought jointly before Parliament, to be subsequently developed on proper commercial lines. His justification for advocating this method of procedure as the most suitable was the supply of electrical energy for all purposes, whether industrial, domestic, or public utility at a price far below what is now being paid: (*a*) for the benefit of the community as a whole; (*b*) for enabling manufacturers to compete successfully with foreign competitors; (*c*) for the abolition of smoke and the consequent improvement of health; (*d*) for the conservation of coal supplies by more scientific and economical utilization; (*e*) and for sustaining the British commercial position.

Increase in Wireless-Telegraph Business.

Steady progress in the wireless telegraph business is shown in the annual report of the Marconi Wireless Telegraph Company directors for 1913. The net profit for the year amounts to $185,145; the revenue from ship telegrams, subsidies, etc., amounted to $731,580, an increase of nearly 50 per cent over 1912.

REGULATION AND REASONABLE RETURNS.[1]

By Halford Erickson.[2]

This discussion relates to state regulation of public utilities and to what constitutes reasonable returns for interest and profits in such enterprises. In other words, it deals with the nature of such regulation and the principles upon which it rests, as well as with the nature and justification for interest and profits and the facts and conditions that should be considered in their determination.

The laws under which public utilities are regulated by the state cover a broad field. Among other things they provide that the services rendered by the utility must be adequate, and that the rates charged for such services shall be reasonable. They also provide for the establishment of commissions for the enforcement or administration of these laws

What constitutes adequate service and reasonable rates are among the questions that in the cases that come before them are passed upon by such commissions, and their findings upon the points involved are usually set forth in the rules, regulations and orders that are promulgated by them. Thus it is usually found that a service to be adequate must conform to certain standards and that a rate to be reasonable should yield enough, under normal conditions, to cover reasonable amounts for operating expenses, depreciation and for interest and profit, and be free from unjust discriminations. Under these rules the cost of the service becomes the basis for the rates that the public pays for the service. That is, the receipts from the rate schedules of utilities when taken as a whole, should cover the charges named and should be so adjusted that each branch of the service and that each class of customers in each branch are made to bear their just share of these charges.

The findings of such commissions are thus, as a rule, based upon facts and are for the most part closely adjusted to existing conditions. These findings are also changed whenever important alterations take place in these facts and conditions. In these respects there are important differences between state and local regulation. For under the latter the conditions as to service and rates are mostly subject to franchise provisions covering long periods of time and which as a rule are not altered during these periods regardless of the changes in the facts and conditions that may take place in the meantime.

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[1] Portion of paper presented at convention of Michigan Section, National Electric Light Association, June 17.

[2] Member of Wisconsin Railroad Commission.

Regulation was first established for the protection of the public. Until recently little if anything was ever said about any protection for the utilities. Whether this was because the utilities were thought to be fully able to protect themselves or because no serious encroachment was ever made upon their rights, is not clear. As time went on, however, the situation changed. Today the statutes themselves as well as the decisions thereon by the courts provide protection for the utilities as well as for their customers. The ostensible purpose of regulation now is to establish equitable and fair conditions between the public on the one hand and the utilities on the other. It has come to be seen that those who serve the public as well as the public itself may need protection; that it is in the end to the best interest of all concerned that proper protection be extended to both.

It is in matters relating to the returns to the investors and to the enterprisers that the principal differences exist between ordinary competitive enterprises and regulated public utilities. In competitive enterprises no limit is placed upon interest and profits. Those engaged therein are usually allowed to make all they can. In the utility field, on the other hand, the rates charged for the services are prohibited by law from being so high as to yield more than reasonable returns.

This leads to the question what constitutes reasonable compensation for the services rendered by such utilities. This is a question that is much discussed at present. In its broadest sense it covers the share of each factor that assists in providing and furnishing the service. In a more limited sense it usually covers interest and profit. In order to determine the question in either case it is necessary to appraise the property and business of a plant, and to analyze its operating expenses, including depreciation, and returns for interest and profits.

The fair value of a utility is as a rule determined from facts that show the original cost and the cost of reproduction, not only of the property used, but of the business as well, due consideration being given to the depreciation that has taken palce in the property. Both the original cost and the cost of reproduction thus constitute evidence of value. The weight that should be given to each of these two lines of evidence is a matter that depends upon the circumstances. In some cases and for certain parts of the plant the greatest weight may have to be given to the original cost. In other cases and for other parts again the cost of reproduction may lead to the fairest results. Appraisals must also at times be made when only one of these two sets of facts are available, and even in such cases it is possible to arrive at a fair value. For experience shows that for plants that have been constructed from time to time, or when prices were higher as well as when prices were lower, the original cost and the cost of the reproduction of the property in use are seldom far apart. For utilities with a short life, such as electrical and telephone plants, the greater part of the property is seldom more than a few years old and is therefore likely to have been constructed under conditions that do not vary greatly from those under which an appraisal is likely to be made.

The operating expenses proper are also subject to measurements. They have their causes and their results both of which upon analysis throw much light on the amount that is needed for operating the plant. There are also many other ways in which the fairness of the different items may be tested. What is thus true for the operating expenses is also true for depreciation. This item depends mostly on the cost of the property and upon its useful life in years. It is also effected by the cost of removing the discarded property and by its scrap value. There is little if anything about these outlays that cannot be determined with a fair degree of accuracy.

When it comes to that part of the cost of the service which is covered by the returns for interest and profits many different views are encountered. This is particularly true in the many rate controversies that are arising from time to time. In such cases those who represent the municipality or the public often hold that no more should be allowed for interest and profit than the rate at which the municipality could borrow the necessary capital, when it pledges all of its taxable property and when the loan is supported by its full taxing power. Those who represent the plant frequently argue that no restriction whatever should be placed upon these returns and that the plant should be allowed as much for these purposes as it can earn when the rates for the services rendered are fixed at all the service can bear. It need hardly be said that these views represent the lower and the upper limit, rather than the fair rates. The reasonable or normal rate of returns is undoubtedly found somewhere between the two extremes.

We are mostly accustomed to look upon interest and profits as the difference between the sum of the operating expenses, depreciation and taxes on the one hand and the total gross earnings on the other. These returns are in fact made up of interest on the capital used, insurance against risks, and profits for the enterpriser. The insurance against risks, however, is seldom treated as a separate factor, but rather as a part of the other two. Those who furnish the capital receive interest as a compensation for the service rendered by the capital. The enterprisers who assume the risk and responsibilities for the management receive profits as their share for the services they perform. For both of these factors the rate of these returns are higher in risky than in comparatively safe undertakings.

The economic theories underlying interest and profits are quite complicated and can only be touched upon here. It is generally understood, however, that both capital and the enterpriser are factors in production; that these factors like the other two factors, land and labor, cannot be had without compensation; and that such compensation, is, in each industry, governed very largely by the demand and supply.

The demand for capital varies with the opportunities for its profitable employment. It is as a rule greatest in and comparatively undeveloped countries and during periods of general activity of business in all lines. The supply of capital also generally varies with the return it brings. Capital is obtained by savings and it is an economic fact that such savings are the greatest when the rates of interest are the highest. In other words, more capital is saved and turned over for use in productive enterprises under high than under low rates of interest.

The normal rate of interest is, perhaps, the rate at which capital in any given industry can be had when the demand and supply of capital about offset each other. This is especially true when the operation of the laws of supply and demand is not unduly restricted by either legal or artificial barriers. In risky undertakings the rates of interest are higher than where greater safety obtains. The reason for this is that investors will not assume extra risks without extra returns. The lowest risks are found in government bonds on which the rate of interest may not exceed 2 or 3 per cent. From this point up the rate rises with the risk, and also for the reason that the amount of work and foresight required in managing or looking after the investments are much greater where risks are taken than when little or no risks are involved.

Profits have their source in the business ability, skill and foresight of the enterprises or in their management. The enterpriser is a sort of an economic buffer who bears the shock and often much of the losses in case of failure and who also reaps the credit and much of the profits in case of success. To successfully exercise the functions of an enterpriser a high order of ability is required. Such a man must have organizing capacity of a high order, be a good judge of man, and have tact in dealing with them; he must have the command of financial resources and the ability to plan and execute commercial and industrial policies; he should also have the technical knowledge that is required to adopt the best methods, outline the most economical processes and to properly pass upon materials and products.

Profits are usually made up of wages of management and compensation for risks. The wages of management that are thus included in profits may among other things cover the work of bringing and holding the factors of production together, of organizing the enterprise, of co-ordinating the work or business as a whole, and of exercising general supervision over the business. In the larger undertakings the profits are mostly made up of compensation for risks since the greater part of the cost of the managerial work, is as a rule, included as general charges in the operating expenses of the concern. In the smaller undertakings, on the other hand, it covers as a rule not only the compensation for the risks but all the compensation for the work of management as well.

The wages of management vary with the business, the ability, skill and amount of work required, the legal restrictions that surround the business and with many other conditions. When industrial society is progressing and when in each succeeding period there is therefore more wealth to be divided among those who share in the product than in the preceding period a large part of the increase is likely to go, at least temporarily, as extra profits to the enterpriser. In the same way when industrial society is retrogressing the loss falls first on the enterpriser. Their greatest share at any time is all they can make. The minimum is the amount the enterprisers could obtain elsewhere working for wages. In the long run, however, the wages of management must be high enough to encourage men of the necessary ability and skill to enter the field.

When the risks are small the compensation therefor is also, as a rule, small. In such cases the profits may not greatly exceed the wages of management. In such enterprises the profits are also apt to be still further reduced when a part at least of the wages of management is charged directly to operating expenses. In the long run, however, the compensation for risks will not fall below the point at which a sufficient number of enterprisers are found who are willing to assume it.

The rates and terms upon which the necessary capital and business ability can be had are matters that depend on the location of the plant and on the conditions generally by which the plant is surrounded. They are likely to be higher and more liberal for entirely new projects than for new extensions to existing plants. The larger undertakings with established earning power, the securities of which have a ready market, can, as a rule, obtain capital on better terms than smaller plants whose securities have no regular markets.

Public utilities should be well regarded by the investor. The services they render have become necessities, since the public cannot do without them and since no effective substitutes are available. Such utilities are also for the most part free from active competition, partly because they are protected by a franchise and partly because it is now becoming generally understood that one utility can serve a community better and at lower rates than two or more utilities. They are entitled to reasonable rates for adequate service and a reasonable rate under normal conditions is usually a rate that will yield fair returns on the investment. When their rates are lower than this, they may be raised; nor can their property be confiscated. Their business goes on in in good times and bad, and is not often seriously affected by general business depressions. As a rule, they earn good returns on a fair value of their property. If their securities do not exceed this value then they should be safe. Such securities also have a constantly widening market, fair price stability and yield a fairly good income.

But even in face of this they are not wholly free from risks nor from all other objectionable conditions. The conditions which surround their construction and operation are often such that costly mistakes therein may easily take place. Serious accidents resulting in costly injuries to persons and to property are often occuring in connection with their construction and operation. The community served may grow less rapidly than was expected and for which preparations had been made. It may even fail to grow at all or its growth may be in unexpected directions. All this may make parts of the investments more or less useless and result in idle capacity and many other losses.

The best evidence of the compensation that is paid for capital and business ability in various undertakings under different conditions is usually found in the prices at which the various classes and kinds of securities of such undertakings are selling in the market; the relation between these securities and the investment therein; the earning power of these undertakings, and in the rates of interest on various classes of loans that prevail from time to time. The prices at which such securities are changing hands take account not only of the value of the investment in an enterprise, but of its earnings and the cost of all the factors of production.

In order to obtain facts of this nature I have investigated a large proportion of the more representative bond and stock issues of public utilities that have been offered to the public during the past few years.

Ten representative first-mortgage bond issues covering electric lighting and street railway plants brought out in 1913, bearing interest at the rate of 5 per cent, were placed on the market at prices under which they would yield the investor an income of from 5 to 6 per cent. The cost to the issuing company of obtaining this capital amounted to from 1 to over 11 per cent for discounts, and to about 3 per cent for selling expenses, or to a total of about 6.2 per cent as an average. In these cases I was not able to obtain absolute figures as to the cost of reproducing the plants and business; but as the issues were taken by responsible bond and banking houses, whose practice it is to appraise the property behind the securities they handle; to determine the earnings from which the interest and dividend charges must come, and to keep the issues within safe margins, I feel it can be assumed that these issues were regarded as well protected.

During the same period ten representative second-mortgage bond issues, covering gas and electric lighting and street railway plants, bearing interest at 5 per cent, were offered at prices that would net investors an income of from about 5 to 6.2 per cent. On these issues the discounts varied from 1 to over 12 per cent, and the selling expense stood at about 3 per cent. The total cost to the companies of this financing ranged from 5.2 to about 7 per cent, the average being about 6.4 per cent. Second-mortgage bonds are not as well regarded as first-mortgage bonds and often for good reasons. They must be resorted to.

however, in order to obtain capital for new extensions when the first mortgage is closed. Generally speaking, the best policy is to make the first mortgage cover as much ground as possible and then hold the bonds in escrow until needed for additions and improvements.

Twelve note issues were offered to the public at prices that placed them on a 6.2 per cent income basis to the investors. When the discounts and selling expenses were taken into account, the cost to the companies of the funds thus obtained is found to be about 9.4 per cent per annum. In this case the discounts ranged from less than 1 to about 2.34 per cent. The selling expenses, however, were rather heavy, since they appear to have ranged from about 5 to over 8 per cent. Five preferred-stock issues were sold on a basis on which the average yield to the investor was about 7.30 per cent. Since the discounts varied from 3 to 12.5 per cent and a selling expense also had to be met, the cost to the companies was, of course, much greater than the price to the public.

For about 40 plants in our state, the appraised value of which varied from about $20,000 to about $2,000,000 per plant, the bonds, when discounts and selling expenses are included, have of late years been selling at prices under which the cost of financing to the plants ranges from about 5.5 to fully 6.5 per cent per annum. In these cases the bonds covered from 50 to more than 85 per cent of the value of the plants and their business, while the net earnings of the plant did not amount to less than twice as much as the interest on the bonds. If in these cases the stock issues had been limited so as to amount to no more than the difference between the sum of the bonds and the total value of the plants; if interest at the rate of about 6 per cent had regularly been paid thereon, and if from time to time it had also received something in the way of extra dividends in some form it is quite likely that these shares would have sold rather readily at about par.

Stocks come after the bonds and are therefore less well secured. Stocks are therefore selling on a higher income basis than the bonds by which they are preceded in order to compensate the investors for the extra risks they assume.

The public utility securities thus described are on the whole well secured, not only by the value of the property behind them, but by the fact that the earnings for years have been much greater than the amount actually required for interest and dividends. Had the security been less good and the earnings lower, then these securities would also have sold at lower prices and would have yielded higher returns to the investors. The best protected issues from the point of view of safety and earnings thus sell at the highest prices and yield the lowest returns to the investors.

The conclusions to be drawn from the principles and facts that have thus been presented can perhaps be illustrated as follows. A public utility, the plant and business of which are worth about $1,000,000, of which $800,000 is represented by bonds and $200,000 by stocks, and having net earnings above the operating expenses, depreciation and taxes of $75,000 per annum, or 7.5 per cent on the value, would likely be able to sell its bonds on about a 5.5 per cent basis and its stock on something like a 6 per cent basis, provided the conditions are such that these earnings are likely to continue in the future and provided further that the stocks from time to time would receive something in the way of extra dividends or rights. In this case the interest on the bonds would require $44,000 each year, or about 42 per cent of the net earnings, while the dividends paid on the stock would absorb about $12,000 annually, or about 39 per cent of the surplus for dividends, which surplus amounts to about $31,000. If the value behind these securities and net earnings thereon had been less than the amounts thus given the securities would also have sold at lower prices or on a higher interest or income basis than those outlined. The cost to the public of the capital and of the enterpriser in this case is thus represented by the net earnings of the plant. It appears from these facts that in the public utility field, even under favorable conditions, it is not safe to assume that interest and profits will require less than 7.5 per cent on the fair value of the plant and its business.

From the facts thus presented it will be noticed that the cost of capital alone in the public-utility field is thus considerably higher than the rates at which municipalities or cities can borrow money when the loan is supported by all the taxable property of the city as well as by its full taxing power. For, as we know, cities, under such circumstances, can usually obtain money on its bonds at the cost of from 4.1 to 5 per cent.

When cities issue special improvement bonds on the other hand, secured only by the property effected or the income therefrom, and not by the general taxing power, they must pay fully as much in interest as the amount paid by public utilities. This is illustrated by the situation in the city of New York, where the money for the construction of the new subway is furnished by the city, which can borrow all the money it needs for the purpose at not over 4.25 per cent when these loans are supported by its taxing power. When the city found it convenient some time ago to have the construction or operating company furnish a part of the capital it was found that, although the securities issued by this company for the purpose, were given the first claim upon the earnings of the subway, not only for the interest charges, but for a sinking fund large enough to amortize the loan in a comparatively short time, they were not taken by the investor at better prices than on a basis on which they yielded considerably more than 5 per cent in the way of income, or about 1 per cent more than the rate at which the city could have borrowed the money.

In other places it has also been found that bonds assumed by the cities in purchasing utilities, as well as special improvement bonds sell at much lower prices than the bonds of the same cities that are supported in full by the taxing power.

In view of such facts as these it would almost seem idle to argue that public utilities should be allowed no greater return for interest and profit than the rate at which the city could borrow the capital under its full borrowing and taxing power. Yet such arguments are often heard and seriously advanced both before commissions and elsewhere.

In order to prevent injustice to anyone it may also be necessary in dealing with returns for interest and profit to give some consideration to the tendency and the course of prices for money, commodities and lab The reason for this is that these returns depend upon the rates charged by the utilities for the services they render and that these rates in turn depend on the cost to the utilities of furnishing the service. For instance, it is often found that rates fixed during years when the costs per unit of service were low and which then yielded reasonable returns, have become too low to yield fair returns shortly afterwards because of increase in the costs per unit due to advancing prices. It is true that in a growing country tendencies of this sort are often partly, if not wholly, offset by decreases in the costs per unit due to increases in the volume of the business. Of late, however, the increases in the cost per unit, due partly to advance in prices and partly to advance in the cost of operation arising from new additions to the plants and extensions of the service which, though needed, have not been accompanied by corresponding increases in the earnings, have often been so great as to lead to material declines in the net earnings. Many rates made a few years ago not only by commissions, but by the utilities themselves, are now too low. The situation that has arisen in this way is very embarrassing. In many cases, however, it might have been avoided if greater consideration had been given to the trend of prices and the needs of the service, and if in this and other ways proper allowance had been made for future conditions.

A few facts illustrating the course of the rate of interest and of prices may not be out of place. In the rate of interest there was a gradual, though often interrupted decline, from about 1890 to about 1904. Since 1904, however, the tendency has been upward.

Not only have interest changes increased during the past decade, but the capital itself has been hard to get, even when extra inducements were offered for it. While this is partly due to the fact that the supply of available funds has not kept pace with the demand, it is also, in a measure, due to the fact that investors and bond houses are gradually becoming more discriminating and are constantly demanding wide margins of safety and more complete information concerning the value and the earning capacity back of the securities they buy. Many have also looked with apprehension upon the rapid extensions of government interference in various ways, and have, therefore, shown some timidity, in their ventures. While government regulation of security issues in the long run is of much value to the bona fide investor, this value is not as yet generally understood. At the same time it is also a fact that to the ultra speculator such regulation is a hindrance rather than an advantage.

It is evident that increases in the cost of furnishing the service unless accompanied by increases in the earnings means lower returns for the enterprises and perhaps also for the investor. When such advances in the cost are due to causes over which the management has no control and when they result in lower than reasonable returns to those who are responsible for the business, then injustice is done. If this condition is not remedied and the plant is compelled to go on and furnish service for less than paying rates, the result will be that new capital will not enter the field; that needed extensions to the plant will not be made; and that adequate service will not be furnished. The public will in fact fail to obtain the service it needs and upon which it depends. A situation like this is neither fair, nor in line with public policy. It should be remedied if necessary by providing more earnings through higher rates. In fact, it is as much in line with public interest to raise rates that yield less than reasonable returns as to lower rates that yield more. At any rate this is the case except perhaps under peculiarly abnormal conditions.

At this point I would like to call attention to a matter that seems to me important. As has been stated herein, capital is not easily obtained even by plants whose securities are sound. This is particularly true for the smaller plants that are not connected with any of the larger interests or holding companies. These difficulties in securing capital will delay, if it does prevent, needed extensions and improvements. It also tends to raise the cost of the capital. The important question is how can this situation be improved? There is one way it seems to me in which this could be done, and this with great benefits to all concerned. It could be done by issuing $100 bonds instead of $1,000 bonds and by selling them to small investors, especially the customers of the plant.

The bonds of public utilities would seem to afford such investors the opportunities they are looking for; provided, of course, that they are issued in the right amounts. Such bonds when kept within the value of the plants are serving well established communities have a most excellent record for safety. They also yield the the investors much better incomes than the savings banks. While not free from hazards and other drawbacks they offer many sound investment opportunities. When everything is considered it would seem that they might be made as safe and become as attractive for the investment purpose thus outlined as any bonds that might be named.

Besides opening up new avenues for obtaining capital this method of investment would enable the utilities to place their bonds where they would do the most good, or among their customers. If so placed it is almost certain that closer relations between the utilities and the public would be established. The importance of this is readily seen. It might often be the means by which many a strained situation could be converted into more harmonious ones.

While under state regulation of public utilities the returns for interest and profits in this field will be kept down to a reasonable level, the reasonableness of these returns is not measured by the bare rate of interest at which municipalities can borrow money, but rather by the amounts for which the capital needed for the enterprises can be had. This means that in the long run these returns for such utilities will be about the same as those that may be obtained in other enterprises, where the conditions are similar.

This is the doctrine of reasonable returns as it stands today. While the processes by which it has been developed have been painful and slow it is in line with the best economic, legal, and ethical principles. Regulation from these points of view is the putting into effect of principles that are inherent in just government everywhere and in all generations. These principles are implied in the whole fabric of the common law, and this fact should enhance rather than otherwise the high plane upon which the doctrine rests and the conscientiousness and care by which it should be administered.

Memphis Electrical Show.

The first electrical show given under the auspices of the Jovian League of Memphis, Tenn., was very successfully held from June 15 to 20. Through the kindness of Herman Rhodes, president of the Rhodes Furniture Company, the new building of this concern was placed at the disposal of the Jovians and the show was held there. Special decorations were provided, in which electrical illumination played a conspicuous part. The show was entirely free to the public and was very well attended. Many prizes of electrical appliances and utensils were given, which helped make the show exceptionally popular.

Contributing to the success of the show was the hearty co-operation of the electrical contractors of the city, the Memphis Consolidated Gas & Electric Company, the Memphis Power Company and other electrical interests in the city. Musical entertainment was provided each afternoon and evening. There were also given a number of popular lectures illustrated with stereopticon views.

Among the exhibitors were the following:

American Pre-Pay Fan Company.
Automatic Telephone Company.
Burroughs Adding Machine Company.
General Electric Company.
O. K. Houck Piano Company.
Lilly Carriage Company.
Memphis Street Railway Company.
Mottley Brothers.
Thordarson Company.
Tri-State Wireless Company.
Western Electric Company.
Westinghouse Electric & Manufacturing Company.

MODERN DEVELOPMENTS IN POWER GENERATION.[1]

By Paul M. Lincoln.

One of the complaints which we are continually hearing these days is the increased cost of living. An analysis of the various items which enter into the cost of living in these modern times will show that unquestionably the cost of living has been materially advancing during the past few years. However, there is one notable exception and that is in the cost of electric service. The cost of electric service has been continually going down. With the earlier central stations, 20 cents per kilowatt-hour was not an unusual price to pay, but the rate has been steadily reduced so that in these times, lighting rates are in almost no case above 10 cents per kilowatt-hour, and in some cases are as low as 5 cents per kilowatt-hour and even lower, and for power where electric service is used in comparatively large quantities, the rates are only a relatively small fraction of that which is required for lighting.

In casting about for a reason for excepting the rates for electric service from the other items that enter into the cost of modern living we find that there are two main reasons that may be logically assigned:

(1) The bettering of the economies of modern central stations as compared with those of former days.

(2) The large increase in the volume of electric service of modern central stations as compared with former ones.

It is difficult to say which of these reasons has the greater weight. They are largely interdependent, since the bettering of economy has come about, to a very considerable degree, due to the demand for larger volume.

Considering first the bettering of economy, the things which have particularly contributed to this are:

(1) The general adoption and use of the steam turbine.

(2) The very large increase in the size of units which has occurred in recent years.

(3) The increased attention to the bettering of efficiency in the burning of fuel.

Let me take these up in order.

In dealing with the range of steam pressure from boiler down to about atmospheric pressure, the steam turbine has a slight advantage over the reciprocating engine. Its main advantage within this range is that since it requires no cylinder lubrication, a higher degree of superheat is available than with reciprocating engines, where it is necessary that the cylinder walls be lubricated. Aside from this the steam turbine does not use the steam through this range of pressure to a very much higher degree of efficiency than does a reciprocating engine. However, when we come to consider the relative economics of steam from atmospheric pressure down to the vacua that are used in modern central-station work, the turbine has a very great advantage over the reciprocating engine. With a turbine it is possible to make use of the expansive power of the steam clear down to the highest vacuum that can be produced; on the other hand, with the reciprocating engine it is impossible to use the expansive power of the steam much higher than a 25 or 26-inch vacuum without making the mechanical parts unduly large and expensive. In other words, with the reciprocating engine, it does not pay to expand the steam below a point corresponding to a 26-inch vacuum, while the same objection does not apply to the steam turbine. This fact allows the steam turbine to obtain a very much larger proportion of the available energy in the steam than is possible with the reciprocating unit.

It is true that the steam turbine is available for power purposes only when used in conjunction with the electric generator. This comes on account of the inherently high speed of the steam turbine. The steam turbine is inherently a high-speed machine and the use of the electric generator is the only practical way in which the power of the steam turbine can be made available for general purposes. The exception to this general statement is the utilization of the power of steam turbines on shipboard and in a few other instances, by first reducing the speed of the steam turbine through special gearing. However, the fact that in general the power of the steam turbine can be utilized only through the agency of an electric generator is not a handicap since, in these modern times, the general utilization of electric service has made this by far the most convenient as well as the most practical method of thus utilizing the available power of steam.

Another thing that has contributed largely to the bettering of economies has been the large increase in the size of modern units as compared to those of former days. Probably the largest reciprocating units ever built, at least in physical dimensions, were those which were installed about 1898 in the power house of the Manhattan Elevated Railway Company in New York, now a part of the Interboro Rapid Transit Company. These units had a nominal capacity of 5,000 kilowatts, but later were found to have the possibility of being rated very considerably beyond this figure. The generators operated at 75 revolutions per minute and, as most of you know, had an outside diameter of over 40 feet. At the time they were installed, they were the most modern and up-to-date generating units ever built. Although they are today just as good for the purpose of generating power as they were when first installed, the advance of the art has left them so far behind that within the past year the Interboro Rapid Transit Company has decided to take out four of them, in which space there is room to install four 30,000-kilowatt turbine generator units. The fact that in the space thus vacated by this old type of reciprocating unit, there is space to install units having six times as great a nominal rating is, in itself, evidence of the rapid growth of our industry. The 30,000-kilowatt units, which are now being installed, have a water rate of 11.25 pounds per kilowatt-hour as against 18 or 19 pounds per kilowatt-hour for the old reciprocating generator units when used alone. Single units of as high a capacity as 35,000 kilowatts have been sold, and that more of such units, or even larger, will follow in the future is only to be expected. This follows naturally from the very large capacity that some of our modern central stations have attained. For instance, the Commonwealth Edison Company, of Chicago, has attained a peak load of nearly 300,000 kilowatts. When considering such tremendous quantities of power, a single unit of 30,000 or 35,000 kilowatts is entirely logical and with the increases in station outputs that are bound to come, it is only logical to expect that still larger single units will be demanded in the future.

Increased attention to the economies of burning fuel is also responsible for the bettering of power-plant efficiencies. The fuel bill amounts in most central stations to somewhere between one-half and three-quarters of the total operating costs. This fact alone makes it desirable that close and careful attention shall be given in order to secure the utmost returns for a given amount of fuel burned. In modern stations the economies of the boiler plant are given much closer attention than they have been in the past. Steam meters on individual boilers, CO_2 recorders and other refinements in boiler practice have done much towards bettering the economies of our modern central stations.

In order to express in general terms the improvement which has taken place in the modern central station, we may say that for the old-time reciprocating station a thermal efficiency of 3 to 5 per cent was about what was usually obtained. By this I mean that from

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[1] Address at a meeting of Pittsburgh Jovians.

3 to 5 per cent of the energy resident in the coal was actually put into the busbars. Contrast this with the statement which was given to me a few days ago by Mr. Stott of the Interboro Rapid Transit Company, probably the most efficient central station in the country. He stated that the thermal efficiency which he was obtaining was about 15 per cent. In other words the modern central station can utilize from 3 to 5 times as much energy from a given amount of coal as could its predecessor of the early days. This, therefore, gives a concrete idea of the bettering of economy which has been secured with our up-to-date modern central stations.

It is not amiss, however, to call attention to the fact that the bettering of economy has been called for by the tremendous increase in the volume of modern electric service as compared with those of the earlier days. When electric service was first inaugurated, it meant simply electric lighting and nothing else. In the modern central station electric lighting is but a small part of the total service rendered, and further the amount of electric lighting in a given community has increased tremendously over what it used to be. If you will inspect the growth curves of almost any central station, you will find a tremendously rapid growth during the last ten years. A station which does not show from 10 to 20 per cent increase in output of any one year over the previous year is rather unusual, and a 10 to 20 per cent increase in annual output continued for a period of 10 to 15 years means a total increase which is simply appalling.

For instance, the City of Chicago demands for its central-station service a load which reaches a peak of nearly 300,000 kilowatts. The aggregate of all the loads of the central stations in and about New York City will amount to at least 500,000 kilowatts. These tremendous outputs, when compared with those of ten or fifteen years ago in the same centers, of themselves tell the story and give the reason why electric service in the modern times is one of the few items which has not risen with the other items that enter into the cost of living.

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Transit Company Inaugurates Self Insurance.

The Brooklyn Rapid Transit Company and the Edison Electric Illuminating Company, of Brooklyn, N. Y., recently announced that they have decided to establish a system of self-insurance in complying with the new workmen's compensation law. This was based upon the belief that the premiums of insurance companies would prove excessive when compared with the risks involved.

A Squantum Club Clambake to Electrical Men.

H. N. Fenner, president of the New England Butt Company, the pioneer manufacturer of machinery for insulating electrical wires, annually invites as his guests to the famous Squantum Club Clambake, on Narragansett Bay, near Providence, a number of New York friends. The most recent of these events was celebrated on Wednesday of last week. So that electrical men may realize what fare is provided, the luncheon and dinner menus are given as follows:

LUNCHEON.

Little Neck Clams in Shell
Lobster Salad
Small Fish Balls
Lettuce Sandwiches Butter Sandwiches
Lamb Kidneys, Madeira
American Cheese Crackers
Doughnuts
Dampeners

DINNER.

Clam Bouillon
Clam Chowder Fish Chowder
Clam Fritters Brown Bread
Clams
Bermuda Onions Sweet Potatoes
Imperial Punch Frappé Tom and Jerry
Cigarettes
Fried Eels
Tartar Sauce
Sea Bass, Stuffed
Potatoes Natural
Lobster
Julienne Potatoes
Indian Pudding and Cream
Watermelon
Edam Cheese
Roquefort Cheese Toasted Crackers
Coffee

Among the gentlemen in attendance who, after amply satisfying their appetites, are gradually finding their way back to New York City, were Messrs. W. L. Candee, H. Durant Cheever, George T. Manson, and William H. Hodgins.

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Incorrect Meter Reading Subject to Correction by Court Verdict.

The Court of Errors and Appeals, Trenton, N. J., has handed down a decision affirming a judgment recently obtained by the Borough of Vineland, operating an electric light and power station, against its consumer, the Fowler Waste Manufacturing Company, involving a condition of incorrect meter readings. For a period of two years the chief electrician, it was held, failed to multiply the elctric meter dial readings by the meter constant of 10, during which time the consumer consequently was charged for only one-tenth of the electric energy actually used; upon discovery of the error the Borough sent the Fowler company a statement for the remaining nine-tenths current not included in regular monthly bills during the period.

Failure of voluntary payment necessitated court action by the Borough, to which the company interposed a claim of equitable estoppel. The company held that the amounts actually paid in response to the erroneous bills were used in calculating its overhead expenses for arriving at the cost of production and establishing the selling price to be charged therefor. It was thus claimed that the company having during this period sold its product at prices accordantly based, could not equitably be subjected to the loss incident to a change in its production cost, because of a mistake for which it was in no way accountable.

The court, in its decision, stated that this specific claim was not upheld inasmuch as testimony was also given that the company sold its products at the highest price obtainable.

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Louisville Electrical Clearing House.

The Louisville, Ky., Electrical Clearing House, which has heretofore been under the auspices of the Kentucky Actuarial Bureau, is to be organized on an independent basis. At the meeting last week the matter of striking out independently of the insurance interests was referred to the executive committee, C. C. Childers, president, F. G. Burdorf, vice-president, and E. C. Knoop, secretary, with instructions to report at the July meeting. The organization of the electrical workers and contractors has filled a long felt want in Louisville and the members are fully aware now of the benefits they will realize from it.

The next meeting of the organization will hear also the report of an augmented committee on conduits. Three men theretofore had been considering that proposition but further consideration was required. A report will also be received by a committee of fixture men on the insulating of canopies. The last meeting saw a discussion on the matter of modifying the loop-system requirements which are in force in Louisville, but members declined to consider any letting down of the bars.

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Akron to Secure Utility's Water Rights.

The expenditure of over $500,000 is involved in the proposed contract, under consideration between the city of Akron, O., and the Northern Ohio Traction & Light Company, by which the company will convey to the city its water rights in the Cuyahoga River. The city is preparing to open a new water plant, and unless it secures the company's water rights will be seriously handicapped in the amount of water it will be permitted to use. A contract has been prepared under which the city may take all of the water it now needs for $348,000, with the option of excluding the company entirely within the next 20 years for the payment of $152,000 additional. The city is prepared to accept this plan, rather than risk the delay involved in litigation.

OF THE UNIVERSITY

BOOK REVIEWS.

"Die Elektrischen Eigenschaften und die Bedeutung des Selens fuer die Elektrotechnik." By C. Ries. Berlin: *Der Mechaniker*. Paper, 189 pages (6½x10 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00 in paper and $1.25 bound.

This work, which deals with the electrical properties of selenium and its importance in the electrical industries, is a second and considerably enlarged edition of Dr. Ries's earlier book upon the same subject which was published in 1908. Starting with the discovery of selenium in the year 1817 by the Swedish scientist, Berzelius, as a by-product from the distillation of sulphuric acid from iron pyrites, and dealing with its physical and chemical characteristics, Dr. Ries discourses upon the action of light, heat, moisture, ozone, X-rays, Becquerel rays, wireless waves, etc., upon the selenium cell. A large number of curves are published illustrating not only the author's own work, but that of other investigators in this field, such as Ruhmer, Pfund, Korn, Luterbacker, Marc, Schrott, Sperling, Corpini, Glatzel, Athanasladis, Reinganum, Wulf and Lucos.

Illustrations are shown of a number of well known types of cells and nearly all the forms known today are described in the subject matter. Various scientific and industrial applications of the selenium cell are also shown, and the text goes more or less fully into its application in photometry, telegraphy and wireless, picture transmission, seeing at a distance, gas buoys, the photophone, the telephonograph, eclipse measurements, etc.

A bibliography, catalog of literature gone into, and a list of authors at the back of the book, and an index of titles in the front constitute this as one of the most useful books which have thus far been published dealing with the properties and applications of the selenium cell.

W. J. Hammer.

"Regulation, Valuation and Depreciation of Public Utilities." By Samuel S. Wyer. Columbus, O.: The Sears & Simpson Company. Flexible leather, 313 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $5.00.

Few of us are yet used to a standard book printed on India paper and for this reason we are, upon hasty examination, apt to conclude that Mr. Wyer's very comprehensive book upon "Regulation, Valuation and Depreciation of Public Utilities," is an interestig pamphlet and dismiss it as such. As a matter of fact, it is a standard book of over 300 pages, and in arrangement, illustration and index it is unusually complete. It perhaps covers more ground than any general book upon the subject of regulation and valuation, and is particularly strong in its concise fundamental definitions. The book should be useful in any consideration of electric, water-power, gas and natural gas, telephone and railway freight rates. The special chapters upon depreciation and electrolysis are a noteworthy contribution to the general subject. The arrangement of referring to a selected bibliography collated as an appendix, by a single number in the text, is very useful and references to court and commission decisions are treated in a like manner.

I know of no book that would give such a complete grasp of the subject, to any one wishing to make an initial study of regulation and valuation. Its value is also great as a complete and handy reference book for the experts upon the subject. The book may be subject to some criticism upon each of the important subjects, but a very close examination of the references given by Mr. Wyer shows that he has used such references with great care and with such a spirit of fairness that such criticism is disarmed. Every author in such a textbook must select his references, and Mr. Wyer has accomplished this part of the work with great skill, for if all references are given in a book of such extended scope as this, we would have instead of a textbook, an encyclopedia, and our only gain would be in size at the expense of less real value. This book should be in the library of every utility company, commission and others dealing with utility problems.

William J. Norton.

"American Electricians' Handbook." By Terrell Croft. New York: McGraw-Hill Book Company, Incorporated. Flexible leather, 711 pages (4x6¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $3.00.

This volume is especially suited to the requirements of electrical contractors, wiremen and the electricians in industrial plants. Its scope is quite different from that of previous electrical handbooks, as may be seen from the following list of sections: Fundamentals; Generators and Motors; Outside Distribution; Interior Wiring; Transformers; Illumination. Not only the principles of operation and construction of the machinery are given, but the common troubles are pointed out, with methods for their localization and correction. Many data are given in the form of tables showing the requirements in wiring and in choice of motors for various applications. The section on outside distribution takes up the construction of both overhead lines and underground conduit, while the section on interior wiring covers the more common materials and the various methods of installation suitable for different types of buildings and the requirements under various jurisdictions. The use of molding, knobs and tubes, and conduits are all fully explained, and much useful information given with respect to the wiring of electric signs, of bell annunciator and burglar-alarm systems, of telephones and of gas-lighting circuits. The wiring of old buildings is specifically taken up. The section on illumination gives a general description of the various forms of lamps and the general principles to be followed in laying out lighting installations. The author has made liberal use of sources of information already available, and many selections are made from articles which have appeared in technical journals and from material published by manufacturers, associations and others. Credit has been given to the sources of information, and a number of references are given to which the reader can refer for complete information upon certain of the subjects considered. For the class of readers for which the book is intended and for the objects in view in its compilation, the reviewer knows of no more satisfactory book of reference than this handbook. Naturally a few errors have crept into the first edition of a volume of this magnitude, but these are few in number and not of a serious nature. The explanation of the terms "series-multiple" and "multiple-series," appearing on page 108, has been somewhat jumbled; incorrect units have been given for the measurement for resistivity; and an incorrect statement has been taken from another author in explaining the application of Ohm's law on page 14. The volume is well illustrated and the diagrams chosen are well executed and add greatly to a clear understanding of the points illustrated. This volume should be in the hands of every individual in the classes above mentioned, and will be found useful to a great many others involved in any way in electrical work.

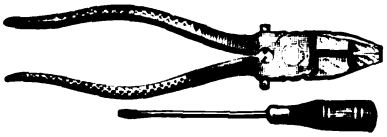
"Practical Illumination." By Justus Eck. London: S. Rentell & Company, Limited. Paper, 85 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for 40 cents.

While this volume is denominated by its author as a pocketbook for engineers, contractors and others interested in the application of electric lighting, it seems to treat the subject in too superficial and elementary a way to be so designated. The fundamental ideas to be observed in lighting are very concisely and simply stated and much information is given which will prove of most value to those who are not already supplied with more comprehensive books on this subject. After some preliminary chapters dealing with the more fundamental factors connected with light and its applications, the author takes up the lighting requirements of different interiors and gives some brief directions for planning an installation. In this connection there are some useful tables, including data on the cost of installation and maintenance.

New Electrical and Mechanical Appliances

New Stripping Pliers.

Of much interest to all electricians are the new stripping pliers added to the extensive "Red Devil" line of linemen's and electricians' tools manufactured by the Smith & Hemenway Company, Incorporated, 150 Chambers Street, New York City.



New Stripping Pliers.

The illustration readily shows the many advantages and the general utility of this tool. The stripping is accomplished by means of two stripping blades, set one in each member of the tool, immediately behind the head. The body of the blades is threaded, permitting the most minute adjustment. This feature permits their use both for cutting and stripping insulation, as either the narrow cutting edge can be put on the insulation, or the broad stripping edge put in contact with the wire. Each pair of pliers is accompanied by a screw-driver for adjusting the blades, which are renewable.

When it is considered that the stripping features of this tool can be had in addition to regular flat-nose and side-cutting pliers, it can readily be seen that the Smith & Hemenway Company is maintaining is reputation of leadership for its "Red Devil" line of linemen's and electricians' tools, which represents over 3,000 styles, sizes and finishes.

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New Universal Portable Electric Grinder.

The Standard Electric Tool Company, Cincinnati, O., has placed on the market a new grinder of the aerial type for surfacing rough castings, and for buffing.

This tool has a universal motor that operates on both alternating and direct current with equal efficiency, being interchangeable. It is especially adapted for low-frequency current, such as 25, 30 and 40-cycle circuits. The motor is form-wound and impregnated in Bakelite, which method of winding and insulation prevents short-circuits, grounds and other troubles, incident to high-speed apparatus if constructed according to slow-speed motor practice. The motor has capacity of one-half horsepower and is very durable and efficient.

The speed is 6,000 revolutions per minute. The tool is fitted with an emery wheel four inches in diameter, with one-inch face. Ball bearings are employed throughout, the best imported types being used. The tool is very effective on alternating current, owing to its high speed, and is much more productive and economical to operate than air grinders. Workmanship and material are of the very highest grade, and the tool will stand the most rigorous continuous service.

New Aerial Type Grinder.

This grinder is furnished with a spring for suspending from the ceiling, and it can be used in connection with a traveler and counterbalance. The motor will run off either lamp socket or power circuit, being furnished with connecting cord and plug for either one.

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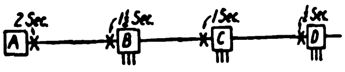
A government commission has recommended that instead of elecrifying the existing railroad between Santiago and Valparaiso, Chile, at an estimated cost of $11,193,000, it would be better to build a new electric line connecting these two important cities.

Overload Relays.

Continuity of service is an essential consideration in all installations, and interruptions of the service cannot be tolerated unless the protection of the apparatus demands it. When they do occur, they must be confined to the smallest area possible. The time-element features of the overload relay, which is described below, facilitate this.

Two forms of overload relay are supplied. Both have an inverse time element. In one of the forms, which has been on the market for some time, the relay trips instantaneously at extreme overloads. In the new form there is an adjustable definite minimum time element. This definite minimum can be adjusted for any point from zero to two seconds in the standard relays, and special relays can be supplied giving up to 10 seconds minimum.



Selective Action of Relays.

The definite-minimum time-element relay provides a selective action where substations are placed in series at intervals along a transmission line, clearing the circuit at the last substation between the trouble and the generating station. Thus, suppose a generating station *A*, in the accompanying diagram, with relays set for two seconds minimum, and substations *B*, *C* and *D* in series, with relays set for one and one-half, one and one-half second minimum, respectively. If a ground or short-circuit occurs beyond *D*, the relay at *D* cuts off the trouble section before the others operate so that the rest of the line remains in operation; if trouble occurs between *C* and *D*, the relay at *C* will cut off the trouble; and so on.

Another use of the definite-minimum time-element relay is in relieving circuit-breakers. It is well known that the ultimate breaking capacity of a circuit-breaker depends on the time of breaking. If a ground or short-circuit can persist for two seconds before the circuit is opened, the ultimate breaking capacity is doubled, that is, the strain on the breaker is reduced to half, owing to the drop in voltage and current during the interval.

This overload relay is manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Electrolytic Iron for Cores.

Fisher's process of preparing sheets of electrolytic iron for use in the manufacture of transformers, motors, etc., is being utilized by Langbein and Pfannhauser, Leipsig, Germany. This material has excellent magnetic properties, especially with respect to permeability. The price is less than twice that of the special transformer iron heretofore used.

Test results upon this material were given recently by M. Breslauer in the Elektrotechnische Zeitschrift. Hysteresis losses are extremely low and may be taken as about 10^{8}-B^{2} watts per kilogram at 50 cycles per second. Owing to its high electrical conductivity the electrolytic iron shows high eddy-current losses. It has, however, the advantage that it can be obtained in very thin, flat plates, giving a smooth surface, free from oxide. Using plates 0.01 inch in thickness, the total iron losses in a dynamo when operating at 50 cycles, 10,000 gausses, 70 degrees Centrigrade, were found to be 1.66 watts per kilogram, as compared with 2.8 watts per kilogram with ordinary plates of double this thickness. In the case of a transformer core under the same conditions, the iron losses were found to be 1.23 watts per kilogram, as compared with 1.45 watts for alloy plates of thickness 0.016 inch.

A comparison of two 30-kilowatt transformers designed for operation at 50 cycles, one using electrolytic iron and the other special alloy plates, was given as follows:

	Electrolytic.	Alloy.
Flux-density, gausses	13,000	9,000
Weight of iron, pounds.....	339	535
Weight of copper, pounds...	113	181
Relative cost...............	100	127

In transformers with artificial cooling, full advantage can be taken of the high permeability of electrolytic iron and the losses on overload decrease, owing to the high temperature-co-efficient of this material.

A similar gain cannot be obtained in armatures by the use of electrolytic iron, since the teeth are ordinarily worked to saturation anyhow, but a saving may be effected in the field poles. In the cases of one 300-kilowatt machine, the weight of the fields was reduced 22.5 per cent by using electrolytic iron in place of cast steel.

The following table shows the magnetomotive force in ampere-turns per centimeter required to produce various flux-densities in the different irons, and shows the great advantage of electrolytic iron in this respect.

Flux-Density in Gausses.	Electrolytic Iron.	Ordinary Iron.	Special Iron.
7,000	0.4	2 to 4	2
10,000	0.7	5 to 6	5.5
15,000	4.0	24 to 32	52.5
18,000	72.	146 to 180	260

◆ ◆ ◆

The town of Walsall, near Birmingham, England, is preparing to borrow $364,258 to erect a new electric supply works to meet the demand for electricity and to replace a plant which has been found to be obsolete.

Two Interesting Motor Installations.

An interesting motor-driven stoker equipment is installed at the plant of the Austin Manufacturing Company, Harvey, Ill. A 250-volt one-horsepower Type 1S Electro Dynamic motor is used to drive a McKenzie stoker during the day and at night is used as a generator to supply current for the engine-room lights and the night lamps in the shops and offices.

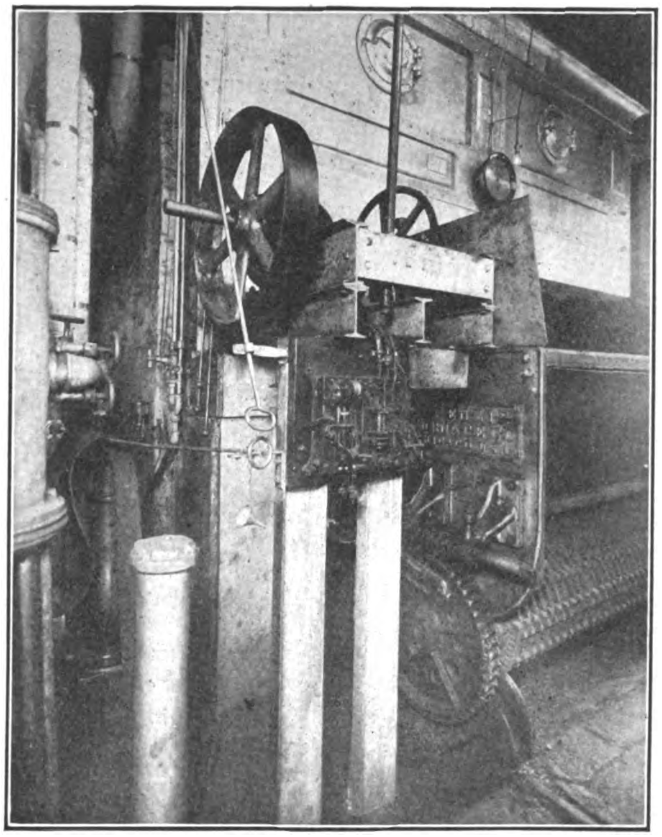


Fig. 1.—Stoker, Motor and Boiler at Harvey Plant.

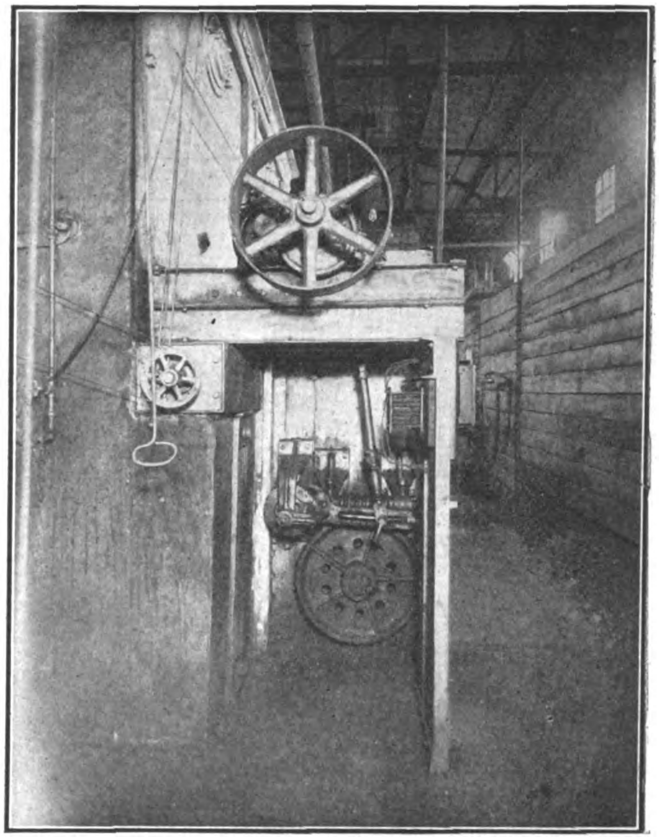


Fig. 2.—Side View of Equipment Showing Operation.

Fig. 1 shows the arrangement of the stoker, motor and boiler. The boiler is a 293-horsepower Sterling water-tube boiler, operating at 150 pounds steam pressure. This boiler supplies part of the steam delivered to a 500-horsepower DeLaval steam turbine driving a 250-volt Crocker Wheeler generator of the same capacity. This generator supplies the necessary energy for power and lighting during the day.

The boiler consumes on the average about 7.5 tons of Harrisburg slack furnace coal per 12-hour day. This coal is fed to the furnace from a hopper by means of a McKenzie chain stoker running at a speed of about 5 feet per minute. As shown in Fig. 2, this chain revolves about a drum to which a worm-driven gear is attached. The worm shaft is driven by means of a ratchet and pawl, the latter being connected to a driving rod driven through reduction gearing from the motor. The motor is of the ball-bearing type and operates at a speed of 425 revolutions per minute.

At night the motor gearing is thrown out of mesh and a belt connected to a small steam engine is thrown on the motor pulley, thus converting the motor into a generator for supplying the night lamps. The small steam engine obtains its steam from a small auxiliary boiler. The motor, which is of the interpole type, operates equally as well as generator or motor without shifting the brushes. When operating as a motor a Cutler-Hammer starting rheostat with no-voltage and overload release is employed. The motor is manufactured by the Electro-Dynamic Company, Bayonne, N. J.

A similar motor, but of a variable speed type, is installed on the second floor of the Baldwin Piano Company's offices in Chicago, Ill. This is a 220-volt interpole Type 2S shunt Electro Dynamic motor having a speed ratio of two, that is a speed variation of from 625 to 1,250 revolutions per minute, and a rating of 3.5 horsepower for continuous service and five horsepower for two hours' intermittent service.

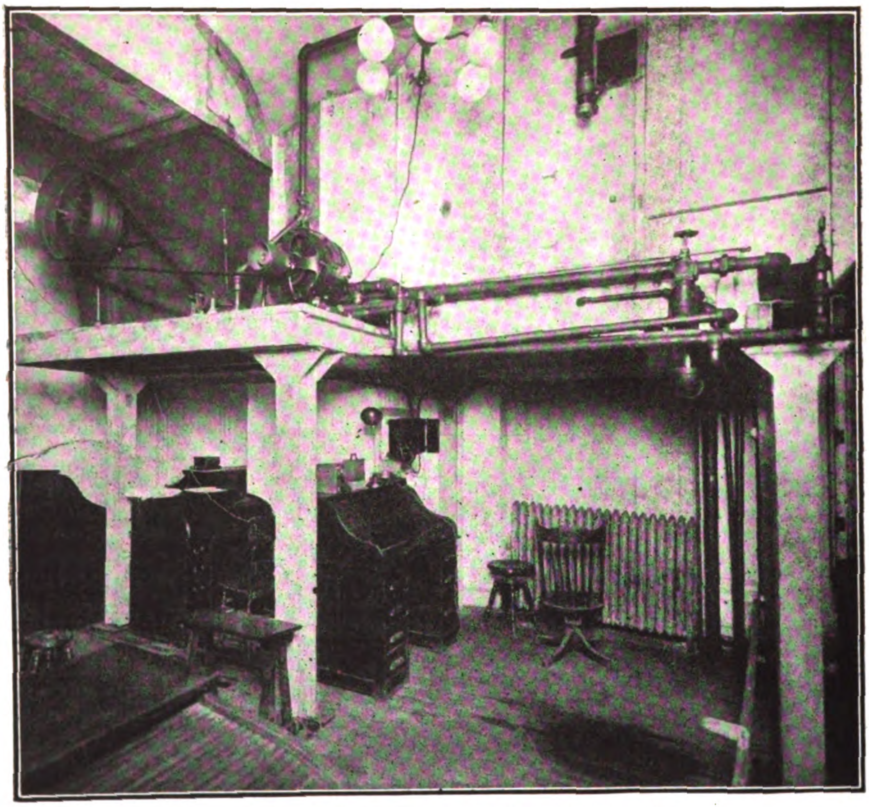


Fig. 3.—Motor-Driven Ventilating Equipment.

Fig. 3 shows that this motor is used to drive a ventilating equipment, being belted to a No. 55 Type B Seri-Vane fan which in turn is belted to a small centrifugal water pump supplying water for a cooling and dust-removing spray in the air intake. This motor is also of the ball-bearing type and is controlled by a 3.5-horsepower Cutler-Hammer shunt-motor controller and a field rheostat which is used to reduce the motor speed to about 750 revolutions per minute.

At this motor-speed the fan delivers about 9,000 cubic feet of air per minute, causing a complete change of air every seven minutes in the three player-piano rooms, the two player-piano music rooms, a lavatory, a den and a large office.

◆

Allis-Chalmers Absorption of Bullock Concern Almost Completed.

The work of completing the various details involved in the absorption of the Bullock Electric Manufacturing Company, of Norwood, O., by the Allis-Chalmers Manufacturing Company, of Milwaukee, Wis., which has heretofore controlled it through stock ownership, is under way, and it is expected that it will be completed by July 15.

All of the bonds of the Bullock Company are to be redeemed in cash, its stock issues being taken care of by bonds and cash. Under the plans of the reorganization being followed the Bullock Company is entirely absorbed by the Allis-Chalmers Manufacturing Company, its assets being over and its securities liquidated.

◆

The automatic telephone system recently installed at Simla, the summer capital of India, has been working so satisfactorily that the service has become extremely popular.

THE LIGHTING OF STOCK QUOTATION BOARDS.

By J. L. Stair.

The first requirement to be met in a special lighting problem of this kind, is that of providing even illumination over the entire surface of the board, so that figures and quotations may be as easily seen at the bottom of the board as at the top. Again an intensity of illumination must be provided sufficient to enable the marks on the board to be seen from any part of the room.

Quotation Board Lighted with Scoop Reflectors.

It is very desirable also so to arrange the lighting system that no lamps or reflecting equipment are visible, since nothing can be more uncomfortable than to attempt to watch the operations of the stock-quotation board, with numerous glaring lamps in plain view.

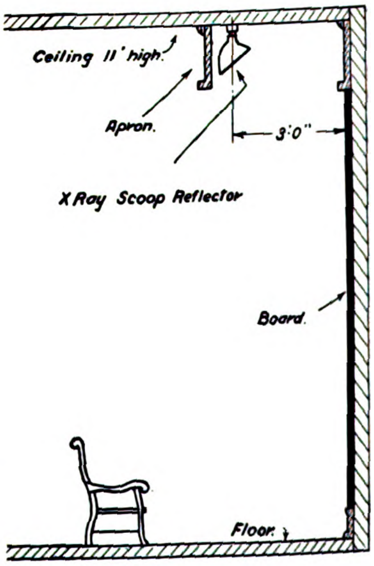


Diagram of Lighting Equipment.

Ordinarily there is a waste of current in the lighting of quotation boards, more lamps being used than are necessary. This waste can be easily eliminated by using care in the selection and placing of lamps and reflectors.

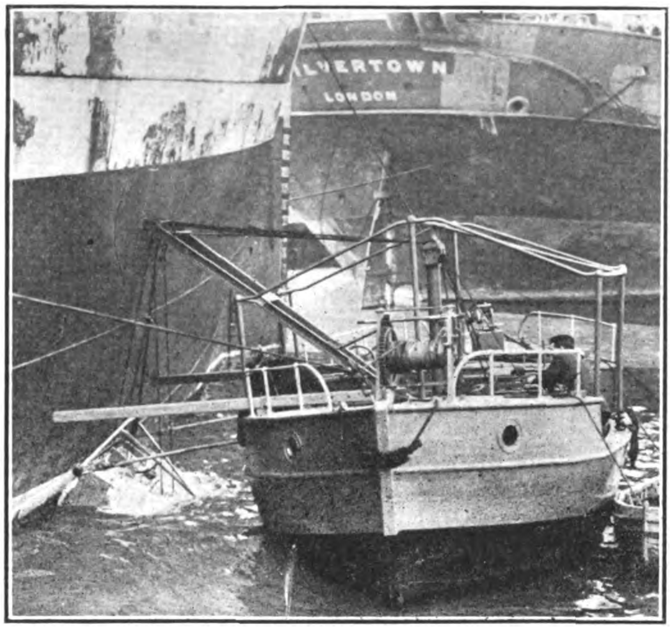
In the installation shown herewith, the requirements for good lighting have been admirably met. It should be noted with what distinctness the figures on the board stand out, and how well the bottom of the board is illuminated. The question of concealing the lamps was simplified by the fact that a beamed ceiling was used in the room. It was only necessary therefore to build in an additional, or false beam, near the board and parallel to it.

This beam, which is in reality only an apron, is about three feet from the wall, and drops down in front of the conduit and reflectors which direct the light upon the board. The beam is finished in mahogany to conform with the woodwork and trim, and at the rear of the room is easily mistaken for one of the beams making up the ceiling construction.

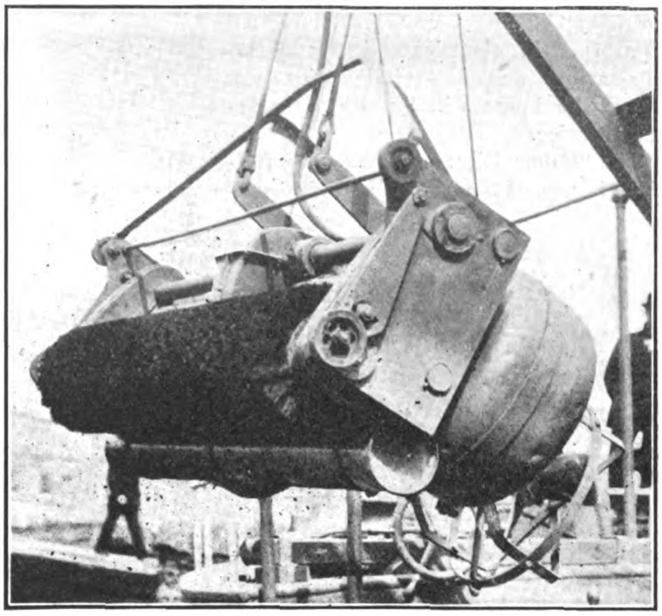
The relative location of the lamps is shown by the sketch. X-Ray scoop reflectors were installed and spaced about two feet apart, with 60-watt tungsten lamps burning in a pendent position.

Electrically Scrubbed Ships.

An electrically driven ship cleaner was recently demonstrated at work on the cable-laying steamer *Faraday* in London, England. The equipment and the method of its application are shown in the accompanying cuts.



Electric Scrubber in Action.



Near View of Scrubber.

The apparatus consists of a circular coir brush five feet long by 12 inches outside diameter. By the interchange of brushes of different strengths of core the different densities of marine growth can be dealt with. The brush is placed in a frame and driven through inclosed gears by a 15-horsepower electric submersible motor which also operates a bronze screw propeller situated at the rear of the brush. The thrust of the propeller pushes the revolving brush up to its work on the ship's side. The brush makes 250 to 270 revolutions per minute, and the propeller 150 to 170 revolutions per minute. The complete machine is self contained and fitted with adjustable suspension gear and two buoyancy tanks to reduce the weight when the machine is submerged. The brush gear is worked from a double-ended wooden barge 30 feet long by 12 feet beam, fitted with a 28-brake horsepower petrol or paraffin motor driving a 10-kilowatt 230-volt compound-wound interpole dynamo for generating the necessary current. A 15-horsepower motor propels the barge under her own power at a speed of five knots per hour.

An electric winch is fitted amidships complete with derrick and controls for lowering and raising the brushing machine. This winch has four barrels and is driven by a 3.5-horsepower electric motor through a five-speed gear, the motor taking current from the main dynamo. Two of the drums are used for hoisting and lowering ropes, one for the electric cable, and the fourth for raising and lowering the derrick. A gauge registers the depth of the brushing machine. The time estimated for cleaning a vessel like the *Faraday*, which is 360 feet on the water line and of 5,028 gross tons would be about 5.5 hours. After a portion of the *Faraday* had been cleaned the brush was changed for one of softer texture. It is stated that it usually costs from $2,000 to $2,500 to dock a merchant steamer of the size of the *Faraday* for cleaning. With the apparatus described the cleaning operation takes place while the vessel lies in port loading or discharging cargo.

The presence of foreign matter on ships' submerged plating may greatly retard the speed of the ship and thus increase the amount of coal consumption. By easy and frequent application of the electric-motor cleaner, an occasional scrub-down would keep a vessel clean, increase its speed and keep the coal bill down. The demonstration was givn by the Submarine Motor Ship-Cleaner Syndicate, Limited, of 66 Broad Street Avenue, London, England.

Semi-Automatic Switchboard for Newark Telephone Exchange.

The New York Telephone Company has arranged for the installation of a new semi-automatic switchboard at its Market Exchange, Newark, N. J. This board, built by the Western Electric Company at its Hawthorne Works, is said to be the first of its kind to be placed in regular commercial service. The board is constructed to accommodate 7,000 lines, and has 24 positions to be occupied by central operators as against 70 on the regular manual type board. The board can be doubled in capacity by increasing its height. The semi-automatic arrangement employs one set of wires, and necessitates but one movement of the operator when the call is received; this consists of the pushing of a button corresponding to the number desired, which automatically rings the subscriber's bell; the ring continues until answered, and with each ring of the bell a light flashes over the number called, notifying the operator of line conditions. The company is also planning for the installation of a similar board at its Waverly Exchange

General Electric's "Home Electrical" for the Panama-Pacific Exposition.

An attractive feature of the General Electric Company's large exhibit at the Panama-Pacific International Exposition, which will be held in San Francisco next year, will be the "Home Electrical" occupying a conspicuous place in the Manufacturers' Buildings. Besides adopting all the practical ideas previously used in various electrical houses for exhibition purposes, this model home at what will propably be the world's greatest exposition will be the first of its kind to be specially designed and built for the purpose by a skilled architect. It will be an electrical home in every sense of the word, inasmuch as the exhibit will include the electrification of the house, garage, workshop, laundry, creamery, etc. All the practical electrically operated labor-saving devices suitable for use about the home will be shown in actual service.

The "Home Electrical" will be a full-sized house, of the attractive California-Spanish type, much the same as the western home of an American family of moderate means. It will consist of a living room, a dining room, breakfast room, bedroom, bath, kitchen, laundry and sewing room. Nearby will be located the electrical garage, the workshop, creamery, etc. The rooms will be suitably decorated and attractively furnished. The plans call for an interior arrangement along the most approved modern lines designed to make housekeeping easy, so that the necessary work can be done without wasted effort or lost time. Each room will be equipped with practical labor-saving and comfort-promoting devices operated by electricity.

The electric wiring of this building will be along the most approved lines and the electric lighting will be entrusted to an illuminating engineer. Mazda lamps will be installed to give an even distribution of light in all parts of the house with no wasted energy, no dazzling flame points, no brilliant glare or heavy shadows.

The kitchen, where most of the housework is accomplished, will be provided with an electric range for all cooking purposes, and with electrically driven machines for peeling vegetables, polishing silver, freezing ice-cream, driving cake and dough mixers and doing other necessary work. In the electric laundry the clothes will be washed by electric power and ironed with electric flatirons. In striking contrast the adjoining room will have an electric refrigerating plant of household size where the same form of energy used for heating and cooking will produce low temperatures for preserving foodstuffs and for making artificial ice.

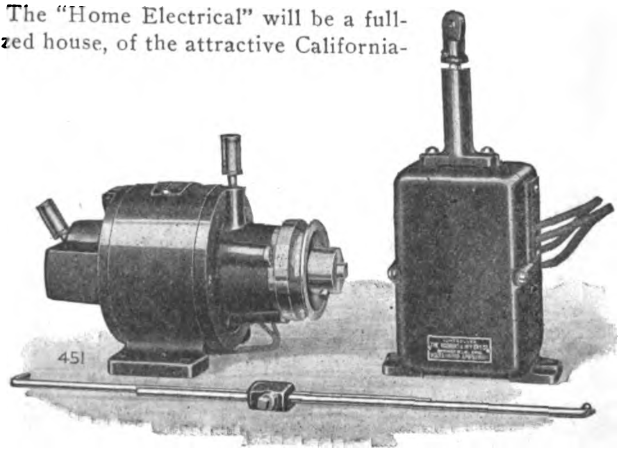
The dining room will be arranged to show how light lunches and suppers can be cooked with the electric chafing dish, or the electric grill, on the table if desired. This same cooking equipment may be utilized for preparing the morning meal in the adjoining breakfast room. The sewing room will be equipped with a motor-driven sewing machine, a small fan and an electric pressing iron suitable for attaching to the light socket. Even the bedroom will have its modern electrical appliances—a small fan, heating pad and baby milk warmer.

In connection with the "Home Electrical," and as a part of the exhibit, will be shown a garage with an electric runabout, battery-charging outfit, etc. Adjoining the garage is to be located a small work shop, completely equipped with electrically driven tools. And, for the benefit of those who live outside the cities and larger towns the use of small motors on the country place will be illustrated by a model dairy room with cream separator, churn, bottle washers, water-pumping station, and other small motor-driven machines, such as are used almost daily on every country place.

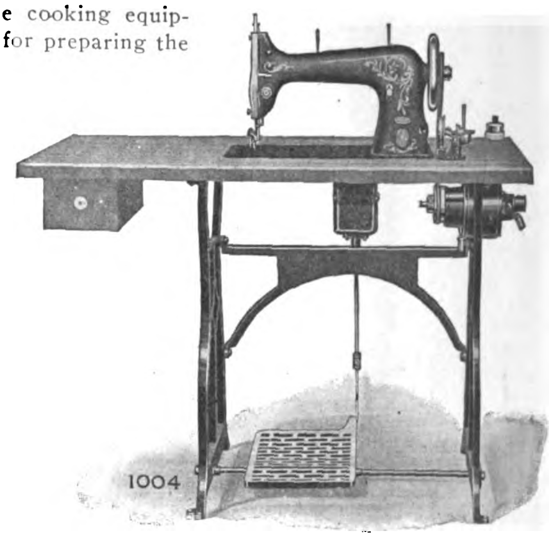
Robbins & Myers Factory Sewing-Machine Motor.

The sewing-machine motor illustrated herewith is constructed to do heavy work such as is required in tent and awning factories, mattress factories, automobile-top factories, department-store repair shops and in all shops where heavy materials are handled.

This motor is supplied for direct current circuits of 115 or 230 volts and has an output of one-sixth horsepower. The head on the pulley end is solid, completely inclosing the motor at this end. It covers a magnetic clutch brake, the winding of which is in series with the armature winding of the motor. The instant the current is turned on the brake clutch is released, and the instant the current is shut off the brake acts, bringing the motor to an immediate stop. The pulley is an integral part of this brake. It has a pitch diameter of three inches and is suitable for a three-eighths-inch round belt.



Sewing-Machine Motor with Controller and Connecting Rod.



Method of Mounting Outfit on a Sewing Machine.

The motor is of the series type and is furnished with a special controller, which is connected in series with the armature. The arm of the controller is connected to the pedal of the sewing machine with an adjustable rod. The controller is normally held in the "off" position by a spring, which acts on a plunger connected to the controller arm. By varying the pressure on the treadle the operator shifts the arm from one contact point to another and can get any speed from a few turns per minute up to 3,000 revolutions per minute.

This outfit is manufactured by the Robbins & Myers Company, Springfield, Ohio.

Ohio Breaks Coal Record.

All previous records in the coal production of Ohio were exceeded in 1913 both in quantity and value. The production increased to 36,200,627 tons.

Current Electrical News

NORTH ATLANTIC STATES.

NEWARK, N. J.—The Public Service Electric Company is planning for the erection of a large steam generating station at Point-no-Point on the Passaic River, near Newark. The initial structure will be about 366 by 154 feet, to comprise turbine room, boiler house, and switchboard. Four boilers and two 25,000-kilowatt steam turbogenerators will be included in the initial installation, and provision made for an ultimate capacity of 150,000 kilowatts. A.

RED BANK, N. J.—The Borough Council is considering the establishment of a municipal electric municipal street-lighting system. A.

SOUTH ATLANTIC STATES.

OAKLAND, MD.—The Farmers' Consolidated Telephone Company has been organized here, with a capital stock of $50,000, by R. A. Ravenscroft, A. D. Naynor and others.

MELBOURNE, FLA.—A municipal electric light plant will be established. Address the mayor.

NORTH CENTRAL STATES.

ADA, O.—There is a movement on foot among business men in this city to erect 18 specially designed electric lamp-posts along the Lincoln Highway. These posts will be topped with cluster incandescent lights in red, white and white and blue, carrying out the Lincoln Highway marker idea. The business men's club donated $500 toward this project. H.

CANTON, O.—Plans are in course of preparation for the installation of an ornamental lighting system on some of the downtown streets, and investigations are being made as to the type of light and light standard most suitable for that purpose. Mayor Stolberg can give information regarding the matter. L.

CINCINNATI, O.—The Archiable-Brouse-Parker Company, recently incorporated here with a capitalization of $5,000, by Henry M. Brouse, W. H. Parker, R. J. H. Archiable, William R. Parker and Gerritt J. Fredricks, Jr., will require a good deal of electrical equipment, motors, etc., in a plant which will be fitted up for the manufacture and repair of automobiles, etc. L.

CINCINNATI, O.—The Avondale Home Steam Laundry Company, of this city, has under way plans for the construction of a new plant, for which power will be furnished by an 85-horsepower engine and a 50-kilowatt generator, both of which have been secured. Several motors, which will be used in the operation of machinery, will be required. G. V. Wert is president. L.

CINCINNATI. O.—Property owners on Main Street are behind an effort which is being made to have an ornamental lighting system installed on that thoroughfare. The Main Street Merchants' Association is in touch with the project. L.

CINCINNATI, O.—Plans for a large steam bakery of modern type are being completed by Harry A. Crosby, architect, of this city, to cost $40,000, exclusive of land and equipment. Power and transmission equipment, as well as electric motors for the operation of the machinery, will be required. L.

CINCINNATI, O.—The Ohio Electrolytic Oxygen Company, recently incorporated with a capital stock of $200,000, will build a plant for the manufacture of oxygen and hydrogen by an electrolytic process which will involve the use of considerable electrical equipment. B. L. Heidingsfeld, J. B. Ratterman and others in Cincinnati are interested in the company. L.

CINCINNATI, O.—Electric elevators, wiring and other equipment for lighting, and a series of stations for the use of night watchmen in recording their rounds will be among the equipment which will be installed in the new courthouse to be constructed here. The Courthouse Building Commission has charge of the work. Bids will be advertised for on July 15. L.

CLEVELAND, O.—A number of motors for use in the operation of laundry machinery will be required by the United Electric Laundries Company, recently incorporated with a capitalization of $10,000. F. Carl Raymond, C. N. Fiscus and W. I. Lewis, of Cleveland, are among those interested. L.

COLUMBUS, O.—The Dunlap Electric Truck Company will probably require considerable electrical equipment in a plant which it will erect for the manufacture of electric motor trucks and accessories. The company was recently incorporated with a capitalization of $20,000 by T. C. Dunlap, George R. Hedges, Stewart A. Hoover and others. L.

HILLSBORO, O.—The Business Men's Association has appointed a committee to investigate and report upon the project of putting in a modern municipal light and power plant. The report is to be ready at the next meeting of the association. J.

LOGAN, O.—The Ohio Light & Power Company has secured the right of way for a transmission line from this point to Shawnee, O. The old electric light plant will be used as a substation, where the current will be transformed from the transmission voltage to the voltage used for commercial distribution. From Thornport, Perry County, a complete circuit of high-transmission lines will be constructed via Lancaster to Logan, and thence to New Straitsville, New Lexington, Somerset and Shawnee, where the lines intersect with those from Newark. J.

MEDINA, O.—Generating and transmission equipment will be purchased by the Phoenix Electric Company, which will construct an electric plant here to furnish current for commercial and domestic purposes. The capital stock of the company, which was recently incorporated, is $25,000. L.

SANDUNSKY, O.—H. Whitford Jones, of Cleveland, O., has been retained by city officials to assist in working out a street lighting system for Sandusky. H.

SPRINGFIELD, O.—A large factory building, fully equipped for the use of electric power, and containing its own electric power plant, will be constructed by E. L. Shuey, of Dayton, O., under plans now being made by Schenck & Williams, architects, of Dayton, for the use of manufacturer. The estimated cost of the structure, which will contain three or four stories, is $150,000. Freight and passenger elevators, electrically operated, will be among the equipment. L.

STEUBENVILLE, O.—The Council proposes to extend the electric lighting on Market and Fourth Streets. Address the mayor.

LADOGA, IND.—The Ladoga Telephone Company has been incorporated, with a capital stock of $20,000, by S. H. Foster, H. A. Foster and others.

TELL CITY, IND.—$17,000 will be expended improving the electric plant. Address the city clerk.

CHESTNUT, ILL.—The Chestnut Mutual Telephone Company has been incorporated, with a capital stock of $1,950, by Philander Simcoe, Henry A. Richner and others.

HAVANA, ILL.—The Havana Association of Commerce is at work securing subscriptions for the installation of a cluster light system and also is making an effort to secure the location here of a new electric light plant. A proposal made by the Central Illinois Public Service Company recently was rejected. Z.

McCONNELL, ILL.—The McConnell Telephone Exchange Company has been incorporated, with a capital stock of $1,000, by John F. Rackow, J. W. Stamm and others.

GRAND RAPIDS, MICH.—The new Y. M. C. A. building now being erected will be equipped with its own plant for generating light and power. Address the secretary.

WASHBURN, WIS.—The Northwestern Fuel Company will equip its coal docks with electricity. Address John Gibson, secretary.

AURORA, MINN.—$20,000 will be expended improving electric plant. Address the village clerk.

FESSENDEN, N. D.—A company will be established here, with a capital stock of $15,000, by J. Bursma, R. H. Smith and others to establish electric lights.

SIOUX FALLS, S. D.—An ornamental lighting system may be installed. Address Walter C. Leyse, city auditor, for desired information.

WESSINGTON SPRINGS, S. D.—At a mass meeting of the citizens the plan for the city to purchase the local electric light system was endorsed. Address city clerk.

DELMAR, IOWA.—The voters at a special election granted a 25-year franchise to the Maquoketah Light and Power Company.

ESTHERVILLE, IOWA.—$60,000 will be spent in more lights and water for the city.

LE MARS, IOWA.—Dr. W. M. Richey is at the head of a movement to extend boulevard lights.

MALVERN, IOWA.—The Malvern Light & Power Company is asking for a special election to decide the question of granting the company a franchise to build their line into Silver City.

NASHUA, IOWA.—The new Cedar Valley Power Company, in developing its business and plant, will build a new concrete dam here, which will be somewhat higher than the present one. An electric generator will be installed to help supply the current for the system.

WATERLOO, IOWA.—The Cedar Valley Power Company has been incorporated. A high-tension line will be run to Clarksville, Hampton, Rockwell and Charles City, and extension lines will be built to smaller towns. A new steam plant will be built at Charles City, equipped with steam turbine, and the water plant will also be equipped. H. H. Caughlin is president.

JEFFERSON CITY, MO.—The power plant on the bridge across the Missouri River was damaged to the extent of $5,000 by fire on June 15. The bridge was slightly damaged. M.

PALMYRA, MO.—$30,000 will be expended improving the light and water system. Address the city clerk for information.

SHELDON, MO.—An election will be held at Sheldon on June 30 to ratify or reject a contract with G. B. Beeny, owner of the local electric light plant, for current for the next three years and also to vote on the installation of 28 additional electric street lights. S. F. Hoppenbrock is city clerk. M.

ST. JOSEPH, MO.—The Council is planning ways to enlarge the capacity of street-lighting plant. Address Elliott Marshall, mayor.

ARKANSAS CITY, KAN.—A proposition to issue $28,000 in bonds for a municipal power plant was rejected at a special election on June 11. The proposition will come up again in the near future, however. An issue of $98,000 for water-works improvements carried. A proposition to make a contract with the Arkansas City Light & Power Company for street lighting and water power also carried. M.

BLUE RAPIDS, KANS.—New boilers and other equipment will be installed in the power plant at Blue Rapids by the management. M.

COFFEYVILLE, KANS.—Maple Street, between Seventh and Eighth, is to be included in the White Way at Coffeyville. Bids for the installation of poles will be received in July by the water and light department. M.

LA CROSSE, KANS.—An election on a bond issue of $12,000 for improvements and extensions to the street-lighting system will be held in July, on a date not yet announced. M.

OTTAWA, KANS.—A transmission line will be built between Ottawa and Marais des Cygnes in the near future by the power company at the latter place. The Bushong Electrical Company, of Ottawa, is interested in the work. M.

PITTSBURG, KANS.—Pittsburg is to have a "White Way." The entire business district is included in plans for the establishment of new ornamental standards. M.

POWHATTAN, KANS.—A bond issue of $10,000 for the establishment of a municipal electric light plant carried at a special election held on June 17. Only four votes were cast against the proposition, and work will begin in the immediate future. M.

SOUTH CENTRAL STATES.

DUCKTOWN, TENN.—Electricity to operate the machinery of its 1,000-ton mine here will be generated by a plant whch is being constructed by the Tennessee Copper Company. G.

RUTLEDGE, TENN.—The Rutledge Telephone Company has been incorporated with a capital stock of $2,500 and will construct 75 miles. Dan West is manager.

SEYPPEL, ARK.—The Crittenden Telephone Company has been incorporated with a capital stock of $10,000. W. G. Pritchard is president.

LAWTON, OKLA.—The Comanche Light & Power Company will reconstruct building and plant. John C. Keys is general manager.

NOWATA, OKLA.—The Nowata Electric Light Company, of this city, has been incorporated. The capital stock is $30,000. E. B. Lawson, Frank Hancock and D. B. Howell, all of Nowata, are the incorporators.

POND CREEK, OKLA.—$7,000 in bonds has been voted to improve, extend and further equip the electric light system. Address E. J. Gentry, mayor.

DALLAS, TEX.—The Southwestern General Electric Company of Dallas has increased its capital stock from $350,000 to $600,000. It will make improvements to its property here. D.

DAYTON, TEX.—The Dayton Light & Power Company, which has been organized here with a capital stock of $20,000, will construct an electric light and power plant. A. E. Kerr is interested in the project. D.

HICO, TEX.—The Central Texas Power & Transmission Company has been incorporated with a capital stock of $100,000 by V. P. Weiser, H. G. Gleason and others.

NEWSOME, TEX.—F. M. Streetman is interested in a proposition to establish an electric light plant.

ORANGE, TEX.—Smythe & McKee were given a franchise to operate a street railway system on June 17. G. M. Hedges and other capitalists also are interested. Work must begin within eight months and the road must be in operation inside of thirty months, according to the franchise. M.

TAFT, TEX.—The electric light plant of the Taft Gin & Oil Company, which was recently destroyed by fire, will be rebuilt. D.

WESTERN STATES.

BUTTE, MONT.—R. F. Morris, general manager, and Attorney Milton Gunn, of the Mountain States Telephone & Telegraph Company, recently submitted plans to the city for an underground system of telephone and telegraph wires in the business section, also in the greater portion of the residence district of this city, to cost approximately $500,000. Plans have been approved of by Mayor Duncan, City Engineer Flood, and City Attorney Mackel. As soon as the City Council approves of the plans, work will be started. It is expected that it will take from one to two years to complete the task. The plans further contemplate the immediate wiring of the portions of the city where improvement districts will be created in the future. O.

CHOTEAU, MONT.—The Choteau Light & Power Company will make extensive improvements during the summer and fall. A new generator and other machinery for the power house are numbered among the improvements. O.

LIVINGSTON, MONT.—Charles Garnier, Sr., L. R. Nye and Dan Miles are circulating petitions for ornamental street lights.

VICTOR, IDAHO.—The City Council is considering the installation of a municipal light and power plant, which will supply this city and adjacent territory. O.

OGDEN, UTAH.—Upon the recommendation of the city engineer, the Board of City Commissioners has authorized the extension of the "White Way" to include three more streets in the business district of Ogden. The engineer was ordered to take the matter up with the Utah Light & Power Company, the Ogden Rapid Transit Company and the Webber Club immediately. Lights will be placed on steel poles on both sides of Twenty-fourth Street between Washington and Wall Avenues, and on Grand Avenue between Twenty-fourth and Twenty-fifth Streets. When this work has been completed all streets within the business district will be lighted by the modern system. U.

SALT LAKE CITY, UTAH.—The Utah Light & Railway Company are preparing plans and specifications for an addition to their car barns to house the twenty-four new interurban cars which the company have on order and which will be delivered in the course of the next thirty days. The addition will cost $50,000. U.

NOGALES, ARIZ.—The City Council has granted a franchise to Spiro Proto and Monte Mansfield for the construction of an electric light and power plant here. D.

NORTH VANCOUVER, B. C.—The City Council recently passed a resolution requesting the District of North Vancouver to give the necessary year's notice to the British Columbia Electric Railway Company, of its intention to purchase the company's lighting and power franchise, when the same is available in August of 1915. O.

ANACORTES, WASH.—Plans for the installation of a telephone cable between this city and San Juan Islands are being discussed by the Independent Telephone Company. B. T. Conley, district manager of the Independent Company, is authority for the statement that cable will be laid from this city to Lopez on the Islands this summer. O.

CHEHALIS, WASH.—The City Commission is considering the installation of a cluster lighting system on both sides of the streets in the business section. O.

NORTH YAKIMA, WASH.—After repeated delays at the instance of both the city officials and the directors of the Yakima Central Heating Company, it has finally been decided to postpone the matter of putting the proposed electric franchise ordinance of the company before the voters until the county primary election in September. O.

RIDGEFIELD, WASH.—This city recently granted franchises for electric lighting system and a water system, to J. H. Cunningham, of Portland, Ore., and construction on the plants will commence as soon as possible and be rushed to completion. Twelve months are allowed for completion of the water works, and eight months for completion of the electric light plant. O.

ASTORIA, ORE.—The Northwest Electric Company will shortly build a large power plant on the White Salmon River, 12 miles from White Salmon. The company has placed orders for lumber, and the construction of shops, machinery houses, etc., will begin at once. O.

MAPLETON, ORE.—Richard H. Clow, of this city, was recently granted a franchise by the County Court, for the construction and maintenance of a system of electric light and power lines on the streets of this city and on some of the county roads adjacent. The promoter owns a water-power site near here, and will begin work immediately constructing a plant, which will furnish light and power to Mapleton and surrounding territory. O.

NEHALEM, ORE.—An election will be held to decide the question of issuing bonds for the construction of a power plant. Address the city engineer.

TILLAMOOK, ORE.—The City Council, at a recent meeting, granted a light and power franchise to F. D. Small and D. C. Urie, with the understanding that they shall within 18 months expend not less than $30,000 on the project. This proposition has been before the Council for the past six months. O.

CALISTOGA, CAL.—The Calistoga Electric Company has applied to the Railroad Commission for a certificate of public necessity and convenience authorizing it to serve consumers in Napa County north of Bale Station. The territory at present is occupied by the Napa Valley Electric Company.

LOS ANGELES, CAL.—The Midland Counties Public Service Corporation, formerly the Coalinga Water & Electric Company, has asked the Railroad Commission for authority to issue and sell preferred stock in the sum of $650,000. It is intended to devote approximately $410,000 to liquidation of floating indebtedness and to apply the remainder to new construction. Plans for new construction include 20 miles of 10,000-volt transmission line from San Miguel to San Lucas, 35 miles from San Miguel to Jolon, 35 miles from San Luis Obispo to Cambria, 30 miles from San Miguel through Natralla, Chelame and Stone Canyon Valleys, 60 miles from Santa Maria to Lompoc, seven miles from Port San Luis to Avila, together with distributing system, transformers and meters for service in the towns of Morros, Cayucos, Cambria, Bradley, San Ardo, San Lucas, Shandon, Parkfield, Jolon, Banta Ynez, Solvang, Orcuta, Los Olivos and Los Alamos.

PLACERVILLE, CAL.—Plans are under way by the Western States Gas & Electric Company for the expenditure of $50,000 in the enlarging and repairing of its system here.

SACRAMENTO, CAL.—A recommendation has been made to the Board of Control, that the State install in the basement of the Capitol building a light and power plant.

SAN DIEGO, CAL.—The City Council has ordered the installation of ornamental lighting posts on both sides of Fourth Street, between B Street and Broadway.

SANTA ANA, CAL.—The Beaver River Power & Plant Company has been incorporated with a capital stock of $100,000, by H. R. Waldo, G. F. Halliday and others.

TULARE, CAL.—Officials of the Tulare County Power Company have authorized the issue of $1,000,000 in bonds for extensions of the commercial systems. Application for a permit to issue the securities will be made to the Railroad Commission. One of the principal developments will be the construction of a new hydroelectric plant in the foothills east of Porterville, for which plans are now being drawn.

VALLEJO, CAL.—Bids have been called for the installation of 40 electroliers on Virginia Street.

PROPOSALS.

POWER HOUSE.—The Electrical Commission, of Easton, Md., through its president, has called for bids July 8 for a complete electrical plant, which will include engines, generators, switchboards, boilers, stack feed, water heater, piping, pumps, etc. Address T. Hughlett Henry, secretary.

TURBOGENATORS.—On June 30, bids will be received for furnishing one 625-kilowatt-ampere steam turbogenerator to the city of Moorehead, Minn. Plans and specifications may be seen at the office of Edward P. Burch, consulting engineer, 922 Plymouth Building, Minneapolis, Minn. Address R. G. Price, city clerk, Moorehead.

ELECTRIC HOISTS.—On July 2, bids will be received at Room 406 City Hall, Chicago, Ill., for furnishing and delivering to the city three motor-driven hoists for construction plants on the Wilson Avenue tunnel, according to plans and specifications on file in the office of the Department of Public Works. Address L. E. McGann, commissioner of public works.

MOTOR-DRIVEN HOISTS.—Sealed bids will be received at Room 406, City Hall, Chicago, Ill., July 2, for three motor-driven hoists for the construction plants on the Wilson Avenue tunnel, according to plans and specifications on file in the office of the Department of Public Works. Address L. E. McGann, commissioner of public works.

ELECTRIC ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until July 18, for the installation complete of an electric passenger elevator and hydraulic lift in the post office and courthouse at Guthrie, Okla., in accordance with drawing and specification, copy of which may be had at the office of the Supervising Architect.

WIRING.—On July 2 bids will be received for performing the work necessary to install the plumbing, drainage and gas fitting, heating and ventilating apparatus, galvanized-iron work, air washer, electric wiring, conduits, lighting fixtures, lamps and bells, generating set and switchboard, etc., in the new Karnes School, to be erected on Pacific Street, Kansas City, Mo. Address James B. Jackson, Jr., secretary of Board of Directors.

BRIDGE EQUIPMENT.—Sealed bids will be received July 1 at Room 406, City Hall, Chicago, Ill., for furnishing and installing electrical equipment for double-leaf trunnion bascule bridge over the Chicago River at Webster Avenue. This work includes all motors for operating the bridge leaves, center locks and pumps, controllers, lights and fixtures, switches, conduits, wiring, cables, etc., installed complete and ready for operation. Address L. E. McGann, commissioner of public works.

GOVERNMENT BUILDINGS.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until the dates given below for the construction complete, including mechanical equipment, lighting fixtures, etc., of the following buildings: Until July 29, United States post office at Garden City, Kans.; until August 3, United States post office at Three Rivers, Mich.; until August 6, United States post office at Gary, Ind. Drawings and specifications may be obtained from the custodians of the respective sites.

PLANT AND LINE EQUIPMENT.—On July 2, bids will be received for labor and material required in the construction of an electric lighting system for the village of Hills, Minn. The work is divided into four parts. Part 1, a cement block or clay tile building; part 2, furnishing and erecting one 50 horsepower oil engine, necessary piping and accessories; part 3, one 375-kilowatt-ampere, 1,200-revolutions-per-minute three-phase, 60-cycle alternator, with belted exciter, switchboard, etc.; part 4, furnishing and erecting poles, wires, street lamps, transformers, etc., for the electrical distribution system of the village of Hills. Address Otto Nelson, village recorder.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids for the following material until the dates given. Bidders should get copies of the schedule numbers given from the office mentioned above or the navy pay office nearest each navy yard. Until July 7; schedule No. 6902, 65 kits electricians' tools, a 60-inch motor-driven geared-head engine lathe, a direct-current 220-volt distributing panel; schedule No. 6928, 17,000 feet stranded portable ship-lighting cable, 3,700 feet single rubber-insulated lead-covered wire, 8,000 feet solid rubber-covered lighting and power wire, 51,000 feet duplex rubber-insulated lighting and power wire; schedule No. 6930, miscellaneous double-cotton-covered magnet wire, 8,000 feet plain 30,000-circular-mil twin-conductor wire, ten 30-inch parabolic searchlight-mirrors; schedule No. 6925, 600 bunker lamps; schedule No. 6938, the annual supply of miniature tungsten lamps; schedule No. 6926, 600 pounds electrician's half-and-half string solder; schedule No. 6934, 24 single-phase pole and subway transformers. Until July 14; schedule No. 6896, miscellaneous radio sets, transformers and masts; schedule No. 6913, miscellaneous X-ray apparatus, etc.; schedule No. 6918, 270 telephones.

FINANCIAL NOTES.

Stockholders of the Philadelphia Company at a special meeting voted in favor of reducing the capital stock from $73,400,000 to $69,433,400. The reduction will be made in the five-per-cent shares, according to present plans.

Boston interests have organized the Texas Southern Electrical Company, which has purchased the electric light and power plants at Victoria, Texas, and Cuero, Texas. The company is planning construction of an extensive system of interurban railways, connecting different southern Texas towns.

The Public Service Commisison of the Second District, New York state, has authorized the Federal Telephone & Telegraph Company to issue $500,000 of seven-per-cent cumulative preferred stock at not less than par, the proceeds to be used to liquidate floating debt and for reimbursement of the treasury for capital expenditures from income.

The National City Bank and N. W. Halsey & Company have purchased $12,000,000 five-per-cent first-mortgage bonds of the North Western Elevated, Chicago. This issue is created by a new mortgage, the old first mortgage for $25,000,000 being canceled.

The Maryland Public Service Commission has approved of the modified plan of the United Railways & Electric Company to issue $1,000,000 two-year convertible five-per-cent notes. The new plan differs from the original one only in that it provides that the notes may be converted at par into common stock at the face value of the latter, which is $50 a share instead of thirty-three and one-third dollars. An underwriting syndicate already is being formed to take such portion of the note as may not be subscribed by the stockholders.

The Michigan Railways Company has sold to New York bankers $5,000,000 five-year six-per-cent notes, dated June 1, 1914, and guaranteed by the Commonwealth Railway, Power & Light Company. Notes are part of an authorized issue of $7,000,000. A large amount of the issue has already been sold. Proceeds of the sale will be used to pay for the construction of interurban railway lines between Saginaw and Bay City, and between Grand Rapids and Kalamazoo. Both of these lines are practically finished and ready for operation, the money having been advanced by the Commonwealth company, the holding company, which will now be reimbursed.

Dividends.

	Term	Rate	Payable
Am. Pub. Utils.	Q	0.75%	July 1
Am. Pub. Util., pf.	Q	1.5%	July 1
Am. Tel. & Tel.	Q	2%	July 15
Au'ra, El. & Chi., pf.	Q	1.5%	July 10
Balt. Elec. pf.	Q	2.5%	July 1
Buff. Gen. Elec.	Q	1.5%	June 30
Cen. & So. Am. Tel.	Q	1.5%	July 9
Chi. City & Con. Rys., pf.	S-A	2.25%	July 1
Con. Trac. of N. J.	S-A	2%	July 1
Cum. Co. P. & L. pf.	Q	1.25%	Aug. 1
Detroit Edison	Q	1.75%	July 15
Elec. Stor. Bat.	Q	1%	July 1
Elec. Stor. Bat.	Q	1%	July 1
Elmira W., L. & R. R. 1st pf.	Q	1.75%	July 1
Kan. G. & E. pf.	Q	1.75%	July 1
Mexican Tel.	Q	2.5%	July 16
Nat. Carbon	Q	1.5%	July 1
Nat. G., El. L. & P.	Q	1%	July 1
Nat. G., El. L. & P.	Q	1.5%	July 1
N. E. Tel. & Tel.	Q	1.75%	June 30
P. S. C. of N. J.	Q	1.5%	June 30
Reading Trac.	S-A	0.75%	July 1
Wash., Balti. & Annap. El. Ry., pf.	Q	1.5%	June 30
West India El.	Q	1.25%	July 2
W. Ohio Ry. 1st pf.	Q	1.75%	July 10
W. Ohio Ry., 2d pf.	Q	1.5%	July 20
W. Penn Trac. pf.	Q	1.5%	July 15
Winnipeg El. Co.	Q	3%	

Reports of Earnings.

DAYTON POWER & LIGHT.

	1914	1913
May gross	$ 68,003	$ 58,722
Net before interest	29,483	25,222
Balance after preferred dividend	2,906	644
Five months' gross	389,823	263,932
Net before interest	174,368	111,300
Balance after preferred dividend	43,805	*11,714

*Deficit.

SOUTHERN BELL TELEPHONE.

The Southern Bell Telephone & Telegraph Company has issued a report to the New York Stock Exchange, for the year ended December 31, 1913, wihch compares as follows:

	1913.	1912.
Gross revenue	$7,289,799	$7,454,295
Expenses, taxes, interest and depreciation	4,884,468	4,750,626
Net earnings	2,405,331	2,703,669
Interest	741,411	638,700
Surplus	1,663,920	2,064,969

TWIN CITY LINES.

	1914.	1913.
April gross	$ 743,578	$ 697,429
Net	357,546	346,770
Surplus after charges	228,398	219,523
Four months' gross	2,920,605	2,733,883
Net	1,317,573	1,287,846
Surplus after charges	801,363	774,367

LEHIGH VALLEY TRANSIT.

	1914.	1913.
April gross	$ 137,274	$ 124,583
Net	67,581	57,523
Surplus	10,675	11,705
Twelve months' gross	1,790,095	1,619,395
Net	897,343	813,358
Balance	264,700	287,452

INTERSTATE ELECTRIC CORPORATION.

Combined earnings of subsidiary companies:

	1914.	1913.
February gross	$ 18,204	$ 16,434
Net earnings	7,949	7,411
Two months' gross	34,858	29,425
Net earnings	14,188	13,257
Twelve months' gross	218,462	194,704
Net earnings	102,974	92,980

MONONGAHELA VALLEY TRACTION.

	1914	1913
April gross	$ 80,616	$ 71,065
Net earnings	48,854	44,864
Surplus after charges	23,319	20,753
Four months gross	306,429	277,446
Net earnings	188,018	179,976
Surplus after charges	86,135	83,555

MEXICAN TELEPHONE.

The Mexican Telephone & Telegraph Company reports for the year ending February 28, 1914, as follows (Mexican currency):

	1914	1913
Gross	$749,290	$716,741
Expenses	376,242	332,132
Net	373,048	384,609
Construction	147,416	616,793

President Smith says, in part: "The company has complied with all its obligations to national, state and municipal governments. Unsettled condition of affairs in Mexico has not seriously affected our business. Collections have been somewhat slower and taxes have been above normal. Owing to the scarcity and high rate of exchange, we have had but a small portion of earnings remitted."

CENTRAL & SOUTH AMERICAN TELEGRAPH.

The Central & South American Telegraph Company reports as follows for the quarter ended June 30, 1914 (receipts partly estimated):

Central & South American Telegraph—	
Traffic receipts	$387,500
Net after taxes	277,500
Other income	3,500
Total income	231,000
Dividend	143,565
Surplus	87,435
Previous surplus	3,385,397
Total surplus	3,472,832

PACIFIC POWER & LIGHT.

	1914	1913
May gross	$ 107,419	$ 104,721
Net after taxes	57,862	44,468
Surplus after charges	26,367	16,291
12 months' gross	1,319,076	1,260,336
Net after taxes	686,358	592,154
Surplus after charges	322,071	287,856
Balance after preferred dividends	77,071	52,856

KANSAS GAS & ELECTRIC.

	1914	1913
May gross	$ 84,417	$ 76,597
Net after taxes	28,889	25,787
Surplus after charges	13,679	11,307
12 months' gross	1,097,279	943,429
Net after taxes	400,844	320,342
Surplus after charges	224,092	154,842
Balance after preferred dividends	119,092	49,842

CITIES SERVICE.

	1914	1913
May gross	$ 281,104	$ 113,021
Net after expenses	272,233	104,112
Balance after interest	243,067	104,112
Balance after preferred dividends	106,234	40,573
Surplus after common dividends	27,722	7,015
Twelve months' gross	3,245,044	1,405,656
Net after expenses	3,151,220	1,334,921
Balance after interest	2,882,324	1,334,921
Balance after preferred dividends	*1,606,789	660,768
Surplus after common dividends	915,506	364,912

Accumulated surplus to May 31, 1914, $2,654,591.

*Equivalent to 11.5 per cent on common stock.

SHAWINIGAN WATER & POWER.

Shawinigan Water & Power Company for May made a new high record in gross earnings, continuing the steady increase which has been a feature for a number of months. Earnings of the company for the first five months of 1914 compare as follows:

	1914	1913
May	$141,965	$133,900
April	141,850	133,785
March	141,815	133,240
February	141,650	132,625
January	141,000	131,200

VIRGINIA RAILWAY & POWER COMPANY.

	1914	1913
May gross	$ 433,497	$ 416,030
Net	221,671	209,047
Surplus after charges	92,430	89,265
11 months' gross	4,717,587	4,443,494
Net	2,373,454	2,224,313
Surplus	971,000	932,894

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 22.	June 15
American Tel. & Tel. (New York)	123⅝	123¼
Commonwealth Edison (Chicago)	136⅝	136
Edison Electric Illuminating (Boston)	250	250
Electric Storage Battery common (Philadelphia)	51	52
Electric Storage Battery preferred (Philadelphia)	51	52
General Electric (New York)	147⅞	148½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	11¼	12
Massachusetts Electric preferred (Boston)	60	62
National Carbon common (Chicago)	115	113¼
National Carbon preferred (Chicago)	119½	119
New England Telephone (Boston)	131	131
Philadelphia Electric (Philadelphia)	25¼	25¼
Postal Telegraph and Cables common (New York)	80	80¾
Postal Telegraph and Cables preferred (New York)	67¼	67½
Western Union (New York)	59¾	61¾
Westinghouse common (New York)	76	76¼
Westinghouse preferred (New York)	124	124

PERSONAL MENTION.

MR. G. M. MILLER, formerly of H. M. Byllesby & Company, has become associated with the firm of A. E Fitkin & Company, in the capacity of sales manager.

PROF. ALBERT F. GANZ, of Stevens Institute of Technology, is now in Winnipeg, Manitoba, assisting the Public Utilities Commission of that province.

MR. N. P. ZECH has resigned as assistant to the general auditor of H. M. Byllesby & Company, to become treasurer and general auditor of the Atlantic Gas & Electric Company.

MR. GEORGE C. ISBESTER, for the past three years attached to the New York office of the Rail Joint Company, has been given charge of its Chicago office, 215 Railway Exchange Building.

MR. CHARLES C. ADAMS, vice-president of the Postal Telegraph-Cable Company, has been elected president of the Board of Trustees of the village of Lawrence, Long Island, N. Y.

DR. E. RATHENAU, general manager of the Allgemeine Elektricitäts Gesellschaft, Berlin, Germany, has been made an honorary member of the Verband Deutscher Elektrotechniker.

MR. T. P. SHONTS, president of the Interborough Rapid Transit Company, New York City, sailed recently for Europe on the new steamer *Vaterland*. He will be abroad about six weeks.

MR. GERARD SWOPE, vice-president and general sales manager of the Western Electric Company, is making a two months' trip to Europe, in the course of which he will visit the company's various allied interests abroad.

MR. ALFIN BACKLUND, chief electrician of the municipal electric light plant in Kansas City, Kans., was elected president of the Kansas City chapter of the National Association of Stationary Engineers at the annual meeting on June 18.

MR. R. C. CONNLEY, a well known electrical contractor of Sedalia, Mo., was married to Miss Barbara Moore, of Lexington, Mo., at the latter place on June 16. The couple will make their home at Sedalia after an automobile honeymoon through Missouri.

MR. WILLIAM P. BEAR, of Chicago, Ill., has been appointed electrical engineer of the Illinois Public Utilities Commission. Mr. Bear is well known throughout the industry, and was for a number of years connected in a sales and engineering capacity with several of the larger companies.

MR. H. M. BYLLESBY, president, and MR. JOHN J. O'BRIEN, vice-president and general auditor of H. M. Byllesby & Company, are making a tour of inspection of the Pacific Coast public utility properties managed by their firm. MR. OTTO E. OSTHOFF, vice-president and chief engineer, and MR. ELMER DOVER, vice-president in charge of Pacific Coast properties, will join them in the trip.

MESSRS. N. C. KINGSBURY and H. B. THAYER, vic-presidents of the American Telephone & Telegraph Company, are busily engaged with a large staff of toll experts, accountants and others in working out the final details of the proposed contract for toll-line service between the American Telephone & Telegraph system and independent telephone companies in accord with the general offer made by the Bell organization to the attorney-general of the United States last December.

MR. O. B. HENDERSON, sales manager of the pleasure car department of the Baker Motor Vehicle Company, Cleveland, O., has resigned on account of personal interests on the Pacific coast which will demand his constant attention. Mr. Henderson leaves the latter part of the month to take up a permanent residence in Los Angeles. The company announces that many years of faithful and untiring service have been greatly appreciated and Mr. Henderson's departure is greatly regretted.

MR. WILLIAM A. BOLE has been elected vice-president in charge of production and erection, by the board of directors of the Westinghouse Machine Company for the plants at East Pittsburgh and Trafford. Mr. Bole has been in the continuous employ of the company since August, 1882, having successfully filled the positions of general shop foreman, superintendent, manager of works and consulting engineer. He has, therefore, taken part in the growth and development of the company since it employed less than 100 men until the present time when the total forces run up into thousands of operatives.

William A. Bole.

MR. CHARLES E. SCRIBNER, chief engineer of the Western Electric Company, returned early in the month from a two months' visit to Europe. His trip was primarily to appear before a Parliamentary Commission in London to present data regarding the new long-distance high-speed printing telegraph developed under his supervision. The presentation resulted in an order for a trial installation for which the equipment is now in process of manufacture. During his stay in Europe Mr. Scribner also inspected and tested the new duplex cable installed by the German Reichspost between Berlin and Magdeburg.

OBITUARY.

MR. PETER C. DOLAN, formerly general manager of the Pittsfield (Mass.) Street Railway Company, and a pioneer in New England electric railway development, died at Pittsfield on June 12 after an illness of five days. Mr. Dolan and his brother, the late Patrick H. Dolan, were associated in street-railway work from the late seventies until 1909 and were widely recognized in electric-traction circles as exponents of sound policies in the field of construction and operation. The Pittsfield system, which was regarded as a model property for its size, was sold to the Berkshire Street Railway interests in 1908. Since 1909 Mr. Dolan has lived in retirement at Pittsfield. He was 59 years of age and is survived by his widow and four children.

NEW PUBLICATIONS.

PHASE RELATIONS.—An article by A. S. Langsdorf entitled "Phase Relations in Interlinked Polyphase Circuits" has been reprinted from the January issue of *Washington University Studies.*

NEW YORK MERCHANTS' ASSOCIATION—The Yearbook of the Merchants' Association of New York for 1914 is being distributed. It contains 3600 names, and annual reports of the officers and various bureaus.

REPORT OF PUBLIC WORKS IN HOLLAND.—The annual report of the Board of Public Work of the city of Holland, Mich., for the fiscal year ending March 16, 1914, has been issued. This includes the Lighting Department.

FLAME STANDARDS AND PHOTOMETRY.—The Bureau of Standards, Washington, D. C., has issued a circular entitled "Flame Standards in Photometry" which discusses the Hefner, pentane and Carcel lamps as fundamental photometric standards.

EXPORTS AND IMPORTS.—The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued Bulletin No. 15, entitled "Trade of the United States with the World, 1912-1913." This covers both imports and exports, listed according to countries and articles, and covers two fiscal years.

BOND BETWEEN CONCRETE AND STEEL.—The Engineering Experiment Station of the University of Illinois has issued Bulletin No. 71, entitled "Tests of Bond Between Concrete and Steel," by Duff A. Abrams. This investigates the effect upon bond of surface of bar, shape of section, condition of storage, age, mix, etc.

MEASUREMENT OF HIGH VOLTAGES.—An article from *Washington University Studies* entitled "The Measurement of High Voltages," by William B. Kouwenhoven, has been reprinted in pamphlet form. This is a portion of a thesis presented for the doctor degree at the Karlsruhe Technical High School. The subject is taken up from both the theoretical and experimental sides.

MEASUREMENT OF EARTH'S MAGNETISM.—The article in the March issue of Terrestial Magnetism and *Atmospheric Electricity* entitled "Regarding Improvement of Appliances for Measurement of the Earth's Magnetic Elements by Magnetic and Electric Methods," by L. A. Bauer, has been reprinted. It includes a description of the new laboratory of the Department of Terrestial Magnetism of the Carnegie Institution of Washington.

A. E. R. A. ENGINEERING MANUAL.—The American Electric Railway Engineering Association has completed the publication of the A. E. R. A. Engineering Manual, which is a loose-leaf publication nearly two inches in thickness. It consists chiefly of the reports of the Committee on Standards, being the compilation of many years' work in the collection of standards, recommendations, miscellaneous methods and practices that have been adopted or approved by the Engineering Association since its organization. It is planned to augment the volume from year to year by the addition of such new standards or recommendations as are adopted from time to time. The different sections of the volume are illustrated and very completely indexed. Copies of this valuable publication may be obtained by non-members of the Association for $3.00, plus $1.00 for the binder.

NEW INCORPORATIONS.

PORT ARTHUR, TEX.—The Pier Railway Company has been organized here for the purpose of constructing a street-railway system and an interurban line. K. M. Smith, J. W. Williams and G. H. Bosler are incorporators. D.

NEW YORK, N. Y.—Marconi-Telegraph-Cable Company, Incorporated, has been granted articles of incorporation, capitalized at $50,000. The incorporators are Edward J. Nally, of Ossining, N. Y.; John Bottomley, of New York City, and George S. DeSousa, of Brooklyn.

SOUTHOLD, N. Y.—Cutchogue Electric Company, Incorporated, has been granted articles of incorporation to generate electricity, etc. The capital stock of the company is $10,000 and the incorporators are S. N. Moore, O. B. Goldsmith and H. L. Fleet, all of Cutchogue, N. Y.

ROCHESTER, N. Y.—Stromberg-Carlson Telephone Manufacturing Company has been granted a charter to manufacture electrical apparatus, etc. Capital $450,000. Incorporators are Wesley M. Angle, W. Roy McCanne and Fred C. Goodwin, all of Rochester, N. Y. This is a reorganization of this well known manufacturer.

PITTSBURGH, PA.—T. K. H. Sign Manufacturing Company, the object of which is to manufacture electric signs and other signs of all descriptions, has been incorporated in Pittsburgh, under the laws of Pennsylvania, with a capital stock of $5,000. The incorporators are Leon S. Klein, Morton H. Herzog, and Eugene B. Strassburger, all of whom reside in Pittsburgh. S.

DATES AHEAD.

American Society for Testing Materials. Seventeenth annual meeting, Atlantic City, N. J., June 30-July 3. Secretary, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, N. Y., October 1-3. Secretary, Joseph W. Richards, South Bethlehem, Pa.

American Institute of Electrical Engineers. Pacific Coast convention, Spokane, Wash., September 9-11. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Cadillac Hotel, Detroit, Mich., July 15-18. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 21-24. Secretary, D. L. Gaskill, Greenville, O.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery Place, New York, N. Y.

New England Section of the National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-11. Secretary, S. E. Pohe, Bloomsburg, Pa.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 15-18. Secretary, C. R. George, Houston, Tex.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Missouri Electrical Contractors' Association. Annual convention St. Louis, Mo., July 11. Secretary, A. J. Burns, Kansas City, Mo.

With the Electrical Manufacturers

American Electrical Works, Phillipsdale, R. I., has recently issued its June price list covering bare, weatherproof and rubber-covered wires and cables, standard cables, galvanized-iron wire, magnet, annunciator and office wires, and various types of lamp cords.

Terry Steam Turbine Company, Hartford, Conn., announces that it has just finished one of the largest months of its history in points of orders received. In order properly to take care of this business and possible future business, additional machine tools have been installed, increasing the capacity of the plant approximately 25 per cent.

Wagner Electric Manufacturing Company, St. Louis, Mo., has recently issued bulletin No. 105, devoted to central-station transformers. This bulletin gives a complete description of these transformers as well as theoretical data on core loss, copper loss, temperature rise, efficiency, regulation, parallel operation, etc., the latter being of great service and convenience as a general reference. Numerous excellent illustrations are included, and detailed descriptions are given of all parts of the transformers, including outlet bushings, voltage taps, insulation, and cutouts.

The Electric Controller & Manufacturing Company, Cleveland, O., has recently issued a reprint of a very interesting article entitled, "Lifting the One Hundred and Thirty-Million-Pound Quebec Bridge," by H. F. Stratton. This article, which appeared in the December, 1913, issue of the *Engineering Magazine*, describes the construction methods employed in erecting the new Quebec bridge. Many exceeding difficult problems attending erection, required special methods of construction and erection, involving the use of many controllers for huge erecting hoists, towers, etc.

Ward-Leonard Electric Company, Bronxville, N. Y., takes considerable pride in the approval of its Nodaz vehicle-headlight device by the Chicago Board of Motor Vehicle Headlight Inspection. This Board is an offshoot of the Chicago Department of Police, and has been authorized by municipal ordinance to inspect motor-vehicle-headlight equipments and permit the use of those only that meet with approval. This regulation has been developed in accordance with the agitation to minimize the dangers resulting from the excessive glare of automobile headlights.

The Electric Storage Battery Company, Philadelphia, Pa., has received an additional order for 650 sets of Ironclad-Exide batteries for locomotive headlight service from the Southern Pacific Railway Company. With the previous order received several months ago, this makes a total of 946 sets or 2,838 cells of type 13-MV Ironclad-Exide batteries which will be used in this class of service by the Southern Pacific Railway Company. The ruggedness of this type of battery, its long life and the fact that it can be operated for long periods without cleaning, makes this battery well adapted to the severe requirements in this class of railway work.

General Electric Company, Schenectady, N. Y., has recently issued its bulletin, No. 41,302, which covers a complete line of standard polyphase induction motors. The characteristics of the different forms of these motors are analytically described, and the windings used for various classes of service are shown. The illustrations show in detail the construction of the component parts of the motors, and the bulletin also illustrates and describes the various types of compensators and control apparatus required. Several plates of repair parts are given as well as a suitable index to the bulletin. Bulletin No. 48,010, which is another recent publication, is devoted to the use of electricity in the shoe and leather industry. This is a bulletin of 32 pages, which considers, in considerable detail, the subject of electric drive in shoe factories and tanneries. There are numerous illustrations of installations in various factories of prominence in the East. The bulletin should be of great interest to those connected with this industry. Bulletins Nos. 43,400, 43,401 and 43,402 are devoted to the subject of modern lighting with Mazda lamps in woodworking plants, in the clothing industry and in machine shops and metal working plants respectively. These bulletins describe the various lamps adapted to this service and give suggestions as to the size and style of the units best suited to the greatest all-round efficiency. There are numerous illustrations in each bulletin, which in themselves offer suggestions to those contemplating the installation of a modern lighting system. Another recent publication is bulletin No. 46,201, which illustrates and describes single-phase watt-hour meters, type I-14. These meters are provided with means for obtaining full and light-load adjustment.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the receipt recently of quite a number of orders for the textile industry. These orders total 217 alternating-current motors, aggregating 4,546 horsepower, and also other equipment as follows: Waltham Bleachery & Dye Works, Waltham, Mass., 13 motors totaling 400 horsepower. Lowell Bleachery, Lowell, Mass., three motors totaling 100 horsepower. River Spinning Company, Woonsocket, R. I., seven motors totaling 230 horsepower, and two 37.5-kilowatt transformers with one three-panel switchboard. City Manufacturing Company, New Bedford, Mass., two motors totaling 75 horsepower. Barre Wool Combing Company, South Barre, Mass., one 100-horsepower motor. Shetucket Company, Norwich, Conn., six motors totaling 105 horsepower. American Mills Company, Waterbury, Conn., 16 one-horsepower loom motors with 16 textile-type switches. American Woolen Company, Fulton, N. Y., three 1,160-kilowatt water-wheel-driven alternators, with three 30-kilowatt exciters and one 75-kilowatt motor-generator exciter set, with a 14-panel switchboard. Clifton Textile Company, Weehawken, N. J., nine motors totaling 95 horsepower. John H. Meyer & Company, Bloomsburg, N. J., one 75-kilowatt turbogenerator unit and exciter with three-panel switchboard, and four motors totaling 35 horsepower. Pine Tree Silk Mills Company, Philadelphia, Pa., 72 one-half-horsepower textile-type loom motors with 72 textile-type switches. J. & J. Dobson, Philadelphia, Pa., one 470-kilowatt low-pressure turbogenerator unit; one Westinghouse Le-Blanc barometric condenser; two motors totaling 500 horsepower; one 25-kilowatt turbine-driven exciter; one 16-kilowatt motor-generator exciter set; one six-panel switchboard. William H. Taylor & Company, Allentown, Pa., seven motors totaling 75 horsepower. Pennsylvania Textile Company, York, Pa., one 562-kilowatts belted alternating-current generator; one 22.5-kilowatt belted exciter; 23 motors totaling 600 horsepower. The Barnesville Manufacturing Company, Fairmont, W. Va., 10 motors totaling 90 horsepower. Norfolk Collar & Pad Company, Norfolk, Va., 11 motors totaling 134 horsepower. Orr Cotton Mills, Anderson, N. C., one 1,000-kilowatt turbo-generator unit; one 10-kilowatt turbo-exciter set; one Westinghouse Le-Blanc condenser; one 12.5 kilowatt motorgenerator exciter set; one four-panel switchboard. Cliffside Mills, Cliffside, N. C., one 375-kilowatt turbogenerator unit with exciter; one 125-kilowatt turbogenerator; one 18-kilowatt generator; two motors totaling 480 horsepower; one four-panel switchboard. Flint Manufacturing Company, Gastonia, N. C., two 200-kilowatt transformers with two-panel switchboard; 14 motors totaling 300 horsepower; 13 oil circuit-breakers. Brown Manufacturing Company, Concord, N. C., 10 motors totaling 290 horsepower; 6 oil circuit-breakers; four auto starters. Aurora Cotton Mills, Burlington. N. C., three 100-kilowatt, 22,000-volt outdoor transformers and one outdoor substation complete; also 11 motors totaling 240 horsepower. Pelzer Manufacturing Company, Pelzer, S. C., two 100-horsepower motors; two 300-kilowatt transformers; one four-panel switchboard. Lang Manufacturing Company, West Point, Ga., 13 motors totaling 275 horsepower; three 100-kilowatt and one 15-kilowatt 11,000-volt transformers, with three-panel switchboard and one set electrolytic lightning arrester. The Westinghouse Electric & Manufacturing Company also reports the following orders received for paper-mill equipments. S. D. Warren & Company, West Brook, Me., five 150-horsepower motors. J. E. Henry & Sons, Lincoln, N. H., one 125-horsepower motor.

Record of Electrical Patents.

Issued by the United States Patent Office, June 16, 1914.

1,099,909. Apparatus for Testing Storage-Battery Circuits. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. A voltmeter-ammeter system with special ground connections.

1,099,912. Telegraph Key. R. C. Brittin, Norwich, Conn. Includes means for locking key.

1,099,914. Advertising Device. J. Buckley, assignor to A. Summer, East Cambridge, Mass. A motor-operated automatom.

1,099,915. Key Plunger Unit. E. B. Craft, assignor to Western Electric Co., New York, N. Y. A plunger switch.

1,099,960. Electric Converter. C. Irving Zimmerman, J. G. Zimmerman, administrator, assignor to General Electric Co. A combination of mercury rectifiers and storage batteries.

1,099,968. Protective Device. E. E. F. Creighton, assignor to General Electric Co. A number of aluminum-cell arresters with special connections.

1,099,986. Outlet or Junction Box. G. A. Lutz, New York, N. Y., and C. C. Sibley, Perth Amboy, N. J. has siding caps over outlet openings. (See cut.)

1,099,987. Outlet or Junction Box. G. A. Lutz, Plainfield, N. J. A modification of 1,099,986.

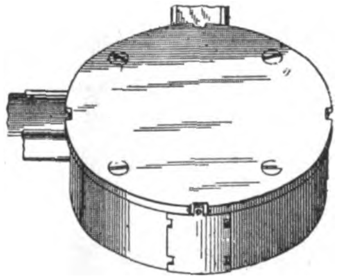
1,099,988. Electric Flat Iron. C. P. Madsen, assignor to The Michigan Stove Co. Covers details of fibrous insulation.

1,099,998. Submarine Signaling Apparatus. J. Schiessler, Baden, near Vienna, Austria-Hungary. A combined wireless-telegraph and submarine signaling system.

1,099,999. Electrical Heater. W. S. Sheppard, Colorado Springs, Colo. A water heater.

1,100,002. Head for Insulating Machines. L. Van Ness, Akron, O. For applying plastic insulation.

1,100,014. Overhead Contact Shoe for Electric Railways. G. Gibbs, New York, N. Y., and E. R. Hill, East Orange, N. J. A pantograph shoe with retractable end portions.



1,099,986 Outlet Box.

1,100,063. Timing Device for X-Ray Tubes and Similar Apparatus. C. F. Fayer, assignor to Wappler Electric Mfg. Co., New York, N. Y. Contact making and breaking device.

1,100,116. Testing System for Telephone Party Lines. C. C. Bradbury, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Covers details.

1,100,117. Electromagnetic Musical Instrument. G. Breed, Philadelphia, Pa., assignor to Lyrachord Co., New York, N. Y. An electric piano.

1,100,134. Controller. C. A. Jacobson, assignor to Kaestner & Hecht Co., Chicago, Ill. A contactor control panel.

1,100,139. Electric Locomotive with Automatic Cable Reel. W. S. Mayers, Columbus, O., assignor to The Jeffrey Mfg. Co. A motor-operated cable reel.

1,100,140. Automatic Cable Reel. W. S. Mayers, assignor to The Jeffrey Mfg. Co. A modification of 1,100,139.

1,100,167-8. Telegraph Key. A. H. Adams, assignor to Western Electric Co. Has a number of contacts.

1,100,188. Electromagnetic Device. B. Liebowitz, New York, N. Y. A polarized relay.

1,100,191. Electric Furnace. W. F. McNabb, Pittsburgh, Pa. An electric-arc crucible furnace.

1,100,207. Semaphorical Direction Indicator. G. F. Watts, Brooklyn, N. Y. An electrically operated semaphore.

1,100,225. Electric Testing Apparatus. J. H. Conlon, Union, Ore. A compact battery, resistance and signal-lamp arrangement.

1,100,243. Railway Signal Apparatus. G. Jackson, Jr., Hobokus, N. J. A track-operated signal.

1,100,253. Electric Switch. A. N. Petit, West Orange, N. J. A pull-chain socket with extender.

1,100,257. Automatic Regulator for

Motor Driven Pumping Apparatus. R H. Rice, assignor to General Electric Co. Automatic electrical control of motor-driven pump.

1,100,262. Means for Handling and Distributing Parcels, Bales, Loads and Other Articles. A. G. Seaman, Bowden, England. A remote-controlled electric system.

1,100,268. Interlocking Overhead Trolleys. S. B. Stewart, Jr., Schenectady, N. Y., assignor to General Electric Co. A combination trolley and pantograph.

1,100,280. Method of and Apparatus for Indicating the Speed of Electric Motors. E. F. W. Alexanderson, assignor to General Electric Co. Consists of simultaneously measuring and indicating voltage across armature and field terminals. (See cut.)

1,100,290. Method of and Apparatus for Electrolyzing Liquids. H. H. Dow, assignor to The Dow Chemical Co., Midland, Mich. An electrolytic apparatus.

1,100,294. System for Preventing Shaft Voltages or Bearing Currents in Electric Machines. W. Frick, assignor to General Electric Co. Depends on setting up counter voltage.

1,100,300. Attachment for the Switches of Electric Lamps. A. Herskovitz, Chicago, Ill. A chain attachment for key sockets. (See cut.)

1,100,336. Miner's and Like Electric Safety Lamp. P. Wolf, Zwickau, Germany. An incandescent lamp.

1,100,340. Potential Regulator for Dynamo-electric Machines. V. G. Apple, assignor to The Apple Electric Co., Dayton, O. Means for intermittently interrupting field resistance.

1,100,357. Telegraphic Transmitter. P. D. Delany, South Orange, N. J. An automatic transmitter.

1,100,382. Signaling System. M. Levison, assignor to Chicago Signal Co., Chicago, Ill. A hospital signaling system.

1,100,383. Thermostat. G. W. Lorimer, assignor to W. R. Keve, Piqua, O. An electric thermostat with testing means.

1,100,385. Control System for Automatic Telephone Switches. F. R. McBerty, assignor to Western Electric Co., New York, N. Y. Includes use of driving motor.

1,100,407. Electric Control System. H. A. Steen, assignor to Allis-Chalmers Mfg. Co. A disk contact-making device.

1,100,408. Interbraced Pantograph Trolley. J. A. Townsend, Pasadena, Cal. Pivotal axes in parallel planes, the axes being in angular relation.

1,100,413. Selective Impulse Transmitter. J. A. Wotton, assignor to Western Electric Co., New York, N. Y. A disk impulse transmitter.

1,100,428. Circuit-Controlling Device. C. C. Graves, assignor to Western Electric Co. A vibrator.

1,100,437. Fixture-Supporting Attachment. W. Lutz and A. D. Doe, Chicago, Ill. A metallic bar suspension.

1,100,480. Telephone Equipment. W. M. Harlson and J. F. Pilkington, Dallas, Tex. Includes use of signal lamp with automatic telephone instrument.

1,100,485. Shield for Circuit Closers. J. F. Kelly, Pittsfield, Mass. For electrically operated musical instruments.

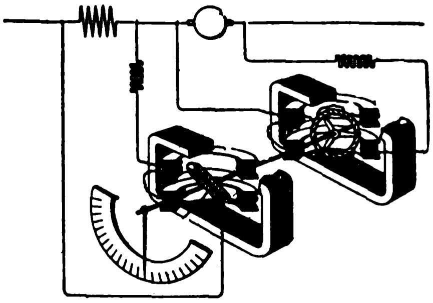
1,100,501. Electromagnetically Controlled Keyboard for Perforating Apparatus. B. Soldatencow, Paris, France. A solenoid-operated device.

1,100,505. Electric Outlet Fitting. G. B. Thomas, assignor to The Bryant Electric Co., Bridgeport, Conn. A concealed-lamp fitting.

1,100,515. Electric Switch. J. M. S. Anderson, assignor to The Perkins Electric Switch Mfg. Co., Bridgeport, Conn. A snap switch with provision to insure operation upon wearing away of parts.

1,100,542. Trolley Guard. R. Dac, Passaic, N. J. Pivoted horns extend beyond trolley wheel.

1,100,556. Electrical Egg Tester. A. E. Graves, Lenexa, Kans. An incandescent-lamp tester.



1,100,280.—Speed Indicator.

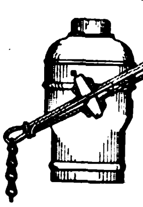
1,100,567. Dynamo-Electrical Machine. W. Horr, Erdington, Birmingham, England. An interpole dynamo.

1,100,584. Means for Regulating Electric Lamp Circuits. H. Leitner, London, England. An automatic rheostat.

1,100,585. Electric Heating Coil. C. C. Lillibridge, Hutchinson, Kans. Covers details.

1,100,633. Alarm Lock. C. C. Tuch, Honolulu, Hawaii. An electric-bell alarm.

1,100,644. Electric Train-Control System. A. J. Allard, Richmond, Va., assignor of one-third to T. F. Green and one-third to D. R. Creecy, Jr. A solenoid-control system.



1,100,300.—Key Attachment.

1,100,648. Electric Agitator. H. F. Bennett, Chicago, Ill. Covers details of soda-fountain agitator.

1,100,650. Spark-Plug. W. M. T. Besson, Selma, Ala., assignor of one-half to H. A. Vaughan. Covers details.

1,100,651. Alternating-Current Magneto for Ignition and Combustion Engines. G. A. Briggs, Elkhart, Ind. An ignition generator and circuit-breaker.

1,100,680. Socket or Base of Trolley Poles for Electric Traction Systems. E. M. Munro, London, England, assignor of one-half to The R. E. T. Construction Co. Covers details.

1,100,681. Electric Lock and Alarm Apparatus. O. Nitsch, Harburg-on-the-Elbe, Germany. A door lock and bell alarm.

Reissue, 13,748. Original, 1,029,980. Insulator. J. Ellis, St. James, Mo. Covers details of shape.

Reissue, 13,750. Original, 1,016,268. Circuit-Controlling Device. W. B. Hughes, assignor to Elevator Supply & Repair Co., Chicago, Ill. An automatic circuit closer.

Reissue, 13,753. Original, 1,056,921. System of Control for Dynamo-Electric Machines. J. N. Mahoney, assignor to Westinghouse Electric Mfg. Co. A liquid-rheostat control.

Patents Expired.

The following United States electrical patents expired June 22, 1914:

584,785. Electric Gas-Lignting and Extinguishing Apparatus. G. F. Krieger, Kiel, Germany.

584,798. Burglar Alarm. H. M. Sutton and W. L. Steele, Dallas, Tex.

584,810. Telephone Transmitter. R. S. Barnum, Chicago, Ill.

584,819. Telephone Annunciator, Call Bell and Fire Alarm. M. Garl, Akron, Ohio.

584,823. Combined Bracket and Insulator. G. W. Mead, Shellsford, Tenn.

584,843. Automatic Switch for Electric Circuits. R. Belfield, London, England.

584,848. Electromagnet. C. F. Bostian, Milton, Pa.

584,853. Therapeutic Electric-Current Generator. E. W. Chellis, Erie, Pa.

584,856. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

584,867. Arc-Lamp Carbon. T. M. Foote, Chicago, Ill.

584,868. Telephone. J. T. Gent, A. W. Staveley and I. H. Parsons, Leicester, England

584,871. Telephone Bracket. A. Y. Gordon, Massillon, O.

584,873. Electric Railway. F. W. Hunter, Cranford, N. J.

584,879. Coin-Freed Electric Meter. G. Knight and G. Ellis, Southsea, England.

584,911. Electric-Railway System. G. Westinghouse, Jr., Pittsburgh, Pa.

584,912. Brush Holder for Dynamos. J. H. Yearsley, Philadelphia, Pa.

584,918. Electric-Railway Trolley. E. M. Bentley, New York, N. Y.

584,936. Electric Conductor. I. W. Henry, New York, N. Y.

584,957. Electrotherapeutical Apparatus. F. J. Patten, New York, N. Y.

584,983. Electric Arc Lamp. A. Bureau, Brussels, Belgium.

585,018. Mining Machine. H. H. Bliss, Washington, D. C.

585,019. Apparatus for Electric Thermal Treatment of Metals, Ores, Etc. G. D. Burton, Boston, Mass.

585,030. Magnetic Circuit-Breaker. W. E. Harrington, Philadelphia, Pa.

585,026. Tieless Insulator. R. Delery, New Orleans, La.

585,040. Method of Melting Iron by Means of Electricity. C. G. P. De Laval, Stockholm, Sweden.

585,047. Conductor for Underground Electric Railways. C. Petersen, San Francisco, Cal.

585,072. Auxiliary Fire-Alarm System. R. E. Alexander, Yonkers, N. Y.

585,137. Multiple-Filament-Regulating Incandescent Lamp. C. Truitt, Columbia, Mo.

585,138. Electrical Alarm for Door Locks. P. V. Vandervelde, Corona, N. Y.

585,160. Method of and Machine for Electric Welding. R. D. Eyre, Johnstown, Pa.

Reissue. 11,613. Insulated Support for Contact Rails. A. Hanson and J. R. Chapman, Chicago, Ill.

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